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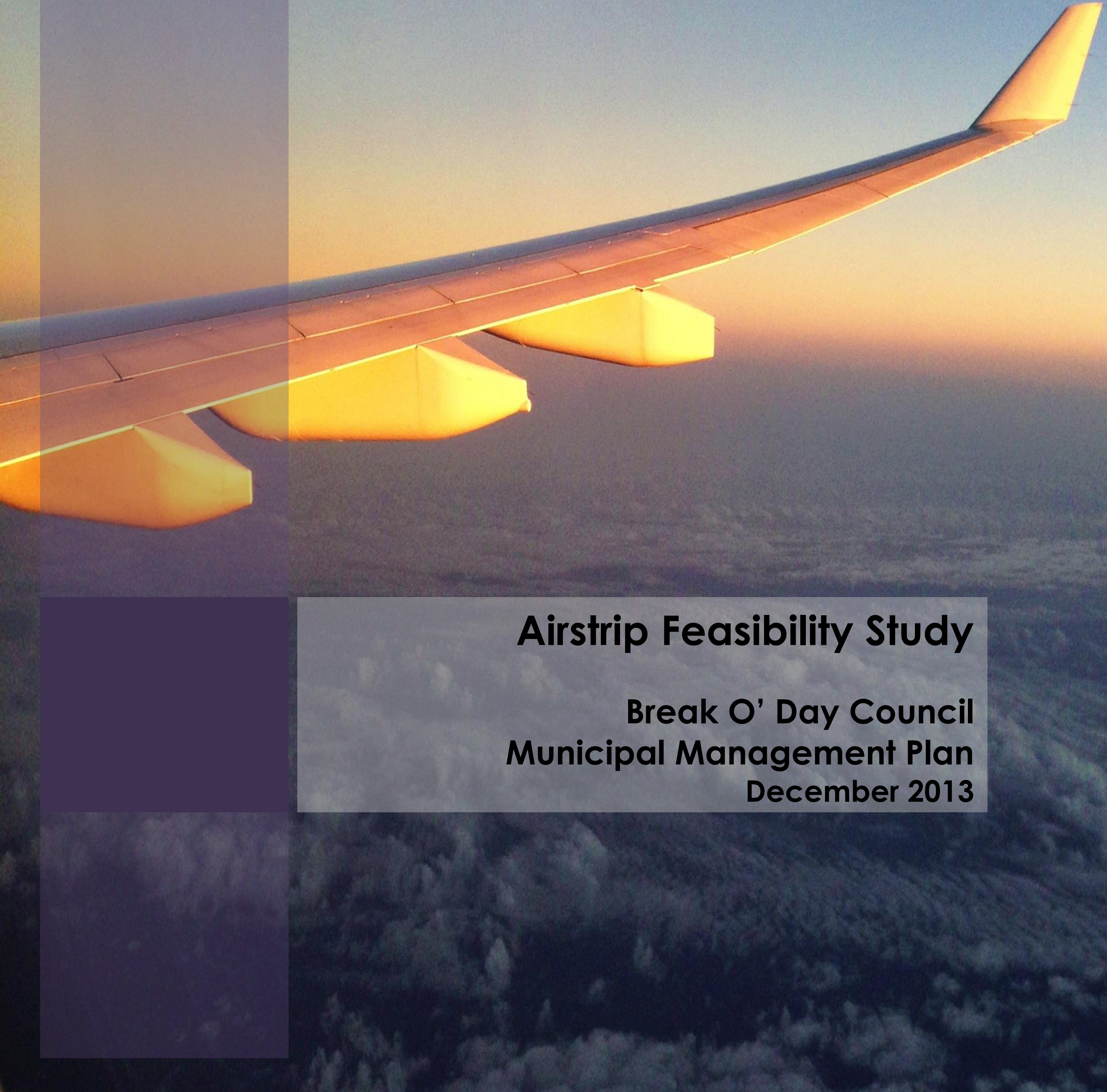

Airstrip Feasibility Study

Break O' Day Council
Municipal Management Plan

December 2013

Part A

Technical Planning & Facility Upgrade

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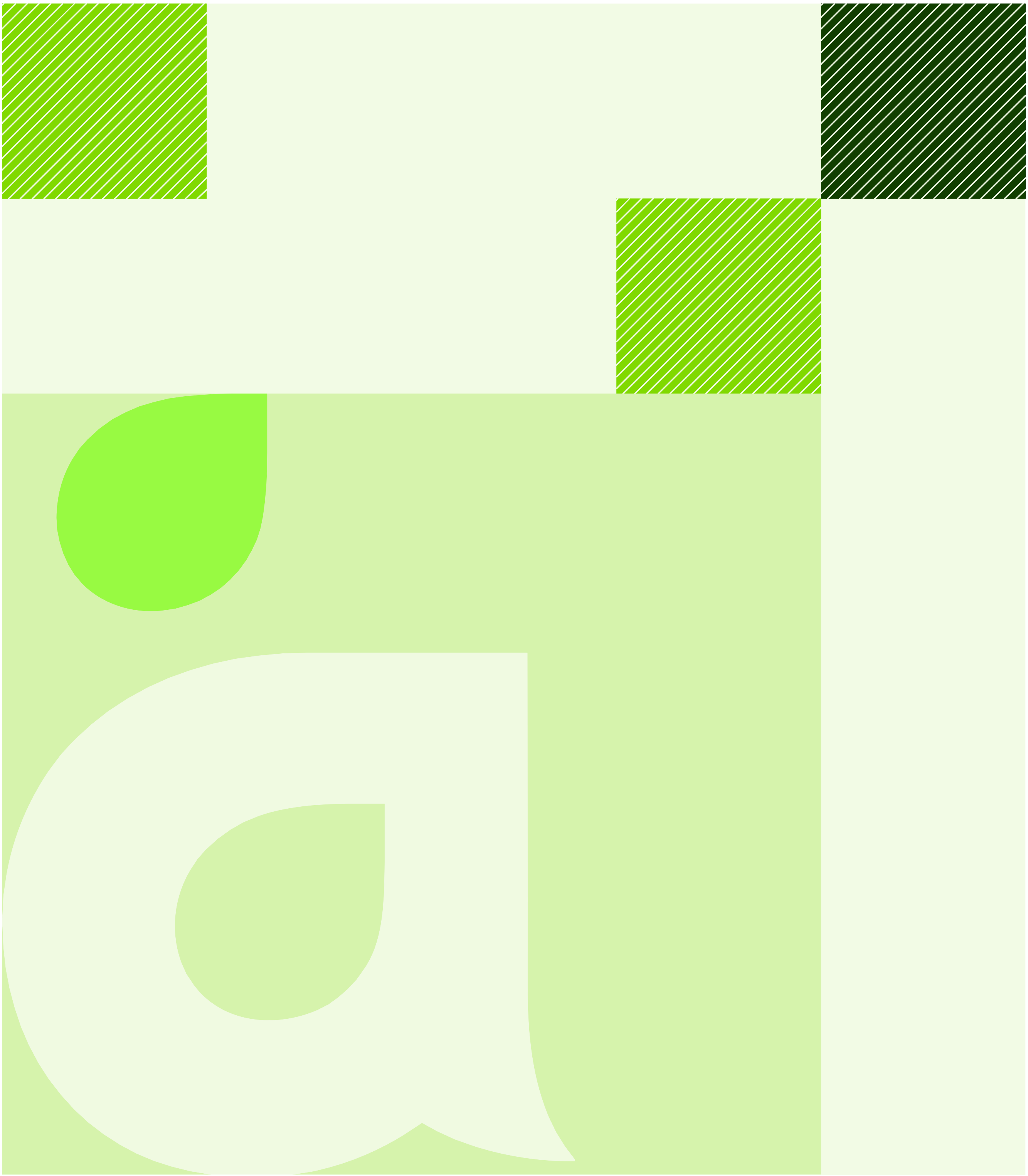

Project: St Helens Aerodrome

Technical Planning and Facility Upgrade Report

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Contents

Appendices

Appendix A

Figures

Appendix B

Geotechnical Investigation

Appendix C

Correspondence

Glossary of Terms and Abbreviations

The following glossary has been provided to facilitate the reading and understanding of the report.

ARC	Aerodrome Reference Code
ARFL	Aeroplane Reference Field Length
CBR	California Bearing Ratio
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
GA	General Aviation (*GA operations include non-scheduled airlines, charter, private flying, pilot training, aircraft testing, ferrying and aerial work).*
GPS	Global Positioning System
GSE	Ground Support Equipment
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IWDI	Illuminated Wind Direction Indicator
MOS Part 139	Manual of Standards Part 139 – Aerodromes (CASA)
MTOW	Maximum Take-Off Weight
NDB	Non-Directional Beacon
OLS	Obstacle Limitation Surface
PAL	Pilot Activated Lighting
PCN	Pavement Classification Number

1 Introduction

1.1 Background

Break O'Day Council (BODC) is investigating options to upgrade the existing airside infrastructure/facilities at St Helens Aerodrome (including the Runway (and associated lighting), Taxiway and Apron) in order to achieve compliance with Civil Aviation Safety Authority (CASA) regulations for existing aircraft operations (up to Code 1B – Royal Flying Doctor Service Beechcraft King Air 200), as well as future aircraft operations up to Code 3C.

Aurecon was commissioned as a sub-consultant to TCG Planning in November 2012 to undertake a desk top Technical Planning and Facility Upgrade Report for St Helens Aerodrome. In conjunction with the study a desktop 'project engineering constraint identification register' has been compiled identifying specific site or aerodrome engineering constraints that may impact on undertaking the detailed design and construction works associated with potential infrastructure/facility upgrades in the future.

1.2 Scope of Report

The objectives of this report are to:

- Provide BODC with general information on the appropriateness of the existing St Helens Aerodrome site to accommodate the potential future expansion of the aerodrome (including access);
- Review the existing St Helens Aerodrome site in terms of runway orientation and length and ascertain if they meet aerodrome operational requirements, including those related to the prevailing winds, topography and environmental conditions;
- Provide BODC with preliminary upgraded runway length, taxiway and apron requirements and aerodrome plan layout for a range of aircraft travelling from other intrastate and interstate locations to St Helens Aerodrome based on Code 1B aircraft operations (short term) with consideration of possible Code 3C aircraft operations (ultimate long term);
- Provide BODC with preliminary airside flexible (bituminous spray seal) pavement design options to cater for the range of aircraft travelling from other Australian interstate locations to St Helens Aerodrome;
- Provide BODC with a project engineering constraint identification register; and
- Provide BODC with preliminary indicative engineering budget estimates for the construction of the airside upgrade works (+/- 30% accuracy).

Aurecon's scope of work for this Technical Planning and Facility Upgrade Report specifically excluded the following tasks:

- Any detailed design;
- Provision for future planning and infrastructure expansion except where specifically stated;

  - Any additional statutory, regulatory (including any liaison with State Government), planning, CASA or environmental requirements not associated with the concept upgrade requirements;
  - Consideration of any aerodrome operational aspects (except where specifically stated);
  - Consideration of any navigation aids (except where specifically stated);
  - Detailed consideration of aircraft operational matters including:
    - Airspace;
    - Take-off and approach tracks;
    - GPS approaches;
    - PANS-OPS Surfaces;
    - Noise and noise abatement procedures; and
    - Obstacle Limitation Surfaces.
- Project planning with stakeholders or aerodrome users;
- Risk assessments;
- Traffic assessments;
- Services proving, upgrading or relocation requirements;
- Feature and level surveys;
- Geotechnical investigations;
- Major drainage studies, investigations or modelling; and
- Environmental studies and investigations (including soil contamination and remediation).

1.3 Limitations

This report has been prepared by Aurecon Pty Ltd at the request of TCG Planning and it is to be solely for use by BODC.

Aurecon does not accept any legal liability or responsibility in respect of the use of the report for any purpose other than the purpose specified above.

In particular, the following specific limitations of this report are to be noted:

- Comments, conclusions and recommendations are provided strictly on the basis that Aurecon takes no responsibility and disclaims all liability whatsoever (including pursuant to the law of Tort or otherwise) for any loss or damage that the BODC or others may suffer as a result of using or relying on any information given to us by the BODC or other parties;
- Information provided by third parties has not been verified; and
- No detailed feature and level survey or geotechnical information relating to the site has been considered in the study.

If the BODC becomes aware of any inaccuracy, or change to any of the facts, findings or assumptions made in our report, it is strongly recommended that Aurecon is notified so that the significance can be assessed and the opportunity is given to review the comments and recommendations.

1.4 Stakeholder Consultation

A stakeholder consultation meeting was conducted on 17 January 2013 at the BODC Chambers in St Helens with the following in attendance:

BODC: Des Jennings – General Manager

BODC: Chris Hughes – Manager Community Services and MMP Coordinator

BODC: Risden Knightly – Consultant Works Manager

BODC: Anita Lewis – Planning Officer

Aurecon: Simon Oakley – Senior Airport Engineer

1.5 References

The following references have been used in undertaking this Technical Planning and Facility Upgrade Report.

1. Civil Aviation Safety Authority (CASA)
   “Manual of Standards (MOS) Part 139 – Aerodromes”
   Version 1.10 – May 2012

2. CASA – Civil Aviation Order (CAO)
   CAO 20.7.1B – Aeroplane Weight and Performance Limitations – Specified Aeroplanes above 5,700kg – All Operations (Turbine and Piston Engined)
   10 June 2005

3. CASA – Civil Aviation Advisory Publications (CAAPs) – various

4. CASA – Advisory Circulars (ACs) – various

5. International Civil Aviation Organisation (ICAO)
   Annex 14 to the Convention on International Aviation
   Volume I - "Aerodrome Design and Operations”
   Fourth Edition, July 2004 (including Amendments 7, 8 and 9)
      Aerodrome Design Manual Part 1 – Runways
      Aerodrome Design Manual Part 2 – Taxiways, Aprons and Holding Bays
      Aerodrome Design Manual Part 3 – Pavements
      Aerodrome Design Manual Part 4 – Visual Aids
      Aerodrome Design Manual Part 5 – Electrical Systems
      Airport Services Manual Part 9 – Airport Maintenance Practices

6. International Air Transport Association (IATA)
   “Airport Development Reference Manual”
   9th Edition, January 2004

7. Federal Aviation Administration (FAA)
   Advisory Circulars – various

8. Australian Standards – various

9. Break O’Day Council
   “Interim Planning Scheme 2013”
   Version 3 – May 2013

10. Break O’Day Council
    “Draft Interim Planning Scheme 2011”
    Draft Version 7 – 16 March 2012

11. Break O’Day Council
    “Break O’Day Council Planning Scheme 1996”

Version – 1996 including 01/03 amendment

12. Break O'Day Council
    "Draft Interim Planning Scheme 2011"
    Informal Draft Version – 22 January 2013

13. Vision East 2030 (partnership)
    "The East Coast Land Use Framework"
    December 2009

2 Basis for Planning

2.1 Planning Criteria

The planning criteria for aerodrome development may be categorised into a three-tiered structure as follows:

- International standards and recommended practices (ICAO);
- National standards and advisory publications (CASA); and
- Local standards and practices.

The international standards and recommended practices are formalised in Annex 14 to the Convention on International Civil Aviation adopted by the International Civil Aviation Organisation (ICAO) under the provisions of the Convention. In addition, ICAO publishes a number of Aerodrome Design Manuals and Airport Services Manuals.

National standards and advisory publications are published by the Australian Civil Aviation Safety Authority (CASA) which administers the Civil Aviation Act (1988) through the Civil Aviation Safety Regulations (CASRs) and the Manual of Standards (MOS).

The Manual of Standards Part 139 – Aerodromes (MOS Part 139) is a CASA policy manual, made in pursuant to Civil Aviation Safety Regulations CASR Part 139. CASR Part 139 sets out the regulatory regime of aerodromes used by aeroplanes conducting regular public transport operations. The regulatory regime provides for aerodromes to be certified or registered.

MOS Part 139 sets out the standards and operating procedures for certified and registered aerodromes, as well as for other aerodromes used for regular public transport operations.

2.2 Aerodrome Reference Code

The planning and design of various aerodrome facilities is controlled by mandatory standards based on the selected Aerodrome Reference Code for each particular airport. The intent of the Aerodrome Reference Code is to provide a simple method for inter-relating the numerous specifications concerning the characteristics of aerodromes so as to provide a series of aerodrome facilities that are suitable for the aeroplanes that are intended to operate at the aerodrome.

The code is composed of two elements that are related to the aeroplanes performance characteristics and dimensions. Element 1 is a number based on the aeroplanes reference field length. Element 2 is a letter based on the aeroplane wing span and outer main gear wheel span.

For Taxiway and Apron works, the various geometric standards are controlled by Code Element 2. The code letter for Element 2 is determined from **Table 1**, Column 3, by selecting the code letter which corresponds to the greatest wing span, or the greatest outer main gear wheel span, whichever gives the more demanding code letter of the aeroplanes for which the facility is intended. For instance, if code letter C corresponds to the aeroplanes with the greatest wing span and code letter D corresponds to the aeroplanes with the greatest outer main gear wheel span, the code letter selected would be “D”.

The Aerodrome Reference Codes for various aircraft are shown in **Table 1**.

Table 1: Aerodrome Reference Codes (Source: MOS Part 139)

Code Element 1		Code Element 2		
Code Number	**Aeroplane Reference Field Length**	**Code Letter**	**Wing Span**	**Outer Main Gear Wheel Span (a)**
1	Less than 800 m	A	Up to but not including 15 m	Up to but not including 4.5 m
2	800 m up to but not including 1,200 m	B	15m up to but not including 24 m	4.5 m up to but not including 6 m
3	1,200 m up to but not including 1,800 m	C	24 m up to but not including 36 m	6 m up to but not including 9 m
4	1,800 m and over	D	36 m up to but not including 52 m	9 m up to but not including 14 m
		E	52 m up to but not including 65 m	9 m up to but not including 14 m
		F	65 m up to but not including 80 m	14 m up to but not including 16 m

a. Distance between the outside edges of the main gear wheels.

Table 2: Aerodrome Reference Code for Various Aircraft

Code 1A	Code 1B	Code 1C	Code 1D	Code 1E	Code 1F
Beech 23-100 Britten BN2 Cessna 152-421 Fuji FA200-180 Grumman G164 Mitsubishi MU2 Piper PA18-PA60 Pitts 2A	Beech 80 Beech 90 Beech 200 Cessna 402 Cessna 414 Cessna 441 Dornier D0228 DHC-6 Twin Otter	DHC-4 Caribou DHC-7	DHC-5E		
Code 2A	**Code 2B**	**Code 2C**	**Code 2D**	**Code 2E**	**Code 2F**
Lear Jet 24F Lear Jet 28/29	Beech 1900 Casa C212 Embraer EMB110 Shorts SD3-30 Metro III	DHC-8 ATR42 Cessna 550			
Code 3A	**Code 3B**	**Code 3C**	**Code 3D**	**Code 3E**	**Code 3F**
BAe125-400 Dassault DA-10 Lear Jet 25D Lear Jet 36A Lear Jet 55 IAI 1124 Westwind	BAe125-800 Canadair CL600 Canadair CRJ-200 Cessna 650 Dassault DA-20 Dassault DA-50 Dassault Falcon 900 EMB145 F28 – 2000 Shorts SD3-60	BAe146 BAe748 BAe Jetstream 31 BAe Jetstream 41 DC-3 DC-9-20 EMB120 EMB170 F27-500 F28-3000 /4000 F50 F100 Saab SF340	Airbus A300 B2 Q400		
Code 4A	**Code 4B**	**Code 4C**	**Code 4D**	**Code 4E**	**Code 4F**
		Airbus A320 Airbus A321 B717 B727 B737 Concorde DC-9/MD80 EMB190	Airbus A300 Airbus A310 B707 B757 B767 DC-8 DC-10/MD11 Lockheed L100 (C130) Lockheed L188 Lockheed L1011	Airbus A330 Airbus A340 B747 B747 SP B777	Airbus A380

2.3 Standard for St Helens Aerodrome

The ultimate design aircraft for the concept airside layout and upgrade options at St Helens Aerodrome is the SAAB 340 aircraft. Therefore, the appropriate planning standards (Aerodrome Reference Code) for the Runway, Taxiway and Apron area are ultimately **Code 3C**, however as part of a staged upgrade (refer to **Section 4.2**), **Code 1B** may be considered as the initial standard (Beechcraft King Air 200).

Although the Beechcraft King Air 200 is technically a **Code 1B** aircraft as stated in **Table 2**, based on the aircraft operators likely operational procedures, only aerodromes with a runway length greater than 900m are generally considered suitable for Beechcraft King Air 200 operations. Considering this, an Aerodrome Reference **Code 2B** shall be adopted for the Beechcraft King Air 200 for planning and design purposes.

The Royal Flying Doctor Service and their alternate operators have a range of aircraft including small jets. The jets are currently only used for interstate medical patient transfers and therefore have not been considered as part of this Technical Planning and Facility Upgrade Report. The Beechcraft King Air 200 and occasionally the Beechcraft King Air 350 model aircraft are the only likely aircraft to service St Helens considering its proximity to Launceston and Hobart. The Beechcraft King Air 350 has comparable operational characteristics to the 200 model aircraft and is marginally larger dimensionally.

Table 3 provides relevant information on current and potential future aircraft applicable to St Helens Aerodrome.

Table 3: Aircraft Identification Guide (Source: Various)

Designator	Code	ARFL (m)	Wingspan (m)	Length (m)	OMGWS (m)	MTOW (kg)	Approximate Passengers
PA-31	1A	650	12.4	10.6	< 4.5	3,175	8
AT-802	1B	650	18.1	11.0	3.1	7,257	N/A
M-18 Dromader	1B	400	17.7	9.47	NA	5,300	N/A
Ayres S-2R Thrush	1B	<800	13.5	8.95	NA	2,720	N/A
BE20	1B	< 1,200	16.6	13.4	5.23	5,670	8
Metro III	2B	995	17.4	18.1	5.4	6,600	19
DHC8-100	2C	950	25.9	22.3	8.5	15,650	36
DHC8-300	2C	1,122	27.4	25.7	8.5	18,642	45
SAAB 340	3C	1,220	21.4	19.7	7.5	13,155	38

2.4 Geometric Design Criteria

Geometric design requirements for Code 1B, 2B, 2C and 3C are shown in **Table 4**.

Table 4: Code 1B, 2B, 2C and 3C Runway, Taxiway and Apron Design Standards (Source: MOS Part 139)

Facility	Item	Code 1B Requirements	Code 2B Requirements	Code 2C Requirements	Code 3C Requirements
Runway	Runway Width	18m (See Note 1)	23m	30m	30m
	Longitudinal Slope (overall)	2% max	2% max	2% max	1% max
	Longitudinal Slope (any portion)	2% max	2% max	2% max	1.5% max
	Longitudinal Slope Change	2% max	2% max	2% max	1.5% max
	Rate of Change of Longitudinal Slope	0.4% per 30m	0.4% per 30m	0.4% per 30m	0.2% per 30m
	Runway Sight Distance	2m to 2m over half runway length 3m to ground over 600m	2m to 2m over half runway length 3m to ground over 600m	3m to 3m over half runway length 3m to ground over 600m	3m to 3m over half runway length 3m to ground over 600m
	Transverse Slope	1.5% min 2.0% preferred 2.5% max	1.5% min 2.0% preferred 2.5% max	1.0% min 1.5% preferred 2.0% max	1.0% min 1.5% preferred 2.0% max
Runway Shoulders	Shoulder Width	N/A	N/A	N/A	3m
	Transverse Slope	N/A	N/A	N/A	2.5% max (down)
Runway Strip	Runway Strip Length	30m beyond Runway End	60m beyond Runway End	60m beyond Runway End	60m beyond Runway End
	Graded Runway Strip Width	60m (See Note 2 and 3)	80m (See Note 4)	80m (See Note 4)	90m
	Runway Strip Width	90m	90m	90m	90m (minimum)(see Note 5)
	Longitudinal Slope	2% max	2% max	2% max	1.75% max
	Longitudinal Slope Change	2% max	2% max	2% max	2% max
	Transverse Slope	3% max (can be 5% in first 3m adjacent to the runway shoulder)	3% max (can be 5% in first 3m adjacent to the runway shoulder)	3% max (can be 5% in first 3m adjacent to the runway shoulder)	2.5% max (can be 5% in first 3m adjacent to the runway shoulder)

Facility	Item	Code 1B Requirements	Code 2B Requirements	Code 2C Requirements	Code 3C Requirements
Runway End Safety Area (RESA)	Length	N/A	N/A	N/A	60m min
		N/A	N/A	N/A	90-240m recommended
	Width	N/A	N/A	N/A	60m (twice runway width)
	Longitudinal Slope	N/A	N/A	N/A	5% max (down)
		N/A	N/A	N/A	Below Approach or Take-off Surface (up)
	Transverse Slope	N/A	N/A	N/A	5% max (up or down)
Taxiway	Taxiway Width	10.5m	10.5m	18m (See Note 6	18m (See Note 6)
	Minimum Distance from Outer Wheel to Taxiway Edge	2.25m	2.25m	4.5m (See Note 7)	4.5m (See Note 7)
	Longitudinal Slope	3% max	3% max	1.5% max	1.5% max
	Rate of Change of Longitudinal Slope	1% per 25m	1% per 25m	1% per 30m	1% per 30m
	Taxiway Sight Distance	2m to ground over 200m	2m to ground over 200m	3m to ground over 300m	3m to ground over 300m
	Transverse Slope	1.0% (min)	1.0% (min)	1.0% (min)	1.0% (min)
		2.0% (max)	2.0% (max)	1.5% (max)	1.5% (max)
Taxiway Strip	Taxiway Strip Width	21.5m	21.5m	26m	26m
	Graded Taxiway Strip Width	12.5m	12.5m	12.5m	12.5m
	Transverse Slope	3% max (up)	3% max (up)	3% max (up)	2.5% max (up)
		5% max (down)	5% max (down)	5% max (down)	5% max (down)
Taxiway Minimum Separation Distances	To Another Taxiway Centreline	33.5m	33.5m	44m	44m

Facility	Item	Code 1B Requirements	Code 2B Requirements	Code 2C Requirements	Code 3C Requirements
	To an object	21.5m	21.5m	26m	26m
Apron Minimum Separation Distances	From centreline of Taxilane to object From aircraft wing tip to object	16.5m 3m	16.5m 3m	24.5m 3m	24.5m 4.5m
Apron	Slope on Aircraft Parking Position Slope on Remainder of Apron	1% (max) As level as practicable without causing water to accumulate but 2% (max)	1% (max) As level as practicable without causing water to accumulate but 2% (max)	1% (max) As level as practicable without causing water to accumulate but 2% (max)	1% (max) As level as practicable without causing water to accumulate but 2% (max)

Note 1	May be reduced to 15m for aircraft not exceeding 5,700kg by day or 10m for aircraft not exceeding 2,000kg by day.
Note 2	May be reduced to 30m for aircraft not exceeding 2,000kg by day.
Note 3	Runways used at night are required to have a minimum 80m runway strip width.
Note 4	May be reduced to 60m for aircraft not exceeding 5,700kg by day.
Note 5	Where it is not practicable to provide the full 150m width of runway strip, a minimum 90m wide graded only strip may be provided where the runway is used by up to and including Code 3C aeroplanes, subject to landing minima adjustment.
Note 6	May be reduced to 15m if the taxiway is only intended to serve aircraft with a wheelbase of less than 18m.
Note 7	May be reduced to 3m if the turning area or curve is only intended to serve aircraft with a wheelbase of less than 18m.

2.5 Stormwater Drainage Design Criteria

There are no mandatory requirements for the degree of protection to be afforded to various aerodrome facilities, but Aurecon generally adopts the standards normally used in Australia, which are based on the Department of Housing and Construction Stormwater Drainage Manual recommendations as shown in **Table 5**.

Table 5: Airport Drainage Design Standards

Aerodrome Area	Criterion	Storm Frequency (years)		
		Aerodrome		
		International	Other Jet	Non-Jet
Pavements				
Runways	No ponding	50	50	50
Taxiways	No ponding	50	50	50
Apron	No ponding	10	10	5
Apron	No ponding within 30 m of buildings.	50	20	5
Grassed Areas				
Runway Strip	Ponding within 75 m of runway centreline not to exceed 12 hours.	5	2	-
Taxiway Strip and Apron Flanks	Ponding within 15 m of pavement edge not to exceed 12 hours.	5	2	-
Building Area				
Terminal	No ponding with 0.3 m of ground floor level	100	50	20
Roads, Carparks	No ponding	5	2	-
Other Buildings	No ponding within 0.3 m of ground floor level.	5	2	-

3 Aerodrome Site Selection and Runway Orientation

3.1 General

The existing St Helens Aerodrome site and runway orientation have been assessed based on the following:

- Ultimate Aerodrome Reference Code 3C (to accommodate SAAB 340 aircraft operations) for an instrument, non-precision approach Code 3 runway;
- Consideration of historical metrological information at the existing St Helens Aerodrome site;
- Consideration of the surrounding topography in the area of the existing St Helens Aerodrome site;
- Consideration of the appropriateness of the existing St Helens Aerodrome site to accommodate the future expansion of St Helens (including access);
- Consideration of the Environmental Impact and the appropriateness of the existing St Helens Aerodrome t site (including noise);
- Consideration of the local Land Use Planning Regulations and the appropriateness of the existing St Helens Aerodrome site;
- Consideration that the existing St Helens Aerodrome site, orientation and length of the runway meets the operational requirements, including those related to the existing prevailing winds, average temperatures, topography, potential aircraft performance, potential aircraft weights and environmental conditions.

3.2 Site Information and Data

3.2.1 Meteorological Information and Data

For the purposes of this assessment, historical meteorological information and data has been utilised from the following stations.

Table 4: Bureau of Meteorology Weather Stations in the St Helens area (Source: Bureau of Meteorology)

Station Name	Station Number	Station Opened	Station Closed	Latitude	Longitude	Elevation
St Helens Aerodrome	092120	2001	Not Applicable	-41.3381°	148.2792°	48m
St Helens Post Office	092033	1890	2007	41°19'21"S	148°14'56"E	5m

The St Helens Aerodrome weather station is approximately 3.8km south of the St Helens township, and is located within the airport boundary.

Historical wind data from the St Helens Post Office weather station (Station No. 092033) which recorded wind data from January 1957 to May 2001 has also been analysed in order to ascertain a broader representation of longer term trends in wind direction and speed in the St Helens area.

Wind data from the weather station at Scamander (Station No. 092094) and has been analysed and considered as part of the Technical Planning and Facility Upgrade Report, however details of the analysis are not provided in this study considering the Scamander weather station is approximately 15km from the existing St Helens Aerodrome site.

3.2.2 Wind Data

At St Helens Aerodrome, winds are generally from the north west. The wind direction as a percentage of total observations according to wind speed for St Helens Aerodrome are shown in **Figures 1** and **2** respectively and provided in more detail in **Table 5**. **Table 6** provides a detailed analysis of the wind direction as a percentage of total observations according to wind speed for St Helens Post Office.

Figure 1: Wind Direction Versus Wind Speed in km/h for St Helens Aerodrome (Jan 2001 to Sep 2010 at 09:00 hours) (Source: Bureau of Meteorology Website – Weather Station 092120)

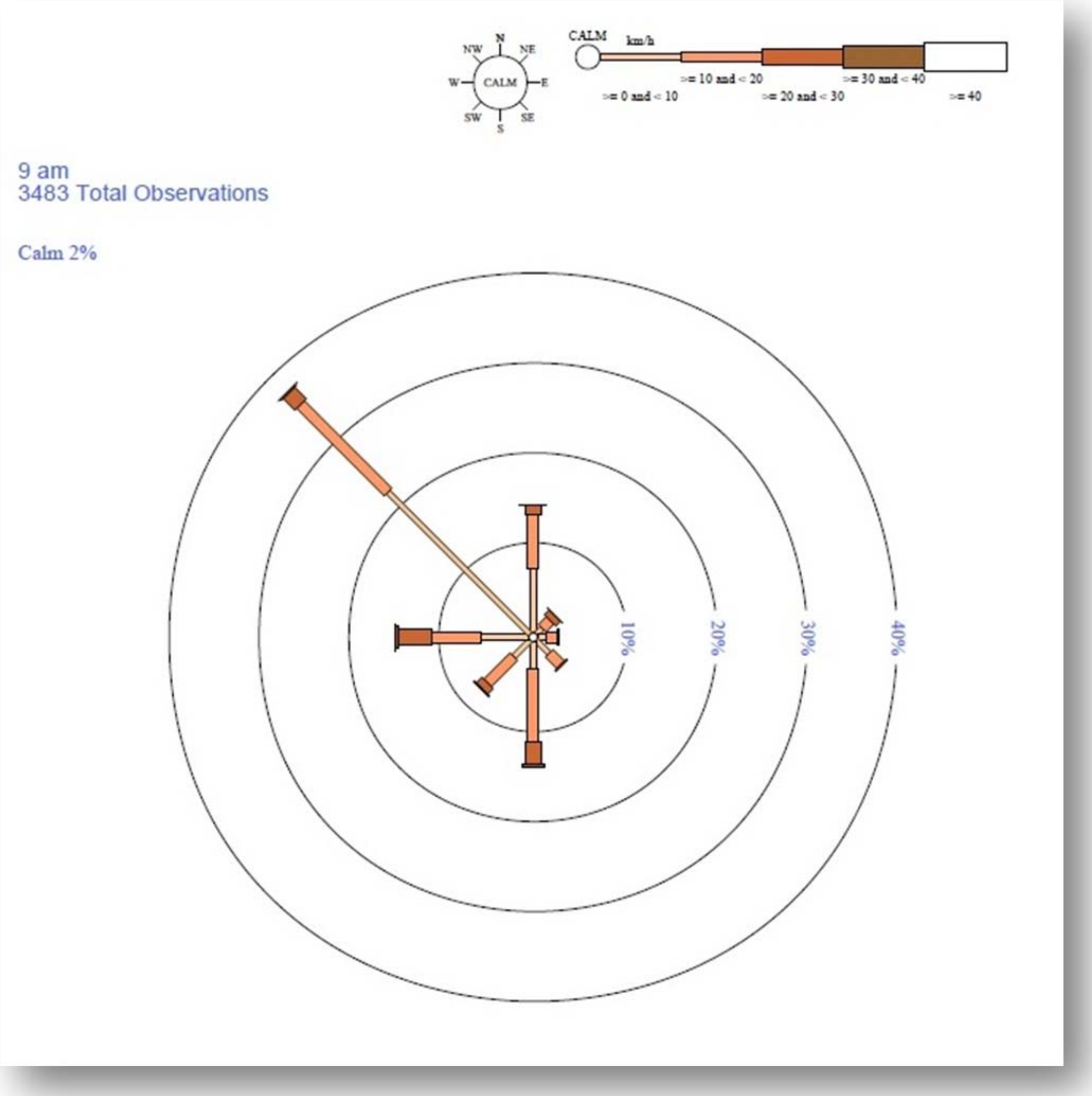


Figure 2: Wind Direction Versus Wind Speed in km/h for St Helens Aerodrome (Jan 2001 to Sep 2010 at 15:00 hours) (Source: Bureau of Meteorology Website – Weather Station 092120)

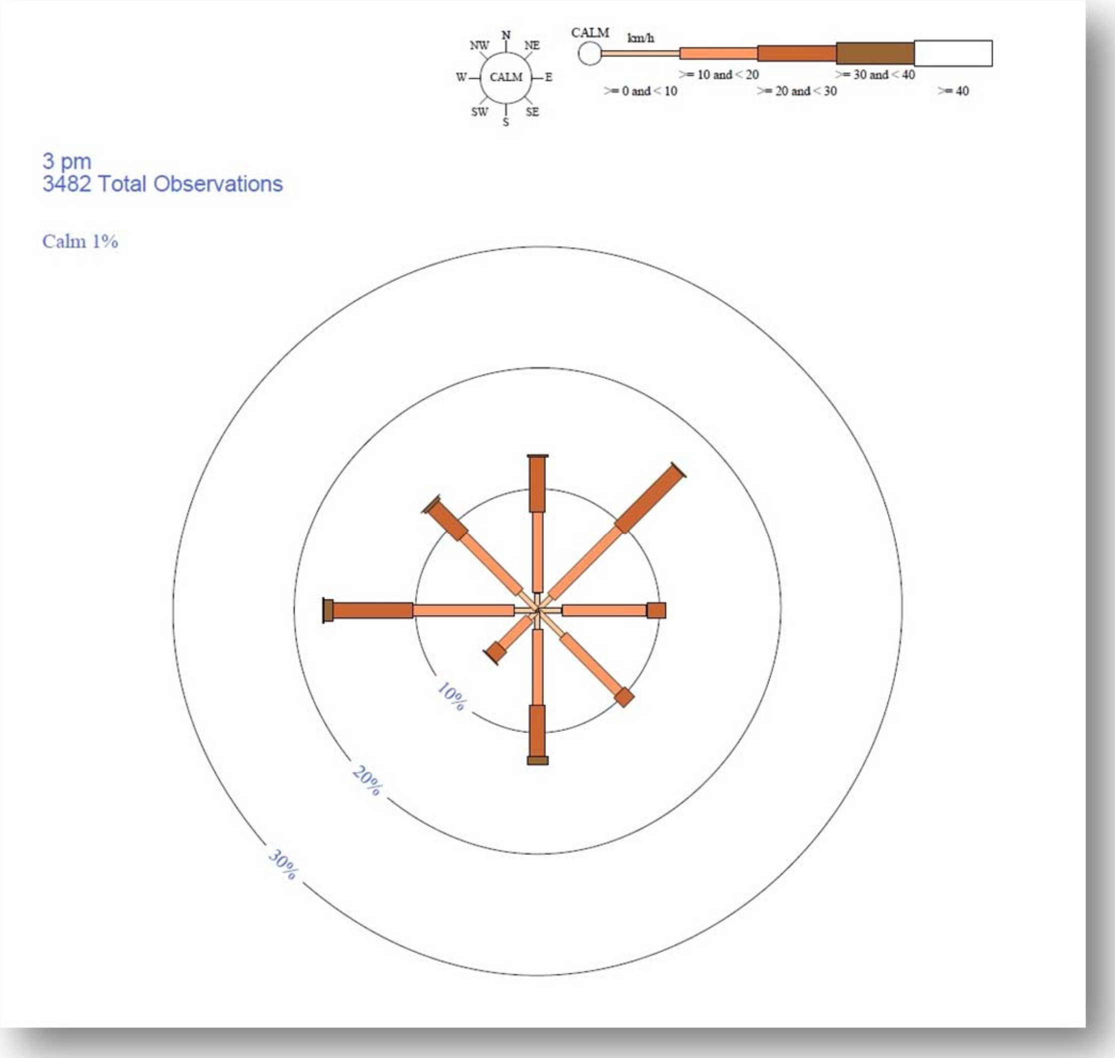


Table 5: Existing St Helens Aerodrome Wind Direction as a Percentage of Total Observations According to Wind Speed (Since 2001) (Source: Bureau of Meteorology 2013 – Weather Station 092120)

Station Name	Number of Observations	Time	Calm	Speed Range	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total	Mean
St Helens Aerodrome	4321	09:00	2.18	1-10 km/h	3.80	1.02	0.37	0.39	0.53	0.53	0.97	1.32	1.69	2.04	1.11	1.23	2.24	5.60	13.58	9.00	**45.43**	**2.84**
St Helens Aerodrome	4321	09:00	2.18	11-20 km/h	2.99	1.60	0.62	0.32	0.69	0.51	0.76	1.97	4.88	3.84	1.48	0.72	2.99	4.44	7.41	5.60	**40.82**	**2.55**
St Helens Aerodrome	4321	09:00	2.18	21-30 km/h	0.51	0.16	0.39	0.35	0.16	0.02	0.14	0.69	1.41	0.72	0.53	0.32	1.69	2.15	0.67	0.69	**10.62**	**0.66**
St Helens Aerodrome	4321	09:00	2.18	>30 km/h	0.02	0.02	0.05	0.02	0.02				0.25	0.02	0.07	0.02	0.21	0.09	0.12	0.02	**0.95**	**0.07**
				Total	**7.31**	**2.80**	**1.43**	**1.09**	**1.41**	**1.06**	**1.87**	**3.98**	**8.24**	**6.62**	**3.19**	**2.29**	**7.13**	**12.29**	**21.78**	**15.32**		

Station Name	Number of Observations	Time	Calm	Speed Range	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total	Mean
St Helens Aerodrome	4319	15:00	0.58	1-10 km/h	0.65	0.72	0.76	0.97	0.81	1.34	1.48	1.37	0.65	0.46	0.37	0.49	0.63	1.25	1.02	0.72	**13.68**	**0.86**
St Helens Aerodrome	4319	15:00	0.58	11-20 km/h	2.36	5.83	4.10	4.10	3.61	2.43	3.08	4.54	3.59	1.41	1.67	1.44	4.51	5.56	3.03	2.76	**54.02**	**3.38**
St Helens Aerodrome	4319	15:00	0.58	21-30 km/h	1.04	5.65	3.70	1.57	0.74	0.02	0.30	2.25	2.73	0.49	0.67	0.76	3.22	4.05	1.67	1.00	**29.87**	**1.87**
St Helens Aerodrome	4319	15:00	0.58	>30 km/h	0.05	0.14	0.07	0.02				0.12	0.44	0.02	0.07	0.07	0.30	0.46	0.09		**1.85**	**0.15**
				Total	**4.10**	**12.34**	**8.64**	**6.67**	**5.16**	**3.80**	**4.86**	**8.27**	**7.41**	**2.38**	**2.78**	**2.76**	**8.66**	**11.32**	**5.81**	**4.47**		

Table 6: St Helens Post Office Wind Direction as a Percentage of Total Observations According to Wind Speed (January 1957 to May 2001) (Source: Bureau of Meteorology 2013 – Weather Station 092033)

Station Name	Number of Observati-ons	Time	Calm	Speed Range	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total	Mean
St Helens Post Office	15036	09:00	22.55	1-10 km/h	2.48	0.53	3.09	0.44	2.53	0.31	4.72	0.69	2.05	0.50	4.68	0.72	9.91	1.76	18.62	1.12	**54.14**	**3.38**
St Helens Post Office	15036	09:00	22.55	11-20 km/h	0.76	0.13	0.49	0.11	0.76	0.17	2.26	0.19	0.69	0.16	0.97	0.07	1.38	0.33	3.96	0.33	**12.76**	**0.80**
St Helens Post Office	15036	09:00	22.55	21-30 km/h	0.20	0.08	0.13	0.05	0.21	0.07	0.95	0.11	0.45	0.06	0.35	0.07	1.09	0.24	2.04	0.13	**6.23**	**0.39**
St Helens Post Office	15036	09:00	22.55	>30 km/h	0.04	0.01	0.04	0.02	0.05	0.02	0.37	0.03	0.13	0.03	0.17	0.03	1.01	0.35	1.97	0.05	**4.32**	**0.27**
				Total	**3.48**	**0.75**	**3.76**	**0.61**	**3.54**	**0.57**	**8.31**	**1.02**	**3.32**	**0.74**	**6.17**	**0.90**	**13.39**	**2.68**	**26.58**	**1.63**		
Station Name	**Number of Observati-ons**	**Time**	**Calm**	**Speed Range**	**N**	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**WNW**	**NW**	**NNW**	**Total**	**Mean**
St Helens Post Office	13469	15:00	5.18	1-10 km/h	2.23	0.87	6.52	1.17	6.97	0.89	6.65	0.79	1.96	0.34	2.99	0.29	3.44	0.65	10.49	0.76	**47.01**	**2.94**
St Helens Post Office	13469	15:00	5.18	11-20 km/h	1.75	0.68	2.82	0.45	3.56	0.36	3.77	0.42	0.97	0.12	1.01	0.12	2.15	0.44	5.99	0.47	**25.06**	**1.57**
St Helens Post Office	13469	15:00	5.18	21-30 km/h	0.85	0.48	1.28	0.23	0.72	0.25	2.26	0.29	0.62	0.08	0.58	0.10	1.50	0.56	3.88	0.30	**13.98**	**0.87**
St Helens Post Office	13469	15:00	5.18	>30 km/h	0.28	0.19	0.29	0.04	0.07	0.03	0.96	0.16	0.27	0.04	0.17	0.15	1.78	0.67	3.52	0.15	**8.76**	**0.55**
				Total	**5.12**	**2.21**	**10.91**	**1.88**	**11.31**	**1.53**	**13.65**	**1.66**	**3.82**	**0.58**	**4.75**	**0.66**	**8.87**	**2.32**	**23.88**	**1.68**		

From **Table 5** it is observed that at 09:00 hours at St Helens Aerodrome, the wind predominately comes from the north west and south east approximately 24% of the time, and the wind speed at 09:00 hours is between 10km/h to 30km/h approximately 52% of the time. The northerly and southerly wind components (WNW, NW, NNW, ESE, SE, and SSE – range of 45° north and 45° south) account for approximately 56% of the total wind direction at 09:00 hours.

From **Table 5** it is observed that at 15:00 hours at St Helens Aerodrome, the wind direction varies, with the majority of winds coming from a general northerly direction. The wind speed at 15:00 hours is between 10km/h to 30km/h approximately 84% of the time. The west north westerly wind components (W, WNW, NW) account for approximately 26% of the total wind direction at 15:00 hours. The north easterly wind components (NNE, NE, ENE) account for approximately 28% of the total wind direction at 15:00 hours.

Through analysis of the wind direction as a percentage of total observations according to wind speed for St Helens Aerodrome, the preferred alignment of the runway for the St Helens is within the range west north west/north west/north north west. This corresponds to a runway designation of 11/29, 12/30, 14/32 or 16/34, with 12/30 or 14/32 being the preferred designation. It is noted that runway designations of 13/31 are not used to avoid pilot confusion.

ICAO Annex 14 states that the runway should be orientated such that it may be used by the aircraft it is intending to serve 95% of the time, considering that for a runway which is intending to serve aircraft with an ARFL greater than1,500m in length, it would not be useable for winds greater than 37km/h (20kt). As illustrated in **Table 5**, the wind in any direction greater than 30km/h occurs approximately only 1.4% of the time (on average).

For aircraft with an ARFL less than1,500m, the runway would not be useable for winds greater than 24km/h (13kt). As illustrated in **Table 5**, the wind in any direction greater than 21km/h occurs approximately 21.6% of the time (on average). Therefore for smaller jet aircraft and turbo prop aircraft, the preferred orientation is in the north west/south east direction in order to maximise the centreline component of the prevailing wind during take-off and landing (to minimise the roll effect).

3.2.3 Temperature and Rainfall Data

At St Helens Aerodrome, the warmest months are from November to March, with an average maximum temperature above 20°C. The mean maximum and minimum temperatures and mean rainfall data for St Helens Aerodrome are shown in **Figures 3** and **4** respectively. St Helens experiences maximum rainfall in August and November. It is noted that the St Helens weather station has only been operational since 2001, which is a relatively short period of time for historical climate data, however for the purposes of this Technical Planning and Facility Upgrade Report the data sourced is considered representative of longer term trends in the climate at St Helens Aerodrome.

Figure 3: Mean Minimum and Maximum Temperature Data for St Helens Aerodrome (Since 2001) (Source: Bureau of Meteorology Website – Weather Station 092120)

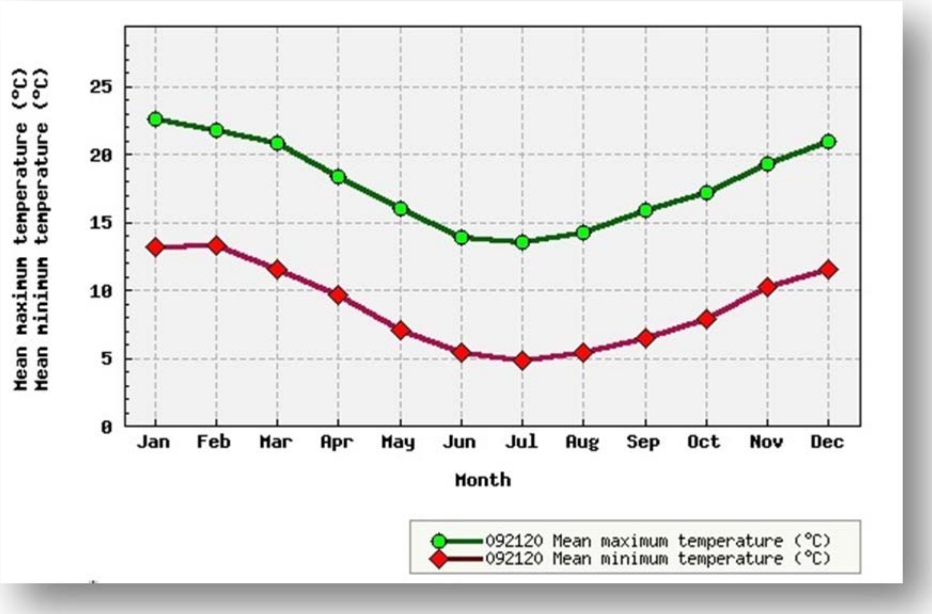
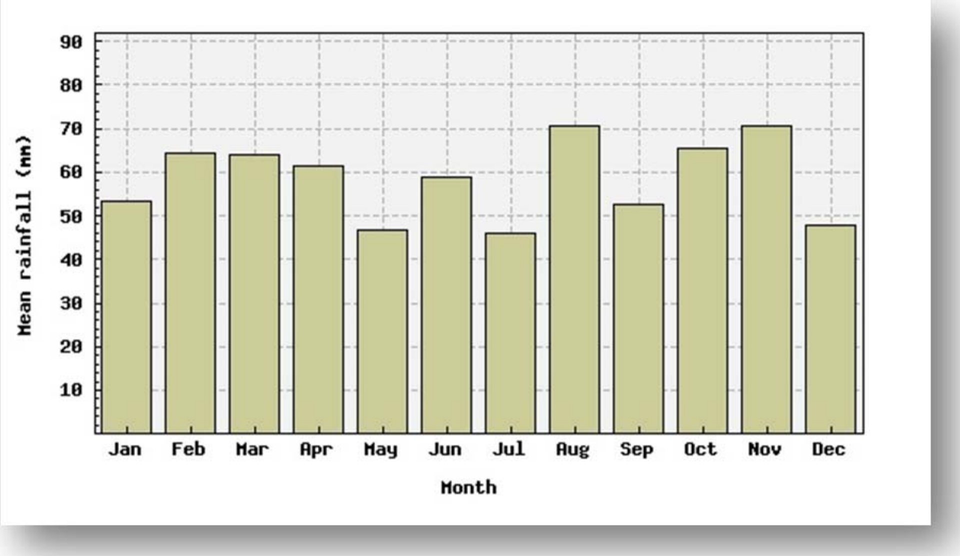


Figure 4: Mean Rainfall Data for St Helens Aerodrome (Since 2001) (Source: Bureau of Meteorology Website – Weather Station 092120)



3.2.4 Geotechnical Information and Data

Limited existing geotechnical information and data was available for the current St Helens Aerodrome site prior to 2013.

Based on historical geological information which is publically available (North Eastern Tasmania Geological Mapping – Mineral Resources Tasmana – Reference AGD66/AMG Zone 55), it is observed that the subgrade in the area had a range of tertiary sediments which were generally non-marine sequences of gravels, sands, silts, clays and regolith, with outcrops of grandodiorite nearby. Although the current St Helens Aerodrome site is approximately 50m above sea level, it was likely that the tertiary sediment subgrades were poorly compacted due to the coastal environment and the presence of water nearby in Georges Bay.

For the purposes of engineering, subgrade soils are identified and classified according to field observations (and later laboratory tested engineering properties) as part of the Unified Soil Classification System (USCS), which enables the likely engineering properties and behaviours of soil materials to be generally predicted at a basic level.

From the historical geological information sourced, it was predicted that the subgrade was likely to range from a coarse sand (SP), sandy clay/clayey sand material to a low plasticity clay (CL).

Historically, soils classified as SP generally have a California Bearing Ratio (CBR) range of between 10 to 30%, and soils classified as CL generally have a CBR range of 2 to 10%.

For the purposes of the Draft Technical Planning and Facility Upgrade Report, a subgrade California Bearing Ratio (CBR) of 3% was adopted. A CBR value of 3% is at the lower end of the scale and was adopted due to the lack of detailed understanding of the soil engineering properties, and the possibility that a loss of material in-situ strength may occur with the presence of water and silts.

Due to the limited existing geotechnical information and data available for the current St Helens Aerodrome site, BODC engaged Earth Air Water and Monitoring Pty Ltd (trading as EAW Geo Services) to undertake a geotechnical investigation which comprised fieldwork and a laboratory testing program of the existing runway, taxiway and apron areas at St Helens Aerodrome. The objective of the investigation was to provide material properties (subgrade and existing pavement) for future pavement design, as well as establishing the existing pavement structure.

The geotechnical investigation fieldwork was undertaken on 26 September 2013 using a 225mm diameter auger mounted on a 6 tonne drill rig.

Geotechnical laboratory testing was carried out by SGS Pty Ltd which is a NATA registered laboratory, experienced in testing soil and rock for engineering purposes.

Supervision of borehole augering, geotechnical logging of the boreholes, and disturbed sampling were carried out by EAW Geo Services.

The original investigation scope prescribed the drilling of approximately 17 test holes, however 19 test holes were completed.

The scope of works included the following:

- Drilling and logging boreholes;
- Conducting field tests and measurements;
- Conducting laboratory tests;
- Collating and reporting the results;
- Determination of 4 day soaked CBR subgrade;

- Preparing a complete geotechnical investigation report that included test results and interpretive comments on the test results; and
- In-situ testing comprising Dynamic Cone Penetrometer Tests as necessary to define the in-situ strength of the materials encountered.

The laboratory testing comprised:

Base Course and Sub-base Course Materials

- Determination of the liquid limit of a soil (AS 1289.3.1.1)
- Determination of the plastic limit of a soil – Standard Method (AS 1289.3.2.1)
- Calculation of the plasticity index of a soil (AS 1289.3.3.1)
- Determination of the particle size distribution of a soil by sieve analysis (AS 1289.3.6.1)

Subgrade Materials

- Determination of the 4 day soaked CBR of a soil – Standard laboratory method for a remoulded specimen (AS 1289.6.1.1)
- Moisture Content of a soil – Oven Drying Method (AS 1289.2.1.1)
- Determination of the liquid limit of a soil (AS 1289.3.1.1)
- Determination of the plastic limit of a soil – Standard Method (AS 1289.3.2.1)
- Calculation of the plasticity index of a soil (AS 1289.3.3.1)
- Determination of the particle size distribution of a soil by sieve analysis (AS 1289.3.6.1)

Based on a statistical assessment it was recommended by EAW Geo Services that a design subgrade CBR of between 6% and 15% be adopted.

The complete EAW Geo Services report titled *“St Helens Aerodrome Geotechnical Investigation”* dated 20 November 2013 is attached in **Appendix B** and correspondence is attached in **Appendix C**.

3.2.5 Feature and Level Survey Information and Data

In January/February 2013, East Coast Surveying undertook a detailed feature and level survey of the existing St Helens Aerodrome site. The extent of the survey included the existing Runway, Taxiway and Apron.

Generally, for existing Runway pavement areas, the survey grid was 10 m longitudinal and 7.5m, 9.0m, 15.0m, 30.0m and 45.0m transverse relative to the Runway centreline, i.e. levels were taken on Runway centreline and at successive 7.5 m offsets on both sides of the Runway centreline to the outer edges of the unbound pavement and beyond, and at 10 m intervals longitudinally. Additionally all unbound pavement outer edges were located and the reduced level (RL) recorded.

Generally, for existing Taxiway pavement area, the survey grid was 10 m longitudinal and 2.0m, 4.0m, 6.0m and 10.0m transverse relative to the Taxiway centreline, i.e. levels were taken on Taxiway centreline and at successive 2.0 m offsets on both sides of the Taxiway centreline to the outer edges of the pavement and beyond, and at 10 m intervals longitudinally. Additionally all pavement outer edges were located and the reduced level (RL) recorded.

On the existing Apron, the levels were taken on a 5 m x 5 m grid, based on a set-out line established by East Coast Surveying.

The survey by East Coast Surveying was completed within the following limits of accuracy:

- Chainages and offsets to within 0.050m; and
- Reduced Levels to within 0.005m.

The location of all the following features were established:

- All airport infrastructure and engineering services (i.e. roads, car parks, fences, drains (open lined and unlined), pits, headwalls, electrical cupboards, water hydrant points, duct markers, cable route markers etc);
- All airport facilities and buildings (i.e. equipment compounds, storage areas, building lines etc);
- All airport boundaries, fences and gates;
- All survey marks and datums;
- All airport furniture, navigation and visual aids (ie airport light fittings, wind indicators, gable markers etc);
- All natural water courses;
- All trees and bush areas within the airport boundary;
- Changes in surface composition (grass gravel etc);
- Edges of sealed pavements and shoulders;
- Existing rolled over edges (including levels at the top and bottom of the rolled over edge);
- Pavement crown location (if not on the centreline);
- Significant changes of grades such as valleys or ridges;
- Any fixed items within the pavements (eg flush light fittings, grated or sealed pits etc);
- Any significant deformations in the pavement surfacing (eg ruts of 20mm or greater);
- Changes of surface type (eg asphalt, sprayed seal, concrete, gravel or grass);
- Any steps in the pavement surface exceeding 20mm (levels at the tops and bottoms of steps are required); and
- Pavement markings (levels are not required on these).

In areas where there is no existing pavement, sufficient points were surveyed to adequately define the topography of the existing ground including ridges, valleys, changes of grade and low points.

Limited existing detailed feature and level survey information and data is available for the area surrounding the current St Helens Aerodrome site.

The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (GDEM) was developed jointly by the Ministry of Economy, Trade, and Industry (METI) of Japan and the United States National Aeronautics and Space Administration (NASA). The ASTER GDEM was contributed by METI and NASA to the Global Earth Observation System of Systems (GEOSS) and is available at no charge to users via electronic download from the Earth Remote Sensing Data Analysis Center (ERSDAC) of Japan and NASA's Land Processes Distributed Active Archive Center (LP DAAC).

The limits of accuracy of the aerial survey is horizontal to within 30m at 95% confidence and Reduced Levels (vertical) to within 20m at 95% confidence. The survey output format is GeoTIFF and is referenced to the WGS84/EGM96 geoid.

The reference elevation for the airport has been approximated as 50m, based on the vertical contours provided in the aerial survey and survey work undertaken by East Coast Surveying.

3.2.6 Land Use Planning

Current Planning Controls

St Helens Aerodrome is currently located wholly within the Environment Protection Zone pursuant to the BODC Planning Scheme.

The Environment Protection Zone allows a range of use classes including Business and Civic; Environmental Management; Recreation; Residential; Utilities and Resource Development. Industrial development is prohibited within the Zone. Surrounding land to the south and east is also zoned for Environment Protection.

The aerodrome currently abuts an Urban Zone to the north-west. The Urban Zone primarily incorporates single dwellings on moderate sized allotments. On this basis it is unlikely that any future expansion of the aerodrome will be possible to the north.

Future Planning Controls

Planning Schemes within Tasmania are currently undergoing reform as part of a State-wide initiative.

The Interim Planning Scheme (2013) is currently available for public viewing, however this may be subject to change prior to finalisation. Under the latest publicly available version of the Interim BODC Planning Scheme (as of 7 May 2013), the western portion of the subject land is zoned Utilities Zone whilst the eastern portion is zoned Environmental Management Zone. The existing aerodrome falls within the Utilities Zone. The existing aerodrome land use is classified as ‘Transport Depot and Distribution’ which is a permitted use class within the Utilities Zone. The zone supports appropriate aerodrome related development at the existing St Helens Aerodrome site. Any development proposal is likely to be subject to a conventional statutory planning approval process, and may be subject to public notification and the allowance of third party appeal rights should the use and development standards within the Utilities Zone not be met. The land use ‘Transport Depot and Distribution’ is a prohibited land use within the Environmental Management Zone. Should any expansion works be proposed in this area, a Planning Scheme Amendment will be required to rezone land to Utilities Zone.

A portion of the existing St Helens Aerodrome site in proximity to the existing Terminal Building is affected by a Priority Habitat Overlay. A small area of the western-most portion of the land is affected by landslip hazard.

Under the Interim BODC Planning Scheme, the land surrounding the eastern portion of the existing aerodrome site is proposed to be Environment Management Zone whilst land to the south and west of is proposed to be Utilities Zone and land to the north is to be General Residential and Rural Living Zones. Land surrounding the aerodrome will be subject to the Airports Impact Management Code which aims to ensure that the use and development within identified areas surrounding aerodromes does not restrict the ongoing security, development and use of aerodrome infrastructure.

The Vision East Land Use Framework identifies local airports/aerodromes (including St Helens) as important infrastructure and stipulates that planning schemes should include land zoned for potential expansion of the airports/aerodromes. Should any land outside of the proposed Utilities Zone be required for future expansion it is recommended that a Planning Scheme Amendment be undertaken to rezone additional land to Utilities Zone as required.

3.2.7 Environmental Information

Limited environmental data exists for the subject land. No known Environmental Impact Studies (EIS) have been undertaken at the existing St Helens Aerodrome site, and as such any expansion of the existing aerodrome activities may require studies relating to aircraft noise, flora, fauna, soil hydrology and cultural/aboriginal heritage. Additional studies may be required by relevant government authorities.

A search of the Natural Values Atlas revealed that there are three recorded specimens of ‘Tasmanian Smokebush’ – *Conospermum hookeri* – in the eastern portion of the subject land. The Tasmanian Smokebush is a threatened species and is considered to be of conservation significance.

An EPBC Act Protected Matters Report revealed that there are 17 Listed Threatened Species and a number of Listed Migratory Species in the vicinity of the existing St Helens Aerodrome site. The site is also within 10km of a RAMSAR wetland (Jocks Lagoon). These environmental matters are likely to require further investigations at such time as any expansion of operations are proposed.

3.2.8 Engineering Services Supply Information and Data

Currently all engineering services (communications, electrical and water supply) at the aerodrome, with the exception of waste water, are provided from St Helens township.

Telstra provides phone and internet to the aerodrome via underground lines that follow the alignment of Aerodrome Road to the existing Terminal Building.

Aurora Energy is the electrical power supply authority that services the aerodrome. The existing electrical supply is provided above ground and follows the alignment of Aerodrome Road to the existing Terminal Building. Aurora Energy has advised that the electrical supply main has a capacity of 240V.

Ben Lomond Water is the water supply authority that services the aerodrome. The existing water supply main follows the alignment of Aerodrome Road to the existing Terminal Building. Ben Lomond Water has advised that the water supply main has a capacity of 10L/minute.

3.3 Preliminary Aerodrome Site and Runway Orientation Assessment

3.3.1 Existing Aerodrome Location

The existing St Helens Aerodrome site and runway orientation assessment is based on the existing St Helens Aerodrome layout which is illustrated in **Appendix A**. The assessment has been based on consideration of the following:

- The existing location of St Helens township north of the existing St Helens Aerodrome site provides suitable access via the Tasman Highway, St Helens Point Road and Aerodrome Road (road infrastructure). Travel time is approximately 7 minutes by car from St Helens township to the aerodrome. There is provision for more direct access from St Helens Point Road to the aerodrome in the future;
- The existing location of St Helens township allows emergency support services to be located in close proximity to St Helens Aerodrome which may be used for both the township and the aerodrome (it is noted that considering anticipated passenger numbers, dedicated rescue and fire fighting service facilities will not be required in the medium to long term);
- The existing St Helens Aerodrome site is located clear of the St Helens township, however the 08 Runway End is aligned in a direction where aircraft departures (and some

approaches) fly directly over residents on the southern edge of George's Bay, resulting in aircraft noise impacts in these areas;

- Existing engineering services (communications, electrical and water supply) already service the existing St Helens Aerodrome site.
- The existing St Helens Aerodrome site is in an area with moderate topographical variation and no major topographical obstacles (localised peaks);
- The existing St Helens Aerodrome site does not have any major valleys (natural watercourses);
- The existing St Helens Aerodrome site landside/airside interface has limited potential to expand in the future (i.e. aircraft parking apron and Terminal Building area) ;
- The existing St Helens Aerodrome site has potential to expand to the west and south in the future; and
- The existing St Helens Aerodrome site adjoins known areas of flora, fauna (conservation) significance.

3.3.2 Existing Aerodrome Orientation

The existing St Helens Aerodrome runway alignment (orientation) of 08/26 has been assessed based on consideration of the following:

- The existing 08/26 runway designation would normally indicate a runway orientated in a west south west/east north east direction (magnetic bearing), however from the current survey and aerial photography the runway is generally orientated in a west north west/east south east direction which is potentially more closely aligned with a 09/27 or 10/21 designation.
- Wind rose information from the Bureau of Meteorology for St Helens Aerodrome, St Helens Post Office (no longer in service) and Scamander which indicates that winds are predominately from a north westerly direction, resulting in a preferred runway designation of 12/30 or 14/32.
- The existing 08/26 runway designation is not preferred for aircraft with an ARFL less than 1500m (smaller jet aircraft and turbo prop aircraft) and in some instances where cross wind speeds are greater than 24km/h, smaller aircraft will not be able to operate approximately 21.6% of the total time on average;
- The existing St Helens Aerodrome site is located clear of the St Helens township, however the 08 Runway End is aligned in a direction where aircraft departures (and some approaches) fly directly over residents on the southern edge of George's Bay, resulting in aircraft noise effects in these areas;
- The existing St Helens Aerodrome is in a location predominately downwind of existing residential properties, increasing the potential for wind blown foreign debris to adversely impact the operation of the aerodrome.

3.3.3 Existing Aerodrome Site and Orientation Assessment

The existing St Helens Aerodrome site adequately serves its current purpose of serving GA, emergency and RFDS aircraft operations.

Aircraft operations are currently restricted when wind speeds are greater than 24km/h and when the unbound runway wearing course becomes wet.

The existing St Helens Aerodrome site has potential to develop the airside areas of the aerodrome to the south and east. There is minimal space available to expand the existing landside facilities, however this is not considered a major issue in the medium to long term.

Should demand necessitate an upgrade for aircraft larger than Code 1B, consideration should be given to constructing a new primary runway with a preferred runway designation of 12/30 or 14/32 at the existing St Helens Aerodrome site, and maintaining the existing runway as a secondary runway for Code 1B aircraft and smaller.

Within 15km of the St Helens township the only potential suitable alternative aerodrome sites are in coastal regions, with the bush land to the south of the existing aerodrome site and south of Binalong Bay the most appropriate alternatives, however these areas are areas of conservation significance and are likely to be subject to strict development controls.

3.3.4 Forecast Traffic Assessment

Ideally for this type of study, BODC would provide the forecast frequency of aircraft types and origin and destination of the various flights anticipated at St Helens Aerodrome based on anticipated demand. This information is not currently available and has therefore been estimated, for the purposes of this Technical Planning and Facility Upgrade Report, through consultation with BODC and TCG Planning.

The following assumptions have been made in order to estimate the potential aircraft types and potential forecast aircraft traffic:

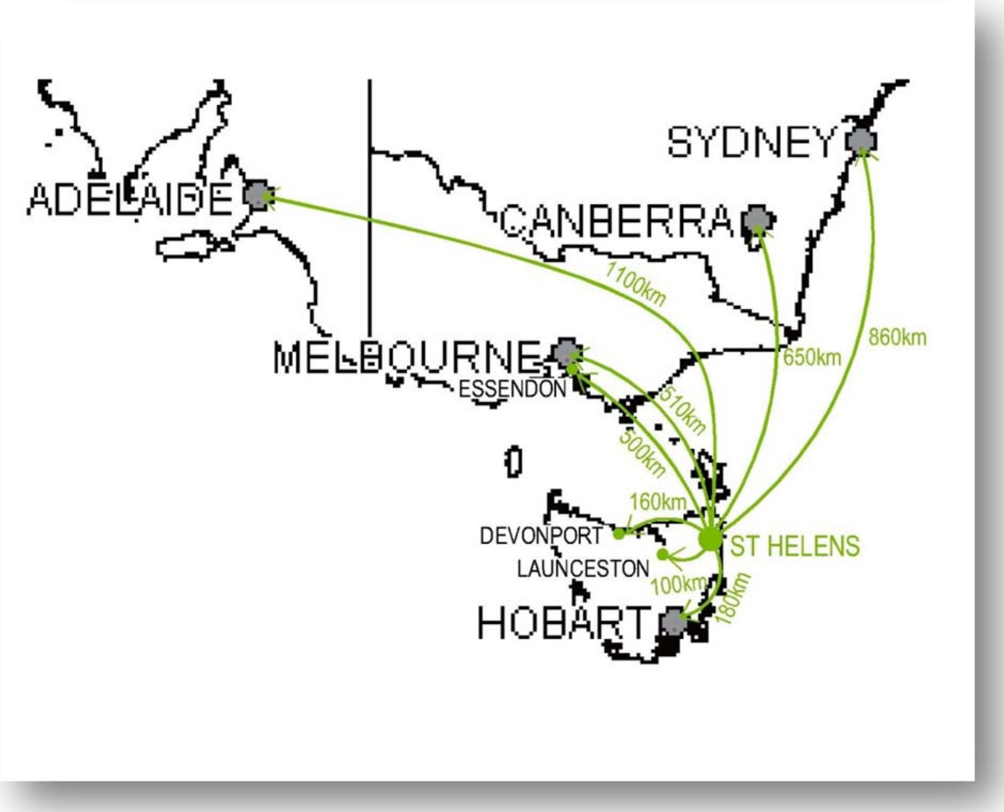
- Consideration of aircraft currently in operation in Australia and Tasmania;
- Consideration of aircraft that may potentially operate from Adelaide, Sydney, Canberra, Melbourne and Hobart to the existing St Helens Aerodrome site;
- Consideration of maximum payload (passengers and freight) for potential aircraft;
- Aircraft potentially departing from their origin at Maximum Take-Off Weight (MTOW) and landing at their destination at Maximum Landing Weight (MLW); and
- Consideration of the forecast growth of St Helens population and the regions catchment:
  - Current population and permanent workforce at existing townships will remain static for the short to medium term;
  - GA and charter aircraft operation growth to marginally increase in the short to medium term
  - Royal Flying Doctor Service to remain the most critical aircraft operations to the region in the short to medium term
  - RPT services very unlikely in the short to medium term considering the proximity of St Helens to Launceston

The approximate distance from the existing St Helens Aerodrome site to the major capital cities and potential major regional centres in Australia are provided in **Table 7**.

Table 7: Approximate Distance from St Helens Aerodrome to Australian Capital Cities and Potential Major Regional Centres

City	Approximate Distance to St Helens
Launceston	100 km
Devonport	160 km
Hobart	180 km
Melbourne (Essendon)	500 km
Melbourne	510 km
Canberra	650 km
Sydney	860 km
Adelaide (Parafield)	1,110 km

Figure 5: Illustration of Approximate Distance from St Helens Aerodrome to Australian Capital Cities and Potential Major Regional Centres.



The potential aircraft mix and the approximate range of each aircraft is provided in **Table 8**.

Table 8: Approximate Aircraft Range for Potential Aircraft Mix

Designator	Code	ARFL (m)	Aircraft Range (km)	MTOW (kg)	Approx. Passengers
PA-31	1A	650	1,260	3,175	8
BE20	**1B**	**< 1,200**	**3,255**	**5,670**	**8**
Metro III	**2B**	**995**	**1,100**	**6,600**	**19**
DHC8-100	2C	950	1,520	15,650	36
DHC8-300	**2C**	**1,122**	**1,540**	**18,642**	**45**
SAAB 340	**3C**	**1,220**	**1,490**	**13,155**	**38**

From the potential aircraft mix provided in **Table 8**, it has been estimated from existing operators aircraft fleets and current trends in the aviation industry, that the aircraft types emboldened within **Table 8** provide the most economical alternatives (considering operating costs, payload potential and aircraft performance/range) for potential aircraft operators to service St Helens Aerodrome into the future. In essence, this is a time series forecast which extrapolates the current trends of aviation activity in Australia and assumes that those factors that currently determine the business model for aircraft operators will continue into future.

The predicted ultimate aircraft traffic for the runway, taxiway and apron at St Helens Aerodrome has been forecast with consideration of the forecast peak passenger demand for the 2013 to 2015 period and then extrapolated to 2023 and 2033 (primarily to assist in establishing the potential traffic for the 20 year design life of the flexible pavements).

It is proposed to adopt the following design aircraft traffic scenarios for the development of pavement thickness design (Refer to **Section 5** for further details relating to Options A and B).

It should be noted that the DHC8-100 aircraft has been omitted from the traffic scenarios provided in **Table 9** for the development of pavement thickness design due to lower MTOW when compared to the DHC8-300, which is more critical in terms of pavement design.

Table 9: Aircraft Traffic Scenarios for Options A and B

Traffic Scenario Description	Aircraft	Movements
Traffic Scenario 1	BE20	15,000
Traffic Scenario 2	BE20	30,000
	Metro III	15,000
Traffic Scenario 3	BE20	75,000
	Metro III	30,000
	DHC8-300	15,000
	SAAB 340	15,000
Traffic Scenario 4	BE20	150,000
	Metro III	75,000
	DHC8-300	30,000
	SAAB 340	30,000

3.3.5 Preliminary Airport Runway Length Assessment

The length of the runway at St Helens Aerodrome is dependent on three main factors. The CASA applied regulations for particular categories of aircraft, the environmental conditions at the proposed site (i.e. temperature, surface wind, runway gradient, altitude and runway condition) and the aircrafts performance (i.e. the range of operating weights and conditions that the aircraft is certified to perform in for the aircrafts range).

The runway length required is invariably based on the assumption that the aircraft sustains an engine failure at a critical moment in the take-off run and subsequently either aborts the take-off (‘Accelerate-Stop’) or continues (‘Accelerate-Go’) depending on whether the failure occurs before or after the critical decision speed (V_1) is achieved.

Generally aircraft manufacturer’s aircraft performance data is referenced at standard conditions (ambient conditions at sea level, dry, no wind and at International Standard Atmosphere (ISA) 15°C) for ease of comparison.

For the purposes of this Technical Planning and Facility Upgrade Report the aircraft manufacturers aircraft performance charts have been analysed to determine the most performance critical aircraft based on the following critical (worst case) conditions:

- Take-off weight of the aircraft (varies – Runway Limited Weight considered);
- Engine type and thrust of the aircraft (varies);
- Maximum payload (passengers plus baggage and freight) for the aircraft (varies);
- Aircraft operator will adopt the optimum take-off flap setting for the local weather conditions and no other aircraft system which may inhibit aircraft performance will be activated during landing or take-off;
- Intended range or flight sector length of 1,100km (refer to **Table 7**);
- Wind strength of 30km/h and from a north westerly direction (refer to **Section 3.2.2**);
- Elevation of the airport of 50m (atmospheric pressure) (refer to **Section 3.2.5**);
- Temperature at the airport of 25°C (ISA +10°C) (refer to **Section 3.2.3**);
- Runway gradient range between 0% and maximum 2%;
- No significant obstacles within or beyond the take-off (departure) splay;
- In the case of a continued take-off following engine failure, the aircraft would be allowed to continue to climb on the runway alignment to a specified height above the airport elevation; and
- Runway pavement wearing course type is sprayed seal for Code 3C aircraft and in good condition (assumed both wet and dry pavement surface). A wet runway is assumed to have less than 3mm of standing water.

Based on the above variable inputs (worst case), the critical Code 2C aircraft is the DHC8-300 which theoretically requires 1,250m minimum runway length for take-off at MTOW. Therefore, providing a factor of safety to account for worse case individual aircraft operating procedures and performance, a minimum runway length for Code 2C of 1400m may be necessary.

The only Code 3C aircraft assessed is the SAAB 340 which theoretically requires 1,300m minimum runway length for take-off at MTOW. Therefore, providing a factor of safety to account for worse case individual aircraft operating procedures and performance, a minimum runway length for the SAAB 340 of 1,500m may be necessary.

Considering the aircraft adopted for the design traffic scenarios, aircraft such as the BE20 and Metro III are likely to be the most common aircraft types operating at St Helens Aerodrome. Both of these aircraft have better performance characteristics than both the DHC8-300 and SAAB 340 which allows them to operate without restriction to their maximum capability.

It should be noted that the actual aircraft performance will vary according to the individual operators aircraft specification (i.e. depending on engine type, associated performance ratings and structural limit options etc) as well as the aircraft operators procedures (i.e. prescribed take-off speed ratios etc), hence the minimum runway lengths provided below for each critical aircraft are provided for planning purposes only. Accordingly, actual runway length requirements should be confirmed with the likely operators of particular aircraft into St Helens Aerodrome prior to detailed design and construction.

The critical (worst case) conditions assumed for the runway length assessment (high temperatures, wet runway condition, large aircraft weights etc) are likely to occur infrequently. Therefore, in such instances aircraft operators may reduce their payloads or vary their operating procedures to safely operate on a less than optimal runway length for a particular aircraft as required.

Considering all of these variables, the minimum runway length recommended for the short term (0-5 years) is 1,070m (existing condition). In the medium term (5-10 years) it is recommended that a minimum runway length of 1,200m be provided, with an ultimate long term minimum runway length of 1,500m.

The runway lengths above are considered to be the Take-off Run Available (TORA), which may be defined as the length of runway available for the ground run of an aircraft taking off, not including the clearway, stopway or Runway End Safety Area (RESA). For the purpose of this study, the Landing Distance Available (LDA), which may be defined as the length of runway available for the ground run of a landing aircraft, not including the clearway, stopway or RESA is considered to equal the TORA. The Accelerate –Stop Distance Available (ASDA) is defined as the length of the take-off runway available plus the length of any stopway, however for this study it is considered equal to the TORA and LDA.

4 Airside Facilities

4.1 Existing Facilities

4.1.1 Existing Runway Dimensions and Standards

Runways are classified as non-instrument (also known as visual or circling approach) or instrument runways. Instrument runways are further classified as non-precision or precision. A non-precision instrument runway is served by visual aids and a radio aid providing at least directional guidance adequate for a straight in approach with a published minimum descent altitude, also known as a landing minima for a particular radio aid or combination of radio aids.

A precision approach runway is a runway served by an Instrument Landing System (ILS) with minima significantly lower than for a non-precision runway.

The existing Runway is 1,070m long and 18m wide. The existing Runway is orientated in a 08/26 direction. It is currently classified as a Code 1B non-precision instrument Runway and has an unbound granular wearing course with no shoulders.

Photo 1 – Typical Runway unbound granular wearing course

Photo 2 – Facing west at the eastern (26) Runway End

There is no existing Runway line marking.

It is unknown whether the existing Runway longitudinal and transverse grades fully comply with MOS Part 139 for Code B aircraft operations as a detailed existing surface shape analysis has not been undertaken, however during the visual inspection it was noted that erosion of the gravel wearing course along the Runway centreline at the Runway edge may have created non-compliant transverse gradients.

The current survey indicates:

- The existing Runway surface potentially exhibits non-compliant transverse grades up to 4.5% in some localised areas (particularly at the outer edge of the unbound granular pavement); and
- The existing Runway surface potentially has a non-compliant runway sight distance whereby from a point 2m above the runway to any other point 2m above the runway for half the length of the runway there must be an unobstructed line of sight along the surface of the runway.

4.1.2 Existing Runway Strength

The existing Runway is currently unrated in terms of pavement strength, however the geotechnical investigation indicates that the existing total pavement thickness is 150mm to 400mm.

An unrated pavement strength generally indicates that the Runway pavement is suitable for restricted movements of aircraft up to 5,700kg with standard tyre pressure (less than 500 kPa).

From the recent geotechnical investigation and the historical geology maps for the area, the subgrade CBR is estimated to be in the range of 6% to 15%.

4.1.3 Existing Taxiway Dimensions and Standards

The existing single Taxiway is located at the western end of the Runway (08 End) and provides sufficient Runway and Apron access to cater for the low traffic volumes.

The existing Taxiway width is approximately 10.5m, which is suitable for Code B aircraft operations. The Taxiway has a bituminous spray seal wearing course with no shoulders. Taxiway guideline and hold position markings exist.

It is unknown whether the existing Taxiway longitudinal and transverse grades comply with MOS Part 139 for Code B aircraft operations as a detailed existing surface shape analysis has not been undertaken, however the current survey indicates:

- The existing Taxiway surface potentially exhibits non-compliant transverse grades in the range of 0.2%-3% in some localised areas; and
- The existing Taxiway long section is potentially non-compliant with respect to the rate of change in grade being greater than 1% per 30m.

Photo 3 – Runway/Taxiway connection facing north

Photo 4 – Taxiway hold position facing north west

4.1.4 Existing Taxiway Strength

Similar to the Runway, the existing Taxiway pavement strength is currently unrated. From the results of the geotechnical investigation, the total pavement thickness ranges from 200mm to 300mm and consists of a clayey sand base course and a bituminous spray seal wearing course.

4.1.5 Existing Apron Dimensions and Standards

The existing aircraft parking area is surfaced with a bituminous spray seal wearing course which is approximately 75m wide (east-west) and 35m long (north-south) and is suitable for a restricted number of free moving operations (power in/power out). The aircraft parking area can accommodate aircraft up to Code B aircraft. Although a detailed existing surface shape analysis has not been undertaken, the current survey indicates that approximately 40% of the existing Apron surface exhibits non-compliant grades outside the range 1%-2%.

The existing aircraft parking area is operationally deficient due to the following:

- Limited space available for aircraft parking; and
- Poor Apron organisation with no line marking or guidance for pilots.

Photo 5 – Existing aircraft parking area facing east

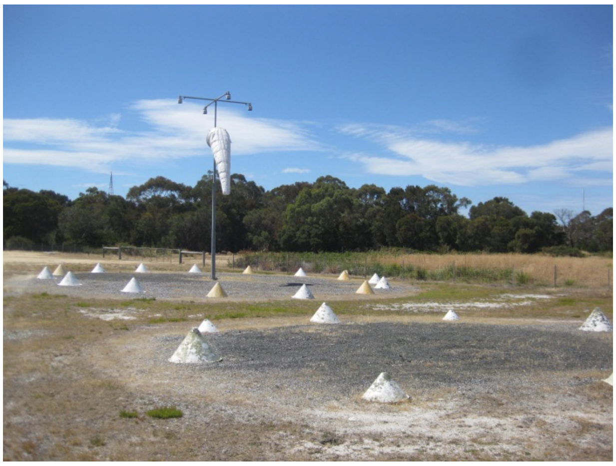


Photo 6 – Existing IWDI and Signal Circle

4.1.6 Existing Apron Strength

Similar to the Runway, the existing Taxiway pavement strength is currently unrated. From the results of the geotechnical investigation, the total pavement thickness ranges from 200mm to 500mm and consists of a sandy gravel base course and a bituminous spray seal wearing course.

4.1.7 Existing Landing Aids

Aerodrome Lighting

The Runway is fitted with low intensity Runway edge lights (single stage mains power with potential for diesel generator backup – diesel generator stored at BODC depot). The Runway edge lights are supported by a Pilot Activated Lighting (PAL) system. It is understood that the Runway edge and end light conduits/cables and transformers are all direct buried.

There is currently no Apron floodlighting.

Photo 7 – Existing Runway Threshold Lights

Photo 8 – Existing Runway Edge Light

Visual Aids

The Runway has white fibre glass (cone) gable markers. Located adjacent to the Terminal Building and aircraft parking area is an Illuminated Wind Direction Indicator (IWDI) and signal circle.

Visual Approach Slope Indicator Systems

The Runway currently does not have a slope indicator system.

Movement Area Guidance Signs (MAGS)

There are no MAGS currently installed at St Helens Aerodrome.

Non Directional Beacon (NDB)

St Helens Aerodrome is currently equipped with an NDB. The NDB is used for approach down to a circling minima. An RNAV non instrument approach procedure also exists for the 26 Runway End.

4.1.8 Existing Stormwater Infrastructure

There is limited existing stormwater drainage on the aerodrome. An open swale drain is located on the south eastern side of the runway. It is understood that apart from the open swale drain, the only form of drainage is through natural runoff and seepage over time. There was no indication of excessive water ponding adjacent to movement areas and water ponding was not raised as an operational issue. Detailed analysis of the existing stormwater drainage infrastructure existing capacity and future requirements has not been undertaken.

4.2 Proposed Upgrades

For indicative budget cost purposes, the following staged construction has been investigated through discussions with BODC.

Stage 1 (Figure 3 in Appendix A)

- Proof rolling and construct bituminous spray seal on the Runway (18m wide x 1,070m long), Taxiway and Apron;

- Install new single stage, low intensity elevated Runway edge and threshold lights (including associated cabling/conduits, pits and Series Isolating Transformers (SITs) which utilises the existing PAL system;
- Install new line marking on the Runway, Taxiway and Apron;
- Install new gable markers; and
- Install new aerodrome entrance signage.

Stage 2 (Figure 4 in Appendix A)

- Widen the existing 18m wide x 1,070m long bituminous spray seal surfaced Runway (Code 1B) to 23m wide (Code 2B);
- Lengthen the existing 18m wide x 1,070m long bituminous spray seal surfaced Runway to 1,200m or 1250m;
- Construct stormwater drainage infrastructure;
- Install new/relocate existing Runway edge lights;
- Relocate the existing secondary Wind Direction Indicator at the 26 Runway End; and
- Install line marking of the Runway extension.

Stage 3 (Figure 5 in Appendix A)

- Determine approach and departure procedures for the new runway alignment;
- Construct a new 30m wide x 1,500m long bituminous spray seal surfaced Runway (instrument, non-precision approach Code 3C Runway) in a north west direction;
- Upgrade taxiway pavement strength and widen to 15m minimum;
- Upgrade apron pavement strength and construct apron extension (new apron area to be investigated prior to construction);
- Install new three stage, medium intensity elevated Runway edge and threshold lights (including associated cabling/conduits, pits and SITs);
- Construct stormwater drainage infrastructure;
- Install new line marking;
- Install a new Illuminated Wind Direction Indicator adjacent the Apron;
- Relocate the existing secondary Wind Direction Indicator at the 26 Runway End
- Install new perimeter fence;
- Construct new access road to Terminal Building and car park from the west;
- Construct a new Terminal Building or upgrade the existing;
- Construct a car park extension;

It is noted that adopting a staged construction process and widening the existing Runway to 23m (Code 2B) and lengthening to 1,200m in Stage 2, may not be economical for the following reasons:

- Widening the existing Runway to 23m will only achieve the minimum runway width required for Code 2B aircraft which does not significantly increase the operational capability of the aerodrome;
- As a granular overlay of the existing pavement is likely to be required prior to applying a bituminous spray seal wearing course in Stage 1 (refer to **Section 5**), additional granular material may be required over the widened pavement to achieve grade compliance prior to application of the bituminous spray seal if constructed in two stages; and
- Constructing a bituminous spray seal wearing course on the existing Runway in Stage 1 and then widening and lengthen the existing Runway to 23m and 1,200m respectively in Stage 2 will impose Contractor re-establishment costs.

It is noted that during the construction of Stages 1 and 2 the existing 08/26 Runway will not be operational for periods of time during construction.

4.2.1 Existing Runway Vertical Geometry

Longitudinal Section

It is unknown whether the existing Runway longitudinal grades fully comply with MOS Part 139 for Code A or B aircraft operations as a detailed existing surface shape analysis has not been undertaken, however historical information indicates that the original design is likely to be MOS Part 139 compliant for Code A and B aircraft operations. However the recent feature and level survey indicates that the existing Runway surface potentially has a non-compliant runway sight distance whereby from a point 2m above the runway to any other point 2m above the runway for half the length of the runway there must be an unobstructed line of sight along the surface of the runway.

The upgraded pavement thickness and composition is discussed in further detail in **Section 5**.

Transverse Grades

It is unknown whether the existing Runway transverse grades comply with MOS Part 139 for Code A or B aircraft operation as a detailed existing surface shape analysis has not been undertaken, however during the visual inspection it was noted that erosion of the gravel wearing course on the Runway centreline and at the Runway edge may have created non-compliant transverse gradients. The current survey indicates that the existing Runway surface potentially exhibits non-compliant transverse grades up to 4.5% in some localised areas (particularly at the outer edge of the unbound granular pavement).

4.2.2 Horizontal Geometry

General

It should be noted that no operational or airspace issues have been considered in any detail as part of this Report, however such considerations and limitations may be critical to any proposed operations. It is presumed that BODC will clarify Runway length requirements and any operational limitations with proposed operators into the future.

Runway Length

The existing Runway length of 1,070m is theoretically adequate for a selection of Code 1B aircraft including the Beechcraft King Air 200, however this is dependent on the individual aircraft and the operational procedures of the aircraft operator (payload, flap settings etc) and weather conditions. In critical conditions aircraft operators may reduce their payloads or vary their operating procedures to safely operate on a less than optimal Runway length for particular aircraft as required. Therefore the 1,070m Runway length is considered appropriate for the purposes of this Technical Planning and Facility Upgrade Report only. For Stages 2 and 3 the Runway lengths will theoretically be 1,200m and 1,500m respectively.

Runway Width

It should be noted that the runway width hereafter refers to pavement only that is capable of allowing aircraft to land and take-off.

The Runway unbound granular wearing course (pavement) of 18m is currently suitable for Code 1B aircraft operations without approval or direction from CASA.

MOS Part 139 states that a Code 2B Runway is required to be 23m in width, however it does not specify the minimum sealed pavement width for the Runway to be technically considered Code 2B. The same applies to a Code 3C Runway which is required to be 30m in width. Consultation with aircraft operators and CASA should be undertaken by BODC to determine the appropriate sealed pavement width for the Runway prior to detailed design.

For the purposes of this Technical Planning and Facility Upgrade Report it is assumed that ultimately the full 18m, 23m or 30m wide Runway will have a bituminous seal wearing course.

Shoulders have not been allowed for as MOS Part 139 states that shoulders are not required for Runways less than 30m in width.

Runway Strip Width

The overall runway strip width is currently 90m which is compliant with MOS Part 139 for a Code 1 or 2 non-precision approach Runway.

The graded portion of the runway strip is currently approximately 80m in width, which is suitable for Code 2 Runway. It should be noted that for a Code 2 Runway, the width of the graded portion of the runway strip shall be 80m, however where aeroplanes are not exceeding 5,700kg by day, the runway strip width may be 60m.

For a Code 3 Runway the overall runway strip width required is 150m, with a 90m graded portion.

Taxiway Routes and Width

The existing Taxiway width of 10.5m is currently suitable for Code A and B aircraft operations. No allowance has been made for Taxiway shoulders.

For a Code C Taxiway the width required is 18m, however if the Taxiway is intended to only serve aircraft with a wheelbase of less than 18m, the Taxiway width may be reduced to 15m.

Apron Layout

An Apron layout with free-moving operations (power-in and power-out) provides the desired aircraft parking capacity and flexibility within the existing site constraints (reverse parking positions).

An apron layout for Stage 3 capable of accommodating Code C aircraft operations has not been considered as part of this Technical Planning and Facility Upgrade Report due to the existing space restrictions of the area surrounding the existing apron and the need to potentially investigate alternative apron sites.

The concept Apron parking position layout shown on **Figure 6** in **Appendix A** accommodates one primary Beechcraft King Air 200 aircraft parking position and additional Code A aircraft parking to the west (push back/power out only) (or helicopter parking).

The concept Apron parking position layout shown on **Figure 7** in **Appendix A** accommodates one primary Beechcraft King Air 200 aircraft parking position and Code A aircraft parking to the west (push back/power out only) with additional Code A and B aircraft parking to the east (or helicopter parking).

In order to increase parking capacity in the medium to long term, allowance has been made for the construction of new apron pavement for additional GA aircraft parking in concept illustrated in **Figure 7** in **Appendix A**, however the extent of additional parking will be limited due to the space available to the east of the existing apron, and is contingent on the relocation of the of the existing illuminated wind direction indicator and signal circle and boundary fence. The Code A aircraft parking to the west of the existing apron is on grass only and operators would be required to manually push back their aircraft into these positions.

The concept primary aircraft parking position is considered a short to medium term option for Beechcraft King Air 200 aircraft operations to accommodate medical emergencies. The concept primary parking position maintains Code B wingtip clearance from all obstacles and has provision for a reverse parking position. The concept primary parking position is based on minimising the extent of new Apron pavement construction.

The concept aircraft parking layouts have been designed on the following basis:

- Minimising the extent of pavement construction in the short term;
- Free-moving operation (power-in and power-out), independent aircraft parking positions;
- No aircraft refuelling;
- Aircraft parking flexibility (reverse parking position);
- Provision for helicopter parking if required; and
- No GSE considerations (including storage or access).

4.2.3 Stormwater Drainage

For the purposes of this Technical Planning and Facility Upgrade Report it has been assumed that in Stages 2 all overland stormwater runoff will be directed to either the eastern or western end of the site via open unlined drains located outside the Runway strip or subsurface drains where drainage will continue to occur through natural seepage over time.

It has also been assumed that subsurface drains may be required at the interface between the new pavement structure and existing ground due to the potential for water to accumulate at this interface and saturate the pavement structure. Depending on the extent of pavement upgrade undertaken, it is anticipated that subsurface drains will not have any pits or flush out risers (as these would be located at the edge of the pavement, within graded portion of the Runway strip) and that all drains would flow to daylight outside the Runway strip.

For Stage 3 it is assumed that all overland stormwater runoff will be directed to either the eastern or western side of the runway via open unlined drains located outside the Runway strip

The detailed design of the stormwater drainage system will have to consider such issues as:

- Achieving minimum gradients in pipes and open unlined drains (swales) to allow water flow considering the relative small grades across the existing site;

- The location of pipes, open unlined drains (swales) and outfalls;
- Pipe sizing to control outflows; and
- Cover over pipes.

4.2.4 Landing Aids

Aerodrome Lighting

The aerodrome lighting upgrade requirements have been assessed and it is assumed that in Stages 1 and 2 the existing low intensity Runway edge light fittings may need to be removed and replaced with new LED Runway edge light fittings, with the associated direct buried conduits/cables and transformers demolished and removed and replaced with a new cable and conduit system with pits and SITs. It is assumed that capacity for secondary/backup power to be supplied by a diesel generator will be retained.

For Stage 3 a new lighting system will need to be installed.

St Helens Point Road and Aerodrome Road north of the airport has above ground power lines which are 240V. Aurora Energy have provided verbal confirmation regarding the capacity of the existing power supply. It has been assumed that a 415V, 3 phase, 30kVA power supply capable of supplying the new low intensity (single stage PAL system) aerodrome lighting will be required.

The following electrical power supply and lighting infrastructure will be required in order to upgrade the existing aerodrome lighting system to a low intensity (single stage PAL system) aerodrome lighting system supplied by mains power with a new back-up diesel generator.

- Above ground transformer (either on Aerodrome or St Helens Point Road);
- Combination of above and below ground power mains and pits from Aurora Energy power supply source (not known to date) to the existing lighting equipment room connected to the toilet block);
- Lighting equipment room refurbishment;
- Lighting Control Panel;
- Upgraded PAL unit;
- Stand-by diesel generator;
- Runway Edge Lights;
- Taxiway Edge Lights;
- Primary and secondary lighting cables and conduits;
- Series Isolating Transformers (SITs);
- SIT pits; and
- Precast structural pits.

No allowance has been made for Apron floodlighting, however BODC should consult with stakeholders to determine any Apron floodlighting requirements prior to detailed design. Building mounted Apron floodlighting may be suitable for emergency operations.

Illuminated Wind Direction Indicator

The existing IWDI shall remain linked to the single stage PAL system so that it is illuminated when the Runway and Taxiway edges lights are illuminated. It is anticipated that the existing IWDI may not be suitable in terms of lux levels and configuration compliance for Stage 3, however this will need to be assessed during detailed design. For the purposes of this Technical Planning and Facility Upgrade Report it is assumed that a new IWDI is required in Stage 3 only.

Gable Markers

New MOS Part 139 compliant gable markers have been allowed for at the limits of the graded portion of the Runway strip in Stage 1. For Stages 2 and 3 the gable markers can be relocated and additional gable markers installed as required.

4.2.5 Airspace Management

As part of the detailed design of Stage 3, further investigation will need to be undertaken regarding approach and departure procedures for the new runway alignment. This will need to be undertaken in consultation with Airservices Australia.

5 Pavement Design

5.1 Traffic Scenarios

Ideally for this type of Report, BODC would provide the forecast frequency of aircraft types anticipated at St Helens Aerodrome based on anticipated demand. This information is not currently available and has therefore been estimated (through consultation with BODC and TCG Planning), for the purposes of this Technical Planning and Facility Upgrade Report, as follows:

Traffic Scenario 1

BE20	1 arrival per day at Maximum Landing Weight (5.7 tonnes)
BE20	1 departure per day at Maximum Take-off Weight (5.7 tonnes)

Traffic Scenario 2

BE20	2 arrivals per day at Maximum Landing Weight (5.7 tonnes)
BE20	2 departures per day at Maximum Take-off Weight (5.7 tonnes)
Metro III	1 arrival per day at Maximum Landing Weight (6.6 tonnes)
Metro III	1 departure per day at Maximum Take-off Weight (6.6 tonnes)

Traffic Scenario 3

BE20	5 arrivals per day at Maximum Landing Weight (5.7 tonnes)
BE20	5 departures per day at Maximum Take-off Weight (5.7 tonnes)
Metro III	2 arrival per day at Maximum Landing Weight (6.6 tonnes)
Metro III	2 departure per day at Maximum Take-off Weight (6.6 tonnes)
DHC8-300	1 arrival per day at Maximum Landing Weight (18.1 tonnes)
DHC8-300	1 departure per day at Maximum Take-off Weight (18.7 tonnes)
SAAB 340	1 arrivals per day at Maximum Landing Weight (12.9 tonnes)
SAAB 340	1 departures per day at Maximum Take-off Weight (13.2 tonnes)

Traffic Scenario 4

BE20	10 arrivals per day at Maximum Landing Weight (5.7 tonnes)
BE20	10 departures per day at Maximum Take-off Weight (5.7 tonnes)
Metro III	5 arrival per day at Maximum Landing Weight (6.6 tonnes)
Metro III	5 departure per day at Maximum Take-off Weight (6.6 tonnes)
DHC8-300	2 arrival per day at Maximum Landing Weight (18.1 tonnes)
DHC8-300	2 departure per day at Maximum Take-off Weight (18.7 tonnes)
SAAB 340	2 arrivals per day at Maximum Landing Weight (12.9 tonnes)
SAAB 340	2 departures per day at Maximum Take-off Weight (13.2 tonnes)

These scenarios have been adopted to determine the pavement upgrade requirements for a 20 year functional design life.

It is noted that during the construction of Stages 1 and 2 the existing 08/26 Runway will not be operational for periods of time during construction.

5.2 Pavement Thickness and Composition

Preliminary pavement designs were prepared for each traffic scenario based on a range of design subgrade CBR values. The required pavement thicknesses shown in **Table 10** have been determined based on a number of methods including the *Department of Construction - Aerodrome Pavement Design Manual (1976).*

Table 10: Concept Flexible Pavement Thickness Requirements for Traffic Scenarios 1, 2, 3 and 4 (mm)

	Design Subgrade CBR (%)					
	3	4	5	6	8	10
Traffic Scenario 1	360	300	260	230	190	160
Traffic Scenario 2	430	360	310	280	230	190
Traffic Scenario 3	650	540	470	410	330	290
Traffic Scenario 4	670	560	490	420	340	300

5.2.1 New Wearing Course

It has been assumed that the wearing course for any new pavement will be a two coat (likely 10mm/7mm) bitumen seal in the short to medium term due to the cost difference between asphalt and a two coat bitumen seal. Considering the likely frequency of use, lower wheel loads and lower tyre pressures of Code 2B (and smaller) aircraft, an aerodrome specific two coat bitumen seal is appropriate in the short to medium term. It is recommended in the medium to long term that if aircraft greater than 10,000kg MTOW are proposed to utilise St Helens Aerodrome that consideration be given to an asphalt wearing course as the potential aircraft safety risk and pavement maintenance is minimised with an asphalt wearing course as opposed to a two coat bitumen seal.

For an aerodrome bituminous seal coat it is noted that high quality materials, workmanship and construction techniques are required for the duration of the works to ensure an adequate wearing course is achieved (well compacted, tight surface texture with minimal loose aggregate). The level of construction and material quality generally accepted for a rural road will not be adequate for the movement area wearing courses at the aerodrome. It is recommended that an aerodrome specific bituminous seal coat design be undertaken prior to tender and construction. It is also recommended that Contractors with suitable aerodrome construction experience be sought for such work, as well as ensuring that construction is closely monitored by suitably qualified engineers.

5.2.2 New Pavement

Stages 1 and 2

Based on a 20 year functional design life and an assumed design subgrade CBR 6%, the new pavement composition adopted is as follows based on Traffic Scenario 2;

Two coat bitumen seal; on
Prime Coat; on

300mm Fine Crushed Rock Base Course (Class 2 minimum placed in minimum two layers); on
Proof rolled Subgrade or Select Fill (CBR 6%).

Stage 3

Based on a 20 year functional design life and an assumed design subgrade CBR 6%, the new pavement composition adopted is as follows based on Traffic Scenario 4;

Two coat bitumen seal; on
Prime Coat; on
450mm Fine Crushed Rock Base Course (Class 2 minimum placed in minimum three layers); on
Proof rolled Subgrade or Select Fill (CBR 6%).

The difference in total concept pavement thicknesses between Traffic Scenario 2 and Traffic Scenario 4 is approximately 50% on average, therefore a detailed pavement engineering sensitivity analysis is required during detailed design in order to ensure the pavement composition is economical, practical and minimises construction time.

5.2.3 Existing Pavement Upgrade

The existing Runway and Taxiway unbound granular wearing course surface is not considered to be an adequate surface upon which to apply a bituminous spray seal due to the non-uniform, weathered texture of the existing surface and the embedment of larger aggregate projecting above the existing surface.

Option A

Considering that the existing pavement varies in thickness from 150mm to 400mm, it is proposed that for Stages 1 and 2 in areas where there are existing gravel pavements, these pavements will be proof rolled to locate any weak areas which will then be removed and replaced. The existing gravel will be tyned, and new variable thickness imported crushed rock will be added and compacted to achieve the design surface levels (minimum 250mm thick). It is proposed that the compacted surface will be primed and then surfaced with a two coat bitumen seal. This option provides improved pavement strength to cater for a range of future aircraft traffic (refer to **Figure 8** in **Appendix A**).

Option B

Depending on BODC’s objectives for the pavement upgrade in Stages 1 and 2, if the major objective is to provide a pavement wearing course that will be suitable for operation in wet weather, and BODC accept the potential risk of pavement failure and the associated rectification costs due to pavement overloading, there is potential for the existing gravel pavement to be tyned and a minimum thickness of local crushed rock placed and compacted to achieve a dense finished surface. This surface may then be primed and surfaced with a two coat bitumen seal. It should be noted however that this option will not improve the existing pavement strength and there is increased potential for pavement failures to occur over time due to pavement overloading by aircraft traffic (refer to **Figure 8** in **Appendix A**). Variations in the consistency of the finished surface texture and shape may also result.

A variation of Option B would be to in-situ stabilize the existing pavement material with a combination of lime and/or cement, place a minimum thickness of local crushed rock and compact to achieve a dense finished surface. This surface may then be primed and surfaced with a two coat bitumen seal. The increase in pavement strength would need to be determined through material testing prior to construction.

5.3 Assumptions

The concept pavement designs have been developed based on the following assumptions:

- A 20 year functional design life and an assumed design subgrade CBR 6%;
- All new movement area pavements (Runway, Taxiway and Apron) will require high quality material which may need to be transported to site;
- Select fill material for subgrade replacement will be transported to site; and
- All material that is cut from site during earthworks and subgrade preparation is suitable to be used as general fill on site for flanks and open drains etc.

6 Concept Design Options

6.1 Concept Design Option Summary

The various design options are illustrated in **Figures 3** to **9** of **Appendix A** and described herein.

Table 11 below summarises the advantages and disadvantages of each design option.

Table 11: Summary of Design Options

Option	Advantages	Disadvantages
Pavement Option A	Increased pavement strength to accommodate range of anticipated aircraft traffic (< 7,000kg) Higher quality finished pavement with low risk of poor performance over functional life Bituminous spray seal wearing course for wet and dry weather conditions	Suitable for aircraft up to 7,000kg only Potential reseal required in 8-10 years Higher disruption to existing aerodrome operations during construction Higher capital cost option
Pavement Option B	Bituminous spray seal wearing course for wet and dry weather conditions Lower disruption to existing aerodrome operations during construction Lower capital cost option	Suitable for limited aircraft movements up to 5,700kg only No Increase in pavement strength to accommodate range of anticipated aircraft Lower quality finished pavement with higher risk of poor performance over functional life Potential reseal required in 8-10 years
18m Wide Runway, 1070m Long	Fully compliant (plan geometry)18m wide Code 1B Runway Minimum disruption to existing aerodrome operations during construction (excluding pavement works - disruption to existing aerodrome operations during pavement construction dependent on pavement option adopted) Existing compliant overall runway strip and graded portion of the runway New aerodrome lighting system New bituminous spray seal wearing course (for wet and dry weather conditions) Lowest environmental impact Lowest capital cost option	Potential poor provision for future increase in airside capacity and development (future runway widening potentially required) Suitable for Code 1B aircraft only (or smaller), and therefore not future proofed for Code 2B or 3C aircraft Future widening of runway may impact existing lights (new lighting system may be more economical) Potential pavement reconstruction may be required at a later stage if the runway receives a bituminous spray seal (widening to 23m may be more economical) Potential reseal required in 8-10 years Potential Contractor re-establishment costs if the runway is widened to 23m in the future
23m Wide Runway, 1200m Long	Fully compliant (plan geometry) 23m wide Code 2B runway (partially future proofed asset) Good provision for future increase in airside capacity and development Compliant overall runway strip and graded portion of the runway (assuming eastern boundary fence can be realigned) New aerodrome lighting system New bituminous spray seal wearing course for wet and dry weather conditions No Contractor re-establishment costs	Suitable for Code 2B aircraft only (or smaller) and therefore not future proofed for Code 3C aircraft Higher disruption to existing aerodrome operations during construction Widening of runway may impact existing lights Potential reseal required in 8-10 years Moderate environmental impact Higher capital cost option

Option	Advantages	Disadvantages
30m Wide Runway, 1500m Long	Fully compliant (plan geometry) 30m wide Code 3C runway (future proofed asset) Low disruption to existing aerodrome operations during construction Good provision for future increase in airside capacity and development Compliant overall runway strip and graded portion of the runway (assuming southern and eastern boundaries can be realigned) New aerodrome lighting system New heavy duty pavement and wearing coarse for wet and dry weather conditions and a range of aircraft <18,000kg	Potential for excess operational capacity which may never be utilised Suitable for Code 3C aircraft only (or smaller) Potential reseal/overlay required in 8-10 years Greenfield land to the south will be developed with significant earthworks required Highest environmental impact Relocation of the existing weather station required Highest capital cost option
Apron Layout Option 1	Provision for (plan geometry) 1 power in/power out Beech 200 position (reverse parking) No new pavement construction is required Code A GA aircraft parking to the west (on grass) as well as helicopters Lowest capital cost option	Only 1 aircraft parking position is designated
Apron Layout Option 2	Provision for (plan geometry) 1 power in/power out Beech 200 position (reverse parking) Code A GA aircraft parking to the west (on grass) as well as helicopters Increased flexibility with additional capacity for Code A and B GA aircraft parking	Only 1 aircraft parking position is designated New pavement construction is required Relocation of the illuminated wind direction indicator and signal circle required Highest capital cost option

6.2 Engineering Constraint Identification Register

Table 12 below summarises a range of potential engineering constraints for consideration by BODC.

Table 12: Engineering Constraint Identification Register

Facility	Constraint
All	Stages 2 and 3 – Feature and level survey in the vicinity of the existing aerodrome site to the east and south is unknown
All	Stages 1, 2 and 3 – Geotechnical conditions in the vicinity of the works are unknown
All	Stages 1, 2 and 3 – Potentially unknown engineering services in vicinity of works
All	Stages 1, 2 and 3 – MOS Part 139 requirements (including transverse and longitudinal grades, separation distances etc)
All	Stages 1, 2 and 3 – Existing stormwater drainage capacity unknown
All	Stages 1, 2 and 3 – Extent of new stormwater drainage infrastructure unknown
All	Stages 1, 2 and 3 – Volume of earthworks and subgrade preparation unknown
All	Stages 1, 2 and 3 – Volume of imported material required unknown
All	Stages 1, 2 and 3 – Extent of pavement upgrade and construction unknown
All	Stages 1, 2 and 3 – Extent of new engineering services unknown
All	Stages 1, 2 and 3 – Power supply requirements from Aurora Energy unknown (easement requirements, property acquisition, clearing and grubbing, infrastructure etc)
All	Stages 1, 2 and 3 – Extent of existing engineering services may need to be protected, diverted or reconstructed unknown

Facility	Constraint
All	Stages 1, 2 and 3 – Expansion to the north inhibited by residential dwellings and is therefore fixed
All	Stages 1, 2 and 3 – Expansion to the west inhibited by topography and is therefore fixed
Runway	Stages 2 and 3 – Potential to relocate the eastern and/or southern aerodrome boundary outside the Runway strip unknown
Runway	Stages 2 and 3 – Extent of potential earthworks outside boundary unknown to achieve MOS Part 139 Obstacle Limitation Surface (OLS) compliance
Runway	Stage 3 – Potential to relocate the existing weather station unknown
Apron	Stages 1, 2 and 3 – Potential to relocate eastern fence boundary and illuminated wind direction indicator and signal circle for additional GA aircraft parking unknown
Apron	Stages 1, 2 and 3 – Location of the existing residential dwelling to the west is limiting potential for GA aircraft parking and alternative access to St Helens Point Road

7 Indicative Budget Costs

7.1 Basis for Costing

Indicative budget costs for providing infrastructure and new pavement and existing pavement upgrades for aircraft operations as detailed in this report are summarised below. All costs exclude GST, allowances for other fees, other BODC costs and contingencies.

Aurecon's considers indicative budget costs to be a first cost indication (at current prices at the date stated). They are provided to BODC based on an outline estimate of BODC's needs; prepared by reference to feasibility sketches or assessed without sketches (in some instances) and based on Aurecon's knowledge of costs for similar projects. They have been prepared without the benefit of detailed design and without detailed consideration of survey, geometry, drainage, existing/proposed services or other local information. An indicative cost is intended only as a guide for a pre-feasibility and planning purposes, it is not an estimate and may not be quoted as such. Indicative budget costs are prepared using broad cost parameters (eg. earthworks and pavements on a cost per square metre basis).

Since Aurecon has no control over the cost of labour, materials, equipment or services furnished by others, or over Contractor's methods of determining prices, or over competitive bidding or market conditions, any opinion or indicative costs by Aurecon is made on the basis of our experience and represents Aurecon's judgement as experienced and qualified professional engineers. Aurecon cannot and does not, however, guarantee that proposals, bids or actual construction costs will not vary from our budgets and estimates.

7.2 Indicative Budget Costs

Table 13 provides a summary of indicative budget costs for each option as described in **Section 3** and illustrated on **Figures 3** to **9** in **Appendix A**.

Table 13: Indicative Budget Costs

Element	Stage 1 – 18m Runway – Pavement Option A Cost ($M)	Stage 1 – 18m Runway – Pavement Option B Cost ($M)	Stage 2 – 23m Runway – Pavement Option A Cost ($M)*	Stage 2 – 23m Runway – Pavement Option B Cost ($M)*	Stage 3 – New 30m Runway – Pavement Option A Cost ($M)**
Preliminaries	$0.10	$0.10	$0.20	$0.20	$0.80
Demolition	$0.01	$0.01	$0.10	$0.10	$0.50
Earthworks	$0.05	$0.03	$0.10	$0.10	$5.0
Upgrade Runway Pavement	$1.35	$0.55	$1.35	$0.55	-
Upgrade Taxiway Pavement	-	-	-	-	$0.95
Upgrade Apron Pavement	-	-	-	-	$2.4
New Flexible Runway and Taxiway	-	-	$0.50	$0.50	$7.4
Power Supply Upgrade	$0.45	$0.45	$0.45	$0.45	$0.8
Aerodrome Visual Aids (Lighting , IWDI	$0.20 (ex IWDI and lights)	$0.20 (ex IWDI and lights)	$0.25	$0.25	$0.5

Element	Stage 1 – 18m Runway – Pavement Option A Cost ($M)	Stage 1 – 18m Runway – Pavement Option B Cost ($M)	Stage 2 – 23m Runway – Pavement Option A Cost ($M)*	Stage 2 – 23m Runway – Pavement Option B Cost ($M)*	Stage 3 – New 30m Runway – Pavement Option A Cost ($M)**
and Gable Markers)					
Stormwater Drainage	$0.10	$0.10	$0.07	$0.07	$0.30
Line Marking	$0.05	$0.05	$0.06	$0.06	$0.08
Engineering Services	$0.05	$0.05	$0.07	$0.07	$0.10
Provisional Sums	$0.10	$0.10	$0.22	$0.22	$0.60
Total	**$2.5**	**$1.7**	**$3.4**	**$2.6**	**$19.4**

*The indicative budget costs for Stage 2 do not account for Stage 1 works being completed (i.e. any pavement upgrade, lighting or associated works), it assumes that construction is not staged and that work commences based on the aerodromes existing condition (18m wide Runway). Pavement construction is based on Traffic Scenario 2

** Pavement construction is based on Traffic Scenario 4

The indicative budget costs in **Table 13** are based on construction costs and include an estimation of:

- Preliminaries such as Contractor site establishment and disestablishment, Contractor site administration, Contractor QA and environmental management, maintenance of site access roads, surveying and supply of As-Built drawings;
- Runway, Taxiway and Apron pavement excavation and earthworks and subgrade preparation including cartage and compaction and proof rolling;
- Runway, Taxiway and Apron pavement construction (based on granular overlay, bituminous spray seal, prime, base and sub-base course material);
- Pavement construction from imported materials only for Option A with inclusion for haulage over 170km (Launceston) at a rate of $0.2 per km per tonne;
- Pavement construction from local materials only for Option B with inclusion for haulage less than 50km at a rate of $0.4 per km per tonne;
- Select fill material for subgrade replacement from local imported materials;
- Stormwater drainage (open unlined drains and limited subsurface drainage);
- Electrical power supply upgrades (including transformer and underground mains with pits);
- Aerodrome lighting (including lighting equipment room refurbishment, lighting control panel, PAL system, stand-by diesel generator, Runway, Taxiway and Apron light fittings, cables/conduits, SITs, SIT pits and precast pits);
- Line marking; and
- Provisional items estimate such as subgrade replacement and topsoiling of disturbed areas.

The indicative budget costs in **Table 13** specifically exclude an estimation of:

- Importing select fill material for subgrade replacement from a remote site or location not in close proximity to the proposed works site;
- Disposal of cut material from site which may not be suitable for use as general fill in flanks or open drains on site;
- Costs associated with delays as a result of inclement weather during construction;
- Costs associated with new infrastructure and services (including new buildings, roads, communications, sewerage, water, gas and fuel facilities);
- Costs associated with upgrades to existing infrastructure and services (including buildings, roads, communications, sewerage, water, gas and fuel facilities);
- Costs associated with any aerodrome fencing and security control;
- Costs associated with any restrictions to aerodrome operations during construction;
- Costs associated with any aircraft operational matters including:
  - → Take-off and approach tracks;
  - → GPS approaches;
  - → Noise and noise abatement procedures;

  - → Navigational aids;
  - → Obstacle Limitation Surfaces;
- Costs associated with the potential development or redevelopment of airside areas into the future; and
- Costs associated with any additional statutory, regulatory, planning or environmental requirements associated with the concept layout options.

Annual routine pavement maintenance, lighting maintenance and line marking costs for the development detailed in Stages 1 and 2 is estimated to be in the order of $40,000 and for the development detailed in Stage 3 in the order of $60,000. This estimate does not include other routine airside maintenance activities such as mowing or replacement of gable markers etc.

7.3 Accuracy of Indicative Budget Costs

The accuracy of the indicative budget cost estimates is considered to be of the order of 30% too high to 30% too low.

The accuracy is governed by the limitations identified in **Section 7.1**.

7.4 Potential Project Cost Savings

Once a preferred option is adopted by BODC for further development to detailed design, there is potential for overall project cost savings related to the following:

- The assumed aircraft traffic is refined (potentially reducing the pavement thickness);
- BODC purchase construction materials at rates cheaper than market rates;
- BODC sources suitable construction materials from local sources; and
- BODC may complete earthworks and other construction elements at rates cheaper than market rates.

Appendix A

Figures

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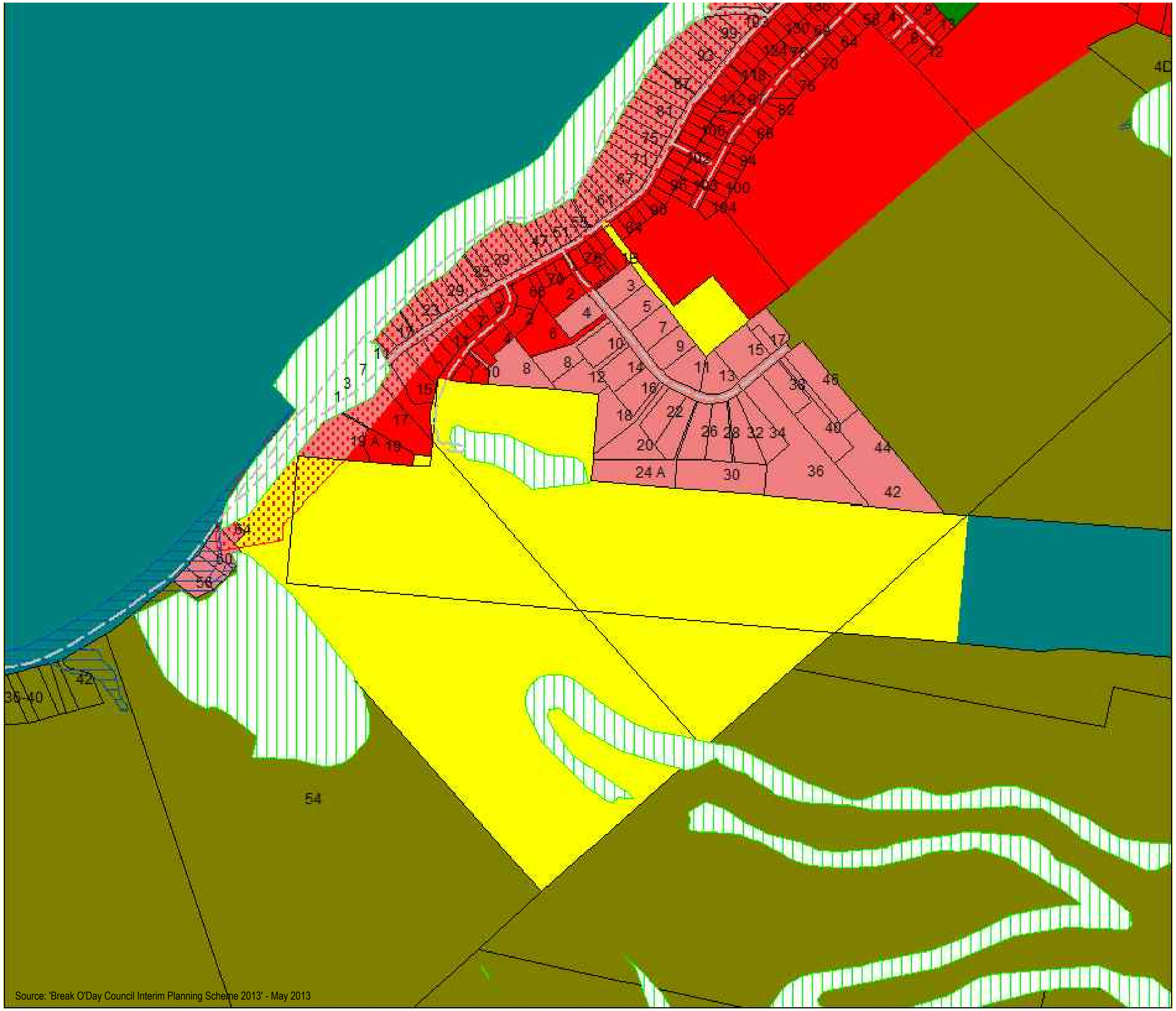

Source: 'Break O'Day Council Interim Planning Scheme 2013' - May 2013

Legend

▨	LAND SLIP RISK AREA
▥	PRIORITY HABITAT
🟨	UTILITIES ZONE
🟦	ENVIRONMENTAL MANAGEMENT ZONE
🟫	ENVIRONMENT LIVING ZONE
🟪	RURAL LIVING
🟥	GENERAL RESIDENTIAL

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NOT TO SCALE

Break O'Day Council - St Helens Aerodrome

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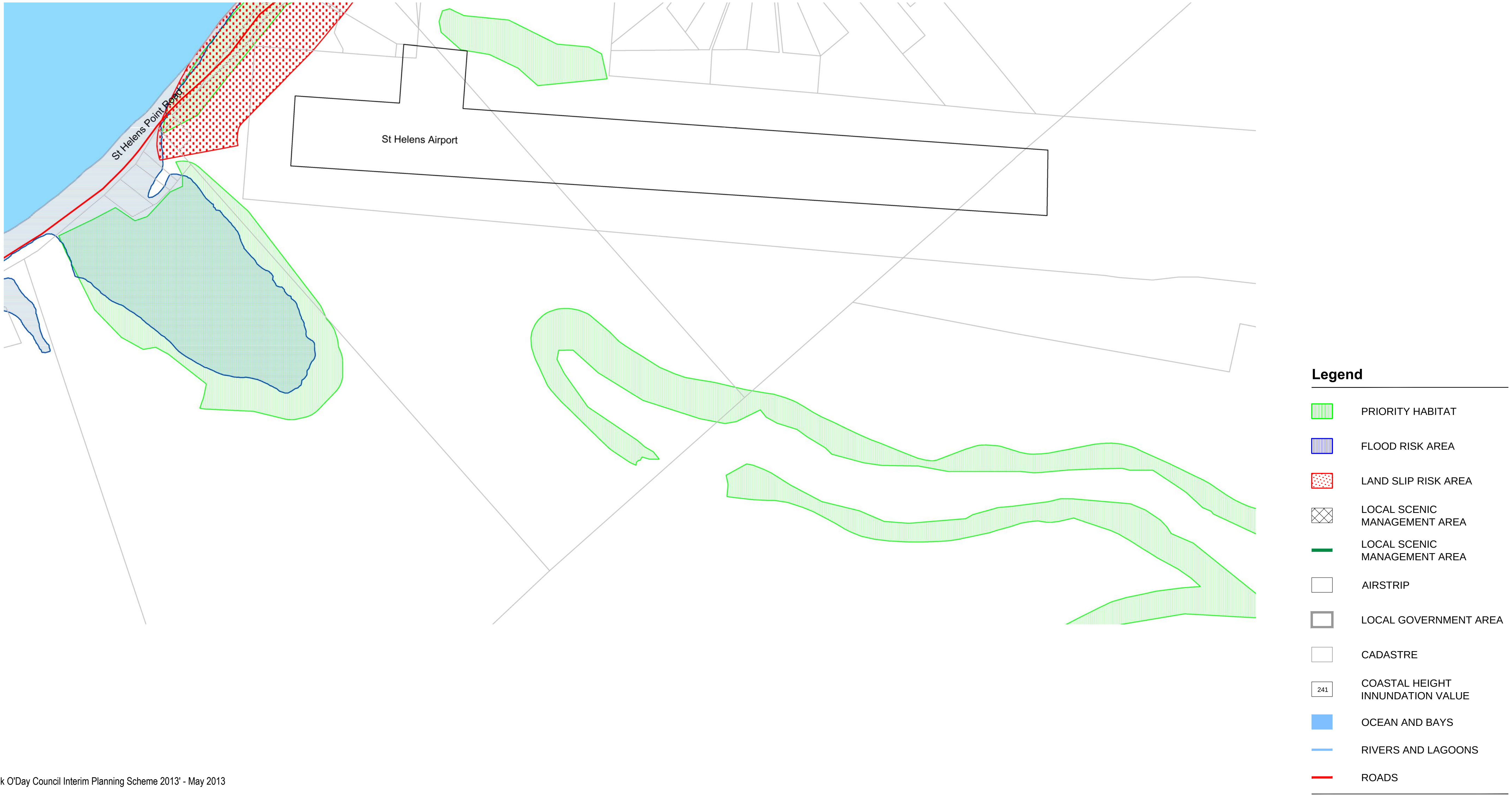
Existing Planning Scheme (Interim Planning Scheme) Zones

FIGURE 1



Source: 'Break O'Day Council Interim Planning Scheme 2013' - May 2013

NOT TO SCALE

Break O'Day Council - St Helens Aerodrome

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Existing Planning Scheme Overlays

FIGURE 2

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Notes

1. EXTENT OF NEW LIGHTING CABLE/CONDUIT AND PIT SYSTEM NOT SHOWN FOR CLARITY.

Legend

▨	PAVEMENT STRENGTHENING AND/OR BITUMINOUS SPRAY SEAL (APPROX. 19350m²) WITH LINE MARKING
○	NEW ELEVATED RUNWAY EDGE LIGHTS (WHITE)
●	NEW ELEVATED THRESHOLD LIGHTS (GREEN)
●	NEW INSET OR ELEVATED RUNWAY THRESHOLD/END LIGHTS (GREEN/RED)
▬	NEW RUNWAY GABLE MARKERS
—/—	EXISTING FENCE

N

SCALE

0 100 200m

Break O'Day Council - St Helens Aerodrome

Concept Aerodrome Upgrade - Stage 1

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FIGURE 3

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Notes

1. EXTENT OF NEW LIGHTING CABLE/CONDUIT AND PIT SYSTEM NOT SHOWN FOR CLARITY.
2. EXTENT OF NEW STORMWATER DRAINAGE INFRASTRUCTURE NOT SHOWN FOR CLARITY.

Legend

🟦	PAVEMENT WIDENING WITH LINE MARKING (23m WIDE RUNWAY) (APPROX. 9100m²)
▨	NEW PAVEMENT CONSTRUCTION WITH BITUMINOUS SPRAY SEAL (APPROX. 17550m²) AND LINE MARKING
○	NEW OR RELOCATED ELEVATED RUNWAY EDGE LIGHTS (WHITE)
🟢	NEW OR RELOCATED ELEVATED THRESHOLD LIGHTS (GREEN)
●	NEW OR RELOCATED INSET OR ELEVATED RUNWAY THRESHOLD/END LIGHTS (GREEN/RED)
▬	NEW OR RELOCATED RUNWAY GABLE MARKERS
—/—	NEW FENCE
—/—	EXISTING FENCE

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N

SCALE
0 100 200m

Break O'Day Council - St Helens Aerodrome

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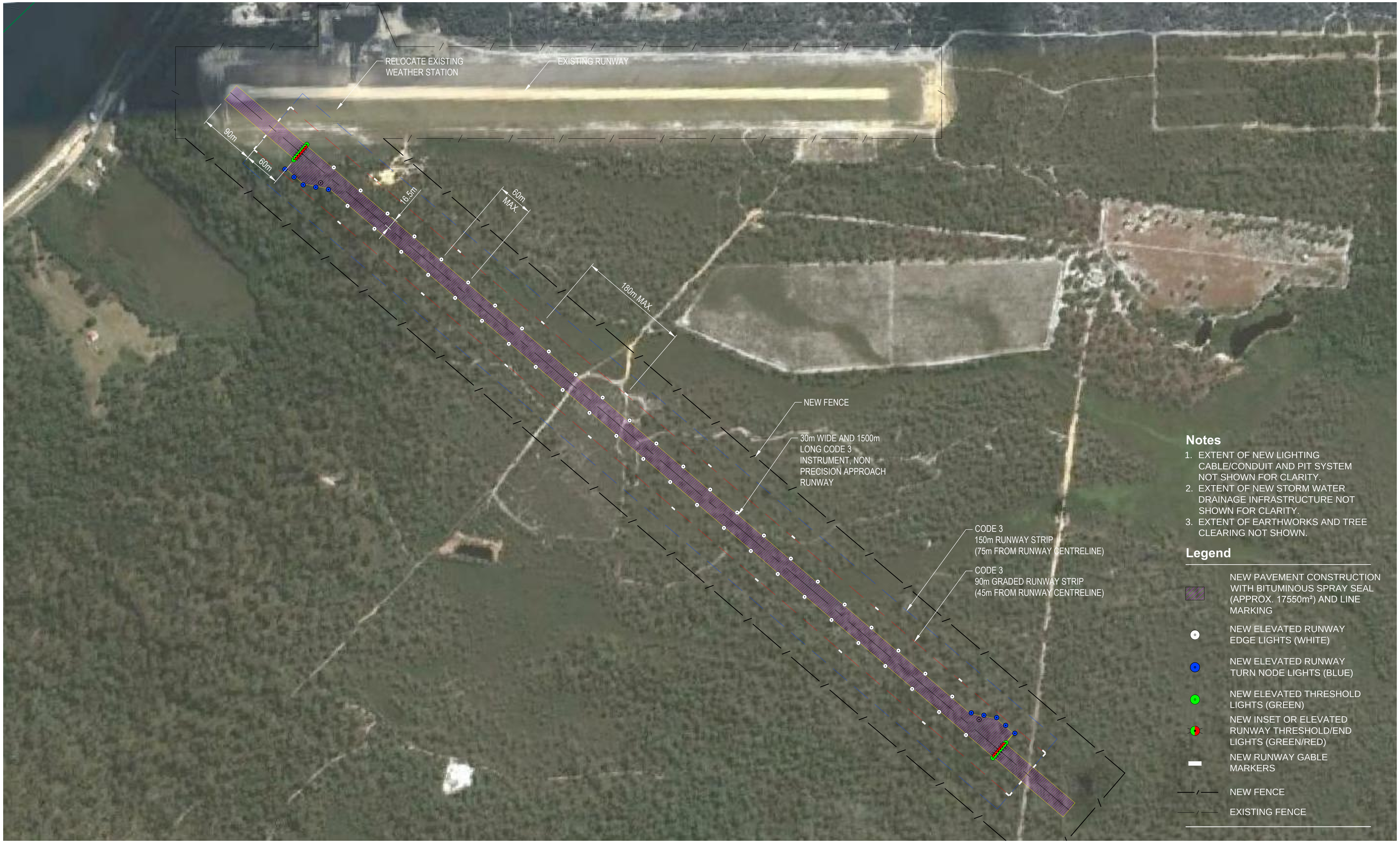
Concept Aerodrome Upgrade - Stage 2

FIGURE 4



Notes

1. EXTENT OF NEW LIGHTING CABLE/CONDUIT AND PIT SYSTEM NOT SHOWN FOR CLARITY.
2. EXTENT OF NEW STORM WATER DRAINAGE INFRASTRUCTURE NOT SHOWN FOR CLARITY.
3. EXTENT OF EARTHWORKS AND TREE CLEARING NOT SHOWN.

Legend

▨	NEW PAVEMENT CONSTRUCTION WITH BITUMINOUS SPRAY SEAL (APPROX. 17550m²) AND LINE MARKING
○	NEW ELEVATED RUNWAY EDGE LIGHTS (WHITE)
●	NEW ELEVATED RUNWAY TURN NODE LIGHTS (BLUE)
●	NEW ELEVATED THRESHOLD LIGHTS (GREEN)
●	NEW INSET OR ELEVATED RUNWAY THRESHOLD/END LIGHTS (GREEN/RED)
▬	NEW RUNWAY GABLE MARKERS
—/—	NEW FENCE
—/—	EXISTING FENCE

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N

SCALE
0 150 300m

Break O'Day Council - St Helens Aerodrome

233492.001

Concept Aerodrome Upgrade - Stage 3

FIGURE 5

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Break O'Day Council - St Helens Aerodrome

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Concept Aircraft Parking Layout - Option 1

FIGURE 6

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NOT TO SCALE

Break O'Day Council - St Helens Aerodrome

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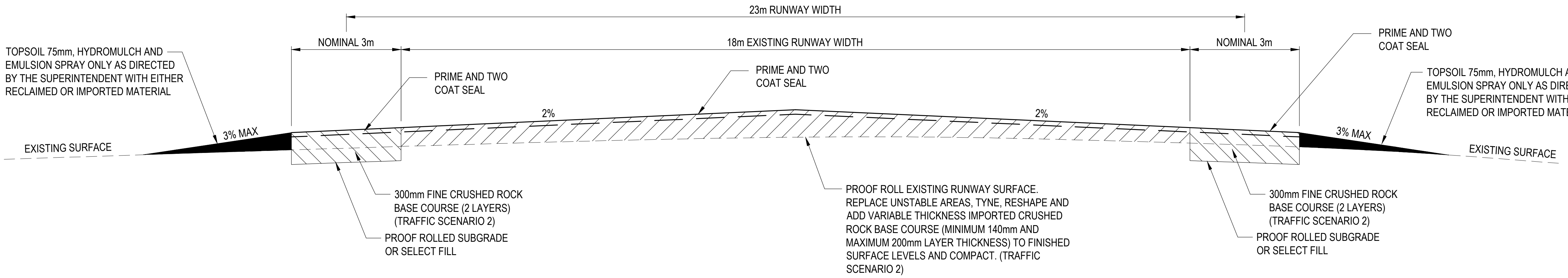
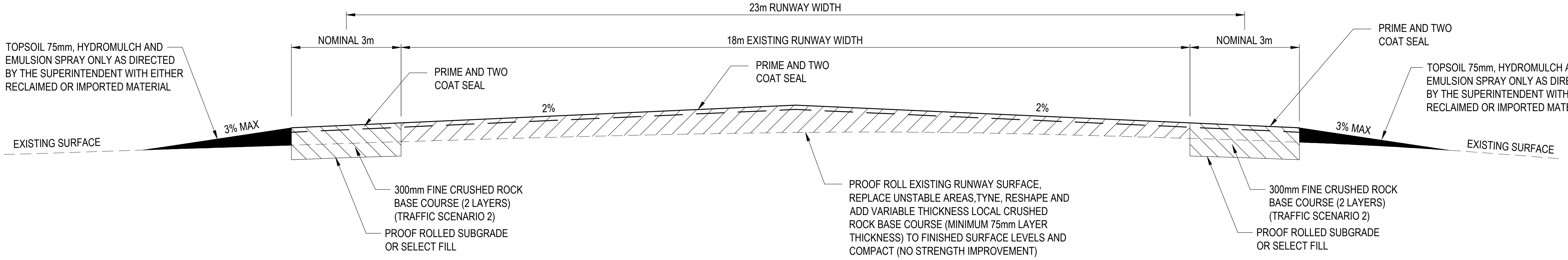
Concept Aircraft Parking Layout - Option 2

FIGURE 7



STAGE 2 TYPICAL RUNWAY CROSS SECTION - GRANULAR OVERLAY (OPTION A)

N.T.S.



STAGE 2 TYPICAL RUNWAY CROSS SECTION - TYNED AND COMPACTED SURFACE (OPTION B)

N.T.S.

NOTES

1. PAVEMENT THICKNESSES SHOWN ARE BASED ON THE FOLLOWING:

TRAFFIC SCENARIO 1

BEECH 200	1 ARRIVAL PER DAY AT MAXIMUM LANDING WEIGHT (5.7 TONNES)
BEECH 200	1 DEPARTURE PER DAY AT MAXIMUM TAKE-OFF WEIGHT (5.7 TONNES)

TRAFFIC SCENARIO 2

BEECH 200	2 ARRIVAL PER DAY AT MAXIMUM LANDING WEIGHT (5.7 TONNES)
BEECH 200	2 DEPARTURE PER DAY AT MAXIMUM TAKE-OFF WEIGHT (5.7 TONNES)
METRO III	1 ARRIVAL PER DAY AT MAXIMUM LANDING WEIGHT (6.6 TONNES)
METRO III	1 DEPARTURES PER DAY AT MAXIMUM TAKE-OFF WEIGHT (6.6 TONNES)

ASSUMED SUBGRADE CBR OF 6%

2. CONTRACTOR IS TO UNDERTAKE SUBGRADE CBR TESTING AS DIRECTED AND TO THE APPROVAL OF THE PRINCIPAL TO DEMONSTRATE SUBGRADE CBR IS 6%. IF SUBGRADE CBR IS NOT 6%, PRINCIPAL WILL DIRECT CONTRACTOR TO PLACE MORE OR LESS THICKNESS OF CRUSHED ROCK BASE AS NECESSARY TO CATER FOR INTENDED AIRCRAFT TRAFFIC

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NOT TO SCALE

Break O'Day Council - St Helens Aerodrome

Stage 2 - Typical Sections and Details

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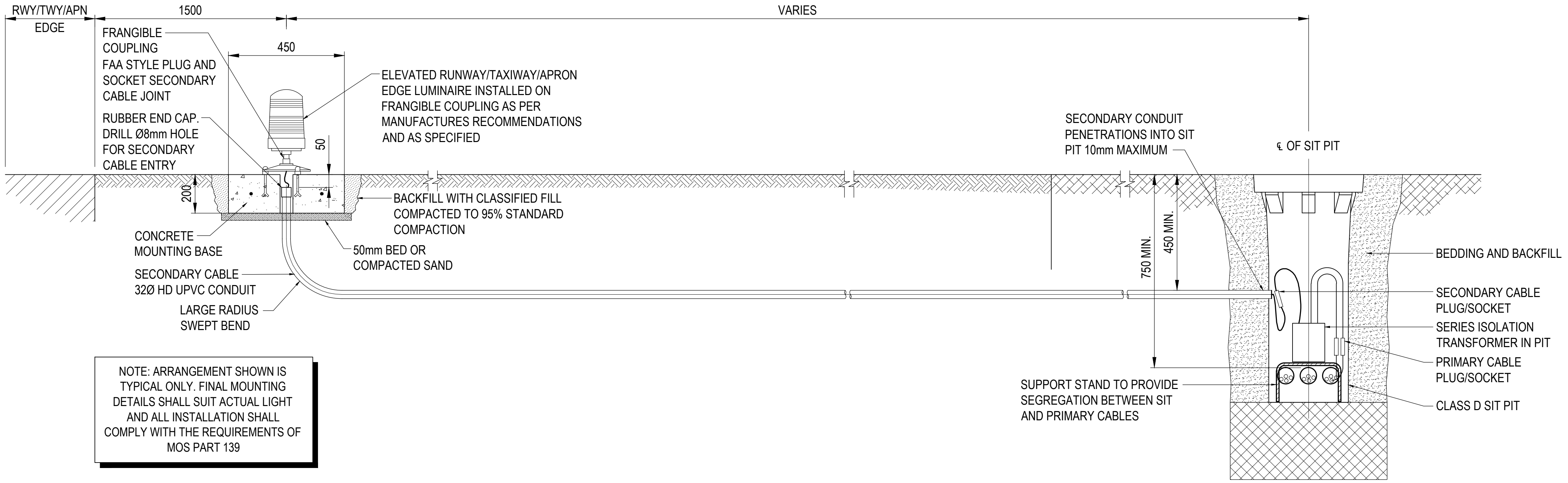
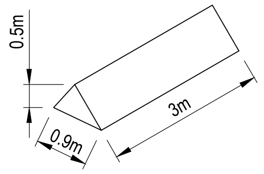
FIGURE 8



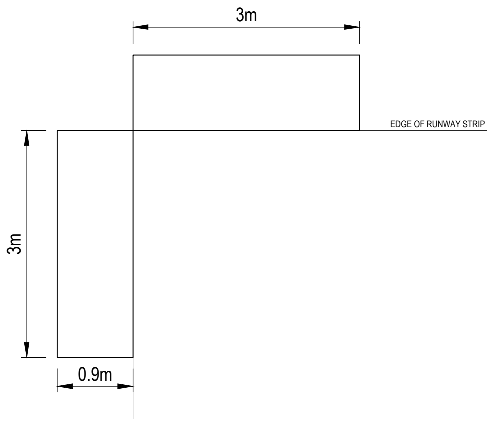
NOTE: ARRANGEMENT SHOWN IS TYPICAL ONLY. FINAL MOUNTING DETAILS SHALL SUIT ACTUAL LIGHT AND ALL INSTALLATION SHALL COMPLY WITH THE REQUIREMENTS OF MOS PART 139

INSTALLATION OF "ELEVATED" RUNWAY, TAXIWAY, APRON EDGE LIGHT AND TRANSFORMER PIT TYPICAL ARRANGEMENT

N.T.S.



1. THE STRIP GABLE MARKERS ARE NOT TO SCALE.
2. SPACING OF GABLE MARKERS NOT TO EXCEED 180.0 METRES.
3. TWO No. GABLE MARKERS TO BE PLACED AT ALL CHANGES OF DIRECTION OF STRIP.
4. ALL MARKERS ARE TO BE PAINTED WHITE.
5. ALL BOUNDARY MARKERS TO BE CONSTRUCTED OF LIGHT FRANGIBLE MATERIAL WHICH WOULD NOT CAUSE DAMAGE TO AIRCRAFT. SUGGESTED MATERIALS ARE MALTHOID RUBBER, CFC AND FIBRE GLASS.
6. GABLE MARKERS TO BE FIXED BY GROUND PEGS OR SUITABLE EQUIVALENT.



RUNWAY STRIP MARKERS (GABLE TYPE)

N.T.S.

POSITION OF CORNER GABLE MARKERS

N.T.S.

NOT TO SCALE

Break O'Day Council - St Helens Aerodrome

Stages 1 and 2 - Typical Lighting and Gable Marker Details

233492.001

FIGURE 9

Appendix B

Geotechnical Investigation

BREAK O'DAY COUNCIL

St Helens Aerodrome
Geotechnical Investigation

BREAK O'DAY COUNCIL

St Helens Aerodrome Geotechnical Investigation

Issue No: 1
Issue Date: 20/11/13

Ref No: BreakODay Airport/2013

Client: Break O'Day Council

EAW Geo Services
3 The Upper Sanctuary Drive
Leonay NSW 2750

Telephone: 0419 242 732
E-mail: newell_w@optusnet.com.au

Report Prepared by: WarrenNewell; MAppSc; FIEAust; CPEng (595788)

Approved: Warren J. Newell
Warren J Newell MAppSc FIEAust CPEng
NPER Reg. Number 595788

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CONTENTS

1. 0 Introduction

Earth Air Water Consulting and Monitoring Pty Ltd, trading as EAW Geo Services were engaged by Break O'Day Council to carry out a geotechnical investigation of the sub-soil conditions at the St Helens Aerodrome. It is understood that there is a planned surface improvement program that will require possible upgrading of the runway surface, taxiway and apron area adjacent to the terminal building.

1.1 Description of the Investigation

The scope of work requested that a series of shallow bores be drilled along the runway at regular intervals, in the taxiway area and around and through the pavement of the apron area. Specifically the scope called for: -

- Bores not more than 100metres apart on alternate sides of the runway. About ten (10) individual bores suggested.
- Bores adjacent to the taxiway. Two (2) bore requested.
- Bores around and through the apron. Five (5) bores requested.

The bores were to extend about 1.0 metres below the soil surface and were to intercept or identify the base-course and the sub-grade material and these materials were to be logged and sampled for a selection of laboratory tests designed to give pavement design information.

To facilitate the sampling program a rotary drill rig fitted with a large diameter auger was utilised to drill in the selected locations. Due to possible runway use by aircraft during the investigation program liaison with the Aerodrome operator was paramount to safety and test location selection.

1.2 Objectives of the Investigation

It is understood that the data obtained from this investigation will be used to determine the current conditions of the runway surface material, the base-course and the sub-grade. The material tests will be utilised to design a pavement that will meet performance expectations into the future of the runway, taxiway and apron area of the existing Aerodrome.

The investigation area did not extend beyond the current runway however the materials in the current runway will indicate the likely performance of the locally available materials should the runway or apron areas have some small extension or increase in capacity in the future.

The CBR values measured in-situ and correlated to the laboratory CBR tests will give an indication of the required construction specifications that will be needed to develop a base-course for any pavement that should meet the performance required for future "loads" on the runway, should air-traffic becomes heavier or more frequent.

2.0 Site Features and Geology

The Aerodrome is located approximately 3000 metres east of the St Helens town on the eastern side of Georges Bay. The runway is about 1000 metres in length and is situated on a flat ridge at approximately 40 metres AHD. A shallow creek valley at the eastern end of the runway marks the eastern limit of the current runway while the western end is defined by the natural fall of the ridge to Georges Bay. The Aerodrome hanger and small terminal building are located at the north western corner of the Aerodrome.

Surrounding ground is moderately vegetated with low scrub to the south and east while the urban development extends along the northern boundary of the Aerodrome. The aerodrome drains to the west and east towards the natural drainage pattern of the immediate area.

The runway is compacted granite gravel with the taxiway and apron bitumen sealed. There are no parallel taxiways with the runway thus aircraft use the runway for taxiing to and from landing or take off points.

Figure 2.1 – Location and Topography of the Aerodrome

The geology of the Aerodrome area as indicated in North Eastern Tasmania Geological Mapping 1:250,000 Digital data. Reference AGD66 – AMG Zone 55 (Mineral Resources Tasmania). (Reproduced in part below) indicates that the site is located in an area of Quaternary age material, being dominantly non-marine sequences of gravel, sand, silt, clay and regolith. This essentially being the soil developed from weathering of the underlying Devonian age granodiorite, which is the dominant base rock in the St Helens area. The Devonian granodiorite has been eroded during the last ice age and sequences between the Devonian aged granodiorite and the recent Quaternary deposits do not appear in the geological profile.

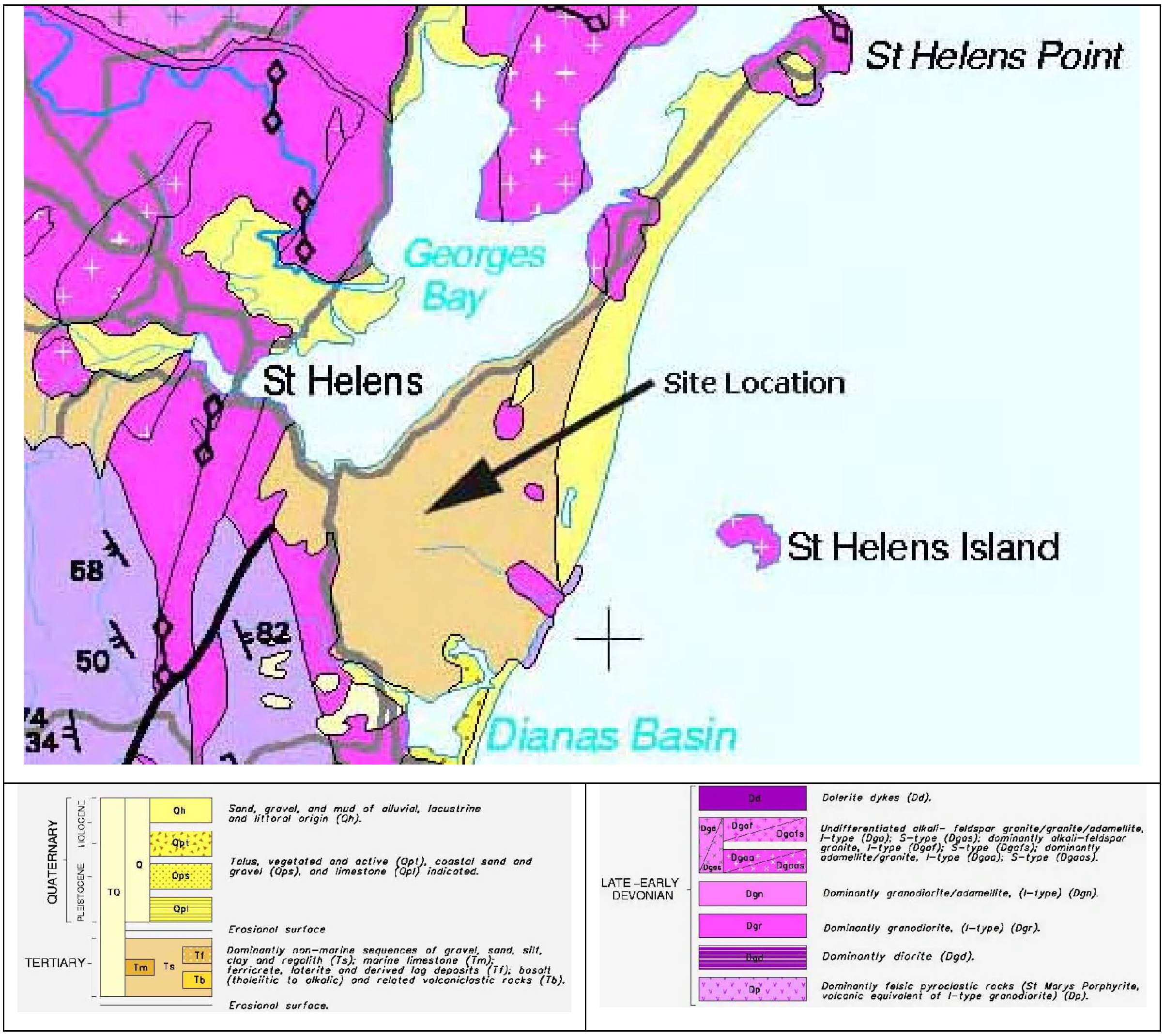


Figure 2.2 – Geology of the Aerodrome Area

3.0 Fieldwork

The field work was carried out on 26 September 2013. At the time the weather was wet with steady rain for most of the day. All holes were drilled using a 225 mm diameter auger mounted on the 6 tonne drill rig. Each bore was drilled to approximately 1.0 metres below ground level. Logging of the recovered material was carried out immediately. Dynamic Cone Penetrometer Tests were carried out at several representative locations using equipment complying with AS1289.6.3.2.

3.1 Drilling and Sampling

Initial inspection of the site indicated that the runway was approximately 1100 metres long (1200 yards). It was noted that runway marker lights were spaced at regular intervals of approximately 91 metres (100 yards) and these were selected as ideal reference points for the regular sampling of the runway sub-soil. As the runway remained active "on notice" throughout the investigation it was determined the most expedient method of spacing the test points was to select points approximately 5 metres east of each runway light, just clear of the wheel track area of the runway or fairly close to the runway formation edge. As drilling progressed towards the east along the runway, locations alternated between the northern side and the southern side of the runway, i.e. a zigzag pattern. The locations have been marked on the site plan in Section 8, of this report. In total, twelve locations were drilled along the runway. Each location was assigned a reference number from R1 to R12, west to east along the runway.

The taxiway locations selected were on alternate sides of the sealed area, once again with the hole being drilled right on the edge of the sealed surface. The taxiway is approximately 65 metres in length thus the space between the sample points was approximately 50 metres. The samples from this location were numbered T1 and T2 and were also from alternate sides of the taxiway.

The apron area was drilled in five (5) locations which were essentially each corner then the mid-point of the apron. The area of the apron is approximately 2840 square metres with a shape dimension of 45 metres by 62 metres. The samples from this location were numbered A1 to A5.

Sampling of all locations followed the same pattern in that as each hole was drilled, the recovered material was logged and samples collected, for laboratory testing. The scope of work had agreed that representative samples would be collected from the base-course and the sub-grade of each area. Inspection on site and observations during drilling showed there was a significant consistency in material along the runway and in the Taxiway and Apron areas. This allowed a slightly different approach to the selection of sample material in that the only gradual changes in appearance of the sub-grade material occurred towards the eastern end of the runway.

Bulk samples were collected as tabled below: -

Laboratory Sample No:	Location	Base-course Sub-grade	Comment
T001	Western end of Runway	Base-course	Composite sample from R1 to R4
T002	Western end of Runway	Sub-grade	Composite sample from R1 to R4
T003	Eastern end of Runway	Base-course	Composite sample from R7 to R11
T004	Eastern end of Runway	Sub-grade	Composite sample from R7 to R11
T005	Taxiway	Base-course	Composite sample from T1 & T2
T006	Taxiway	Sub-grade	Composite sample from T1 & T2
T007	Apron	Base-course	Composite sample from A1 & A3
T008	Apron	Sub-grade	Composite sample from A3 & A5
T009	Mid Area of Runway	Sub-grade	Composite sample from R8 to R10

Table 3.1 – Sample collected and Identity Numbers

There was very little change in the sampled soil appearance and observed constituents along the length of the runway. The runway surface was dense clayey sand that was well compacted. Generally the running surface was about 300mm to 400 mm in depth. The running surface overlaid greyish brown clayey sand and in one area there appeared to be some organic material. The organic material is indicated on the appended logs.

The taxiway and apron pavement structure had some aggregate in the base-course which in turn overlaid similar clayey sand observed along the runway.

3.2 DCP Testing

Dynamic Cone Penetrometer tests (DCP) were carried out in accordance with AS1289.6.3.2 using a drop hammer and cone that had been measured and checked against the standard specifications. Given that the observed conditions on site and the material was consistent there were eight (8) DCP's executed on the runway and two (2) along the taxiway. The Taxiway sub-grade was similar to the sub-grade in the apron area and also taken in close proximity to the apron.

The runway DCP's were taken adjacent to the bores at locations R1, R3, R5, R7, R9, R10, R11 and R12. The DCP Field test results have penetration and calculated CBR values included and are appended to this report in Section 10. All DCP tests returned similar values further confirming a consistency in material along the runway.

The taxiway DCP's were taken adjacent to the two bore locations T1 and T2.

4. Laboratory Testing

The samples collected in the field during this investigation were labelled and bagged then sealed to maintain a stable or as near to stable moisture content as possible. The samples were then transported to the SGS Soil Testing facility in Sydney. Transport was carried out by EAW Geo Services thus no third party carrier was used that may have compromised the sample integrity. The SGS facility is NATA Approved (Accreditation No: 2418) for the requested tests. The SGS facility in Sydney carries out testing for a wide range of projects across Australia and is frequently used by EAW Geo Services.

4.1 Sample and Test Selection

As detailed in Section 3.1 above, bulk samples (15kg to 20kg) were collected in the field and identified. Based on appearance and estimated constituents it was thought that atterberg limit tests may not be satifactory due to the high sand content thus the executing of the atterberg tests was delayed until the particle size grading had been completed. As a NATA Materials Laboratory Assessor, it is often noted that less experienced soils Engineers request tests on samples that may, due to the samples nature, return inappropriate results. The selected tests on each sample are tabled on the following page.

The first phase of the particle size distribution indicated approximately 20% of the material passing the 0.075 mm sieve apperture. This became a hold point in the testing and the results and sample conditions reviewed. The two more clayey samples, T004 and T005 were thensubjected to a particle size distribution test using the Hydrometer method to extend the particle size distribution to sizes less than 0.075mm. The test was extended by several days and the resultant distirbution curves showed the smaller particles being mainly silt with clay sizes less than 8%.

The two more clayey samples T004 and T005 were also tested for their Atterberg Limits and while still dominantly silty gave reasonable Liquid Limit and Plasticity results.

Laboratory Sample No:	Location	Base-course Sub-grade	Selected Tests
T001	Western end of Runway	Base-course	Moisture Content; Particle Size Distribution
T002	Western end of Runway	Sub-grade	Moisture Content; Particle Size Distribution; CBR; Dry Density / Moisture Content Relation;
T003	Eastern end of Runway	Base-course	Moisture Content; Particle Size Distribution; CBR; Dry Density / Moisture Content Relation;
T004	Eastern end of Runway	Sub-grade	Moisture Content; Particle Size Distribution; CBR; Dry Density / Moisture Content Relation; Atterberg Limits
T005	Taxiway	Base-course	Moisture Content; Particle Size Distribution; CBR; Dry Density / Moisture Content Relation; Atterberg Limits
T006	Taxiway	Sub-grade	Moisture Content; Particle Size Distribution; CBR; Dry Density / Moisture Content Relation;
T007	Apron	Base-course	Moisture Content; Particle Size Distribution; CBR; Dry Density / Moisture Content Relation;
T008	Apron	Sub-grade	Moisture Content; Particle Size Distribution; CBR; Dry Density / Moisture Content Relation;
T009	Mid Area of Runway	Sub-grade	Moisture Content; Particle Size Distribution; CBR; Dry Density / Moisture Content Relation;

Table 4.1 – Sample Tests Selected

4.2 Test Methods

All test methods were in accordance with AS1289, and carried out in a NATA accredited facility. The registration of SGS is current for all the requested tests. The actual test methods are tabled on the following page.

Test Undertaken	Australian Standard Reference
Moisture Content of a Soil	AS 1289.2.1.1
Particle Size Distribution	AS 1289.3.6.1
Particle Size Distribution (Hydrometer)	AS 1289.3.6.3
California Bearing Ratio of a Soil	AS 1289.6.1.1
Dry Density/ Moisutre Content Relation	AS 1289.5.1.1
Atterberg Limits with Linear Shrinkage	AS 1289.3.1.2, 3.2.1, 3.3.1, 3.4.1

Table 4.2 – Test Standard Reference

4.3 Material Limitations

The material selected for testing did not show any limitations other then the issues noted above relative to the more sandy nature and the application of the Atterberg test proceedures.

In the field, the material appears to be preforming well as a light runway surface and there were no indications of settlement or movement. The surface of the runway is regularly maintained and this removes the minor rutting that occurrs in the landing areas.

5. Geological Profile

The auger drilling undertaken was limited to a depth of 1.0 metres below surface and thus deeper soil data to develop a geological profile is limited. Observations made during drilling and from the local area as well as the mapped geology indicate that the underlying granodiorite ridge is probably close to horizontal with a tendency to be rounded off nearer the edges of the ridge particularly near the creek course on the southern and eastern side.

Granodiorite outcrops on the southern perimeter fence in the vicinity test locations R9 through to R11. The drill bit met "advancement refusal" in bores R10 and R11, although bore R11 was extended deeper to 1.4 metres below surface to identify the refusal point. DCP test point R7 encountered refusal however it appears this refusal depth may have been on large gravel.

The material drilled below 400mm depth at R9 through to R11 appeared to be extremely weathered granodiorite which correlates to surface observations. With the limited information available it appears the surface of the granodiorite dips gently from the location of R10 and R11 towards the west and possible more steeply to the east from this point. The depth of the granodiorite surface is known to be approximately 1 metre below surface in the vicinity of R10 and R11 and can only be estimated as being 1.5 to 2.0 metres below surface at the western end of the runway.

6. Interpretation of Investigation

Observations made on site during the investigation, the drill logs, DCP testing and laboratory test results have been used in developing the interpretation of this investigation.

6.1 Field Data

The drill logs have been appended in section 9 of this report along with the in-situ DCP tests carried out along the runway and taxiway.

The drilling logs show consistent soil conditions along the length of the runway and within the taxiway and apron areas. Generally the surface of the runway has between 300 to 500 mm of compacted granodiorite as the running or flexible pavement surface. In the paved areas of the taxiway and apron there is essentially about 25mm of bitumen overlaying approximately 250mm of compacted base-course on the sub-grade.

The sub-grade does not appear to have had any significant preparation but the location of the aerodrome has a naturally well drained environment and no impacts from groundwater were noted. Bore R2 intercepted some decaying vegetation and the presence of the dark brown to black clayey sand appeared to be the buried topsoil layer. This observation indicates that the formation was likely to have been leveled during construction but the exclusion of topsoil and some vegetation from the sub-grade has not taken place. This was possibly a typical formation for a small aerodrome of this type. The topsoil observed is very sandy and not unlike the deeper or surrounding soil and it's presence appears to have and is likely to continue to have little influence on the surface and sub-grade. During any pavement upgrade it would be prudent to remove any decaying vegetation.

DCP testing indicates consistent sub-grade and base-course strength appears to compare reasonably well with the the CBR tests undertaken in the laboratory. The DCP / CBR tests are discussed following in Section 7.1

6.2 Laboratory Data

The laboratory results from the testing undertaken is tabilated below. The Particle size distribution is not included in the table, however the graphed results are appended in Section 11, following and are commented on in general terms below.

Sample ID	**Test**	**Moisture Content** %	**Grading**	**CBR**		**Dry Density / MC Relastionship**		**Atterberg Limits**			**Linear Shrinkage %**
	Location			CBR at 2.5 mm	CBR at 5.0 mm	Max Dry Density	OMC %	LL %	PL %	PI %	
T001	Runway	10.5	SW	Nt		Nt	Nt	Nt	Nt	Nt	Nt
T002	Runway	5.5	SW	25	30	2.05	9.0	Nt	Nt	Nt	nt
T003	Runway	7.8	SW	10	12	2.03	10	Nt	Nt	Nt	Nt
T004	Runway	5.9	SW	20	25	2.08	9.0	Nt	Nt	Nt	Nt
T005	Taxiway	10.8	SW	9	13	2.0	10.5	24	16	8	5.5
T006	Taxiway	11.0	SW	10	14	1.95	11.5	24	19	5	4.5
T007	Apron	7.2	SW	8	10	2.1	8.5	Nt	Nt	Nt	Nt
T008	Apron	7.7	SW	16	20	2.03	9.5	Nt	Nt	Nt	Nt
T009	Runway	6.6	SW	16	20	2.07	9.5	Nt	Nt	Nt	Nt

Table 6.1 – Test Result Summary

The results of the laboratory testing show a consistency between samples. The moisture contents may have been impacted to a limited degree by the morning rain on site and the recent rain, especially given the free draining nature of the soil.

Particle size grading show a well graded sandy soil with silt and a trace of clay – less than 8%. The only sample with oversize material was the base-course from the apron area however excessive over size aggregate was not encountered in all holes.

Maximum dry density of the sampled material ranged between 1.95 tonnes per cubic metre to 2.1 tonnes per cubic metre. The optimum moisture content for compaction was in the range of 8.5% to 11.5 %. The graphed data from testing indicates a plus or minus of about 2% would be acceptable in an earthworks project. The silt content is unlikely to cause any compaction issues near the optimum moisture content.

Atterberg Limit tests and linear shrinkage testing indicates a low plasticity soil with low reactivity. Only two samples were considered suitable for Atterberg tests and even selecting those samples was considered marginal with the decision driven more by interest rather than need for a result to determine a construction parameter.

CBR tests ranged between 8 and 25 for the 2.5 mm piston penetration and ranged between 10 and 30 for the 5.0 mm piston penetration. This supports the hypothesis that sub-grade construction may have been limited to rolling but little compaction control.

6.3 Inconsistencies or Limitations in Data

There are no significant inconsistencies in the data collected on site and tested in the laboratory. The sandy nature of the soil limited the suitability for Atterberg Testing however this has no significant impact on design of any new sub-grade or pavement.

7. Recommendations for Pavement Design

The actual proposed works has not been indicated to the writer however some general comments are made in this section in relation to preparing the sub-grade for some form of renewed pavement. Once loads and expected aircraft sizes are known a more comprehensive design can be commissioned.

7.1 Dynamic Cone Penetrometer V's CBR Correlation

There appears to be reasonable correlation between the DCP Calculated field CBR's and the Laboratory test CBR's, in the range of CBR's up to ratios of 15 to 20. Statistically some outliers would be expected in this type of sample.

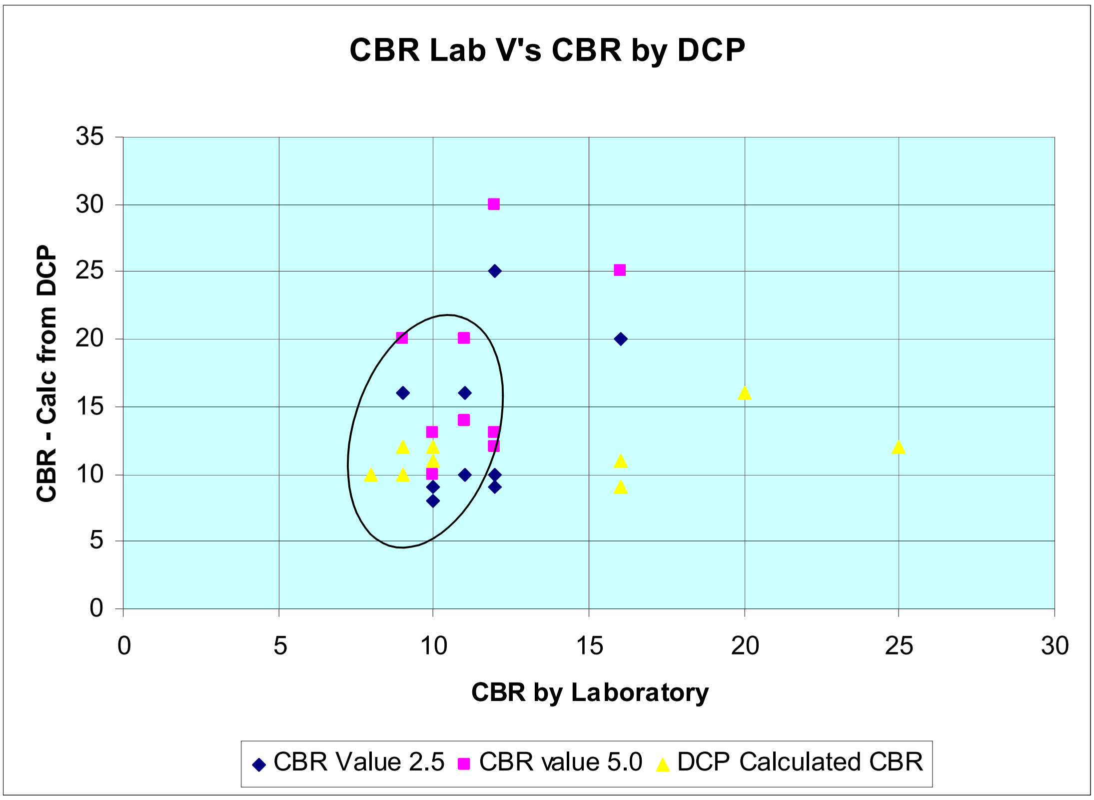


Figure 7.1 - Comparision between Field and Laboratory CBR's

In reviewing the results, it must be remembered that the sample submitted to the laboratory was a composite of up to three bore holes and while field DCP's were executed adjacent to each selected bore location, the laboratory result was not nessecarily on the same sample and there would be some mixing of the soil from the profiles, thus identical samples are not being compared.

Additionally, small gravel or other inclusions in the soil may have impacted on the field DCP result however a high field outlier would be expected.

Another aspect of the testing is that the material in the field is not as compacted or dense as the material remoulded in the laboratory and hence the field results show the insitu CBR while the Laboratory CBR's show what the CBR will be at 100% compaction or maximum density. The soil tested was also wet from recent rain events and it is accepted that "wet" soil will have a lower strength than a dry soil.

7.2 CBR Recomendations

Based on CBR's testing carried out in the laboratory and compared to Field test results it is reasonable to assume CBR's of 12 to 20 can be reached in the field with rolling and class 1 earthworks supervision. If the runway is not going to be sealed then lower CBR' should be taken at the design stage as moisture will penetrate the profile thus lowering the soil strength.

Greater soil strength may be gained by cement stabilisation, however it would be recommended that further laboratory testing be carried out to determine the optimum cement content for the sub-grade.

Based on the LL being ≤ 25 and the PI ≤ 5, with the improvement work carried out under supervision, the sub-grade should be compacted to at least 98% in layers not exceeding 150 mm depth. The loading on the current runway is generally limited by its length and unless there are plans to lengthen the runway the sub-grade compaction needs to extend to about 250mm to 300mm depth under the flexible pavement.

Observations of the material on site, there does not appear to be any structural issues with the existing runway and improvements such as applying a flexible pavement would reduce the water penetration and enhance the strength of the sub-grade.

8. Site Plan and Test Locations

Figure 8.1 - Aerodrome Locality

Figure 8.2 - Runway Sample Bore Locations

Location	Latitude	Longitude	Comment
Runway Test Locations			
R1	41°20'14.52" S	148°16'45.26" E	Runway lights used as main locators. Each bore was located approximately 4 to 6 metres east of each relative light. Odd numbered tests on north side of runway - Even numbered tests on south side of runway.
R2	41°20'15.37" S	148°16'49.03" E	
R3	41°20'14.92" S	148°16'52.96" E	
R4	41°20'15.80" S	148°16'56.84" E	
R5	41°20'15.40" S	148°17'0.89" E	
R6	41°20'16.16" S	148°17'4.74"E	
R7	41°20'15.80" S	148°17'8.73" E	
R8	41°20'16.46" S	148°17'12.59" E	
R9	41°20'16.15" S	148°17'16.67" E	
R10	41°20'16.81" S	148°17'20.44" E	
R11	41°20'16.47" S	148°17'24.33" E	
R12	41°20'17.26" S	148°17'28.07" E	
Taxiway Locations			
T1	41°20'12.81" S	148°16'51.61" E	Off edge of paved area
T2	41°20'14.25" S	148°16'52.02" E	Off edge of paved area
Apron Locations			
A1	41°20'12.14" S	148°16'50.71" E	SW Corner
A2	41°20'11.25" S	148°16'50.54" E	NW Corner
A3	41°20'11.11" S	148°16'53.43" E	NE Corner near gate
A4	41°20'12.05" S	148°16'53.29" E	SE Corner near windsock
A5	41°20'11.80" S	148°16'52.04" E	Middle

Table 8.1 – Test Locations – GPS Location – Lat. & Long.

Figure 8.3 - Taxiway and Apron Sample Bore Locations

9. Bore Logs

EAW Geo Services ***Shallow Bore / Pit Log*** **BORE No R 1**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 14.5" S
148° 16' 45.3" E
Bearing: Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil						Rock						Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense dark brown sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1000	🟨	**SAND: (SC) (CL):** Dense greyish brown to grey sand with silt and some clay. Moist.				■										
		1500 2000		**BORE TERMINATED AT 1.2 Metre BGL**														

EAW Geo Services ***Shallow Bore / Pit Log*** **BORE No R 2**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 15.4" S
148° 16' 49.0" E
Bearing: Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil						Rock						Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist. Occassional small semi decayed sticks.				■										Assumed natural material below this depth.
		1000	🟨	**SAND: (SC) (CL):** Dense greyish brown to grey sand with silt and some clay. Moist.				■										
		1500 2000		**BORE TERMINATED AT 1.2 Metre BGL**														

EAW Geo Services ***Shallow Bore / Pit Log***

BORE No **R 3**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 14.9" S 148° 16' 52.9" E
Bearing:
Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil					Rock							Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1000	🟨	**SAND: (SC) (CL):** Dense greyish brown to grey sand with silt and some clay. Moist.				■										
		1500 2000		**BORE TERMINATED AT 1.1 Metre BGL**														

EAW Geo Services ***Shallow Bore / Pit Log***

BORE No **R4**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 15.8" S 148° 16' 56.8" E
Bearing:
Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil					Rock							Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense dark brown sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1000	🟨	**SAND: (SC) (CL):** Dense greyish brown to grey sand with silt and some clay. Moist.				■										
		1500 2000		**BORE TERMINATED AT 1.1 Metre BGL**														

EAW Geo Services ***Shallow Bore / Pit Log***

BORE No **R5**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)
Co-ords: (Approx) 41° 20' 15.4" S 148° 17' 0.9" E
Bearing:
Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil: V Soft/V Loose	Soil: Soft/Loose	Soil: Firm/M Dense	Soil: Stiff/Dense	Soil: V Stiff/V Dense	Soil: E Weak (Hard)	Rock: V Weak	Rock: Weak	Rock: M Strong	Rock: Strong	Rock: V Strong	Rock: E Strong	Weathering	**Remarks**
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense greyish brown sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1000	🟨	**SAND: (SC) (CL):** Dense greyish brown to grey sand with silt and some clay. Moist.				■										
		1500		**BORE TERMINATED AT 1.0 Metre BGL**														
		2000																

EAW Geo Services ***Shallow Bore / Pit Log***

BORE No **R6**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)
Co-ords: (Approx) 41° 20' 16.2" S 148° 17' 4.7" E
Bearing:
Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil: V Soft/V Loose	Soil: Soft/Loose	Soil: Firm/M Dense	Soil: Stiff/Dense	Soil: V Stiff/V Dense	Soil: E Weak (Hard)	Rock: V Weak	Rock: Weak	Rock: M Strong	Rock: Strong	Rock: V Strong	Rock: E Strong	Weathering	**Remarks**
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense greyish brown sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1000	🟨	**SAND: (SC) (CL):** Dense greyish brown to grey sand with silt and some clay. Moist.				■										
		1500		**BORE TERMINATED AT 1.0 Metre BGL**														
		2000																

EAW Geo Services *Shallow Bore / Pit Log*

BORE No **R7**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Co-ords: (Approx) 41° 20' 15.8" S
148° 17' 8.7" E
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)
Bearing:
Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil					Rock							Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense greyish brown sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
			🟨	**SAND: (SC) (CL):** Dense greyish brown to grey sand with silt and some clay. Moist.				■										
		1000	🟨	**SAND: (SC) (CL):** Dense dark brown to grey sand with gravel to 30mm and some clay and silt. Moist.				■										
			🟨	**SAND: (SC) (CL):** Dense light brown sand clay and silt. Moist.				■										
		1500 2000		**BORE TERMINATED AT 1.2 Metre BGL**														

EAW Geo Services *Shallow Bore / Pit Log*

BORE No **R 8**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Co-ords: (Approx) 41° 20' 16.5" S
148° 17' 12.6" E
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)
Bearing:
Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil					Rock							Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	▤	**SAND: (SC) (CL):** Very Dense greyish brown sand with weakly cemented rock, silt and some clay. Moist.					■									Assumed natural material below this depth.
			🟨	**SAND: (SC) (CL):** Dense greyish brown to grey sand with silt and some clay. Moist.				■										
		1000	🟨	**SAND: (SC) (CL):** Dense grey sand with silt and some clay. Moist.				■										
		1500 2000		**BORE TERMINATED AT 1.0 Metre BGL**														

EAW Geo Services *Shallow Bore / Pit Log*

BORE No **R 9**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 16.2" S
148° 17' 16.7 "E
Bearing: Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong	Weathering	**Remarks**
					Soil					Rock								
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense greyish brown sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
			🟨	**SAND: (SC) (CL):** Dense dark brown sand with silt and some clay. Moist.				■										
		1000	🟨	**SAND: (SC) (CL):** Dense grey sand with silt and some clay. Moist.				■										
				BORE TERMINATED AT 1.0 Metre BGL														
		1500																
		2000																

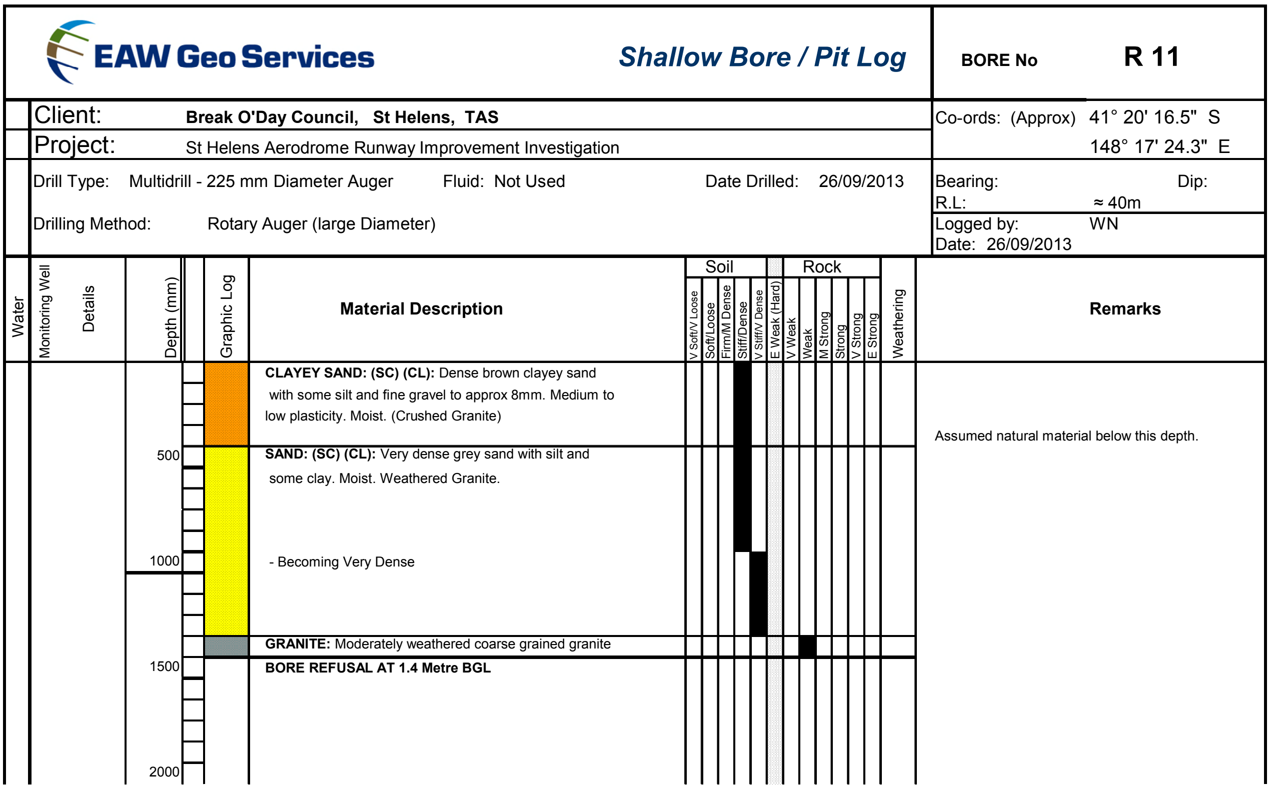
EAW Geo Services *Shallow Bore / Pit Log*

BORE No **R 10**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 16.8" S
148° 17' 20.4" E
Bearing: Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong	Weathering	**Remarks**
					Soil					Rock								
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Very dense grey sand with silt and some clay. Moist. Weathered Granite.					■									Assumed natural material below this depth.
			▩	**GRANITE:** Moderately weathered coarse grained granite								■						
		1000		**BORE REFUSAL AT 0.9 Metre BGL**														
		1500																
		2000																

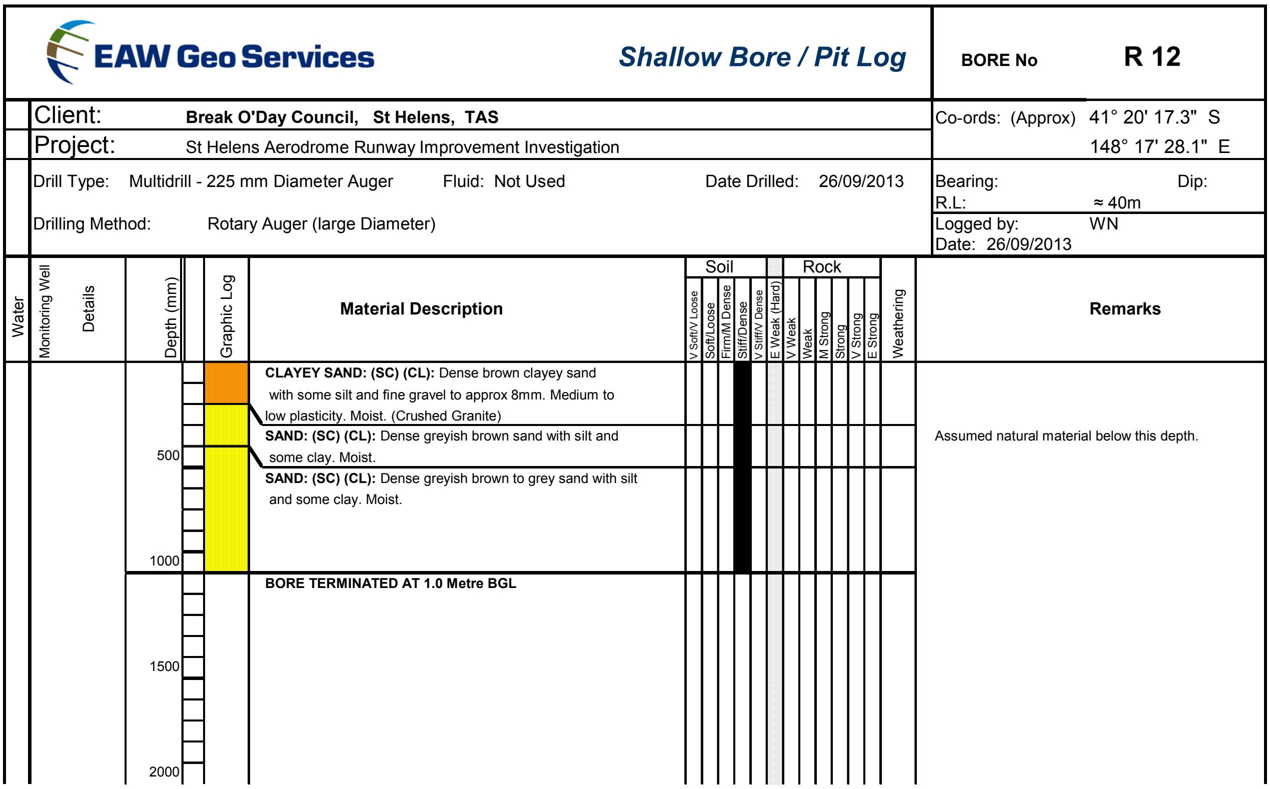


EAW Geo Services *Shallow Bore / Pit Log*

BORE No **R 11**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)
Co-ords: (Approx) 41° 20' 16.5" S 148° 17' 24.3" E
Bearing:
Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Material Description	Remarks
CLAYEY SAND: (SC) (CL): Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)	Assumed natural material below this depth.
SAND: (SC) (CL): Very dense grey sand with silt and some clay. Moist. Weathered Granite. - Becoming Very Dense	
GRANITE: Moderately weathered coarse grained granite	
BORE REFUSAL AT 1.4 Metre BGL	



EAW Geo Services *Shallow Bore / Pit Log*

BORE No **R 12**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)
Co-ords: (Approx) 41° 20' 17.3" S 148° 17' 28.1" E
Bearing:
Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Material Description	Remarks
CLAYEY SAND: (SC) (CL): Dense brown clayey sand with some silt and fine gravel to approx 8mm. Medium to low plasticity. Moist. (Crushed Granite)	
SAND: (SC) (CL): Dense greyish brown sand with silt and some clay. Moist.	Assumed natural material below this depth.
SAND: (SC) (CL): Dense greyish brown to grey sand with silt and some clay. Moist.	
BORE TERMINATED AT 1.0 Metre BGL	

EAW Geo Services ***Shallow Bore / Pit Log***

BORE No **T 1**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 12.8" S
148° 16' 51.6" E
Bearing: Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil						Rock						Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel. Moist. (Crushed Granite)				■										
		500	🟨	**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist.				■										Assumed natural material below this depth. Note: Test Location just off the edge of the Taxiway paved - bitumen surface.
		1000	🟨	**SAND: (SC) (CL):** Dense yellowish grey sand with silt and some clay. Moist.				■										
		1500 2000		**BORE TERMINATED AT 1.0 Metre BGL**														

EAW Geo Services ***Shallow Bore / Pit Log***

BORE No **T 2**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 14.3" S
148° 16' 52.0" E
Bearing: Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil						Rock						Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			🟧	**CLAYEY SAND: (SC) (CL):** Dense brown clayey sand with some silt and fine gravel. Moist. (Crushed Granite)				■										Assumed natural material below this depth.
		500 1000	🟨	**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist.				■										Note: Test Location just off the edge of the Taxiway paved - bitumen surface. Located near blue T/way Lights
		1500 2000		**BORE TERMINATED AT 1.0 Metre BGL**														

EAW Geo Services *Shallow Bore / Pit Log*

BORE No **A 1**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Co-ords: (Approx) 41° 20' 12.2" S
148° 16' 50.7" E
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Bearing:
Dip:
R.L.: ≈ 40m
Drilling Method: Rotary Auger (large Diameter)
Logged by: WN
Date: 26/09/2013

					Soil						Rock							
Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong	Weathering	**Remarks**
			■	**BITUMEN:** Approx 25 mm Bitumen paving														Paving Generally in good condition
			▨	**SANDY GRAVEL: Very** dense grey sandy Gravel to nom70mm with sandy clay and some silt and fine gravel. Moist.					■									
		500 1000	🟨	**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1500 2000		**BORE TERMINATED AT 1.0 Metre BGL**														

EAW Geo Services *Shallow Bore / Pit Log*

BORE No **A 2**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Co-ords: (Approx) 41° 20' 11.2" S
148° 16' 50.5" E
Drill Type: Multidrill - 225 mm Diameter Auger
Fluid: Not Used
Date Drilled: 26/09/2013
Bearing:
Dip:
R.L.: ≈ 40m
Drilling Method: Rotary Auger (large Diameter)
Logged by: WN
Date: 26/09/2013

					Soil						Rock							
Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong	Weathering	**Remarks**
			■	**BITUMEN:** Approx 25 mm Bitumen paving														Paving Generally in good condition
			▨	**SANDY GRAVEL: Very** dense grey sandy Gravel to nom70mm with sandy clay and some silt and fine gravel. Moist.					■									
		500 1000	🟨	**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1500 2000		**BORE TERMINATED AT 1.0 Metre BGL**														

EAW Geo Services — ***Shallow Bore / Pit Log***

BORE No **A 3**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 11.1" S
148° 16' 53.4" E
Bearing: Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil						Rock						Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
		500	🟨	**SANDY GRAVEL: Very d**ense grey sandy Gravel to nom10mm with sandy clay and some silt and fine gravel. Moist.					■									Location drilled just off the edge of the paved apron. Minimal Gravel encountered
		1000	🟨	**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1500 2000		**BORE TERMINATED AT 1.0 Metre BGL**														

EAW Geo Services — ***Shallow Bore / Pit Log***

BORE No **A 4**

Client: **Break O'Day Council, St Helens, TAS**
Project: St Helens Aerodrome Runway Improvement Investigation
Drill Type: Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013
Drilling Method: Rotary Auger (large Diameter)

Co-ords: (Approx) 41° 20' 12.0" S
148° 16' 53.3" E
Bearing: Dip:
R.L: ≈ 40m
Logged by: WN
Date: 26/09/2013

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil						Rock						Weathering	**Remarks**
					V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	V Weak	Weak	M Strong	Strong	V Strong	E Strong		
			■	**BITUMEN:** Approx 25 mm Bitumen paving														Paving Generally in good condition
			▨	**SANDY GRAVEL: Very d**ense grey sandy Gravel to nom70mm with sandy clay and some silt and fine gravel. Moist.					■									
		500 1000	🟨	**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1500 2000		**BORE TERMINATED AT 1.0 Metre BGL**														

EAW Geo Services *Shallow Bore / Pit Log*

BORE No **A 5**

Client:	**Break O'Day Council, St Helens, TAS**	Co-ords: (Approx)	41° 20' 11.8" S
Project:	St Helens Aerodrome Runway Improvement Investigation		148° 16' 52.0" E
Drill Type:	Multidrill - 225 mm Diameter Auger Fluid: Not Used Date Drilled: 26/09/2013	Bearing: R.L:	Dip: ≈ 40m
Drilling Method:	Rotary Auger (large Diameter)	Logged by: Date: 26/09/2013	WN

Water	Monitoring Well Details	Depth (mm)	Graphic Log	**Material Description**	Soil: V Soft/V Loose	Soft/Loose	Firm/M Dense	Stiff/Dense	V Stiff/V Dense	E Weak (Hard)	Rock: V Weak	Weak	M Strong	Strong	V Strong	E Strong	Weathering	**Remarks**
				BITUMEN: Approx 25 mm Bitumen paving														Paving Generally in good condition
				SANDY GRAVEL: Very dense grey sandy Gravel to nom70mm with sandy clay and some silt and fine gravel. Moist.					■									Located in middle of Apron area
		500		**SAND: (SC) (CL):** Dense dark brown tending to grey sand with silt and some clay. Moist.				■										Assumed natural material below this depth.
		1000																
				BORE TERMINATED AT 1.0 Metre BGL														
		1500																
		2000																

10. Dynamic Cone Penetrometer Field Test Results

EAW Geo Services *Dynamic Cone Test Log*

Test Location No T 1

Client: **Break O'Day Council, St Helens, TAS**

Project: St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 12.8" S
148° 16' 51.6" E

Tested By: Warren Newell

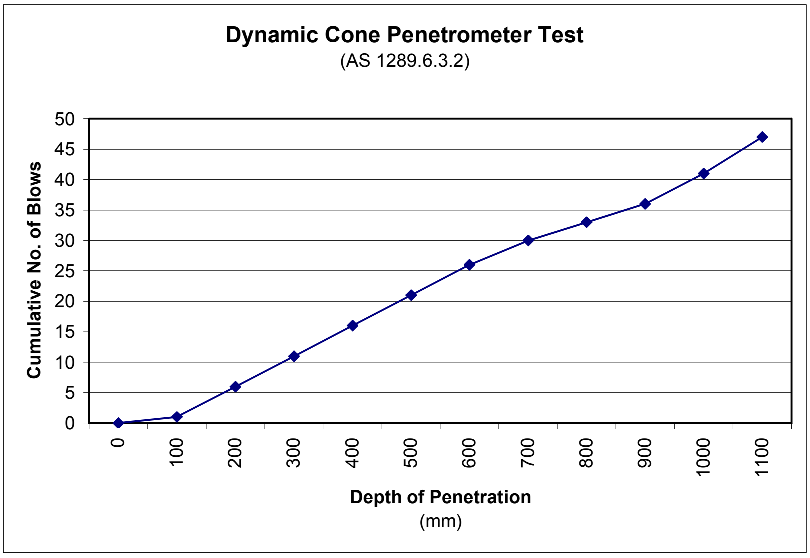
Soil Description: Brown Silty Sand

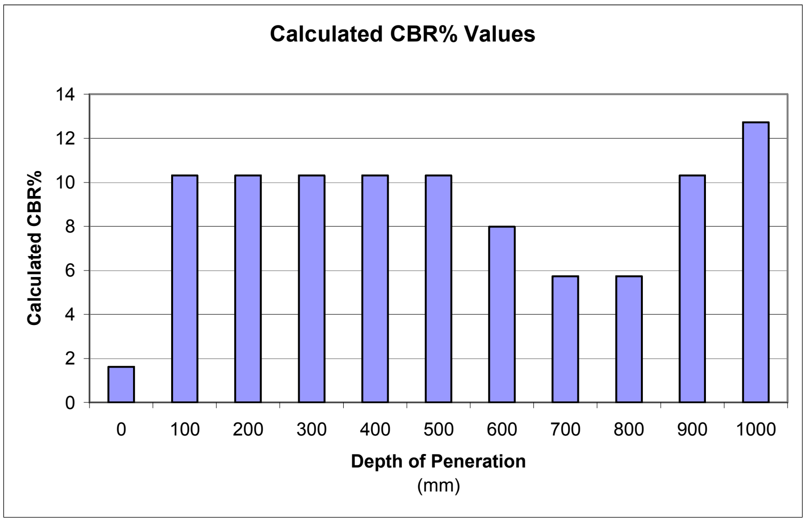
Moisture Content: Moist (raining)

Location Comments
Taxiway edge adjacent to bore T1

Groundwater ? - not encountered

Depth	**Blows /100mm**	**Cum'tiv Sum of Blows**	**mm penetrat'n per Blow**	**Calculated CBR %** per 100mm layer
0	0	0	0	
100	1	1	100	2
200	5	6	20	10
300	5	11	20	10
400	5	16	20	10
500	5	21	20	10
600	5	26	20	10
700	4	30	25	8
800	3	33	33	6
900	3	36	33	6
1000	5	41	20	10
1100	6	47	17	13
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				





TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.

2: Generally consistent strength to 500mm below surface.

3: Lower strength between 500mm and 900mm below surface generally in yellowish grey moist clayey sand.

EAW Geo Services

Dynamic Cone Test Log

Test Location No T2

Client: **Break O'Day Council, St Helens, TAS**

Project: St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 14.3" S
148° 16' 52.0" E

Location Comments
Taxiway edge adjacent to bore T2

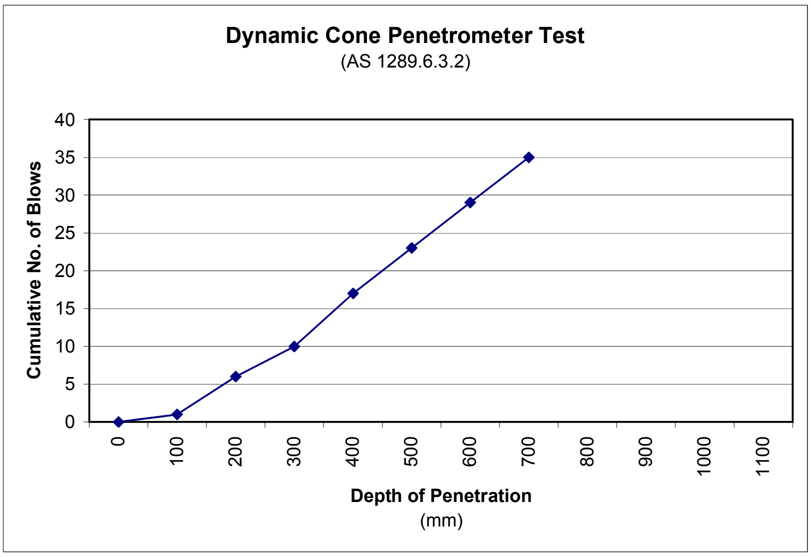
Tested By: Warren Newell

Soil Description: Brown Silty Sand

Moisture Content: Moist (raining)

Groundwater ? - not encountered

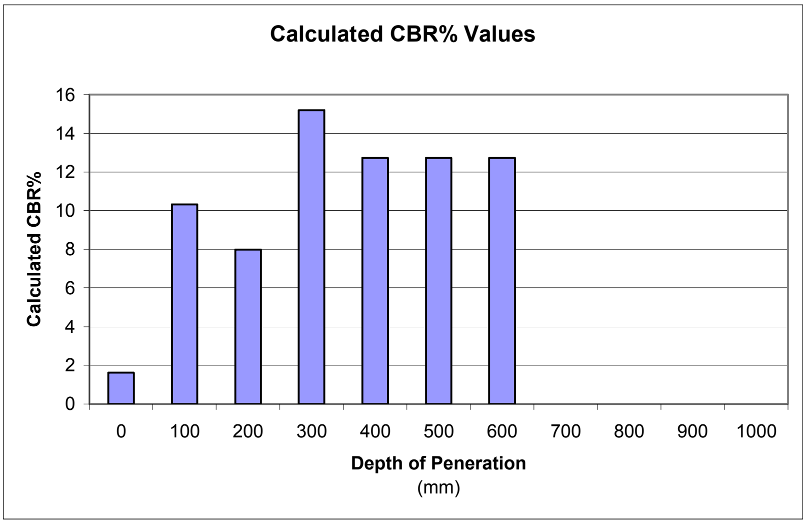
Depth	**Blows /100mm**	**Cum'tiv Sum of Blows**	**mm penetrat'n per Blow**	**Calculated CBR %** per 100mm layer
0	0	0	0	
100	1	1	100	2
200	5	6	20	10
300	4	10	25	8
400	7	17	14	15
500	6	23	17	13
600	6	29	17	13
700	6	35	17	13
800				
900				
1000				
1100				
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				



TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.

2: Generally consistent strength below 300mm



EAW Geo Services *Dynamic Cone Test Log* **Test Location No R1**

Client: **Break O'Day Council, St Helens, TAS**

Project: St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 14.5" S
148° 16' 45.3" E

Location Comments
Runway edge adjacent to bore R1

Groundwater ? - not encountered

Tested By: Warren Newell

Soil Description: Brown Silty Sand

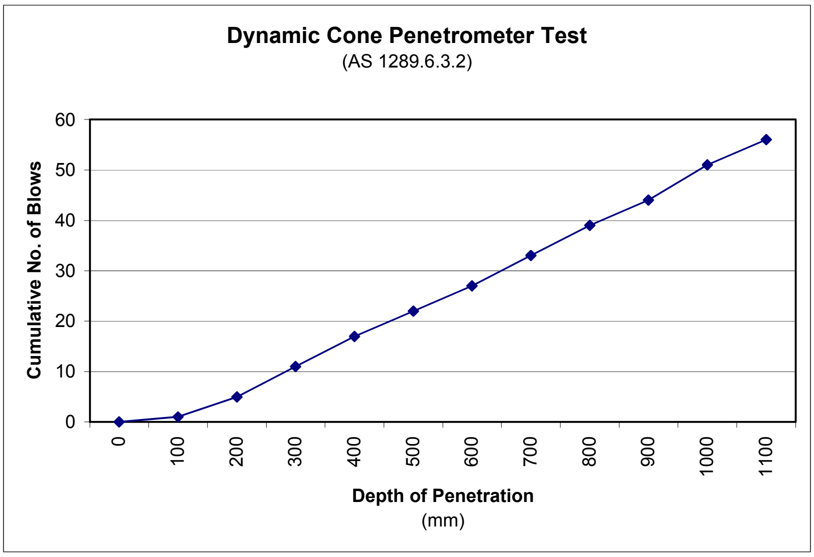
Moisture Content: Moist (raining)

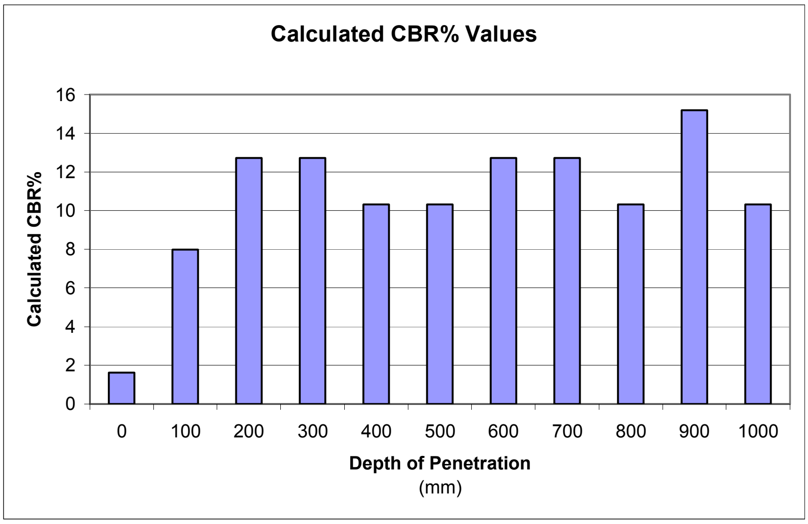
Depth	Blows /100mm	Cum'tiv Sum of Blows	mm penetrat'n per Blow	Calculated CBR % per 100mm layer
0	0	0	0	
100	1	1	100	2
200	4	5	25	8
300	6	11	17	13
400	6	17	17	13
500	5	22	20	10
600	5	27	20	10
700	6	33	17	13
800	6	39	17	13
900	5	44	20	10
1000	7	51	14	15
1100	5	56	20	10
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				

TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.

2: Generally consistent strength below 200mm





EAW Geo Services

Dynamic Cone Test Log

Test Location No R3

Client: **Break O'Day Council, St Helens, TAS**

Project: St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 14.9" S
148° 16' 52.9" E

Tested By: Warren Newell

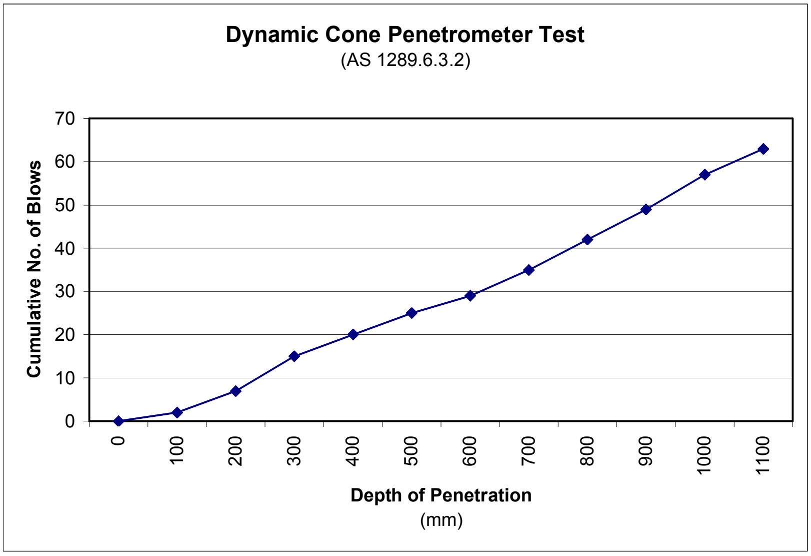
Soil Description: Brown Silty Sand

Moisture Content: Moist (raining)

Location Comments
Runway edge adjacent to Bore R3

Groundwater ? - not encountered

Depth	**Blows /100mm**	**Cum'tiv Sum of Blows**	**mm penetrat'n per Blow**	**Calculated CBR %** per 100mm layer
0	0	0	0	
100	2	2	50	4
200	5	7	20	10
300	8	15	13	18
400	5	20	20	10
500	5	25	20	10
600	4	29	25	8
700	6	35	17	13
800	7	42	14	15
900	7	49	14	15
1000	8	57	13	18
1100	6	63	17	13
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				



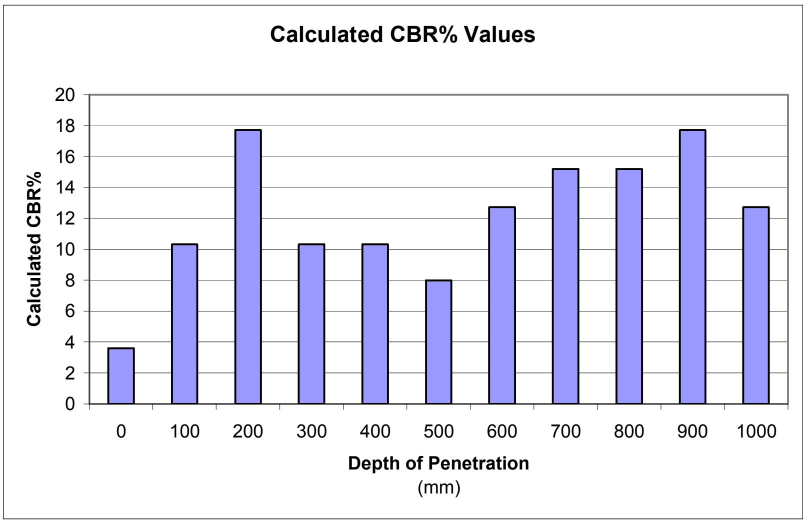
TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.

2: Generally consistent strength below 200mm

3: At 500mm below surface profile changed to brown clayey sand. Strength increased with depth.

4: Higher reading at 200mm below surface may be related to gravel or stones in profile.



EAW Geo Services *Dynamic Cone Test Log*

Test Location No R5

Client: **Break O'Day Council, St Helens, TAS**

Project: St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 15.4" S
148° 17' 0.9" E

Location Comments
Runway edge ajacent to Bore R5.

Groundwater ? - not encountered

Tested By: Warren Newell

Soil Description: Brown Silty Sand

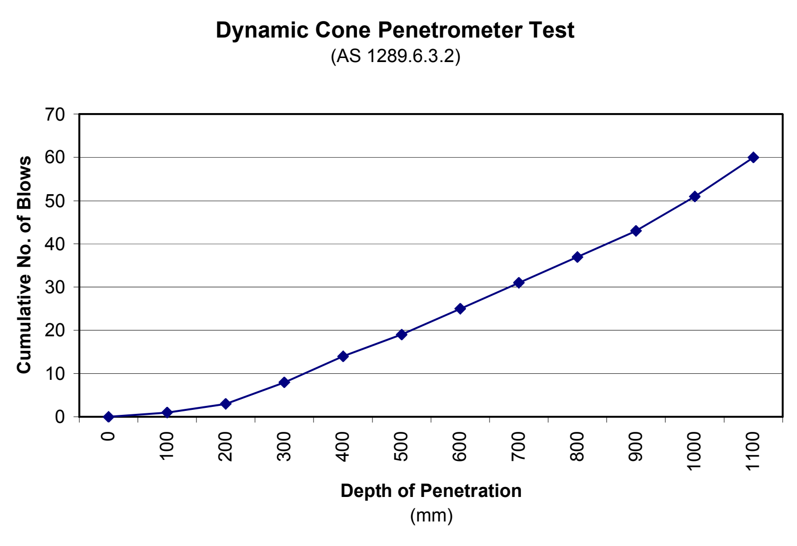
Moisture Content: Moist (raining)

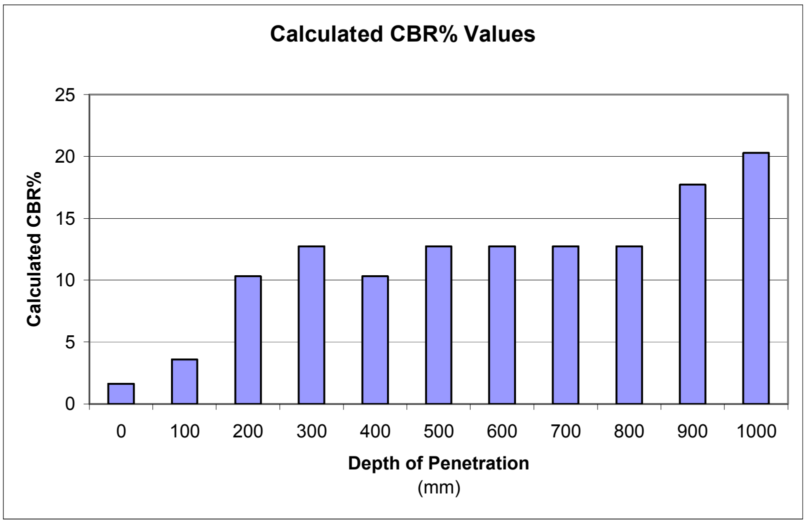
Depth	Blows /100mm	Cum'tiv Sum of Blows	mm penetrat'n per Blow	Calculated CBR % per 100mm layer
0	0	0	0	
100	1	1	100	2
200	2	3	50	4
300	5	8	20	10
400	6	14	17	13
500	5	19	20	10
600	6	25	17	13
700	6	31	17	13
800	6	37	17	13
900	6	43	17	13
1000	8	51	13	18
1100	9	60	11	20
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				

TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.

2: Generally consistent strength below 200mm


Dynamic Cone Penetrometer Test
(AS 1289.6.3.2)


Calculated CBR% Values

EAW Geo Services *Dynamic Cone Test Log*

Test Location No R7

Client:	**Break O'Day Council, St Helens, TAS**	Co-ords: (Approx)	41° 20' 15.8" S
Project:	St Helens Aerodrome Runway Improvement Investigation		148° 17' 8.7" E

Tested By: Warren Newell

Soil Description: Brown Silty Sand

Moisture Content: Moist (raining)

Location Comments
Runway edge ajacent to Bore R7.

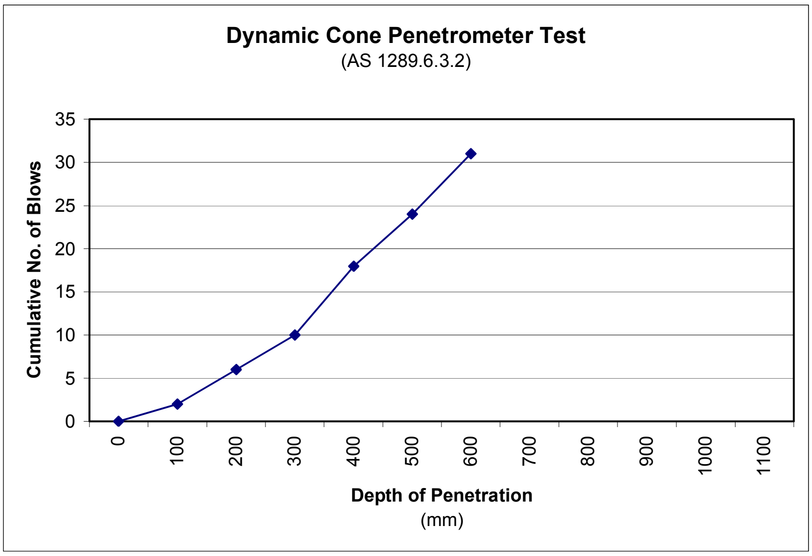
Groundwater ? - not encountered

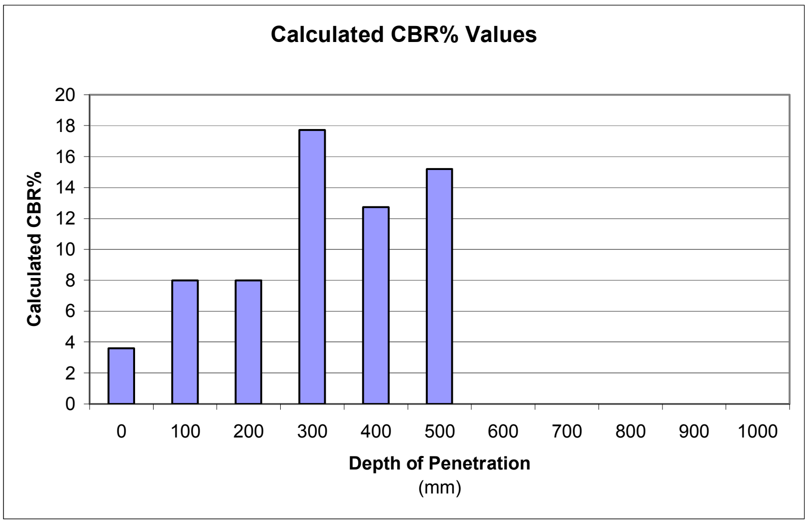
Depth	**Blows /100mm**	**Cum'tiv Sum of Blows**	**mm penetrat'n per Blow**	**Calculated CBR %** per 100mm layer
0	0	0	0	
100	2	2	50	4
200	4	6	25	8
300	4	10	25	8
400	8	18	13	18
500	6	24	17	13
600	7	31	14	15
700	Bounce			
800				
900				
1000				
1100				
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				

TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.

2: Bouncing on rock or very dense sand at 600mm.





EAW Geo Services *Dynamic Cone Test Log*

Test Location No R9

Client: **Break O'Day Council, St Helens, TAS**

Project: St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 16.2" S
148° 17' 16.7 "E

Tested By: Warren Newell

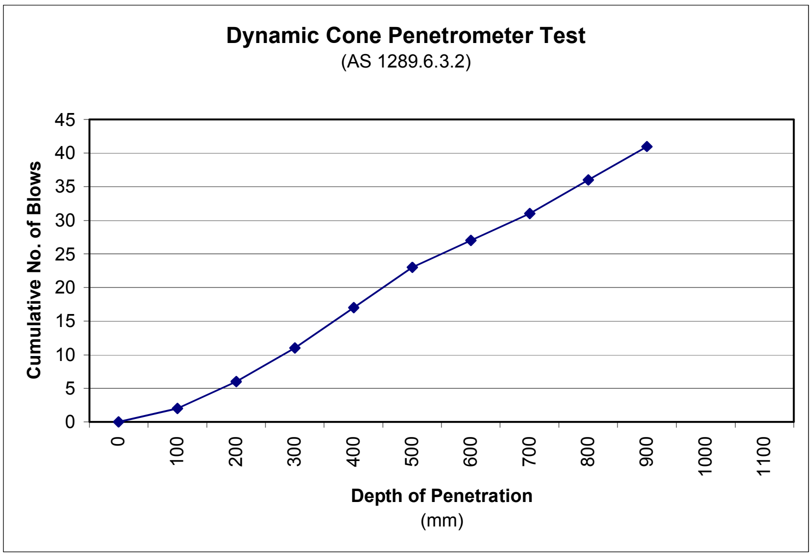
Soil Description: Brown Silty Sand

Moisture Content: Moist (raining)

Location Comments
Runway edge ajacent to Bore R9..

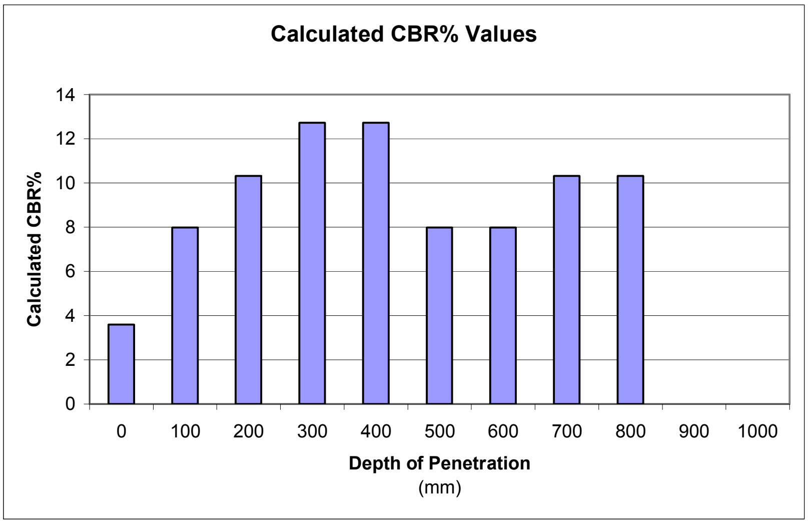
Groundwater ? - not encountered

Depth	**Blows /100mm**	**Cum'tiv Sum of Blows**	**mm penetrat'n per Blow**	**Calculated CBR %** per 100mm layer
0	0	0	0	
100	2	2	50	4
200	4	6	25	8
300	5	11	20	10
400	6	17	17	13
500	6	23	17	13
600	4	27	25	8
700	4	31	25	8
800	5	36	20	10
900	5	41	20	10
1000				
1100				
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				



TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.



EAW Geo Services *Dynamic Cone Test Log*

Test Location No R10

Client: **Break O'Day Council, St Helens, TAS**

Project: St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 16.8" S
148° 17' 20.4" E

Tested By: Warren Newell

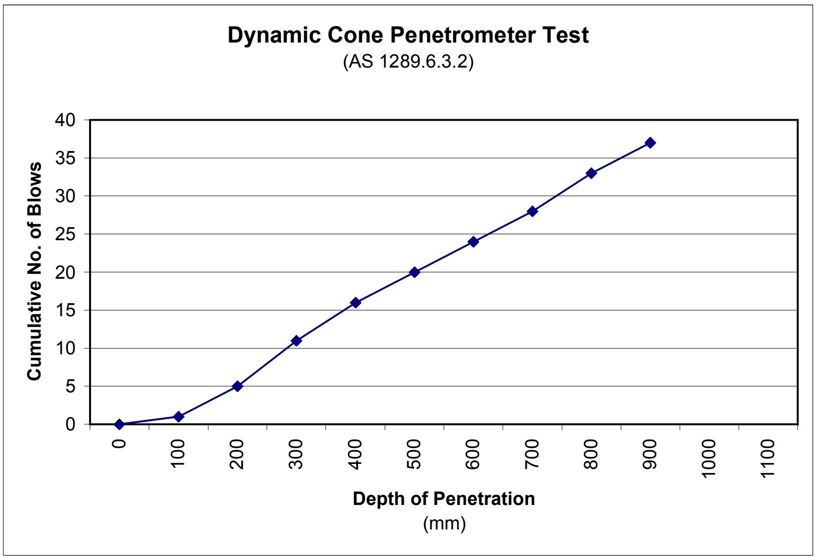
Soil Description: Brown Silty Sand

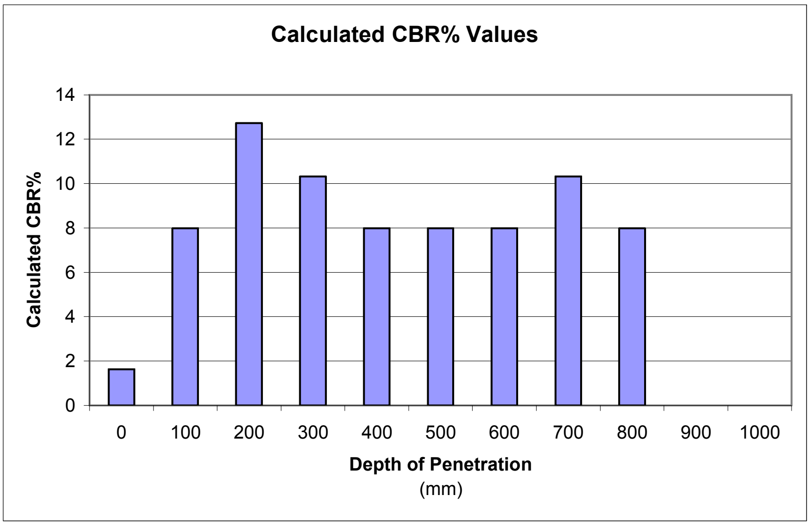
Moisture Content: Moist (raining)

Location Comments
Runway edge ajacent to Bore R10.

Groundwater ? - not encountered

Depth	**Blows /100mm**	**Cum'tiv Sum of Blows**	**mm penetrat'n per Blow**	**Calculated CBR %** per 100mm layer
0	0	0	0	
100	1	1	100	2
200	4	5	25	8
300	6	11	17	13
400	5	16	20	10
500	4	20	25	8
600	4	24	25	8
700	4	28	25	8
800	5	33	20	10
900	4	37	25	8
1000				
1100				
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				





TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.

2: Consistent strength from 200mm down

EAW Geo Services *Dynamic Cone Test Log*

Test Location No R11

Client:	**Break O'Day Council, St Helens, TAS**
Project:	St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 16.5" S
148° 17' 24.3" E

Tested By: Warren Newell

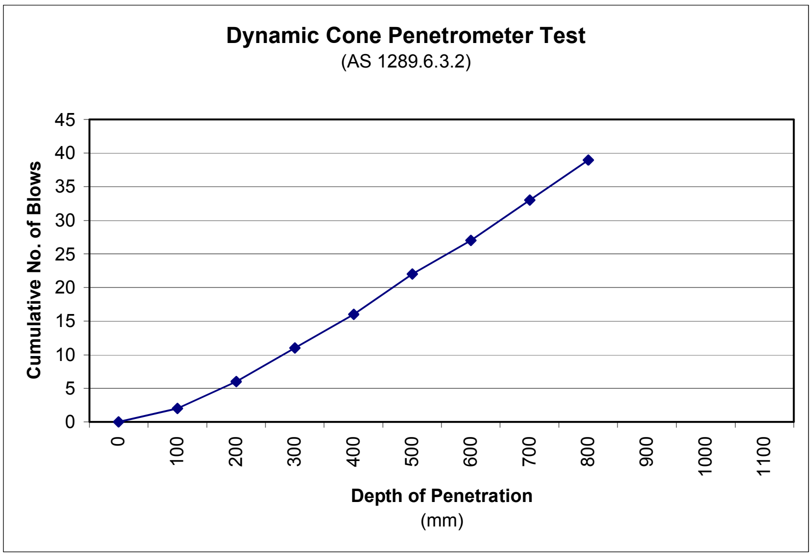
Soil Description: Brown Silty Sand

Moisture Content: Moist (raining)

Location Comments
Runway edge ajacent to Bore R11.

Groundwater ? - not encountered

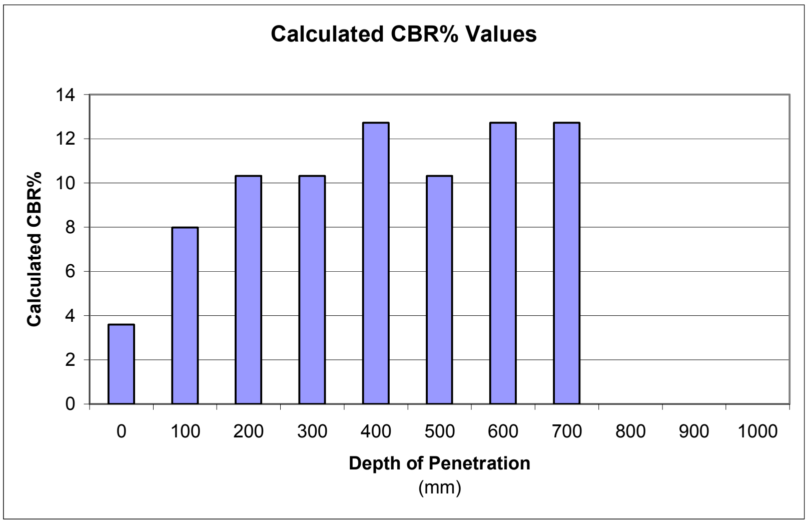
Depth	**Blows /100mm**	**Cum'tiv Sum of Blows**	**mm penetrat'n per Blow**	**Calculated CBR %** per 100mm layer
0	0	0	0	
100	2	2	50	4
200	4	6	25	8
300	5	11	20	10
400	5	16	20	10
500	6	22	17	13
600	5	27	20	10
700	6	33	17	13
800	6	39	17	13
900				
1000				
1100				
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				



TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.

2: Consistent strength from 200mm down



EAW Geo Services *Dynamic Cone Test Log*

Test Location No R12

Client: **Break O'Day Council, St Helens, TAS**

Project: St Helens Aerodrome Runway Improvement Investigation

Co-ords: (Approx) 41° 20' 17.3" S
148° 17' 28.1" E

Location Comments
Runway edge ajacent to Bore R12.

Groundwater ? - not encountered

Tested By: Warren Newell

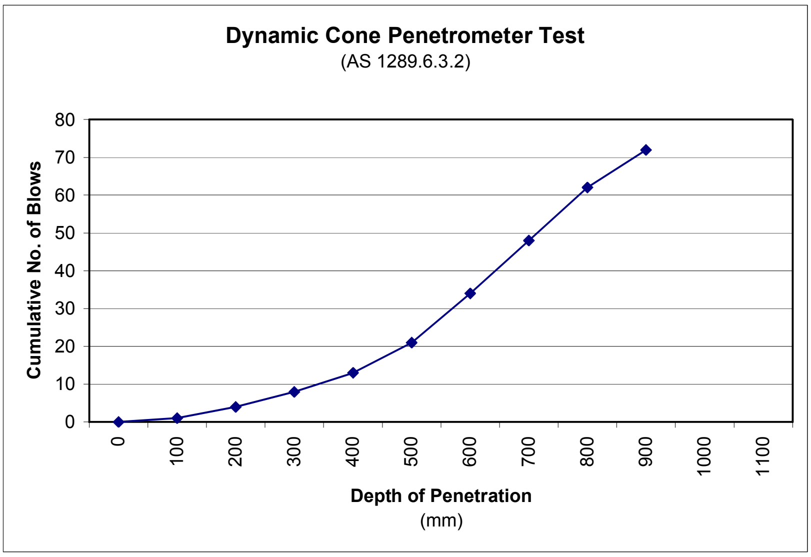
Soil Description: Brown Silty Sand

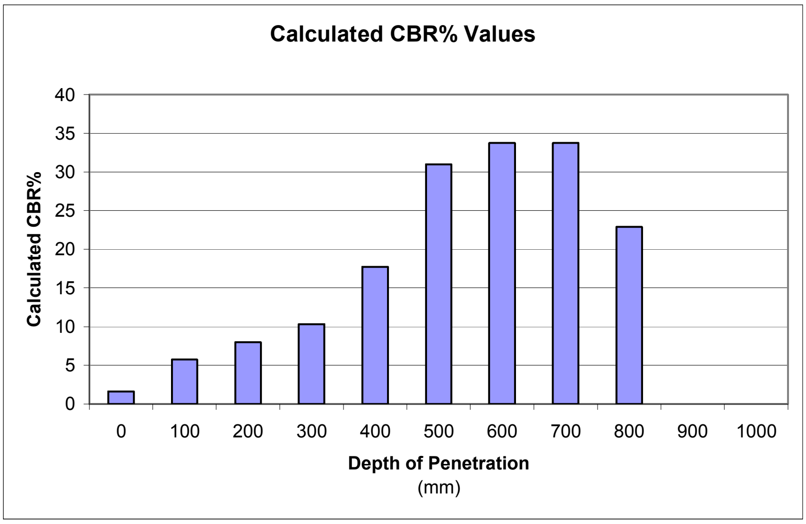
Moisture Content: Moist (raining)

Depth	Blows /100mm	Cum'tiv Sum of Blows	mm penetrat'n per Blow	Calculated CBR % per 100mm layer
0	0	0	0	
100	1	1	100	2
200	3	4	33	6
300	4	8	25	8
400	5	13	20	10
500	8	21	13	18
600	13	34	8	31
700	14	48	7	34
800	14	62	7	34
900	10	72	10	23
1000				
1100				
1200				
1300				
1400				
1500				
1600				
1700				
1800				
1900				
2000				

TEST COMMENTS

1: Upper Surface loose becomes firm nearer 100mm below surface.





11. About This Geotechnical Report

As a client of a geotechnical engineer, you should know that site subsurface conditions might cause more construction problems than any other factor. The Association of Engineering Firms (ASFE) firms practicing in the Geosciences offers the following suggestions and observations to help you manage your risks.

A Geotechnical Engineering Report is based on an Unique Set of Project Specific Factors

Your Geotechnical engineering report is based on a subsurface exploration plan designed to consider a set of project specific conditions relevant to your site. These factors include the nature of the proposed structures involved, the size and layout, and other improvements on the site such as access (temporary and permanent), parking and other utilities. Added to this are additional risks imposed by the client through access issues, financial constraints or other limitations. To help avoid costly problems, ask your geotechnical engineer to evaluate factors that may change site conditions subsequent to the time of the report. Additional work on a site may alter the conditions of the site that will severely impact on the recommendations of the former report.

Unless your geotechnical engineer states otherwise you are advised not to use your geotechnical report when:

- The nature of the proposed structure is altered, perhaps if the originally proposed parking building is altered to be an office or a warehouse is to become a cool store.
- The size, layout, form or elevation of the proposed structure is altered.
- The location or site layout of the proposed structure is altered.
- The property ownership changes.
- The report is to be applied to an adjacent site.

Our Company cannot accept responsibility for geotechnical problems that may occur if we are not consulted after factors on site change subsequent to the report. Any alterations to site conditions and the proposed work should be discussed with the Company's geotechnical engineers.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time of the subsurface exploration. Construction decisions should not be based on geotechnical reports that may have been affected by a lapse of time. We ask that you contact this office and speak with our geotechnical engineer and ask if additional tests are advisable before any construction commences.

Additional tests may be required when the subsurface conditions on the site are affected by construction operations, at or adjacent to the site, or by earthquake, changes in groundwater or natural events such as floods or prolonged drought. Please advise this office of any such events.

Most Geotechnical Findings are Professional Judgements

Site exploration methods identify actual subsurface conditions only at the points where the samples are taken. The data are extrapolated by the geotechnical engineer who then applies judgement to assist in reaching an opinion about the overall subsurface conditions. The interface between materials may be more gradual or sudden than your report indicates. The actual conditions in areas not sampled may differ from those predicted in the report. While nothing can be done to prevent such situations, you are asked to work with the geotechnical engineer to help minimise the impact of these situations. We recommend that you retain our Company to observe construction and offer advice where required.

The Report's Recommendations Can Only Be Preliminary

The construction recommendations included in this report are preliminary, because they are based on the assumption that conditions revealed through the investigation are indicative of actual conditions throughout the site. Because actual subsurface conditions can be discerned only during earthwork, the Company geotechnical engineer should be retained to observe actual conditions and to offer advice in finalising recommendations. Only the geotechnical engineer who prepared this report is fully familiar with the background information needed to determine the report recommendations are valid. The geotechnical engineer is also able to determine whether or not the contractor is abiding by the applicable recommendations.

The geotechnical engineer who prepared your report cannot assume liability for the adequacy of the report's recommendations if another party is retained to observe construction.

Geotechnical Services Are Performed For A Specific Purpose and Persons.

Consulting geotechnical engineers prepare reports to meet specific needs to specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless specifically indicated, this report has been prepared for you and expressly for the purpose you indicated. No one other than you should apply this report for its intended purpose without first conferring with the geotechnical engineer. No party should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.

Geoenvironmental Concerns Are Not an Issue

Your geotechnical engineering report is not likely to relate any findings, conclusions or recommendations to any environmental issues such as contamination or site remediation. A separate report must be commissioned for this purpose.

12. Laboratory Test Certificates (SGS)

TEST CERTIFICATE

chris.lloyd@sgs.com
ABN: 44 000 964 278
ph: +61 (0)2 8594 0481
fx: +61 (0)2 8594 0499

SGS Australia Pty Ltd
PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	22/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4590
Lab:	Alexandria CMT	Sample ID:	Runway West - Surface T001

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	GRAVELLY SAND:brown/grey
Moisture Content:	10.5%

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

Form No.PF-AU-INDCMT-GEN-AN-010

Site No.: 2418
Cert No.: 13-AC-4590-AN010

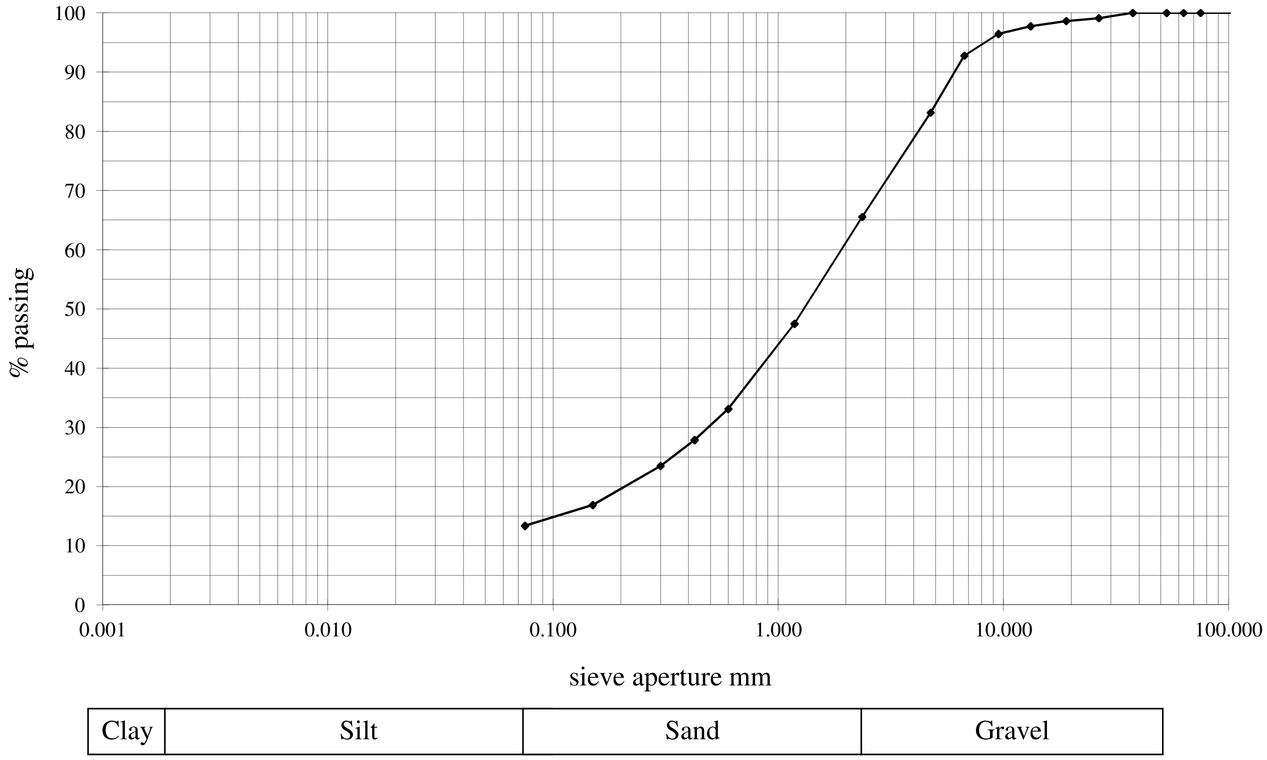
TEST CERTIFICATE

SGS
ABN 44 000 964 278
ph: +61 (0)2 8594 0481
fax: +61 (0)2 8594 0499

SGS Australia Pty Ltd
Unit 15, 33 Maddox Street
(PO Box 6432)
Alexandria NSW 2015
Australia

PARTICLE SIZE DISTRIBUTION

Client: **EAW Geo Services**
Address: **Unit 32 Pullman PlaceEmu Plains NSW 2750**
Project: **St Helens**
Location:
Test Method: **AS 1289 3.6.1**
Job Number: 13-32-581
Lab Number: 13-AC-4590
Sample Source: Runway West - Surface T001
Date Tested: 17/10/2013
Sampled By: Client
Checked By: JL



Sample Description: GRAVELLY SAND:brown/grey

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**47**
75.0		0.600	**33**
63.0		0.425	**28**
53.0		0.300	**23**
37.5	**100**	0.150	**17**
26.5	**99**	0.075	**13**
19.0	**99**	0.050	
13.2	**98**	0.020	
9.5	**96**	0.010	
6.7	**93**	0.005	
4.75	**83**	0.002	
2.36	**66**		

Hydrometer Type: **N/A**
Dispersant Type: **N/A**
Pretreatment:
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Aaron Lacey
Date: 18/10/2013

Accredited for Compliance with ISO/IEC 17025

ilac-MRA NATA

Accreditation No. 2418

chris.lloyd@sgs.com
ABN: 44 000 964 278
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TEST CERTIFICATE

SGS Australia Pty Ltd
PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	21/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4591
Lab:	Alexandria CMT	Sample ID:	Runway West - Basecourse T002

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	GRAVELLY SAND:brown/grey
Moisture Content:	5.5%

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-010

Site No.: 2418
Cert No.: 13-AC-4591-AN010

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

TEST CERTIFICATE

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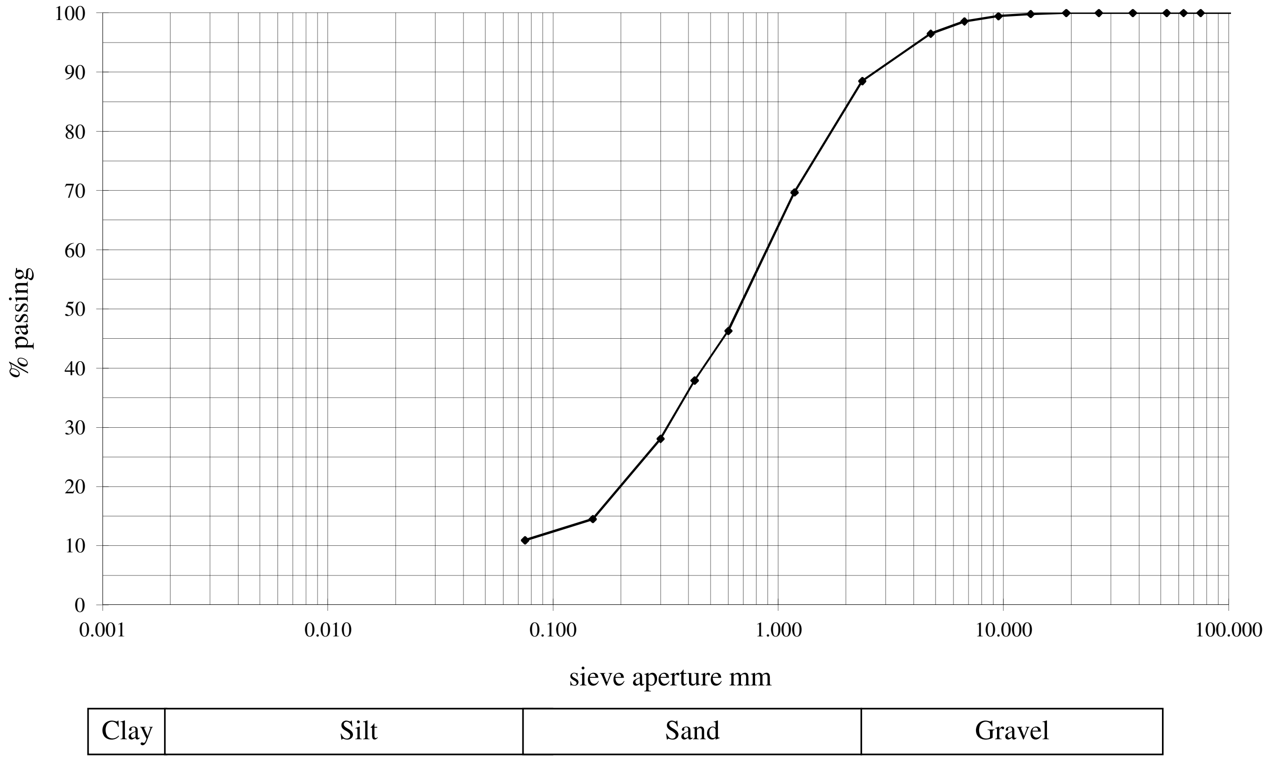
fax: +61 (0)2 8594 0499

SGS Australia Pty Ltd
Unit 15, 33 Maddox Street
(PO Box 6432)
Alexandria NSW 2015
Australia

PARTICLE SIZE DISTRIBUTION

Client: **EAW Geo Services**
Address: **Unit 32 Pullman PlaceEmu Plains NSW 2750**
Project: **St Helens**
Location:
Test Method: **AS 1289 3.6.1**
Job Number: 13-32-581
Lab Number: 13-AC-4591
Sample Source: Runway West - Basecourse T002
Date Tested: 16/10/2013
Sampled By: Client
Checked By: JL



Sample Description: GRAVELLY SAND:brown/grey

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**70**
75.0		0.600	**46**
63.0		0.425	**38**
53.0		0.300	**28**
37.5		0.150	**15**
26.5		0.075	**11**
19.0		0.050	
13.2	**100**	0.020	
9.5	**99**	0.010	
6.7	**99**	0.005	
4.75	**96**	0.002	
2.36	**88**		

Hydrometer Type: **N/A**
Dispersant Type: **N/A**
Pretreatment:
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Aaron Lacey
Date: 18/10/2013

Accredited for Compliance with ISO/IEC 17025

Accreditation No. 2418

chris.lloyd@sgs.com
ABN: 44 000 964 278
ph: +61 (0)2 8594 0481
fx: +61 (0)2 8594 0499

TEST CERTIFICATE

SGS Australia Pty Ltd
PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4591
Lab:	Alexandria CMT	Sample ID:	Runway West - Basecourse T002

California Bearing Ratio of a Soil

AS 1289.6.1.1 - Standard Compactive Effort

Sample Description:	GRAVELLY SAND:brown/grey
CBR at 2.5mm:	**25**
CBR at 5.0mm	**30**
Sample Data	
Compaction Specification:	100% MDD at 100% OMC
Maximum Dry Density:	2.05t/m^3
Optimum Moisture Content:	8.9
Mass of Surcharges:	4.5kg
Period of Soaking:	4 Days
Sample Preparation	
Dry Density - Before Soaking:	2.05t/m^3
Dry Density - After Soaking:	2.05t/m^3
Percent Oversize - 19.0mm Sieve:	0% Excluded
Moisture Content - Before Soaking:	8.8%
Laboratory Density Ratio:	100%
Laboratory Moisture Ratio:	99%
Moisture Content - After Soaking	
Top 30mm of Specimen:	8.6%
Remainder of Specimen:	8.8%
Swell of Specimen After Soaking:	0.0%
Compactive Effort:	Standard - AS 1289.5.1.1

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418
Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

Site No.: 2418
Cert No.: 13-AC-4591-AN038

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fx: +61 (0)2 8594 0499

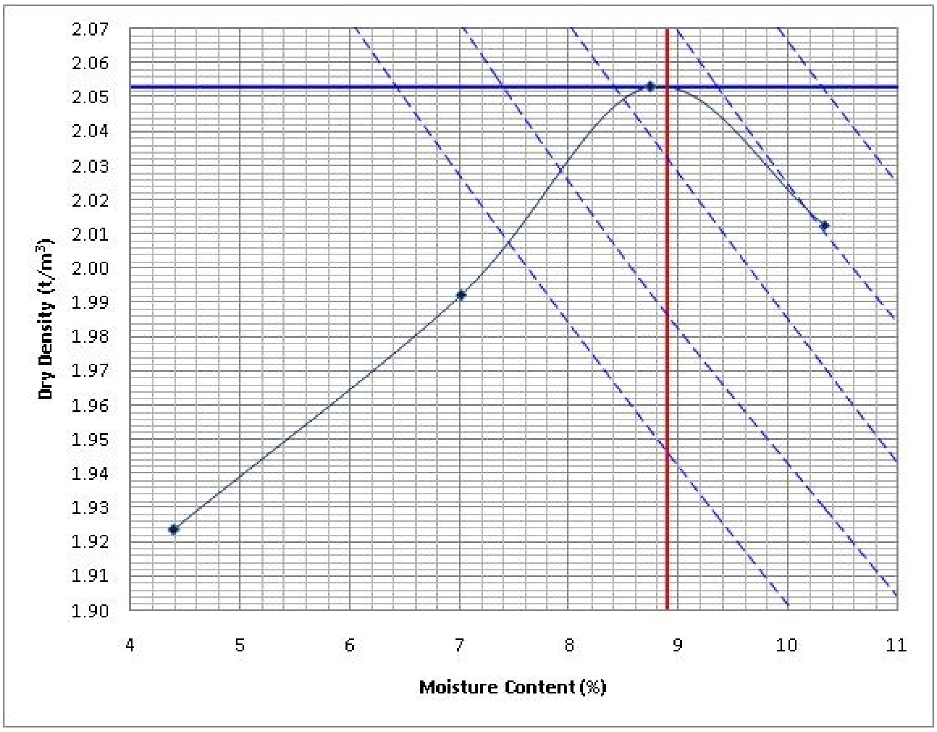
TEST CERTIFICATE

SGS Australia Pty Ltd
PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	22/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4591
Lab:	Alexandria CMT	Sample ID:	Runway West - Basecourse T002

Dry Density / Moisture Content Relation of a Soil

AS 1289.5.1.1 - Standard Compactive Effort



Sample Description:	GRAVELLY SAND:brown/grey
Maximum Dry Density:	2.05t/m³
Optimum Moisture Content:	9.0%
Percent Oversize:	0%
Sieve Size:	19.0mm

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor)

Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-027

Site No.: 2418
Cert No.: 13-AC-4591-AN027.1
Page: 1 of 1

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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TEST CERTIFICATE

SGS Australia Pty Ltd
PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	22/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4592
Lab:	Alexandria CMT	Sample ID:	Runway East - Surface T003

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	GRAVELLY SAND:brown
Moisture Content:	7.8%

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-010

Site No.: 2418
Cert No.: 13-AC-4592-AN010

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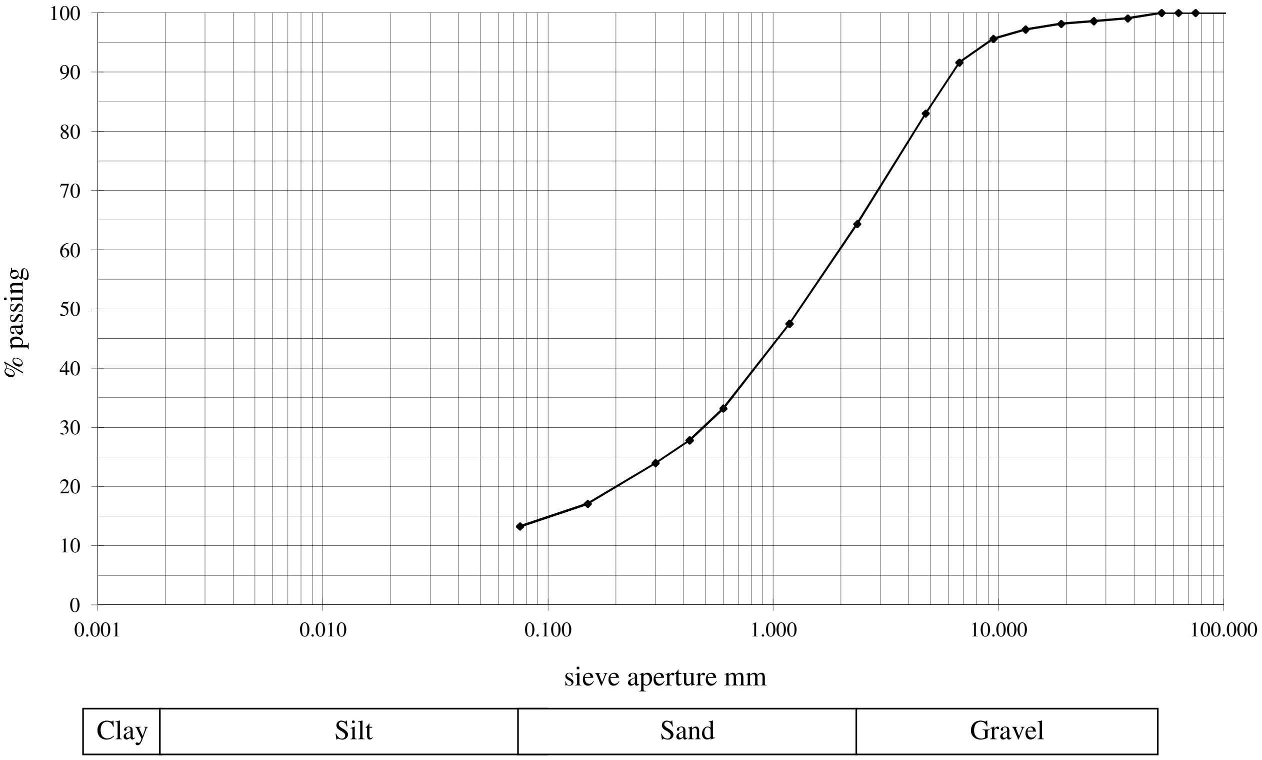
Australia

PARTICLE SIZE DISTRIBUTION

Client:	**EAW Geo Services**		
Address:	**Unit 32 Pullman PlaceEmu Plains NSW 2750**		
Project:	**St Helens**		
Location:			
Test Method:	**AS 1289 3.6.1**		
Job Number:	13-32-581	Lab Number:	13-AC-4592
Sample Source:	Runway East - Surface T003	Date Tested:	17/10/2013
Sampled By:	Client	Checked By:	JL



Sample Description: GRAVELLY SAND:brown

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**48**
75.0		0.600	**33**
63.0		0.425	**28**
53.0	**100**	0.300	**24**
37.5	**99**	0.150	**17**
26.5	**99**	0.075	**13**
19.0	**98**	0.050	
13.2	**97**	0.020	
9.5	**96**	0.010	
6.7	**92**	0.005	
4.75	**83**	0.002	
2.36	**64**		

Hydrometer Type: **N/A**
Dispersant Type: **N/A**
Pretreatment:
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Aaron Lacey Date: 18/10/2013

Accredited for Compliance with ISO/IEC 17025

ccreditation No. 2418

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Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4592
Lab:	Alexandria CMT	Sample ID:	Runway East - Surface T003

California Bearing Ratio of a Soil

AS 1289.6.1.1 - Standard Compactive Effort

Sample Description:	GRAVELLY SAND:brown
CBR at 2.5mm:	**10**
CBR at 5.0mm	**12**
Sample Data	
Compaction Specification:	100% MDD at 100% OMC
Maximum Dry Density:	2.03t/m³
Optimum Moisture Content:	10.0
Mass of Surcharges:	4.5kg
Period of Soaking:	4 Days
Sample Preparation	
Dry Density - Before Soaking:	2.04t/m³
Dry Density - After Soaking:	2.04t/m³
Percent Oversize - 19.0mm Sieve:	2%
	Excluded
Moisture Content - Before Soaking:	10.2%
Laboratory Density Ratio:	101%
Laboratory Moisture Ratio:	102%
Moisture Content - After Soaking	
Top 30mm of Specimen:	9.9%
Remainder of Specimen:	10.0%
Swell of Specimen After Soaking:	0.0%
Compactive Effort:	Standard - AS 1289.5.1.1

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-038

Site No.: 2418
Cert No.: 13-AC-4592-AN038

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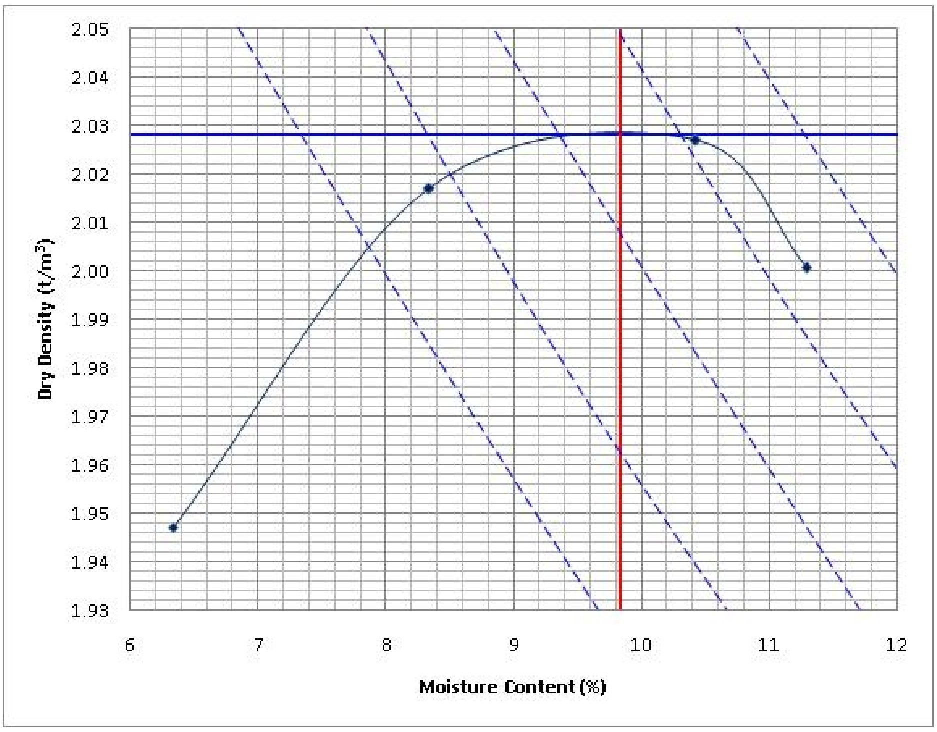
Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	18/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4592
Lab:	Alexandria CMT	Sample ID:	Runway East - Surface T003

Dry Density / Moisture Content Relation of a Soil

AS 1289.5.1.1 - Standard Compactive Effort



Sample Description:	GRAVELLY SAND:brown
Maximum Dry Density:	2.03t/m³
Optimum Moisture Content:	10.0%
Percent Oversize:	2%
Sieve Size:	19.0mm

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4592-AN027.1

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	22/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4593
Lab:	Alexandria CMT	Sample ID:	Runway East - Basecourse T004

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	GRAVELLY SILTY SAND:brown/grey
Moisture Content:	5.9%

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-010

Site No.: 2418
Cert No.: 13-AC-4593-AN010

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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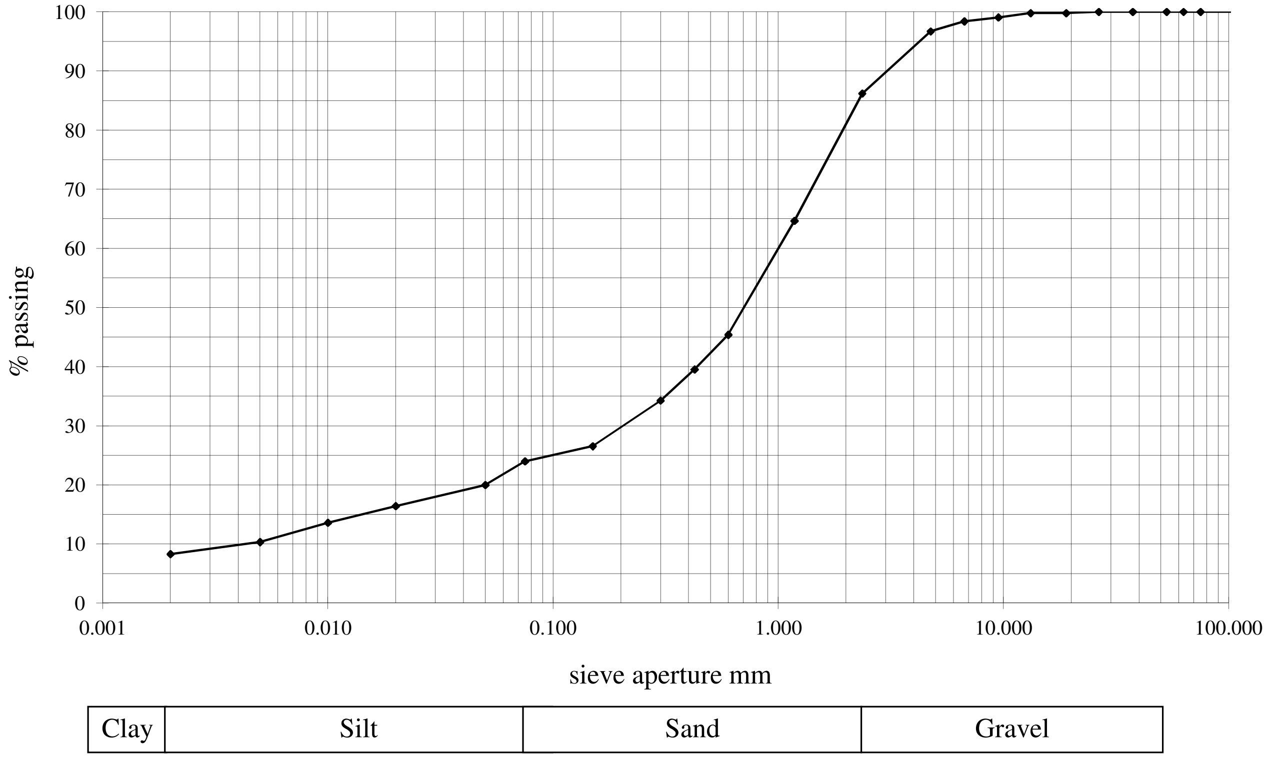
Australia

PARTICLE SIZE DISTRIBUTION

Client: **EAW Geo Services**
Address: **3 The Upper Sanctuary Drive Leonay NSW 2750**
Project: **St Helens**
Location:
Test Method: **AS 1289 3.6.1 / 3**
Job Number: 13-32-581
Sample Source: Runway East - Basecourse T004
Sampled By: Cient
Lab Number: 13-AC-4593
Date Tested: 8/11/2013
Checked By: JL



Sample Description: GRAVELLY SAND:grey/brown

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**65**
75.0		0.600	**45**
63.0		0.425	**40**
53.0		0.300	**34**
37.5		0.150	**27**
26.5		0.075	**24**
19.0		0.050	**20**
13.2	**100**	0.020	**16**
9.5	**99**	0.010	**14**
6.7	**98**	0.005	**10**
4.75	**97**	0.002	**8**
2.36	**86**		

Hydrometer Type: **ASTM 152H**
Dispersant Type: **Sodium Hexametaphosphate**
Pretreatment: **None**
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Chris Lloyd Date: 18/11/2013

Accredited for Compliance with ISO/IEC 17025

ccreditation No. 2418

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TEST CERTIFICATE

SGS Australia Pty Ltd
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Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4593
Lab:	Alexandria CMT	Sample ID:	Runway East - Basecourse T004

California Bearing Ratio of a Soil

AS 1289.6.1.1 - Standard Compactive Effort

Sample Description:	GRAVELLY SILTY SAND:brown/grey
CBR at 2.5mm:	**20**
CBR at 5.0mm	**25**
Sample Data	
Compaction Specification:	100% MDD at 100% OMC
Maximum Dry Density:	2.08t/m³
Optimum Moisture Content:	8.9
Mass of Surcharges:	4.5kg
Period of Soaking:	4 Days
Sample Preparation	
Dry Density - Before Soaking:	2.06t/m³
Dry Density - After Soaking:	
Percent Oversize - 19.0mm Sieve:	0% Excluded
Moisture Content - Before Soaking:	9.1%
Laboratory Density Ratio:	99%
Laboratory Moisture Ratio:	102%
Moisture Content - After Soaking	
Top 30mm of Specimen:	8.9%
Remainder of Specimen:	8.8%
Swell of Specimen After Soaking:	
Compactive Effort:	Standard - AS 1289.5.1.1

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4593-AN038

Form No.PF-AU-INDCMT-GEN-AN-038

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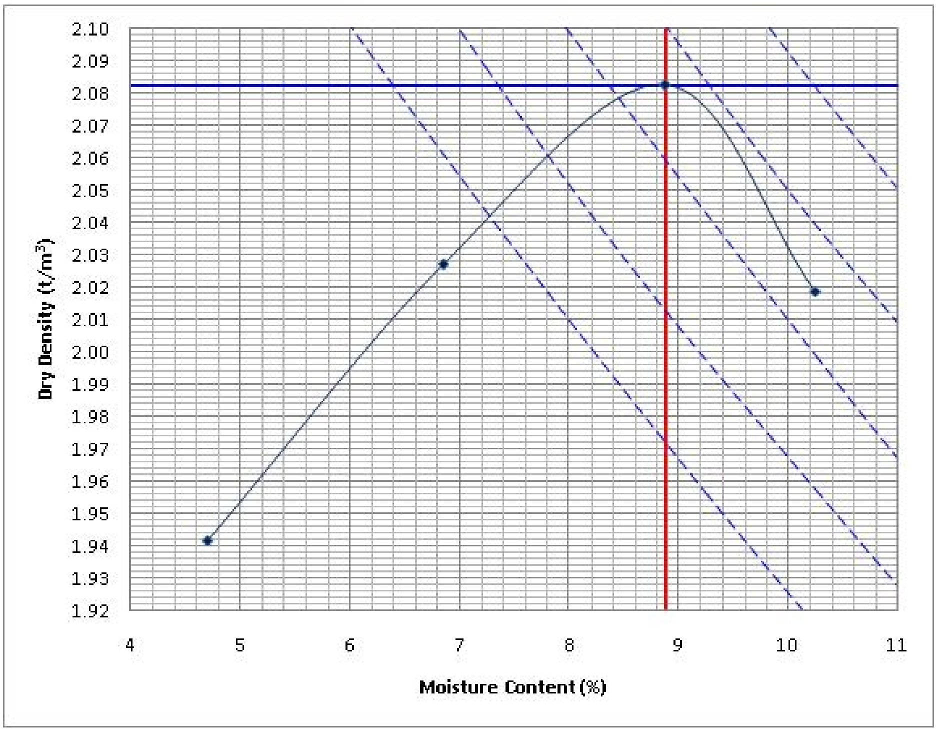
Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4593
Lab:	Alexandria CMT	Sample ID:	Runway East - Basecourse T004

Dry Density / Moisture Content Relation of a Soil

AS 1289.5.1.1 - Standard Compactive Effort



Sample Description:	GRAVELLY SILTY SAND:brown/grey
Maximum Dry Density:	2.08t/m³
Optimum Moisture Content:	9.0%
Percent Oversize:	0%
Sieve Size:	19.0mm

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4593-AN027.1

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Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	21/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4594
Lab:	Alexandria CMT	Sample ID:	Taxi-way - Basecourse T005

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	SILTY GRAVELLY SAND:brown
Moisture Content:	10.8%

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-010

Site No.: 2418
Cert No.: 13-AC-4594-AN010

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Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4594
Lab:	Alexandria CMT	Sample ID:	Taxi-way - Basecourse T005

Atterberg Limits (1 Point Casagrande Method with Linear Shrinkage)

AS 1289.3.1.2, 3.2.1, 3.3.1, 3.4.1

Sample Description:	SILTY GRAVELLY SAND:brown
Liquid Limit:	24%
Plastic Limit:	16%
Plasticity Index:	8%
History of Sample:	Air-Dried
Method of Preparation:	Dry-Sieved
Linear Shrinkage:	5.5%
Length of Mould:	125mm
Dry State:	Linear

Note: Sample supplied by client.

Approved Signatory: Aaron Lacey (Aaron Lacey.Operations Supervisor) Date: 24/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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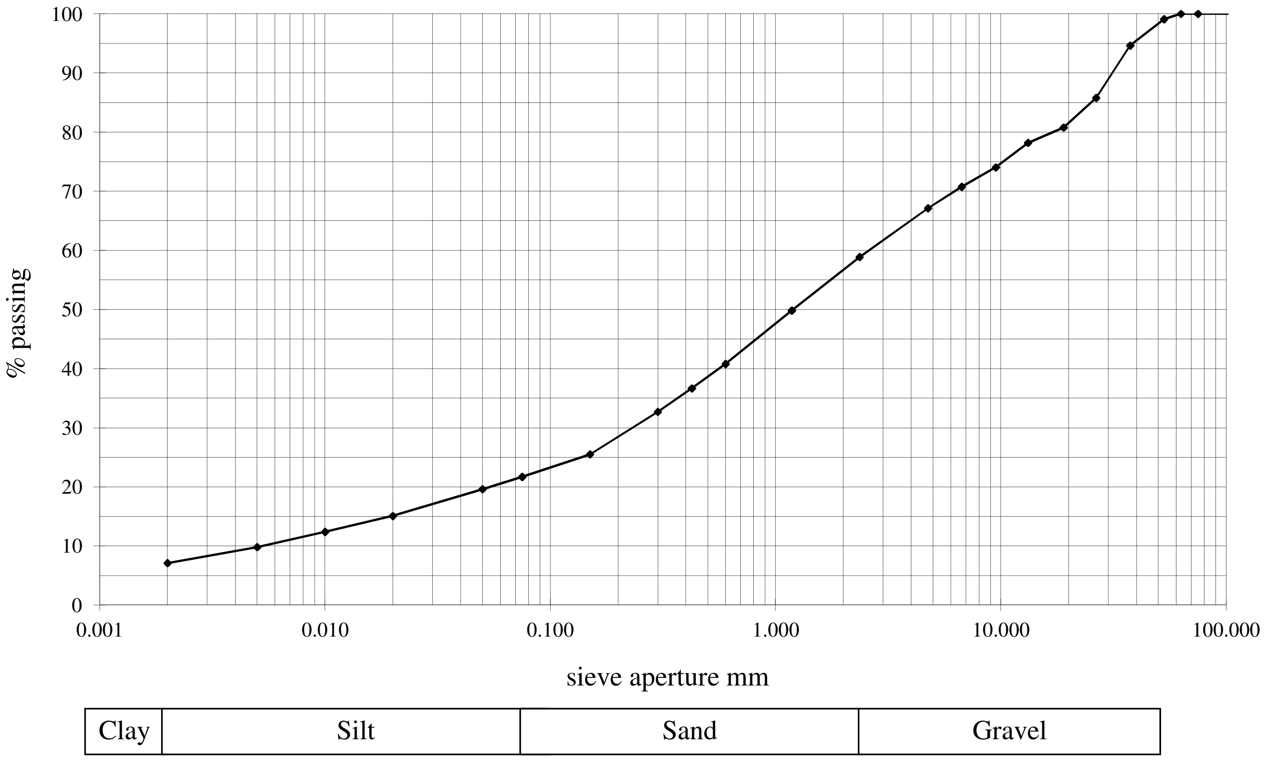
Alexandria NSW 2015
Australia

PARTICLE SIZE DISTRIBUTION

Client: **EAW Geo Services**
Address: **3 The Upper Sanctuary Drive Leonay NSW 2750**
Project: **St Helens**
Location:
Test Method: **AS 1289 3.6.1 / 3**
Job Number: 13-32-581
Sample Source: Taxi-way - Basecourse T005
Sampled By: Client
Lab Number: 13-AC-4594
Date Tested: 8/11/2013
Checked By: JL



Sample Description: SILTY SANDY GRAVEL:brown

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**50**
75.0		0.600	**41**
63.0	**100**	0.425	**37**
53.0	**99**	0.300	**33**
37.5	**95**	0.150	**26**
26.5	**86**	0.075	**22**
19.0	**81**	0.050	**20**
13.2	**78**	0.020	**15**
9.5	**74**	0.010	**12**
6.7	**71**	0.005	**10**
4.75	**67**	0.002	**7**
2.36	**59**		

Hydrometer Type: **ASTM 152H**
Dispersant Type: **Sodium Hexametaphosphate**
Pretreatment: **None**
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Chris Lloyd Date: 18/11/2013

Accredited for Compliance with ISO/IEC 17025

ilac-MRA NATA

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PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
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Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4594
Lab:	Alexandria CMT	Sample ID:	Taxi-way - Basecourse T005

California Bearing Ratio of a Soil

AS 1289.6.1.1 - Standard Compactive Effort

Sample Description:	SILTY GRAVELLY SAND:brown
CBR at 2.5mm:	**9**
CBR at 5.0mm	**13**
Sample Data	
Compaction Specification:	100% MDD at 100% OMC
Maximum Dry Density:	2.00t/m³
Optimum Moisture Content:	10.5
Mass of Surcharges:	4.5kg
Period of Soaking:	4 Days
Sample Preparation	
Dry Density - Before Soaking:	1.99t/m³
Dry Density - After Soaking:	1.99t/m³
Percent Oversize - 19.0mm Sieve:	19% Excluded
Moisture Content - Before Soaking:	10.9%
Laboratory Density Ratio:	100%
Laboratory Moisture Ratio:	104%
Moisture Content - After Soaking	
Top 30mm of Specimen:	11.2%
Remainder of Specimen:	10.7%
Swell of Specimen After Soaking:	0.0%
Compactive Effort:	Standard - AS 1289.5.1.1

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Site No.: 2418
Cert No.: 13-AC-4594-AN038
Page: 1 of 1

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-038

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TEST CERTIFICATE

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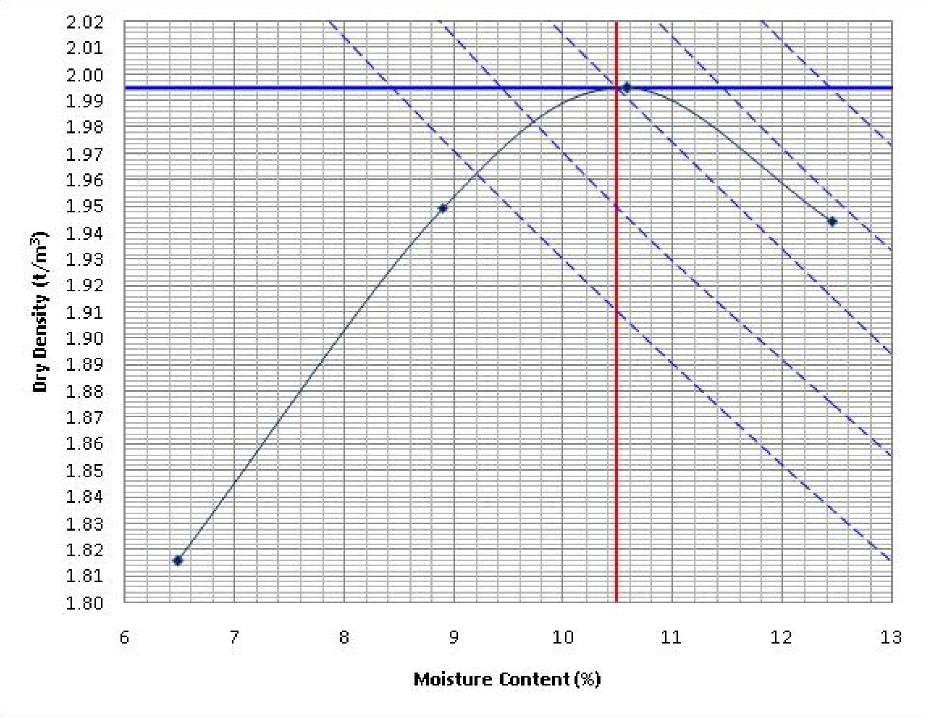
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	22/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4594
Lab:	Alexandria CMT	Sample ID:	Taxi-way - Basecourse T005

Dry Density / Moisture Content Relation of a Soil

AS 1289.5.1.1 - Standard Compactive Effort



Sample Description:	SILTY GRAVELLY SAND:brown
Maximum Dry Density:	2.00t/m³
Optimum Moisture Content:	10.5%
Percent Oversize:	19%
Sieve Size:	19.0mm

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4594-AN027.1

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4595
Lab:	Alexandria CMT	Sample ID:	Taxi-way - Subgrade T006

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	SILTY GRAVELLY SAND:brown
Moisture Content:	11.0%

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-010

Site No.: 2418
Cert No.: 13-AC-4595-AN010

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	18/11/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4595
Lab:	Alexandria CMT	Sample ID:	Taxi-way - Subgrade T006

Atterberg Limits (1 Point Casagrande Method with Linear Shrinkage)

AS 1289.3.1.2, 3.2.1, 3.3.1, 3.4.1

Sample Description:	SILTY GRAVELLY SAND:brown
Liquid Limit:	24%
Plastic Limit:	19%
Plasticity Index:	5%
History of Sample:	Air-Dried
Method of Preparation:	Dry-Sieved
Linear Shrinkage:	4.5%
Length of Mould:	250mm
Dry State:	Linear

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 18/11/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4595-AN014

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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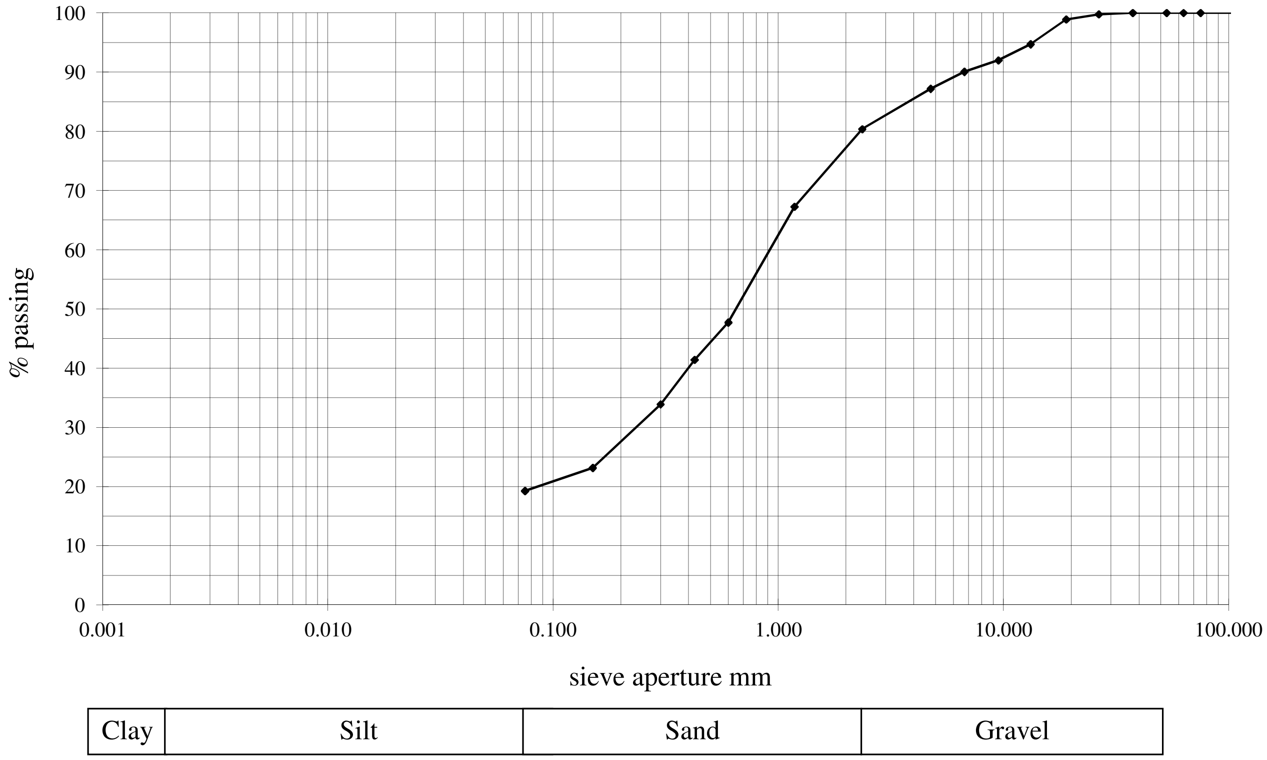
Australia

PARTICLE SIZE DISTRIBUTION

Client: **EAW Geo Services**
Address: **Unit 32 Pullman PlaceEmu Plains NSW 2750**
Project: **St Helens**
Location:
Test Method: **AS 1289 3.6.1**
Job Number: 13-32-581
Sample Source: Taxi-way - Subgrade T006
Sampled By: Client
Lab Number: 13-AC-4595
Date Tested: 17/10/2013
Checked By: JL



Sample Description: SILTY GRAVELLY SAND:brown

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**67**
75.0		0.600	**48**
63.0		0.425	**41**
53.0		0.300	**34**
37.5		0.150	**23**
26.5	**100**	0.075	**19**
19.0	**99**	0.050	
13.2	**95**	0.020	
9.5	**92**	0.010	
6.7	**90**	0.005	
4.75	**87**	0.002	
2.36	**80**		

Hydrometer Type: **N/A**
Dispersant Type: **N/A**
Pretreatment:
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Aaron Lacey Date: 18/10/2013

Accredited for Compliance with ISO/IEC 17025

ilac-MRA NATA

Accreditation No. 2418

TEST CERTIFICATE

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SGS Australia Pty Ltd
PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4595
Lab:	Alexandria CMT	Sample ID:	Taxi-way - Subgrade T006

California Bearing Ratio of a Soil

AS 1289.6.1.1 - Standard Compactive Effort

Sample Description:	SILTY GRAVELLY SAND:brown
CBR at 2.5mm:	**10**
CBR at 5.0mm	**14**
Sample Data	
Compaction Specification:	100% MDD at 100% OMC
Maximum Dry Density:	1.95t/m³
Optimum Moisture Content:	11.6
Mass of Surcharges:	4.5kg
Period of Soaking:	4 Days
Sample Preparation	
Dry Density - Before Soaking:	1.96t/m³
Dry Density - After Soaking:	1.96t/m³
Percent Oversize - 19.0mm Sieve:	1% Excluded
Moisture Content - Before Soaking:	11.4%
Laboratory Density Ratio:	101%
Laboratory Moisture Ratio:	98%
Moisture Content - After Soaking	
Top 30mm of Specimen:	11.4%
Remainder of Specimen:	11.6%
Swell of Specimen After Soaking:	0.0%
Compactive Effort:	Standard - AS 1289.5.1.1

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4595-AN038

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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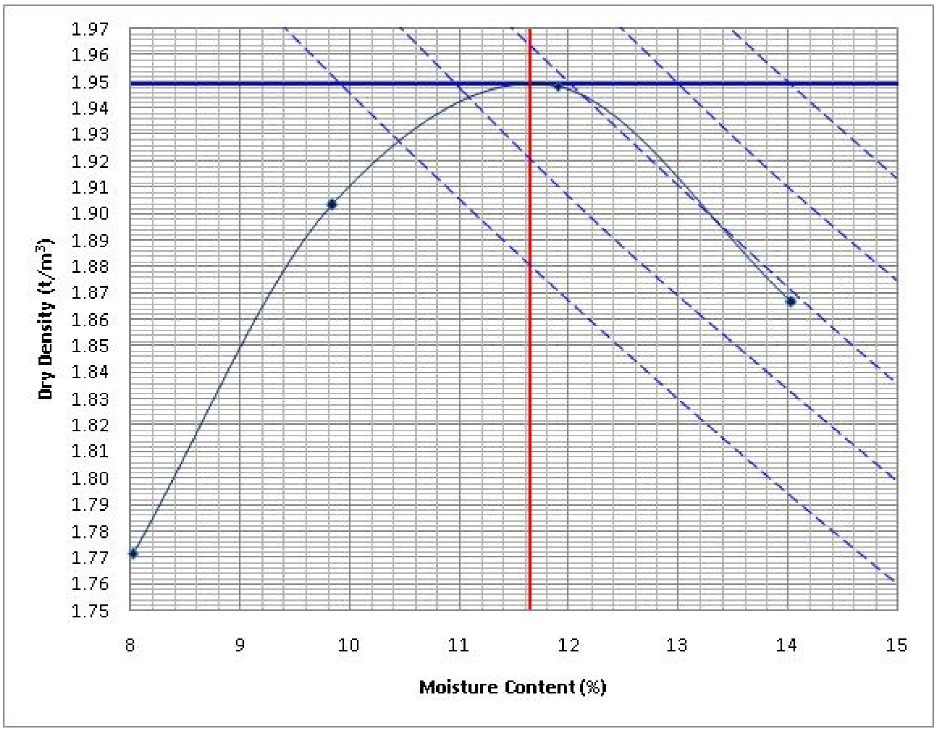
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4595
Lab:	Alexandria CMT	Sample ID:	Taxi-way - Subgrade T006

Dry Density / Moisture Content Relation of a Soil

AS 1289.5.1.1 - Standard Compactive Effort



Sample Description:	SILTY GRAVELLY SAND:brown
Maximum Dry Density:	1.95t/m³
Optimum Moisture Content:	11.5%
Percent Oversize:	1%
Sieve Size:	19.0mm

Note: Sample supplied by client.

Approved Signatory: Aaron Lacey (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-027

Site No.: 2418
Cert No.: 13-AC-4595-AN027.1

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4596
Lab:	Alexandria CMT	Sample ID:	Apron - Basecourse T007

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	SILTY GRAVELLY SAND:brown
Moisture Content:	7.2%

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4596-AN010

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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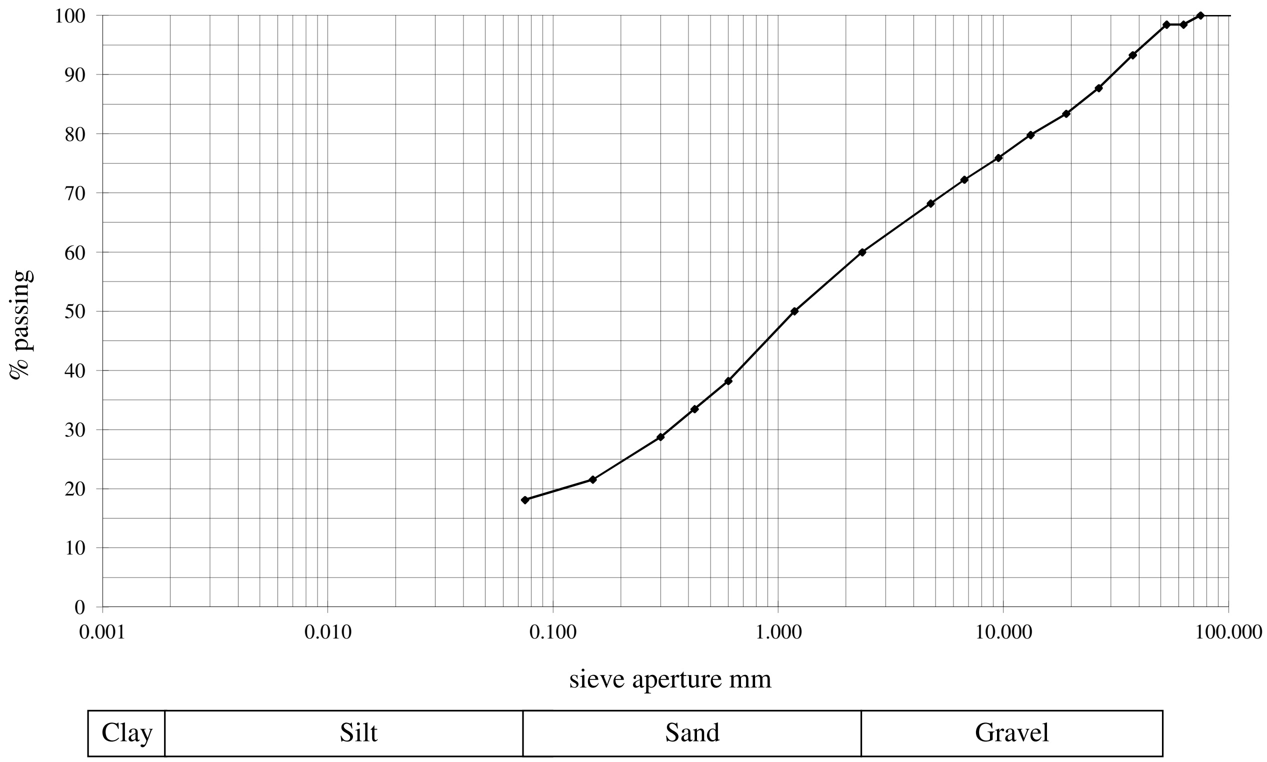
Alexandria NSW 2015
Australia

PARTICLE SIZE DISTRIBUTION

Client: **EAW Geo Services**
Address: **Unit 32 Pullman PlaceEmu Plains NSW 2750**
Project: **St Helens**
Location:
Test Method: **AS 1289 3.6.1**
Job Number: 13-32-581
Sample Source: Apron - Basecourse T007
Sampled By: Client
Lab Number: 13-AC-4596
Date Tested: 17/10/2013
Checked By: JL



Sample Description: SILTY GRAVELLY SAND:brown

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**50**
75.0	**100**	0.600	**38**
63.0	**98**	0.425	**33**
53.0	**98**	0.300	**29**
37.5	**93**	0.150	**22**
26.5	**88**	0.075	**18**
19.0	**83**	0.050	
13.2	**80**	0.020	
9.5	**76**	0.010	
6.7	**72**	0.005	
4.75	**68**	0.002	
2.36	**60**		

Hydrometer Type: **N/A**
Dispersant Type: **N/A**
Pretreatment:
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Aaron Lacey Date: 18/10/2013

Accredited for Compliance with ISO/IEC 17025

ccreditation No. 2418

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SGS Australia Pty Ltd
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Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4596
Lab:	Alexandria CMT	Sample ID:	Apron - Basecourse T007

California Bearing Ratio of a Soil

AS 1289.6.1.1 - Standard Compactive Effort

Sample Description:	SILTY GRAVELLY SAND:brown
CBR at 2.5mm:	**8**
CBR at 5.0mm	**10**
Sample Data	
Compaction Specification:	100% MDD at 100% OMC
Maximum Dry Density:	2.10t/m³
Optimum Moisture Content:	8.6
Mass of Surcharges:	4.5kg
Period of Soaking:	4 Days
Sample Preparation	
Dry Density - Before Soaking:	2.10t/m³
Dry Density - After Soaking:	2.10t/m³
Percent Oversize - 19.0mm Sieve:	17% Excluded
Moisture Content - Before Soaking:	8.8%
Laboratory Density Ratio:	100%
Laboratory Moisture Ratio:	102%
Moisture Content - After Soaking	
Top 30mm of Specimen:	8.8%
Remainder of Specimen:	8.4%
Swell of Specimen After Soaking:	0.0%
Compactive Effort:	Standard - AS 1289.5.1.1

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Site No.: 2418
Cert No.: 13-AC-4596-AN038

Accreditation No.: 2418

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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TEST CERTIFICATE

SGS Australia Pty Ltd
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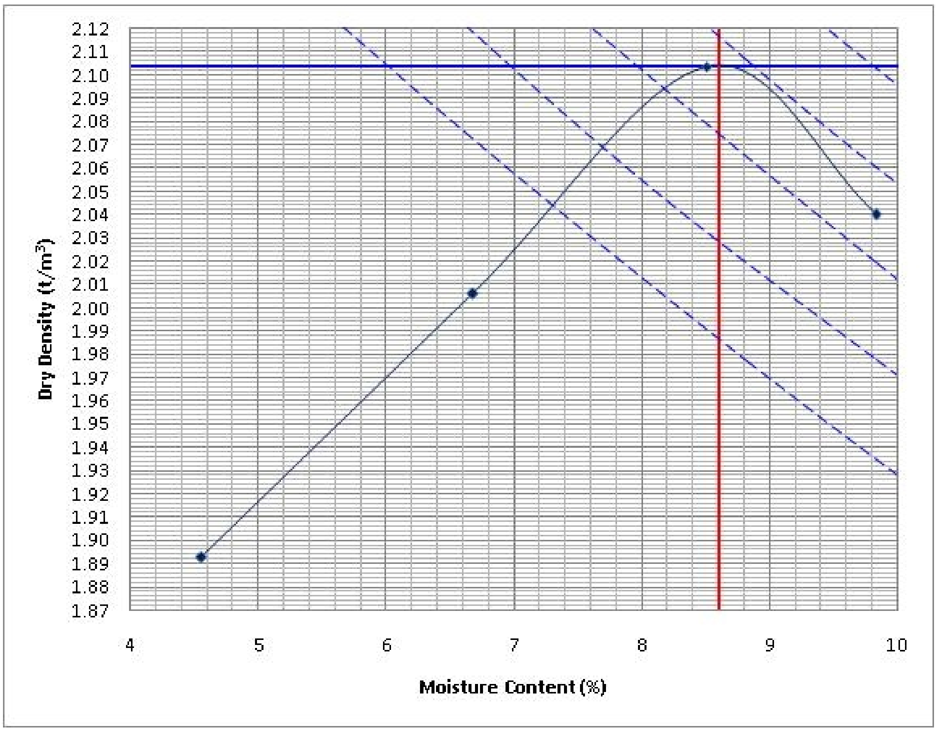
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	22/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4596
Lab:	Alexandria CMT	Sample ID:	Apron - Basecourse T007

Dry Density / Moisture Content Relation of a Soil

AS 1289.5.1.1 - Standard Compactive Effort



Sample Description:	SILTY GRAVELLY SAND:brown
Maximum Dry Density:	2.10t/m³
Optimum Moisture Content:	8.5%
Percent Oversize:	17%
Sieve Size:	19.0mm

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4596-AN027.1

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	21/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4597
Lab:	Alexandria CMT	Sample ID:	Apron - Subgrade T008

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	GRAVELLY SAND:brown/grey
Moisture Content:	7.7%

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Site No.: 2418
Cert No.: 13-AC-4597-AN010

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-010

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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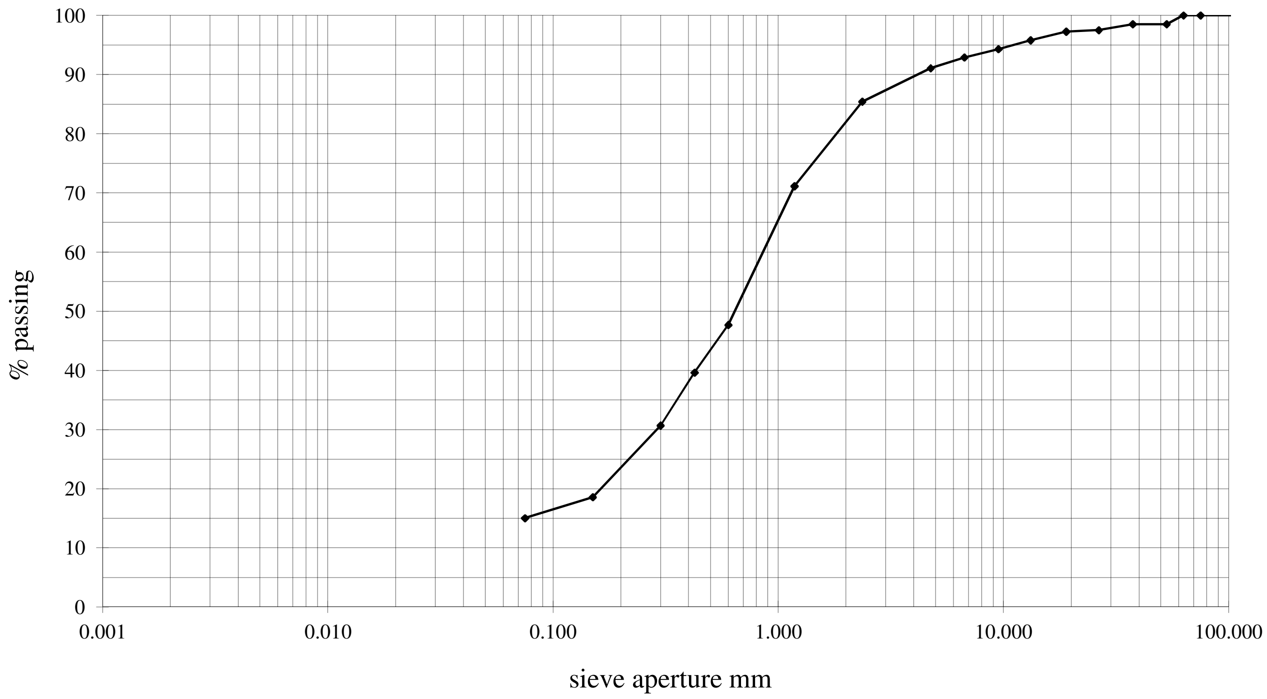
Alexandria NSW 2015
Australia

PARTICLE SIZE DISTRIBUTION

Client: **EAW Geo Services**
Address: **Unit 32 Pullman PlaceEmu Plains NSW 2750**
Project: **St Helens**
Location:
Test Method: **AS 1289 3.6.1**
Job Number: 13-32-581
Sample Source: Apron - Subgrade T008
Sampled By: Client

Lab Number: 13-AC-4597
Date Tested: 18/10/2013
Checked By: JL



Clay	Silt	Sand	Gravel

Sample Description: GRAVELLY SAND:brown/grey

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**71**
75.0		0.600	**48**
63.0	**100**	0.425	**40**
53.0	**99**	0.300	**31**
37.5	**99**	0.150	**19**
26.5	**97**	0.075	**15**
19.0	**97**	0.050	
13.2	**96**	0.020	
9.5	**94**	0.010	
6.7	**93**	0.005	
4.75	**91**	0.002	
2.36	**85**		

Hydrometer Type: **N/A**
Dispersant Type: **N/A**
Pretreatment:
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Aaron Lacey **Date:** 21/10/2013

Accredited for Compliance with ISO/IEC 17025

Accreditation No. 2418

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Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4597
Lab:	Alexandria CMT	Sample ID:	Apron - Subgrade T008

California Bearing Ratio of a Soil

AS 1289.6.1.1 - Standard Compactive Effort

Sample Description:	GRAVELLY SAND:brown/grey
CBR at 2.5mm:	**16**
CBR at 5.0mm	**20**
Sample Data	
Compaction Specification:	100% MDD at 100% OMC
Maximum Dry Density:	2.03t/m³
Optimum Moisture Content:	9.5
Mass of Surcharges:	4.5kg
Period of Soaking:	4 Days
Sample Preparation	
Dry Density - Before Soaking:	2.01t/m³
Dry Density - After Soaking:	2.01t/m³
Percent Oversize - 19.0mm Sieve:	3% Excluded
Moisture Content - Before Soaking:	9.8%
Laboratory Density Ratio:	99%
Laboratory Moisture Ratio:	103%
Moisture Content - After Soaking	
Top 30mm of Specimen:	9.1%
Remainder of Specimen:	9.8%
Swell of Specimen After Soaking:	0.0%
Compactive Effort:	Standard - AS 1289.5.1.1

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-038

Site No.: 2418
Cert No.: 13-AC-4597-AN038

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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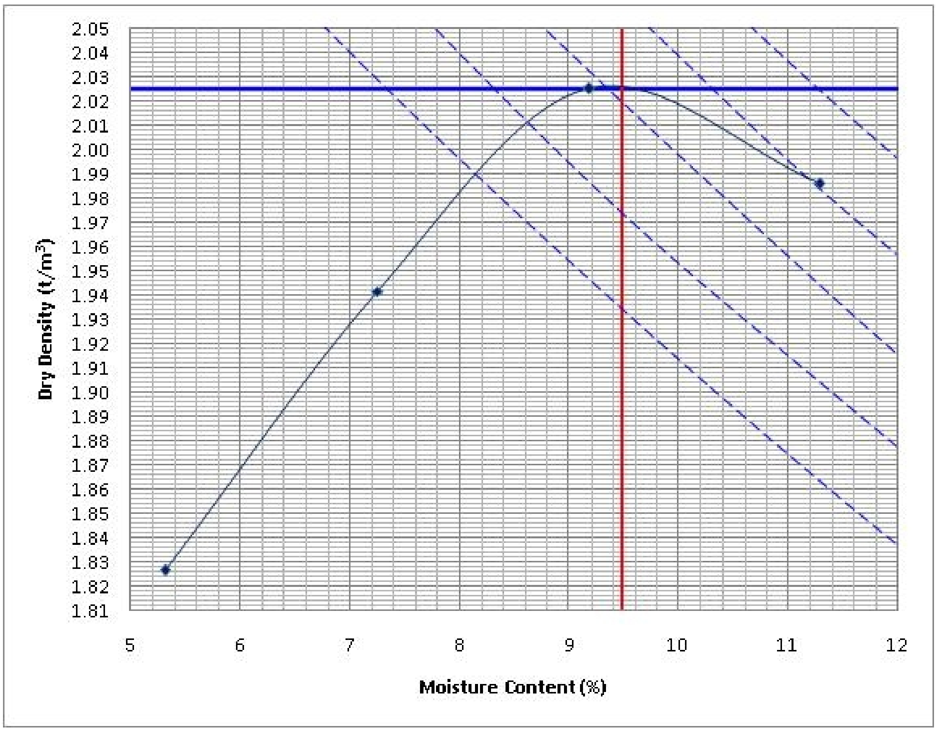
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	23/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4597
Lab:	Alexandria CMT	Sample ID:	Apron - Subgrade T008

Dry Density / Moisture Content Relation of a Soil

AS 1289.5.1.1 - Standard Compactive Effort



Sample Description:	GRAVELLY SAND:brown/grey
Maximum Dry Density:	2.03t/m³
Optimum Moisture Content:	9.5%
Percent Oversize:	3%
Sieve Size:	19.0mm

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-027

Site No.: 2418
Cert No.: 13-AC-4597-AN027.1

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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SGS Australia Pty Ltd
PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	22/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4598
Lab:	Alexandria CMT	Sample ID:	Runway - Subgrade T009

Moisture Content of a Soil

AS 1289.2.1.1

Sample Description:	GRAVELLY SAND:dark grey
Moisture Content:	6.6%

Note: Sample supplied by client.

Approved Signatory: Aaron Lacey (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-010

Site No.: 2418
Cert No.: 13-AC-4598-AN010

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

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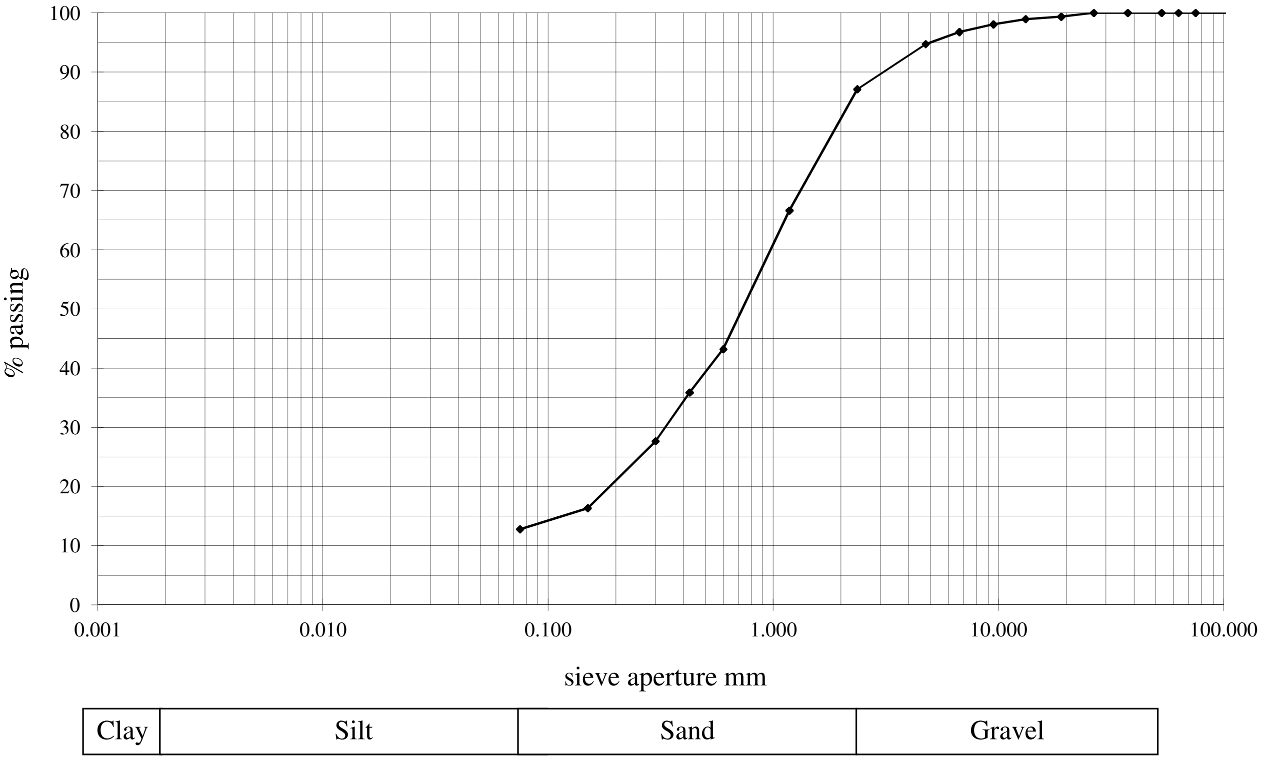
Alexandria NSW 2015
Australia

PARTICLE SIZE DISTRIBUTION

Client: **EAW Geo Services**
Address: **Unit 32 Pullman PlaceEmu Plains NSW 2750**
Project: **St Helens**
Location:
Test Method: **AS 1289 3.6.1**
Job Number: 13-32-581
Sample Source: Runway - Subgrade T009
Sampled By: Client
Lab Number: 13-AC-4598
Date Tested: 17/10/2013
Checked By: JL



Sample Description: GRAVELLY SAND:dark grey

Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
150.0		1.18	**67**
75.0		0.600	**43**
63.0		0.425	**36**
53.0		0.300	**28**
37.5		0.150	**16**
26.5	**100**	0.075	**13**
19.0	**99**	0.050	
13.2	**99**	0.020	
9.5	**98**	0.010	
6.7	**97**	0.005	
4.75	**95**	0.002	
2.36	**87**		

Hydrometer Type: **N/A**
Dispersant Type: **N/A**
Pretreatment:
Loss on Pretreatment: **None**
Remarks:

Approved Signatory: Aaron Lacey **Date:** 21/10/2013

Accredited for Compliance with ISO/IEC 17025

ccreditation No. 2418

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TEST CERTIFICATE

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PO Box 6432 Alexandria NSW 2015
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	22/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4598
Lab:	Alexandria CMT	Sample ID:	Runway - Subgrade T009

California Bearing Ratio of a Soil

AS 1289.6.1.1 - Standard Compactive Effort

Sample Description:	GRAVELLY SAND:dark grey
CBR at 2.5mm:	**16**
CBR at 5.0mm	**20**
Sample Data	
Compaction Specification:	100% MDD at 100% OMC
Maximum Dry Density:	2.03t/m^3
Optimum Moisture Content:	9.5
Mass of Surcharges:	4.5kg
Period of Soaking:	4 Days
Sample Preparation	
Dry Density - Before Soaking:	2.01t/m^3
Dry Density - After Soaking:	2.01t/m^3
Percent Oversize - 19.0mm Sieve:	1%
	Excluded
Moisture Content - Before Soaking:	9.8%
Laboratory Density Ratio:	99%
Laboratory Moisture Ratio:	103%
Moisture Content - After Soaking	
Top 30mm of Specimen:	9.1%
Remainder of Specimen:	9.8%
Swell of Specimen After Soaking:	0.0%
Compactive Effort:	Standard - AS 1289.5.1.1

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Form No.PF-AU-INDCMT-GEN-AN-038

Site No.: 2418
Cert No.: 13-AC-4598-AN038

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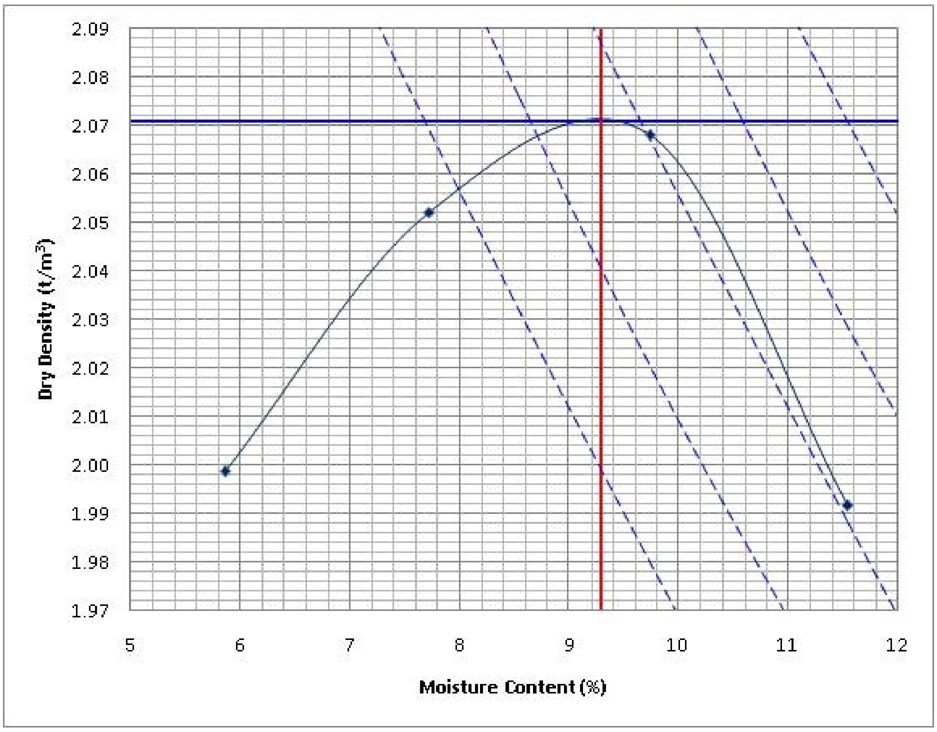
Unit 15, 33 Maddox Street
Alexandria NSW 2015

Client:	EAW Geo Services	Client Job No:	
Order No:		Project:	St Helens
Tested Date:	18/10/2013	Location:	
SGS Job Number:	13-32-581	Sample No:	13-AC-4598
Lab:	Alexandria CMT	Sample ID:	Runway - Subgrade T009

Dry Density / Moisture Content Relation of a Soil

AS 1289.5.1.1 - Standard Compactive Effort



Sample Description:	GRAVELLY SAND:dark grey
Maximum Dry Density:	2.07t/m³
Optimum Moisture Content:	9.5%
Percent Oversize:	1%
Sieve Size:	19.0mm

Note: Sample supplied by client.

Approved Signatory: (Aaron Lacey.Operations Supervisor) Date: 23/10/2013

Accredited for compliance with ISO/IEC 17025

Accreditation No.: 2418

Site No.: 2418
Cert No.: 13-AC-4598-AN027.1

Client Address: 3 The Upper Sanctuary Drive Leonay NSW 2750

Appendix C

Correspondence

Simon Oakley

From: Warren <newell_w@optusnet.com.au>
Sent: Tuesday, 10 December 2013 2:18 PM
To: Simon Oakley
Subject: RE: St Helens Aerodrome Geotechnical Investigation

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Simon

Following up on your questions and our telephone conversation this afternoon.

1. The SW Classification is based on the grading from the laboratory while the CL classification in the logs is based on the field observation while we were drilling. Even in the field I was considering whether or not the material was closer to sand than clay so with the lab results indicating around 8% Clay the SW classification became more appropriate.
2. The DCP has a 60 Degree cone, Diameter 20mm in accordance with AS 1289.6.3.2 . The cone used on this project was relatively new and within the specifications set out in the standard.
3. As discussed, I had looked very much at the raw data in relation to the DCP / CBR relationship and as we know there is only rough correlation. When I consider the material and the site I would be happier if you considered CBR values of between 6 and 15 when designing. There was evidence, in two holes, of organic material and the dark sand encountered near the top of most holes is likely to be the old sandy "topsoil" horizon. I would expect that if the site was stripped back there would be several other areas of organic contamination in the soil profile.

Hope this confirms our discussion. You can call me at any time if you have further questions.

Regards

Warren Newell
MAppSc; FIEAust; CPEng:
Director
EAW Geo Services
Phone 0419 242732

EAW Geo Services

From: Simon Oakley [mailto:Simon.Oakley@aurecongroup.com]
Sent: Monday, 9 December 2013 1:56 PM
To: Warren
Subject: RE: St Helens Aerodrome Geotechnical Investigation

Thanks Warren.

From: Warren [mailto:newell_w@optusnet.com.au]
Sent: Monday, 9 December 2013 1:51 PM
To: Simon Oakley
Subject: RE: St Helens Aerodrome Geotechnical Investigation

Hi Simon
Will call later today or about 9:30 AM tomorrow morning

Regards
Warren

From: Simon Oakley [mailto:Simon.Oakley@aurecongroup.com]
Sent: Monday, 9 December 2013 1:08 PM
To: newell_w@optusnet.com.au
Cc: Elaine Treglown (elaine@tcgplanning.com.au)
Subject: St Helens Aerodrome Geotechnical Investigation

Hello Warren,

By way of introduction, we have been engaged by Break O'Day Council to undertake a feasibility study into the upgrading of St Helen's Aerodrome. I was also the author or the geotechnical investigation brief which I believe you quoted on.

There are a couple of main points from your report which I would appreciate clarification on including:

1. Within the report the classification is stated as SW, however in the bore logs it is CL and SC
2. What type of cone was used for the DCP tests and how have you accounted for the fact that it is a sand and not a granular material (conversion factor etc)
3. I am concerned that the recommended subgrade CBR of 12 to 20 is high (especially considering the confining effects of the CBR mould with sand, and the conversion of DCPs undertaken in sand). I would have anticipated CBRs more in the range of 5 to 12, especially if it is a CL or SC.

The pavement thickness is greatly dependent on the CBR as illustrated in the table below, which in turn greatly affects the costs, hence we need to get the design subgrade CBR as close to the mark as possible.

Table 10: Concept Flexible Pavement Thickness Requirements for Traffic Scenarios 1, 2, 3 and 4 (mm)

	Design Subgrade CBR (%)					
	3	4	5	6	8	10
Traffic Scenario 1	360	300	260	230	190	160
Traffic Scenario 2	430	360	310	280	230	190
Traffic Scenario 3	650	540	470	410	330	290
Traffic Scenario 4	670	560	490	420	340	300

Can you please give me a call when you get a chance? Thanks.

Regards,

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Part B

Market Assessment

MCa

<Final Report>

Market Assessment:

Flights to St Helens Aerodrome

Break O'Day LGA

MCa <Michael Connell & Assocs.>

September 2013

Executive Summary

This report provides a market assessment and highlights some issues in relation to the potential demand for air flights for visitors to the region; for game and ocean fishing and for tourist related activities (including charter flights for golf and other special purpose visits). It also examines air freight issues for the region.

A. Visitors to the Region

The demand for flights is driven by the number of interstate visitors to an area. In 2011/12 there were a total of 84,200 interstate overnight visitors to Break O'Day. This includes persons staying in commercial accommodation and those staying with friends and relatives. There has been a substantial decline in visitor numbers between 2008 and 2012.

Of interstate visitors to St Helens over 70% travel by air (27% via Launceston Airport and 47% via Hobart). This indicates that most were fly/drive visits.

A key factor in terms of demand for direct passenger flights (or charter flights) into an area are accessibility to a major airport and distances and travel times. Other factors are the frequency and cost of flights.

In the case of Break O'Day travel time from Launceston Airport to St Helens is around 1 hour and 50 minutes, and from Hobart Airport is 3 hours. Launceston Airport offers flights from the two major sources of visitors to Break O' Day (ie. Melbourne and Sydney). Visitors from other States tend to hub through Melbourne Airport. The following airlines operate at Launceston: Jetstar, Qantas (Qantas Link), Virgin Australia and Sharp Airlines. Launceston had 1.13 million passenger movements in 2012 and this is projected to more than double over the next 15 years.

Access to the region via Launceston Airport is good, providing services for tourist visitors and connecting residents and business people to the mainland.

B. Freight

Only around 1% of Tasmania's freight is carried by air. However air freight is critical for time sensitive products such as fresh and live seafood, some fruit products and cut flowers. Air freight is carried on most domestic flights from both Hobart and Launceston and in dedicated freighters. There have been recent upgrades in freight facilities at Launceston.

The seafood industry has expressed concerns at different times in relation to the adequacy of air freight services out of Tasmania. This occurs particularly when airlines implement their off-peak season timetables, which reduces flight frequencies and overall capacity.

C. Airports Tasmania

The major airports are Hobart International Airport and Launceston Airport and the regional airports of Devonport and Burnie have passenger services to Melbourne. Flinders Island and King Island are serviced through regional airlines (eg. Sharp, Regional Express)

The smaller airports do not have regular passenger flights and are used for general aviation (sight-seeing flights, charters, emergency services, and private GA use).

St Helens is the least developed of the small air strips with a gravel runway. The other smaller strips have sealed runways (eg. Cambridge, Smithton Airport, Strahan Airport). St Helens is currently used for emergency services use, some limited freight use (seafood) and private use (general aviation and flight training). In the past joy flights have been conducted from St Helens Airport.

D. Regional Airports

The report examines some of the drivers of passenger services as they relate local airports. The regional airports (in areas with larger populations) generally have a mix of passenger services (Regular Public Transport -RPT operators); some charter operators; flight training operations; and air ambulance and other emergency services use.

Those with passenger services have a number of characteristics: located a long way from other major airports (eg. 4 hours + driving distance); have a large resident population to sustain a passenger service (with local residents travelling); are the primary tourist destination in a region and have large-scale tourism infrastructure including accommodation (to support large number of visitors); and have a large local economy or several large-scale major employers that generate regular requirements for business travel.

For these airports passenger volumes are significant for most of the year, which allows for the maintenance of regular flight schedules (with additional flights during peak seasons).

There are other factors that also affect the potential demand for travel to a small airport. These include the limited timetables of flights and the general willingness of passengers to fly on smaller aircraft (when a major airport is relatively close by).

E. Break O'Day Market

Business Market:

In the case of business travel, the regional businesses in Break O'Day are relatively small and there are no large scale operations that involve executives flying in and out. The business market is serviced by flights out of Launceston or Hobart and there is no real demand for the use of charter flights for this type of travel.

Passenger Services:

Regular passenger services require guaranteed passenger numbers to make a service financially viable over a year (or during a defined peak season). This normally requires a combination of tourists, local residents and business travel (and a significant catchment area for local passengers).

Our assessment is that there is no current potential to develop regular direct passenger services via St Helens Aerodrome.

Fishing Charters:

One special market that has been identified is the use of charter flights to bring in visitors for game and ocean fishing activity. St Helens is recognised as a key location for this type of fishing activity. In most of the other major fishing locations around Australia, visitors have access through major regional airports.

The report models the charter market based on assumptions about interstate fishing visitors. Based on a 30% take-up (of charter travel), there could potentially be demand for 2 charter flights per week during the peak fishing season (ie. November to May period).

The overall viability of charter flights is dependent on fishing charter passenger numbers. Flights would not be supported by general tourist visitors or by a sufficient numbers of business visitors to the Break O' Day region (wanting to fly direct into the St Helens).

The size of the fishing market may not be of the scale to maintain regular charter flights. However there may be the potential to develop special packages for the premium market (covering charter flights, transfers, fishing charter and accommodation) during the peak season.

Other Flights:

Other uses include general aviation covering: ad-hoc charters or special event charters that would continue to use the airport; the development of East Coast scenic flights from St Helens Airport; and some private general aviation use.

There may be some limited demand for golf packages, but these would likely to be irregular special packages, rather than part of a regular service.

The aerodrome has the potential for this type of special use and needs to be maintained and developed to support these aviation uses.

Freight:
Air freight out of Tasmania accounts for around 1% of overall freight volumes. Air freight comprises high value/time sensitive products and seafood and some fresh food exports are in this category.

Break O'Day and the adjacent East Coast areas are involved in: rock lobster, abalone, scallops and some scale fish. Aquaculture in St Helens involves oysters and mussels. The two major East Coast fishing locations are St Helens and Bicheno.

The volumes out of St Helens are estimated at rock lobster 120 tonnes (around 9% of Tasmanian catch) and scallops 500 tonnes (shell weight – around 30% of Tasmanian catch). Scale fish is estimated at $12-15 million per year and lobsters at $30 million. Aquaculture has continued to expand.
There is limited freight use of St Helens Aerodrome, with one plane being used to transport seafood product to Melbourne (on an irregular basis). Freight use was more prevalent in the past when the fishing industry was less regulated.

In the longer term there may be future potential for seafood industry freight and this should be taken into account in any infrastructure development of the aerodrome.

Airparks:
Airparks have been developed successfully in the large USA market. Airparks are targeted at a very narrow demographic market (largely retirees who are aviation enthusiasts).

In Australia larger projects are located in tropical areas, which attract retirees and offer weather conditions that allow year round aviation. Developments in Bundaberg and Whitsunday developments are linked to substantial regional airports, which have quality facilities, commercial aviation activity and some RPT services. They also have general residential lots to attract a broader market. The airparks proposed at smaller rural airstrips generally have limited facilities and have struggled to attract sales.

St Helens Airport would have limited market appeal as an Airpark location. Any residential development would be chasing a very narrow potential market.

F: Assessment of Development Options

The following table provides an assessment of each of the development options for the aerodrome.

Capital Work Options and Potential Activity

No	Option	Capital Cost $M	Description of Capital Works	Type of Aircraft	Comments – Market Analysis
1	Stage 1 – 18m Runway – Pavement Option A < 1070 m runway>	2.5	Upgrade pavement – strengthen and bituminous spray/seal. New lighting.	Code 1B Aircraft and below Would accommodate larger aircraft (up to 7000 kg) This covers: Beechcraft King Air 200 (7 passengers); and Beechcraft King Air 350 - 9 passengers. Royal Flying Doctor Service (RFDS) mainly use these two types of aircraft.	This level of upgrade would allow slightly larger aircraft (eg. Beechcraft King Air 350 - 9 passengers). -RFDS: it would meet Royal Flying Doctor Service (RFDS) requirements. - General aviation: would allow existing GA aircraft use and slightly larger Code 1B aircraft (up to 7000 kg). - Freight : would allow for slightly larger freight aircraft Commercial activity: this would support: small charters, sight-seeing flights and current limited freight operations (using slightly larger aircraft). **Assessment: this upgrade would allow for slightly larger charter flights and freight service.**
2	Stage 1 – 18m Runway – Pavement Option B < 1070 m runway>	1.7	Seal existing pavement- with bituminous spray/seal. New lighting	Code 1B (up to 5700 kg) and below. Suitable for existing light aircraft use. This covers: Beechcraft King Air 200 (7 passengers)	This level of upgrade would support existing aircraft. -RFDS: this is the minimum required to meet Royal Flying Doctor Service requirements. - General aviation: this would allow existing GA aircraft use. - Freight: would allow current freight activity. Commercial activity: this would support: small charters, sight-seeing flights and current limited freight operations (using current aircraft). **Assessment: this upgrade would support existing uses and aircraft types.**
3	Stage 2 – 23m Runway – Pavement Option A < 1200 m runway>	3.6	Widen runway and lengthen. Upgrade pavement - strengthen and bituminous spray/seal. New lighting. Increased airside capacity.	Code 2B Aircraft and below Accommodate larger aircraft (up to 7000 kg) This would take a Metro III Aircraft (19 seats) - for RPT Service or larger charter flights.	This level of upgrade allows for larger aircraft (up to 7000 kg). - RFDS: it would meet all Royal Flying Doctor Service (RFDS) requirements. - General aviation: would allow existing GA aircraft use and larger Code 2B aircraft (up to 7000 kg). - RPT Service (regular public transport): this would allow potential for a RPT Service using a Metro III aircraft (19 seats). - Freight: would allow for slightly larger freight aircraft. Commercial activity: this would support: charters, sight-seeing flights and current limited freight operations (using slightly larger aircraft). **Assessment: this upgrade would be required to support larger aircraft, including those suitable for an RPT service.**
4	Stage 2 – 23m Runway – Pavement Option B < 1200 m runway>	2.8	Widen runway and lengthen and seal existing pavement with bituminous spray/seal. New lighting. Increased airside capacity.	Code 1B Aircraft (up to 5700 kg) and below. Suitable for existing light aircraft use. This covers: Beechcraft King Air 200 (7 passengers)	This level of upgrade would support existing aircraft. -RFDS: this is the minimum required to meet Royal Flying Doctor Service requirements. - General aviation: this would allow existing GA aircraft use. Commercial activity: this would support: small charters, sight-seeing flights and current limited freight operations (using current aircraft). Provides increased airside capacity. **Assessment: this upgrade would support existing activity and provide increased airside capacity.**
5	Stage 3 – New 30m Runway – Pavement Option A < 1500 m runway>	19.0	Major capital works: new flexible runway and taxiway (longer and wider); upgrade pavement strengthen and bituminous spray/seal; and new lighting. Increased airside capacity.	Code 3C aircraft (up to 18,000 kg). This would allow for RPT service Saab 340 aircraft (38 seats & 13,000kg)	This level of upgrade supports all existing aircraft and allows for larger Code 2B and large Code 3C aircraft (up to 18,000 kg) and provides a major increase in airside capacity. - RFDS: it would meet all Royal Flying Doctor Service (RFDS) requirements. - General aviation: would allow existing GA aircraft use and larger Code 2B aircraft (up to 7000 kg). - RPT Service (regular public transport): this would allow potential for a RPT Service using a Saab 340 aircraft (38 seats and 13,000kg). Freight: could handle large freighters up to 18,000 kg. Commercial activity: this would support: small charters, sight-seeing flights and expanded freight operations (using larger aircraft); and allow for a RPT service based on a Saab 340 (38 seats and 13,000kg). Provides increased airside capacity. **Assessment: This investment would fully future proof the aerodrome for all relevant types of aircraft. However it has the potential for excess operational capacity that would not be used based on the market analysis in this report.**

Source: St Helens Aerodrome Technical Planning and Facility Upgrade Report, Aurecon 5 April 2013

From the analysis of the technical analysis and development options and the market review the following assessment is made:

- Option 5 which involves a full redevelopment of the runway (indicative cost $19 million) would likely result in major excess capacity (would be able to take a Saab 340 aircraft - 38 seats) that would not be taken up based on a market assessment.
- Of the other options for development, Option 3 (indicative cost $3.6 million) provides for use by larger aircraft and the potential for an RPT service (using a Metro III Aircraft -19 seats).
- Options 2 and 4 (both with pavement Option B) do not increase the capacity for larger aircraft.
- Based on providing increased capacity for larger aircraft use, Option 3 would support the potential for increased usage in future.

The redevelopment of the airport should focus on the option that provides for the potential for growth (through increase capacity for larger aircraft use), within a realistic assessment of the market. This indicates Option 3 may be the preferred option

Contents

Table of Contents

1. Introduction

This report provides a market assessment and highlights some issues in relation to the potential demand for air flights for visitors to the region; for game and ocean fishing and for other specialised tourist related activities (including charter flights). It also examines air freight issues for the region.

Regular direct flights into the aerodrome require a sustainable market for travel into and out of the region. A sustainable market would need to comprise a combination of: tourism travel; flights for special groups (eg. fishing, golf etc.), and some business travel. Other uses include: existing emergency services use; private general aviation use; irregular charters; and sight-seeing flights.

Some key issues for St Helens and the aerodrome are: the level of demand for direct flights given the accessibility to major airports (particularly for visitors undertaking coastal trips); the potential demand for charter flights as part of fishing packages and other packages ; and the potential to expand freight use particularly for time sensitive seafood and higher value products.

Different types of services require different types of aircraft. The various levels of upgrades of the aerodrome and its facilities for aircraft types have been outlined in the Aurecon Report and the implications of these for operations and for market demand are examined in this report.[1]

This market assessment and the technical report provide a foundation for considering the longer term uses of the aerodrome.

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[1] St Helens Aerodrome Technical Planning and Facility Upgrade Report (Draft), Aurecon April 5 2013

2. Visitor Market

The visitor market is the major driver of demand for air travel. This section examines interstate visitors to Break O'Day and St Helens.

2.1 Visitors and Flights

The demand for flights is driven by the number of interstate visitors to an area.

Visitor data is available from the Tasmanian Visitors Survey for St Helens.[2] Using St Helens as the main centre for tourism for Break O'Day, the region has experienced a number of trends:

- In 2011/12 there were a total of 84,200 interstate overnight visitors to Break O'Day. This includes persons staying in commercial accommodation and those staying with friends and relatives.
- The overall interstate overnight visitor numbers declined by 20,600 or 20% in the period between 2008 and 2012. This reflected major declines in visitors from Victoria (10,600 or 27%) and New South Wales (7400 or 24%); and declines in visitors from all other states, except Western Australia.
- There was also major fall in the numbers travelling via TT Line (down 9600 or 22%).
- In addition to a decline in overnight visitors, other data show that there has been a fall in the number of persons, who are passing through and those visiting but not staying overnight.

Table 1. Overnight Visitors - St Helens 2008-2011

Total Visitors Aged 14 Years and Over: St Helens (Visited/Stayed O/night Interstate)	July 2008 - June 2009	July 2009 - June 2010	July 2010 - June 2011	July 2011 - June 2012	2010/11- to 2011/12 % Change		Share Year 2011/12	Year 2009/10	Year 2008/9	Change 08/09-11/12 No	%
Residence											
Victoria	38,900	38,600	34,700	28,300	-18.4	▼	33.6	36.3	37.1	-10,600	-27.2
New South Wales	31,000	27,000	25,000	23,600	-5.5	▼	28.0	25.4	29.6	-7,400	-23.9
Queensland	19,300	20,000	24,500	16,800	-31.5	▼	20.0	18.8	18.4	-2,500	-13.0
South Australia	6,200	10,800	5,900	4,800	-17.7	▼	5.7	10.2	5.9	-1,400	-22.6
Western Australia	5,600	7,400	8,600	8,600	0.7	▲	10.2	7.0	5.3	3,000	53.6
ACT	2,700	1,800	2,200	1,400	-33.5	▼	1.7	1.7	2.6	-1,300	-48.1
NT.	1,100	600	800	700	-15	▼	0.8	0.6	1.0	-400	-36.4
Australia – no State given	300	200	700	700	-9.4	▼	0.8	0.2	0.3	400	133.3
Total Interstate Visitors	104,800	106,200	101,700	84,200	-17.0	▼	100.0	100.0	100.0	-20,600	-19.7

Source: Tasmanian Visitors Survey (TVS) – Tourism Tasmania 2012.

Of the interstate overnight visitors to St Helens, 64% came by air and 24% via the TT Line Ferry from Melbourne. Launceston Airport is the entry point for around 27% of (22,734 in 2011/12) interstate overnight visitors to Break O'Day (St Helens) and 47% came via Hobart Airport.

Table 2. St Helens Overnight Visitors (Interstate)- Arrival Points

Arrival Point	No	Share %
Launceston Airport	22,734	27
Hobart Airport	39,574	47
Devonport (TT Line)	20,208	24
Total	**82,516**	

Source: Tasmanian Visitors Survey (TVS) – Tourism Tasmania 2012 and MCa analysis

Interstate overnight visitors are a significant part of the tourist market for Break O'Day and almost two thirds of these visitors travel to Tasmania by air.

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[2] Tasmanian Visitors Survey (TVS) – Tourism Tasmania 2012.

2.2 Airport Access

Key factors in terms of demand for direct passenger flights (or charter flights) into an area are accessibility to a major airport and distances and travel times. Other factors are the frequency and cost of flights.

The following shows travel times to Break O'Day locations from the three major entry points for interstate visitors. Travel time from Launceston Airport to St Helens is around 1 hour and 50 minutes, and from Hobart Airport is 3 hours.

- Travel time to Launceston Airport to St Helens is under 2 hours, which is good access for a regional destination.
- Arrivals via Hobart Airport (a 3 hour drive to St Helens) are likely to be undertaking East Coast travel with St Helens being one of their overnight stops (the average overnight visitor stay on St Helens was 1.9 nights).

Table 3. Travel Times to Break O'Day Locations

Travel	Distance	Travel Time
From Launceston Airport		
Fingal	94	1 hour
St Marys	115	1 hour 20 minutes
St Helens	150	1 hour 50 minutes
From Hobart Airport		
Fingal	211	2 hours 20 minutes
St Marys	208	2 hours 25minutes
St Helens	244	3 hours
From Devonport TT Line		
Fingal	187	2 hours 2minutes
St Marys	208	2 hours 25minutes
St Helens	243	2 hours 50 minutes

3. Launceston Airport Services

Launceston Airport offers flights from the two major sources of visitors – Melbourne and Sydney. Visitors from other States tend to hub through Melbourne.

3.1 Passenger Services

Launceston airport is operated by Australia Pacific Airports Corporation (APAC), which in conjunction with the Launceston City Council, acquired the lease for Launceston Airport in May 1998.[3] The airport is a domestic, regional and general aviation gateway to Northern Tasmania for commercial aircraft, air freight and private operators.

Launceston Airport has continued to grow with total passenger numbers of 1.13 million in 2012. There were 11,000 domestic aircraft movements in 2012 and 7000 general aviation aircraft movements. Projections in the airports master plan are for passenger volumes to increase to between 2.1 million and 2.5 million by 2028/29.[4]

As the airport has expanded with regular passenger services, the general aviation use has declined and represented 7000 aircraft movements in 2012.

Table 4. Launceston Airport – Operational Statistics 2002-2012

Airport	2002	2004	2006	2008	2010	2012
Passenger Volumes						
Domestic Passengers (million)	0.53	0.67	0.92	1.10	1.12	1.13
Aircraft Movements						
Domestic ('000)	9	8	10	11	11	11
General Aviation ('000)	12	7	6	6	7	7
Total	21	15	16	17	18	18

Source: Australia Pacific Airports Corporation, Annual Report 2012

The following airlines operate at Launceston: Jetstar, Qantas (Qantas Link), Virgin Australia, and Sharp Airlines. The airport is serviced with flights to Melbourne and Sydney and Sharp Airlines operates flights to Flinders Island and King Island. Flight frequencies vary over the seasons, with an increased number of flights over the peak periods.

Access to the region via Launceston Airport is good, providing services for tourist visitors and connecting residents and business people to the mainland.

Table 5. Passenger Services – Launceston Airport

		Frequency- Daily (week days)	
Airline	Routes	Arrivals	Departures
Jetstar	Melbourne, Sydney	3	3
Qantas	Melbourne	4	3
Virgin Australia	Melbourne, Sydney	5	4
Sharp Airlines	Flinders Island, King Island	3	3

Source: Airline Flight Schedules, May 2012

3.2 Freight Services - Launceston

Only around 1% of Tasmania's freight is carried by air. However air freight is critical for time sensitive products such as fresh and live seafood, some fruit and cut flowers.

Air freight is carried on most domestic flights from both Hobart and Launceston. Australian Air Express also provides some dedicated air freighter services from both Hobart and Launceston to all

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[3] Australia Pacific Airports Corporation (APAC) in conjunction with the Launceston City Council acquired the lease for Launceston Airport in May 1998.
[4] Launceston Airport Master Plan 2009 Australia Pacific Airports Corporation (APAC) P22

mainland destinations. These services provide connections to international flights for high value fresh and live seafood for export markets. The seafood industry has expressed concerns at different times in relation to the adequacy of air freight services out of Tasmania. This occurs particularly when airlines implement their off-peak season timetables, which reduces flight frequencies and overall capacity.

Air freight through Launceston Airport is carried as belly freight on RPT aircraft and by freight aircraft. A dedicated freighter aircraft comprises one B737-400 operating 6 nights per week.[5]

As part of the airport's master plan, there have been recent upgrades to Australian Air Express (Qantas Freight) freight terminal and to the apron to accommodate more freight capacity. Toll Air Express is the designated freight group for Virgin Australia.

The major freight from Break O'Day comprises seafood and some food products. Seafood that is unloaded at St Helens is generally chilled and shipped to the Melbourne and Sydney Fish Markets. There is some product that goes to export markets (eg. lobster).

The Launceston Airport Master Plan is being implemented to increase the capacity for both passengers and for freight services.[6]

Table 6. Launceston Airport -Facilities Upgrades Since 2009

Development	
Main terminal	Upgrades
Sharp Airlines	New Terminal
Australian Air Express	New Freight Terminal
Apron upgrade	For freight capacity – increased load capacity

There has been an upgrade in freight facilities at Launceston Airport over the last two years.

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[5] Launceston Airport Master Plan 2009 Australia Pacific Airports Corporation (APAC) P24

[6] Launceston Airport Master Plan 2009 Australia Pacific Airports Corporation (APAC).

4. Airports in Tasmania

There are a number of airports and aerodromes in Tasmania, including several small facilities that are providing general aviation services.

4.1 Airports

The following shows information on airports in Tasmania. The major airports are Hobart International Airport and Launceston Airport, and the regional airports of Devonport and Burnie have passenger services to Melbourne. Flinders Island and King Island are serviced through regional airlines (eg. Sharp, Regional Express)

The smaller airports do not have regular passenger flights and are used for general aviation (sight-seeing flights, charters, emergency services, and private GA use).

St Helens is the least developed of the small air strips with a gravel runway. The other smaller strips have sealed runways (eg. Cambridge, Smithton Airport, Strahan Airport). St Helens is currently used for emergency services use, limited freight use (seafood) and private use (general aviation and flight training). In the past joy flights have been conducted from St Helens Airport.

Table 7. Airports in Tasmania

Airport	Location	Passenger Services	Freight Services	Flights	Runways
Passenger Services					
Hobart International Airport	Hobart	▲	▲	Major airport Jetstar – Gold Coast, Melbourne, Sydney Qantas – Melbourne. Sydney, Brisbane Qantas Link – Melbourne Virgin Australia – Brisbane, Melbourne , Sydney Freight services- Launceston/Melbourne	1 sealed
Launceston Airport	Launceston	▲	▲	Major airlines and regionals. Jetstar. Qantas Link, Virgin Australia, and Sharp Airlines. Routes: Melbourne, Sydney, Flinders Island, King Island Freight service	1 sealed , 2 grass
Devonport Airport	Devonport	▲		Qantas Link - Melbourne	1- sealed & 1 grass
Burnie Airport (Wynyard Airport)	Wynyard / Burnie	▲		Regional Express – Melbourne Sharp Airlines - Launceston, King Island	2 sealed
Flinders Island Airport	Flinders Island (Whitemark)	▲		Sharp Airlines - Melbourne, Launceston	2 - sealed
King Island Airport	King Island (Currie)	▲		Passenger Flights : Regional Express – Melbourne; King Island Airlines – Moorabbin Airline of Tasmania - Wynyard, Launceston	1 sealed, 1 gravel, 1 composite
No Passenger Services					
Cambridge Aerodrome	Hobart / Cambridge			No passenger services - day trips and scenic flights around Hobart and the South West Wilderness ; Aeroclub of Southern Tasmania	2 sealed
St Helens Airport	St Helens			Small airport: no passenger service, irregular freight use, emergency services use, some GA use.	1 gravel
Smithton Airport	Smithton			Small airport: no passenger service , emergency services use	1 sealed , 1 grass
Strahan Airport	Strahan			Small airport: no passenger services. Helicopter and fixed wing charter flights into the south-west wilderness area/ western Tasmania.	1 Sealed

4.2 Airports and Passenger Services

This section examines some of the drivers of passenger services to regional airports. Local airports that have passenger services generally have a number of characteristics:

They are located a long way from a major regional airport (eg. 4 hours + driving distance).

They have a large resident population and catchment area to sustain a passenger service (with local residents travelling).

They are the primary tourist destination in a region and have large-scale tourism infrastructure including accommodation..

They have a large local economy or several large-scale major employers that generate business travel to help sustain flights.

Passenger volumes are significant for most of the year to allow for the maintenance regular flight schedules (with additional flights during peak seasons).

Table 8. Regional Airports and Passenger Services - Assessment

Airport	Location	RPT Services	1.Long Distance from Major Airport	2.Large Regional Population <Resident Travel>	3.Primary Tourism Destination	4.Large Regional Economy <Business Travel>	5.Year Round Passenger Volumes
Tasmania							
Burnie Airport	Wynyard	Yes (limited- regionals)	▲	▲	-	▲	▲
Devonport Airport	Devonport	Yes (limited- Qantas Link)	▲	▲	-	▲	▲
St Helens	St Helens	No service	Within 2 hours- Launceston Airport	-	-	-	-
Victoria							
Portland Airport	Portland	Yes (Limited regionals)	▲	▲		▲	▲
Latrobe Regional Airport	Morwell	No service	Services discontinued (within 2.5 hours- Melbourne Airport)	▲	-	▲	▲
Mildura Airport	Mildura	Yes (Major airlines & regionals)	▲	▲	▲	▲	▲
Echuca Airport	Echuca	No service (within 2.5 hours of Melb Airport)	Within 2.5 hours - Melbourne Airport	▲	▲	▲	▲
Warrnambool Airport	Warrnambool	No service – some charters/sight seeing	▲	▲	-	▲	
New South Wales							
Ballina Byron Gateway Airport	Ballina	Yes (Major airlines and regionals)	Yes (Major airlines and regionals)	▲	▲	▲	▲
Illawarra Regional Airport (Wollongong Airport)	Albion Park	No service – GA operations	Services discontinued (within 1.5 hour-Sydney Airport	▲	-	▲	▲
Coffs Harbour Airport	Coffs Harbour	Yes (Major airlines & regionals)	▲	▲	▲	▲	▲
Clarence Valley Regional Airport	Grafton	Yes (Regional-REX)	▲	▲	-	▲	▲
Lismore Airport	Lismore	Yes (Regional-REX)	▲	▲	-	▲	▲
Merimbula Airport	Merimbula	Yes (Regional-REX)	▲	▲	▲	▲	-
Port Macquarie Airport	Port Macquarie	Yes (Regionals)	▲	▲	▲	▲	▲

Break O'Day is too close to Launceston airport to allow for the development of regular passenger services to St Helens. There are a number of factors that affect this situation.

Table 9. Break O 'Day Assessment - Passenger Services

Requirement	Break O'Day LGA
1. Long distance to major airport.	LGA is close to Launceston Airport.
2. Large resident population in the region to support passenger services.	Population in Break O'Day and the potential catchment areas is small.
3. Location is the primary tourist destination with large accommodation capacity.	Break O'Day is often not the primary/single destination, and is usually part of tourist route for interstate travelers.
4. Large local economy with significant business travel.	Local economy is small and business travel is likely to be limited.
5. Passenger volumes are significant during most of year.	Passenger volumes would be limited to tourist season (Spring-Summer-Autumn in holiday periods)

The following table provides some examples of regional airports that illustrate these market requirements.

- Regional airports: the regional airports (in areas with larger populations) generally have a mix of passenger services (Regular Public Transport (RPT) Operators); some charter operators; flight training operations; and air ambulance and other emergency services use.
- St Helens: St Helens airport has been used to transport fresh seafood from the east coast to mainland locations. The airport has also been used for flight training and for scenic flights. Current freight use has involved one aircraft transporting lobsters to the Melbourne market. There was more freight use of the airport in the past when the seafood industry was less regulated.
- There are other factors that also affect the demand for travel to a small airport. These include the limited timetables of flights and the general willingness of passengers to fly on smaller aircraft (when a major airport is relatively close).

Regional Airport Examples

The following provides some data on regional airports in Victoria, New South Wales and Tasmania.

Airport	Operator	Flights	Regional Population (LGA)	Comments
Victoria				
Portland Airport <Portland>	Glenelg LGA Council Portland Aero Club and the Sharp Airlines	Sharp Airlines: Melbourne (Essendon)- Portland; Adelaide – Portland <5 Flights per day – ex Melbourne>	Glenelg LGA 19,843	Service is supported by business travel to the region (aluminium smelter, forest industries, and chemicals) and visitor travel. <Regional catchment is around 100 kms> Portland is 375 kms from Melbourne Airport; 4.5 hours travel time; 540 kms from Adelaide- 6.5 hours travel.
Latrobe Regional Airport <Morwell>	Latrobe Regional Airport Board	No passenger services due to proximity to Melbourne. Location for aviation cluster, aircraft manufacturing (GippsAero) aircraft manufacturing, air ambulance and rescue helicopter, Country Fire Authority Department of Sustainability and Environment aerial firefighting aircraft. Significant general aviation use – charter and hire, flight training). Total of 25,000 General Aviation Movements in 2011.	Latrobe City 75,000	No passenger services due to closeness to Melbourne with good highway access. Location: 152 kms or 1.5 hours from Melbourne.

Airport	Operator	Flights	Regional Population (LGA)	Comments
Mildura Airport <Mildura>	Mildura Airport Pty Ltd	Qantas (Qantas Link) - Melbourne Regional Express – Melbourne , Adelaide, Broken Hill, Sydney Virgin Australia – Melbourne Cobden Air and the Mildura Aero Club Passenger Movements 2012: 196,000..	Mildura Regional City 54,666	Airport expanding due to increase demand - tourist and business demand. Regional catchment – in the Murray and Mallee Areas is estimated at 200kms. Location: 541 kms from Melbourne 6 hours travel time; 395 kms from Adelaide 4.5 hours travel time.
Echuca Airport <Echuca>	Echuca Aerodrome Committee of Management /Campaspe Shire Council	No passenger service and some limited charters. Aero Club and some light aircraft servicing. CFA and air ambulance use.	Campaspe LGA 38,981	Seen as too close to Melbourne to have a passenger service. Good road access from Melbourne Airport. Location: 218 kms from Melbourne and 2.5 hours travel time.
Warrnambool Airport < Warrnambool>	Warrnambool City Council	No airlines serve the airport. Some scenic tours offered by Air Warrnambool. Emergency services use (Air Ambulance.	Warrnambool City 34,193	No passenger service Location: 266 kms from Melbourne 3 .5 hours travel time
New South Wales				
Ballina Byron Gateway Airport <Ballina>	Ballina LGA Council	Jetstar: Melbourne, Sydney Regional Express: Newcastle, Sydney Virgin Australia : Sydney Passenger Movements 2011: 291,200; aircraft movements 3784.	Ballina LGA 40,753 Byron LGA 29,208	Major tourism area of Byron Bay, a 20 minute drive north. 742 kms from Sydney; 9 hours travel.
Illawarra Regional Airport (Wollongong Airport) <Albion Park>	Shellharbour City Council	Qantas Link Service (to Melbourne discontinued). Light Aeronautics Industry Cluster, the Historical Aircraft Restoration Society (HARS), Australian Aerial Patrol. Fully sealed runways.	Illawarra Region 275,983 Wollongong City 192,418	The airport is an 80 minute drive from Sydney Airport
Coffs Harbour <Coffs Harbour>	Coffs Harbour City Council	Qantas - Sydney, Virgin Australia – Melbourne , Sydney, Tiger Airways Australia- Sydney, and Brindabella Airlines - Brisbane Passenger Movements 2011: 341,116; Aircraft movements 2011: 6928.	Coffs Harbour LGA 68,413	532kms Sydney; 6 hours travel from Sydney
Clarence Valley Regional Airport <Grafton>	Clarence Valley Council	Regional Express – Sydney, Taree.	Clarence Valley LGA 49,665	661 kms 7 hours from Sydney
Lismore Airport <Lismore>	Lismore City Council	Regional Express – Sydney. Passenger Movements 2011: 49,365 Aircraft movements 2011: 2467.	Lismore City 42,766	749 kms 9 hours from Sydney
Merimbula Airport <Merimbula >	Airport Agencies Pty. Ltd.	Regional Express – Sydney, Moruya. Passenger Movements 2011: 51,299 Aircraft movements 2011: 2889.	Merimbula 6973 Bega Valley LGA 31,950	530 kms 6 hours from Sydney
Port Macquarie Airport < Port Macquarie >	Port Macquarie-Hastings Council	Qantas Link Sydney, Lord Howe Island Virgin Australia (Skywest) Brisbane, Sydney Passenger Movements 2011: 218,897 Aircraft movements 2011: 5236	Port Macquarie-Hastings LGA 72,696	384 kms 4 hours from Sydney

Airport	Operator	Flights	Regional Population (LGA)	Comments
Tasmania				
Burnie Airport <Wynyard >	Burnie Airport Corporation	Regional Express Airlines – Melbourne Sharp Airlines – Launceston, King Island Passenger Movements 2011: 70,402; Aircraft Movements: 3050.	Burnie City LGA 19,329	Regional airlines provide access to city and to North Region.
Devonport Airport <Devonport>	Tasmanian Ports Corporation Pty. Ltd	Qantas Link Melbourne Passenger Movements 2011: 139,109; aircraft movements 4416.	Devonport City 26,000	Services the region and visitor and business travel. Proposal to Virgin to fly from Melbourne.

5. Special Markets - Flight Charters

Charter flights are often linked to specialist tourist packages or servicing business requirements for direct travel to an isolated location.

5. 1 Business Market

In the case of business travel, the regional businesses in Break O'Day are relatively small and there are no large scale operations that involve executives flying in. The business market is serviced by flights out of Launceston or Hobart, and there is no real demand for the regular use of charter flights.

5.2 Special Tourist Market - Fishing

5.2.1 Fishing Locations

One special market that has been identified is the use of charter flights to bring in visitors for game and ocean fishing activity. St Helens is recognised as a key location for fishing activity.

There is a need to: examine current activity; the potential future size of the market; and the locations that St Helens competes with.

- Game fishing is a major activity in a number of locations around Australia - in Queensland, New South Wales, Victoria, South Australia and Western Australia.
- In Tasmania, St Helens is a major location for game fishing and ocean fishing and has several fishing charter operations.
- All of the areas identified attract persons for both game fishing and for ocean fishing. The fishing seasons vary as fish stocks move around the Australian coast in their migration patterns.

Some of the major centres for game fishing charters and for ocean fishing charters are: Queensland: Townsville, Cairns, Whitsundays, Mooloolaba and the Gold Coast; New South Wales: Port Stephens, Port Douglas and Eden; Victoria: Portland and Sorrento; South Australia: Port Lincoln; and Western Australia: Exmouth and Broome.

These centres differ in the scale of their fishing and charter operations:

- Queensland - these centres have a significant number of charter operators in each location, who offer single day trips and multi-day trips (overnight accommodation on boats) from major marina facilities. These locations also attract a significant number of private large boat owners (some having boats in the marinas and others bring boats in on trailers).
- New South Wales - has a smaller number of charter operators and a significant number of number of private boat owners. For example, Port Stephens attracts seasonal charter operators from Queensland (moving boats in for the peak season for 2-3 months), with operations centred on the marina at Nelson Bay.
- Victoria - Portland attracts large numbers of private boats on trailers (mainly from Victoria and South Australia) and several ocean fishing charter operators move in for the tuna season.

All of these centres attract a large number of local private boats (including boats at the marinas and trailer boats). The more remote locations in Western Australia have a greater focus on charter operations.

Accessibility for visitors varies with the major tourist locations (mainly Queensland) being serviced by larger airports and frequent flights by all of the major airlines (including direct flights from most of the main capitals).

Appendix A has more detailed information on these fishing locations.

Table 10. Game and Ocean Fishing Locations

Location	Main Season-Game Fishing	Major Airport (major airline services operate)	Aerodrome (regular regional airline services)	Major Tourism Centre (interstate/international)	Significant number of fishing charter operators
Queensland					
Townsville	November-April	▲	-	▲	▲
Cairns	September -March	▲	-	▲	▲
Mooloolaba	September -April	▲	-	▲	▲
Whitsundays	October- April	▲	-	▲	▲
Gold Coast	December - January	▲	-	▲	▲
New South Wales					
Port Macquarie	November- April	▲	-	▲	-
Port Stephens	December - April :	▲ (Newcastle)	-	-	▲ (season)
Eden	November - June	-	▲	-	-
Victoria					
Portland	November - April	-	▲	-	▲ (season)
South Australia					
Port Lincoln	November-June	-	▲		▲
Western Australia					
Exmouth	April -September	-	▲		
Broome	April - October	▲	-	▲	▲
Tasmania					
St Helens	November- April	-	-	-	-

5.2.2 Tourism Activity

A major issue is that these fishing areas also vary in the scale of their general tourism activity.

- Queensland: these locations are mainly major tourism centres, which attract a large number of visitors annually (over the whole year with major peaks during the holiday seasons) for beach holidays. There are large marinas in these locations and sight-seeing boat trips are also on offer. The areas have reputations for both ocean and game fishing. Charter boats tend to be permanently based in the marinas. These locations are serviced by the major airlines with frequent daily flights from most capitals.
- New South Wales: the areas attract a significant number of visitors from within New South Wales and also some interstate visitors. Port Stephens and Port Macquarie have major marinas and also offer sightseeing charters and whale watching. A significant number of recreational fishers come to Port Stephens (Nelson Bay) from Newcastle and from the Sydney metropolitan area. Eden attracts recreational fishing visitors (and boats) from Victoria and New South Wales.
- Victoria: Portland is not a major tourism centre, but it is now attracting a large number of recreational fishers, with their own large boats, for game fishing and for ocean fishing. There are large numbers of visitors during the season, with much fewer visitors during the off-season. Several major charter operators bring in boats for the fishing season. Glenelg Shire Council is planning the development of a marina and new boat ramps to cope with the growth in the market.
- South Australia: Port Lincoln has a reputation due to its tuna industry and attracts a significant number of private boats. Fishing is a major attraction for visitors. Generally Port Lincoln is not seen as a main tourist destination but is a stopover on the coast for road travellers.
- Western Australia: Broome has developed as a major tourist location for Australian and international visitors. Game fishing is one of the attractions for some visitors. Due to its isolation it attracts fewer private boats and charter operations are significant.

5.2.3 Air Access

The larger tourist areas have the advantage of major airports and are being serviced by the main airlines (Qantas, Jetstar and Virgin). In most cases there are regular daily flights from capital cities. Some of the smaller areas are serviced by regional airlines with flights from several metropolitan airports or from regional hubs (flights in these locations are usually daily or 3-4 times per week).

Flights and frequencies are driven by several market factors: the size of the city/region and its passenger catchment area; the number of tourist visitors to the area; and the demand for business travel into and out of a region.

Recreational fishing visitors are able to take advantage of these capital city services (often with discounted airfares). There is no need for charter flights to service game fishing or ocean fishing visitors travelling to the area.

The fishing charter industry benefits greatly from this flight access to these areas. However in all these areas the fishing market segment on its own would not support regular flight operations.
The overall demand is driven by a combination of general tourist visitors, local residents travelling and business related travel into and out of the regions.

5.3 St Helens Fishing Market

St Helens is recognised as a major area for fishing in Tasmania (game fishing, ocean fishing, estuary fishing, fly fishing etc.) The area: attracts a large number of trailer boats during the year and over the peak fishing season; has a Game Fishing Club; has regular fishing competitions; and there are several fishing charter businesses.

5.3.1 Fishing Charter Operations

Several charter boats operate (part time/seasonal) offering day fishing excursions for game fish and for ocean fish. Most are seasonal/part time operations and operations are typically small owner-operated businesses. There were 7 charter operations in 2007 and this has declined to 4 operators in 2012,

In the 2007 study estimates of total revenues were around $500,000 per year based on 3280 passengers.[7] Up to 80% of revenues are earned in a 6-7 month period (ie. a fishing season of November to May).[8] However fishing charter operations and recreational fishing also have impacts in terms of visitors and job opportunities in tourism accommodation, tourism activities, cafés and restaurants, and retail.

5.3.2 Airport Access

St Helens has the advantage of being accessible from two major airports (with regular daily flights) - Launceston and Hobart (for fly/drive visits). This makes the area accessible for charter fishers along with other visitors to the area. This access (particularly being under 2 hours to Launceston Airport) tends to limit the market for special charter flights to service the ocean/game fishing market.

5.3.3 St Helens Aerodrome - Charter Operations

The St Helens airstrip is currently used for emergency services, including the air ambulance and fire services. In the past it has been used for charter passenger services; sight-seeing flights; private general aviation use; and for some freight services.

The Aurecon Report assesses the technical upgrades that are required for use by different types of aircraft.[9]

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[7] This was based on assumptions of 450 days of charter fishing per year for 3280 passengers or 7 passengers per fishing trip (average revenue of $1230 per trip).

[8] Social and Economic Impacts Caused by Restrictions on Access to Georges Bay , M Stars August 2007 P27

[9] St Helens Aerodrome Technical Planning and Facility Upgrade Report (Draft), aurecon April 5 2013

Potential Demand

Data in the following table is indicative, of potential passenger numbers from interstate and is based on a series of assumptions in relation to the charter fishing market.[10]

There are several issues in relation to the use of charter flights:

- The analysis assumes that a significant share of interstate visitors are potential users of direct charter flights into St Helens (however in reality many may prefer to fly in on larger aircraft via a major airport - Launceston Airport).
- The take up rate of charter flights would also be dependent on pricing. Prices are dependent on: the estimated passenger numbers and frequency of flights; and the operating costs of the service.

The following utilises data for fishing charter customers (the data used is from the 2007 study) to estimate the potential numbers for packages including charter flights direct to St Helens.[11] It should be noted that the number of charter boat operators was higher in 2007 than now and therefore the data may overstate the potential customers in the current market.

Three different assumptions are used regarding persons using charter flights: all interstate fishing charter customers using direct charter flights into St Helens; 30% of interstate fishing charter customers using direct charter flights into St Helens; and 50% of interstate fishing charter customers using direct charter flights into St Helens.

Based on these assumptions on flight charter use the number of passenger and flights are as follows:

- 100% take up rate: 262 passengers per month (in peak period); 66 per week or 7 flights per week.
- 30% take up rate: 79 passengers per month (in peak period); 19 per week or 2 flights per week.
- 50% take up rate: 79 passengers per month (in peak period); 32 per week or 3 flights per week.

Based on a 30% take up there could potentially be demand for 2 charter flights per week during the peak fishing season (November to May).

The overall viability of charter flights is dependent on fishing charter passenger numbers. Flights would not be supported by general tourist visitors or by a sufficient numbers of business visitors to the Break O' Day region (wanting to fly direct into the St Helens).

There may be the potential to develop special packages. For the premium market, fishing charter operators could offer:

- St Helens packages involving: fishing charters, accommodation and direct charters to St Helens Aerodrome to attract interstate and international visitors.
- Other packages involving: fishing charters, accommodation and airport transfers to/from Launceston Airport to attract interstate and international visitors.

This type of combined package is offered in some of the major centres in Queensland and in Port Stephens.

The fly-in fishing market would need to be actively developed by fishing charter operators and an aviation business with significant marketing to potential customers interstate.

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[10] The assumptions from the 2007 study in relation to fishing charters have been used. Social and Economic Impacts Caused by Restrictions on Access to Georges Bay, M M Starrs August 2007

[11] The assumptions from the 2007 study in relation to fishing charters have been used. Social and Economic Impacts Caused by Restrictions on Access to Georges Bay, M M Starrs August 2007

Table 11.Estimating Demand for Charter Flights

Estimates of Potential Passengers for Flights		Assumptions
Total		
Fishing Charter Passengers (2007 estimate)	3280	
Number in Peak Period		
Fishing Charter Passengers (November- May)	2624	Assumes 80% in this period
Interstate Fishing Passengers (Peak Period)		
Total from Interstate	1968	Assumes 60% are from interstate
Total from interstate for the 6 month peak season	1574	Numbers in peak period
1. Assumes 100% of persons use charter flights		
Total from interstate per month in the peak season	262	
Total from interstate per week in the peak season	66	
Potential Flights per week	**7**	Based on 10 passengers per flight and all using the direct charter flights
Interstate Using Charter Flights		
2.Assumes 30% of persons use charter flights		
Total from interstate per month in the peak season	262	
Total from interstate per week in the peak season	66	
Total from interstate per month in the peak season- using charter flights	79	
Total from interstate per week in the peak season –using charter flights	19	
Potential Flights per week	**2**	Note: Based on 10 passengers per flight
3. Assumes 50% of persons use charter flights		
Total from interstate per month in the peak season	262	
Total from interstate per week in the peak season	66	
Total from interstate per month in the peak season- using charter flights	131	
Total from interstate per week in the peak season –using charter flights	32	
Total	**3**	Note: Based on 10 passengers per flight

Source: MCa analysis May 2013

6. Freight Market

Air freight out of Tasmania accounts for around 1% of overall freight volumes. Air freight comprises high value time sensitive products. Seafood and some food exports are in this category.

The Tasmanian seafood industry comprises three main sectors: wild catch, aquaculture and seafood processing. Wild catch sector covers: Abalone (blacklip, greenlip); Rock Lobster (southern rock lobster); Giant Crab; Scallop (commercial); Scalefish (various species); and commercial Dive (urchins, periwinkles, clams and seaweed).
Aquaculture sector comprises: Salmonids (Atlantic salmon and Ocean Trout); Pacific Oysters; Mussels; and Abalone. The processing sector involves the processing and packing of wild catch and aquaculture produce.[12]

Break O'Day and the adjacent East Coast areas are involved in: rock lobster, abalone, scallops and some scale fish. Aquaculture in St Helens involves oysters and mussels. The two major East Coast fishing locations are St Helens and Bicheno.

The volumes are estimated at rock lobster 120 tonnes (around 9% of Tasmanian catch) and scallops 500 tonnes (shell weight – around 30% of Tasmanian catch). Scale fish is estimated at $12-15 million per year and lobsters at $30 million. Aquaculture has continued to expand.

Air freight out of Tasmania is mainly utilised by exporters of live product (eg. abalone, king crab, rock lobster). There is some use by other seafood processors for products that have have short times to market for freshness and short shelf life products.

Airfreight services are provided out of Hobart and Launceston Airport, and freight infrastructure at Launceston has been expanded.

For live seafood such as abalone and lobster these products need to be flown to the mainland (Victoria) to arrive on the mainland as close as possible to international departures times. The industry has been concerned about freight issues including: available space; frequency of flights and guaranteed uplift; lack of guaranteed cold chain management; and lack of a dedicated seafood air-freight service.[13]

There is limited freight use of St Helens Aerodrome, with one plane being used to transport seafood product to Melbourne (on an irregular basis). Freight use was more prevalent in the past when the fishing industry was less regulated.

There are no restrictions on future freight utilising light aircraft from St Helens. Given the nature of the region and it industry structure, airfreight would largely be restricted to high value seafood (wild catch and aquaculture). This would require business to switch from their current supply chain arrangements.

Looking to the longer term, there may be future potential for seafood industry freight and this should be taken into account in any infrastructure development of the aerodrome.

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[12] Tasmanian Seafood Industry Workforce Plan, Skills Tasmania April 2013

[13] Tasmanian Seafood Industry Freight Logistics Strategic Plan 2008/09 – 2009/10, Tasmanian Freight Logistics Council

7. Airparks

Airparks have developed in the USA with housing developments adjacent to an aerodrome to allow residents to have a house and hangar. The parks have attracted light aircraft enthusiasts, who are generally over 50, are semi-retired or financially independent and make extensive use of their own aircraft. They want to retire or live in an environment where they can pursue their aviation interest.[14]

This is a specialist market and this has been able to development in the USA because of the absolute scale of the general aviation market (it is large enough to create a market in some locations).

In the case of Australia there are not enough persons in this specialised demographic to establish a significant market.

In Australia there have been a number of developments: some are proposed as part subdivisions adjacent to small regional airstrips; and others are being developed adjacent to larger regional airports. The latter are generally those with most market potential and several include a mix of resident lots (with some lots being airport linked and others part of general subdivisions) and a business/commercial zone).

Some examples of airpark developments are:

- Bundaberg - Kensington Parkside Airpark is part of a major development of aviation linked lots (business and residential airpark) and other residential (covers 57 freehold land blocks and 30 leasehold commercial sites).[15] The development is linked to Bundaberg Regional Airport (owned and operated by Bundaberg City Council).
- Whitsunday Airport - Whitsunday Aviation Village Estate (WAVE).[16] The development comprises residential lots and a commercial precinct.
- Evans Head - Evans Head Airpark.[17] Group of business people seeking to developed a residential airpark at the Evans Head Aerodrome.

Airparks are targeted at a narrow demographic and these larger projects are located in tropical areas, which attract retirees and offer weather conditions that allow year round aviation. The Bundaberg and Whitsunday developments are linked to substantial regional airports, which have quality facilities, commercial aviation activity and some RPT services. They also have general residential lots to attract a broader market.

The airparks proposed for at smaller rural airstrips generally have limited facilities and have struggled to attract sales.

St Helens Airport is likely to limited market appeal as an Airpark location. Any residential development would be chasing a very narrow potential market.

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[14] http://livingwithyourplane.com/

[15] http://www.kensingtonparkside.com.au/residential-airpark/overview/

[16] http://www.whitsundayairport.com/wave/

[17] http://www.evansheadairpark.com.au/Home.aspx

8. Assessment - St Helens Aerodrome

The following are the key issues in relation to air services at St Helens Aerodrome.

Passenger Services

Regular passenger services require guaranteed passenger numbers to make a service financially viable over a year (or during a defined peak season).

This normally requires a combination of tourists, local residents and business travel. Prices will be based on the estimate number of passengers and the need to cover all operating costs and make a profit on a service. Due to lower passenger numbers on these local routes, regional airfares are usually high (and have fewer discounts) and are not geared to a budget conscious tourist market.

Our assessment is that there is no current potential to develop regular direct passenger services via St Helens Aerodrome.

This situation arises because:

- Break O'Day is within close proximity to Launceston Airport (under 2 hours to St Helens), which offers frequent flights from Melbourne and Sydney. Tourist visitors are normally touring and hire cars at the airport (Hobart or Launceston) and generally have a preference to travel in larger aircraft.
- The population in the potential catchment area for St Helens Aerodrome is relatively small (for outbound travel).
- There is limited business travel into the region due to most businesses being small and servicing mainly local markets.

In the longer term (10-15 years) if the regional population grew substantially a market may emerge.

Charter Services

Charter services can operate for specific business purposes or be linked to fishing charter operations or for other specialist tourist markets.

- Viability depends on pricing and on passenger numbers and there is unlikely to be sufficient numbers to drive a regular charter service.
- There are no major businesses in the region to underpin a regular demand for charters for business purposes.
- In the case of fishing charters there may be potential to develop a premium package, which includes airfares, transfers, accommodation and fishing charters. The potential premium market would need to be developed by fishing charter businesses through marketing.
- Other ad hoc charter arrangements would continue.
- There may be some increase in future in private general aviation (GA) use.
- There may be potential to develop scenic flights from St Helen's covering the East Coast.
- The golf market would not support regular passenger services, but there could be a demand for special period/event packages for regional golf tours.

The size of the fishing market may not be of the scale to maintain regular charter flights.
-However there may be potential to develop specific packages during the peak fishing season.
-Ad hoc charters or special event charters would continue to use the airport. This could include golf tours.
-There is potential to develop scenic flights from St Helens Airport.

Freight Services

There is limited freight use of St Helens Aerodrome, with one aircraft being used to transport seafood product to Melbourne (on an irregular basis). Freight use from St Helens was more prevalent in the past when the fishing industry was less regulated.

There are no restrictions on future freight movements from St Helens Aerodrome (utilising light aircraft). Given the industry structure in the region and the future growth outlook, airfreight would largely be restricted to high value seafood (wild catch and aquaculture) and potentially other food products. These are the primary regional products that could utilise airfreight. This would require some businesses to switch from their current supply chain arrangements.

Looking to the longer term there may be future potential for seafood industry freight and this should be taken into account in any infrastructure development of the aerodrome.

Airparks

Airparks are targeted at a narrow demographic and these larger projects are located in tropical areas, which attract retirees and offer weather conditions that allow year round aviation. The larger developments at Bundaberg and Whitsunday are linked to substantial regional airports, which have quality facilities, commercial aviation activity and some RPT services. They also are offering general residential lots to attract a broader market.

The airparks proposed for smaller rural airstrips generally have limited facilities and have struggled to attract lot sales.

St Helens Airport is likely to limited market appeal as an Airpark location. Any residential development would be chasing a very narrow potential market.

Assessment of Development Options

The following table provides an assessment of each of the development options for the aerodrome.

Capital Work Options and Potential Activity

No	Option	Capital Cost $M	Description of Capital Works	Type of Aircraft	Comments – Market Analysis
1	Stage 1 – 18m Runway – Pavement Option A < 1070 m runway>	2.5	Upgrade pavement – strengthen and bituminous spray/seal. New lighting.	Code 1B Aircraft and below Would accommodate larger aircraft (up to 7000 kg) This covers: Beechcraft King Air 200 (7 passengers); and Beechcraft King Air 350 - 9 passengers. Royal Flying Doctor Service (RFDS) mainly use these two types of aircraft.	This level of upgrade would allow slightly larger aircraft (eg. Beechcraft King Air 350 - 9 passengers). -RFDS: it would meet Royal Flying Doctor Service (RFDS) requirements. - General aviation: would allow existing GA aircraft use and slightly larger Code 1B aircraft (up to 7000 kg). - Freight : would allow for slightly larger freight aircraft Commercial activity: this would support: small charters, sight-seeing flights and current limited freight operations (using slightly larger aircraft). **Assessment: this upgrade would allow for slightly larger charter flights and freight service.**
2	Stage 1 – 18m Runway – Pavement Option B < 1070 m runway>	1.7	Seal existing pavement- with bituminous spray/seal. New lighting	Code 1B (up to 5700 kg) and below. Suitable for existing light aircraft use. This covers: Beechcraft King Air 200 (7 passengers)	This level of upgrade would support existing aircraft. -RFDS: this is the minimum required to meet Royal Flying Doctor Service requirements. - General aviation: this would allow existing GA aircraft use. - Freight: would allow current freight activity. Commercial activity: this would support: small charters, sight-seeing flights and current limited freight operations (using current aircraft). **Assessment: this upgrade would support existing uses and aircraft types.**
3	Stage 2 – 23m Runway – Pavement Option A < 1200 m runway>	3.6	Widen runway and lengthen. Upgrade pavement - strengthen and bituminous spray/seal. New lighting. Increased airside capacity.	Code 2B Aircraft and below Accommodate larger aircraft (up to 7000 kg) This would take a Metro III Aircraft (19 seats) - for RPT Service or larger charter flights.	This level of upgrade allows for larger aircraft (up to 7000 kg). - RFDS: it would meet all Royal Flying Doctor Service (RFDS) requirements. - General aviation: would allow existing GA aircraft use and larger Code 2B aircraft (up to 7000 kg). - RPT Service (regular public transport): this would allow potential for a RPT Service using a Metro III aircraft (19 seats). - Freight: would allow for slightly larger freight aircraft. Commercial activity: this would support: charters, sight-seeing flights and current limited freight operations (using slightly larger aircraft). **Assessment: this upgrade would be required to support larger aircraft, including those suitable for an RPT service.**
4	Stage 2 – 23m Runway – Pavement Option B < 1200 m runway>	2.8	Widen runway and lengthen and seal existing pavement- bituminous spray/seal. New lighting. Increased airside capacity.	Code 1B Aircraft (up to 5700 kg) and below. Suitable for existing light aircraft use. This covers: Beechcraft King Air 200 (7 passengers)	This level of upgrade would support existing aircraft. -RFDS: this is the minimum required to meet Royal Flying Doctor Service requirements. - General aviation: this would allow existing GA aircraft use. Commercial activity: this would support: small charters, sight-seeing flights and current limited freight operations (using current aircraft). Provides increased airside capacity. **Assessment: this upgrade would support existing activity and provide increased airside capacity.**
5	Stage 3 – New 30m Runway – Pavement Option A < 1500 m runway>	19.0	Major capital works: new flexible runway and taxiway (longer and wider); upgrade pavement strengthen and bituminous spray/seal; and new lighting. Increased airside capacity.	Code 3C aircraft (up to 18,000 kg). This would allow for RPT service Saab 340 aircraft (38 seats & 13,000kg)	This level of upgrade supports all existing aircraft and allows for larger Code 2B and large Code 3C aircraft (up to 18,000 kg) and provides a major increase in airside capacity. - RFDS: it would meet all Royal Flying Doctor Service (RFDS) requirements. - General aviation: would allow existing GA aircraft use and larger Code 2B aircraft (up to 7000 kg). - RPT Service (regular public transport): this would allow potential for a RPT Service using a Saab 340 aircraft (38 seats and 13,000kg). Freight: could handle large freighters up to 18,000 kg. Commercial activity: this would support: small charters, sight-seeing flights and expanded freight operations (using larger aircraft); and allow for a RPT service based on a Saab 340 (38 seats and 13,000kg). Provides increased airside capacity. **Assessment: This investment would fully future proof the aerodrome for all relevant types of aircraft. However it has the potential for excess operational capacity that would not be used based on the market analysis in this report.**

Source: St Helens Aerodrome Technical Planning and Facility Upgrade Report, Aurecon 5 April 2013

From the analysis of the development options and the market review the following assessment is made:

- Option 5 which involves a full redevelopment of the runway (indicative cost $19 million) would likely result in major excess capacity (would be able to take a Saab 340 aircraft -38 seats) that would not be taken up based on a market assessment.
- Of the other options for development, Option 3 (indicative cost $3.6 million) provides for use by larger aircraft and the potential for an RPT service (using a Metro III Aircraft -19 seats).
- Options 2 and 4 (both with pavement Option B) do not increase the capacity for larger aircraft.

The redevelopment of the airport should focus on the option that provides for the potential for growth (through increase capacity for larger aircraft use), within a realistic assessment of the market. This indicates Option 3 may be

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This report (including appendices) is based on estimates, assumptions and information sourced and referenced by MCa Consulting. These estimates, assumptions and projections are provided as a basis for the reader's interpretation and analysis. In the case of projections, they are not presented as results that will actually be achieved.

The report has been prepared on the basis of information available at the time of writing. While all possible care has been taken by the authors in preparing the report, no responsibility can be undertaken for errors or inaccuracies that may be in the data used.

Appendix A: Major Game and Ocean Fishing Locations

Game Fishing Locations

State	Location	Access	Market	Facilities	Season	Species
Victoria						
	Portland	Located 362 kms from Melbourne Portland Airport: flights from Melbourne and Adelaide (Sharp Airlines).	Attracts recreational fishers with own boats Victoria and South Australian. Charter operators move boats in during the season. There are an estimated 6200 trailer boat trips in Victorian waters in pursuit of southern Bluefin tuna, with 83% of those from Portland.	Launch from Portland Harbour – ramp and wharf.	November- April	Offshore fishing is focused on a range of large ocean fish including: Bluefin tuna, yellowtail kingfish, gummy shark and snapper.
	Sorrento	Located 105 kms from Melbourne. Several ooean fishing charters operate from Sorrento and travel through the Port Phillip Bay Heads.	Ocean fishing and game in the Bass Strait area. Market is mainly from Melbourne	Charters utilise Sorrento Pier and local marinas	December- May	Billfish (mainly Black, Blue and Striped Marlin), Tuna, Sharks, and King Fish.
Queensland						
	Townsville	Located 1357 kms from Brisbane. Airport - Townsville International Airport Flights – Jetstar, Virgin, Qantas and regional airlines and charter services. Flights are from Brisbane, Melbourne and Cairns. (1.6 million passenger movements)	Fishing charters attract domestic, interstate and international visitors. Charters cover the Great Barrier Reef from Lizard Island to The Whitsundays, Hinchinbrook, and The Coral Sea. Operators offer single day and multiple day trips.	Boat ramps and marina (Breakwater Marina)	November-April	Reef species, Game Fish and Barramundi.

State	Location	Access	Market	Facilities	Season	Species
	Mooloolaba – Sunshine Coast	Located 100kms north of Brisbane Sunshine Coast Airport - Maroochydore Jetstar, Virgin and regional airlines. Flights from major capitals. (900,000 passenger movements).	Domestic, interstate and some international visitors. Offshore Reef & Game Fishing. A number of charter boats.	Marina- Mooloolaba River	September -April	Winter Species: Snapper, Scarlet Perch, Red Emperor, Pearl Perch, Moses Perch, Sweet Lip, Maori Cod, Black King Fish, Blue Fin Tuna and Venus Tusk Fish. Summer Species: School Mackerel, Spotty Mackerel, Dolphin Fish, Sailfish, Black Marlin, Blue Marlin, Cobia, Blue & Yellow Fin Tuna. Black Marlin, Sailfish, Yellow fin Tuna and a myriad of other species. On the wider grounds Blue, Striped and larger Black marlin are
	Cairns	Located 1705 kms north of Brisbane Cairns Airport: Qantas/Qantas Link, Jetstar, Virgin, Tiger, regional airlines. Flights from major capitals and some regional centres. (3.5 million passenger movements).	Domestic, interstate and some international visitors. Charters- share and sole charter, day trips or live aboard, seaplane transfers. A large number of charter boats operate from the marina.	Cairns Marlin Marina- facilities for cruising yachts and tourism and game fishing fleets.	September through December : Black Marlin December to March: Blue Marlin Year round: Spanish Mackerel, Yellowfin Tuna, Trevally and Barracuda	Black Marlin, Spanish Mackerel, Yellowfin Tuna, Trevally and Barracuda. Giant Trevally. Juvenile Black Marlin and Sailfish as well as Mahi Mahi, Wahoo .
	Gold Coast	Located 80 kms south of Brisbane Gold Coast Airport (Coolangatta): Jetstar, Virgin Air New Zealand From: Melbourne, Sydney, Hobart, Auckland, Adelaide, Newcastle, Cairns (6 million passenger movements).	Domestic, interstate and some international visitors. Large number of charter boats. Charters- share and sole charter, day trips or live aboard , A number of charter boats operate from Main Beach marinas	Mariners Cove Marina -Main Beach, Gold Coast	December - January Marlin, Sailfish, Wahoo, Mahi-mahi, Spanish, School and Spotted Mackerel. May - August Winter and Spring are our best times for Snapper, Tuna, Sharks	Black marlin, Striped marlin, Blue marlin, Yellowfin tuna, Sailfish, Wahoo, Kingfish

State	Location	Access	Market	Facilities	Season	Species
	Whitsundays	Airlie Beach 1120km north of Brisbane, and 630km south of Cairns. Whitsunday Coast Airport (located near Proserpine). Serviced by: Virgin and Jetstar. Great Barrier Reef Airport - Hamilton Island Airport: Scheduled flights are operated by Jetstar, Virgin Australia and Qantas Link. Services to Hamilton Island Airport include daily flights from Melbourne and Cairns, two flights daily from Sydney and two flights from Brisbane.	Domestic, interstate and some international visitors. Large number of charter boats. Game fishing takes place around the islands and out at the Barrier Reef (majority of billfish caught are tagged and released).	Game-fishing charter boats operate from the mainland and from several of the islands. Shute Harbour/Airlie Beach Marinas: Able Point, Hamilton Island Marina	October- April :- black marlin, swordfish, sailfish and tuna May- October: spanish mackerel	Black marlin, Striped marlin, Blue marlin, Spanish mackerel,

State	Location	Access	Market	Facilities	Season	Species
New South Wales						
	Port Stephens	Nelson Bay is 223 kilometres north of Sydney and 69 kilometres north of Newcastle Newcastle Airport: flights from Melbourne airport, Gold Coast airport, and Brisbane airport. <1.3 million passenger movements>.	Domestic, interstate and some international visitors – charter customers. Some interstate visitors fly in for charter fishing. Large number of recreational fishers with own boats. A number of fishing charters and whale watching boats operate.	d'Albora Marina Nelson Bay	December- April : Black Marlin, Blue Marlin, Striped Marlin, Dolphin Fish, King Fish May-November: migrating yellowfin and Bluefin tuna	Black Marlin, Blue Marlin, Striped Marlin, Dolphin Fish, King Fish, yellowfin and Bluefin tuna
	Eden	On the Princes Highway 34km south of Merimbula. 554 kms from Melbourne and 548 kms from Sydney. Merimbula Airport: Rex Express flights – Sydney and Melbourne.	Eden is a recognised commercial fishing port. Large number of recreational fishers with own boats (from NSW and Vic). A number of fishing charter operations.	Eden deep-water harbour , and Quarantine Bay facilities	November - July.	Marlin, Yellowfin Tuna and Sharks. Yellow and Blue fin Tuna, Thresher and Mako Sharks, Broadbill and Short bill Spearfish and Marlin
	Port Macquarie	383 kms north of Sydney. 245kms north of Newcastle. Port Macquarie Airport : QantasLink and Virgin Australia - Sydney and Brisbane Flights. <220,000 passengers movements>	Attracts recreational fishers – NSW and Queensland with own boats. A number of charter operators work out of Port Macquarie.	Town Wharf- Port Macquarie	November- April	Game fishing with marlin, mackerel, dolphin fish, tuna and wahoo. Australian Salmon , Kingfish, Marlin – Black, Tuna – Longtail, Tuna – Yellowfin.

State	Location	Access	Market	Facilities	Season	Species
South Australia						
	Port Lincoln	393 km from Adelaide. 1118 kms to Melbourne Port Lincoln Airport: Qantas Link and REX - flights from Adelaide. <200,000 passenger movements.	Famous for tuna farming. Attracts recreational fishers – mainly from South Australia and Victoria. Other interstate attracted to charters. A number of fishing charter businesses operate,	Marinas at both Port Lincoln and Tumby Bay. Boat ramps are located at a number of locations. .	November-June	Giant Yellowtail Kingfish, Southern Bluefin Tuna
Western Australia						
	Exmouth	Exmouth on the tip of the North West Cape, 1270km north of Perth (accessible by road via the North West coastal highway) Airport: SkyWest has daily flights from Perth to Exmouth/Learmonth; and Qantas flies to Exmouth 3 times a week.	Major game fishing location with continental shelf only 2 miles from edge of Ningaloo Reef. Domestic and interstate visitors. Around 8 charter operators provide services.	Exmouth Boat Harbour is located 2km south of the Exmouth town and offers concreted boat ramps within the sheltered wall of the marina.	April- September	Blue, Black & Striped Marlin, Sailfish, Yellowfin Tuna, Wahoo, Dolphin Fish and the elusive night feeding Broadbill Swordfish
	Broome	Broome is located 2200 kms from Perth. Broome International Airport (BIA): Serviced by Qantas, Qantas Link, and Virgin. Flights from Perth, Darwin and Port Hedland. <Around 400,000 passenger movements.>	Broome is the Sailfish capital. Attracts visitors –from WA , interstate and overseas. Around 8 charter operators service the area.	Broome Harbour: major port : supports livestock export, offshore oil and gas exploration supply vessels, pearling, fishing charter boats, cruise liners .	April -October	Spanish Mackeral, Sailfish, Blue and Black marlin, Wahoo, Dolphinfish, several species of Shark