PSBA | Environmental Assessment Report

PUBLIC SAFETY BUSINESS AGENCY

Proposed Infrastructure Designation under the *Planning Act 2016*

El Arish Auxiliary Fire and Rescue Station

5-7 Ryrie Street, El Arish 4855

Lot 100 on SP306470

February 2019

Proudly supporting those who keep our community safe

Queensland Government

Document History

Version	Date	Status	Key Changes	Author(s)	Reviewer(s)
1.0	28/11/2018	Draft for Review	General Edits	D. Payne	M. Ross
2.0	06/12/2018	Final	…	D. Payne	B. Wood

Table of Contents

List of Figures

List of Tables

Abbreviations

AS	Australian Standards
CLR	Contaminated Land Register
DATSIP	Department of Aboriginal and Torres Strait Partnerships
DES	Department of Environment and Science
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning
EAR	Environmental Assessment Report
EMR	Environmental Management Register
EPBC	Environmental Protection and Biodiversity Conservation Act 1999
ESCP	Erosion and Sediment Control Plan
IE	Infrastructure Entity
MGR	Ministers Guidelines and Rules July 2017
MNES	Matters of National Environmental Significance
PA	Planning Act 2016
PR	Planning Regulation 2017
PSBA	Public Safety Business Agency
QFES	Queensland Fire and Emergency Services
SPP	State Planning Policy

Executive Summary

The proposed infrastructure Designation is for replacement of the El Arish Queensland Fire and Emergency Services (QFES) Auxiliary Fire and Rescue Station at 5 - 7 Ryrie Street, El Arish described as Lot 100 on SP306470.

The proposal includes the following:

- Standard FS2 Station including 2 bay engine room, duty office, training room, amenities and outdoor covered area
- Upgrade two of the existing crossovers and removal of one redundant crossover.
- The eastern crossover provides dual ingress and egress for staff and returning emergency vehicles. The western crossover will be dedicated exit for emergency service vehicles
- One visitor / person with disability (PWD) park is provided at the site's frontage. Seven secure staff car parking spaces are also provided
- The training room accommodates for weekly training sessions, generally two hours in length. Training includes group briefings and training drills on the external training pad. A portion of this training is undertaken inside the station which includes checking the appliances and suits to ensure they are operational. Major training events are only conducted once a year to keep the brigade up to date on activities such as rescuing persons from a crashed vehicle. This training is essential to ensure that the auxiliary fire fighters have the appropriate up to date knowledge and techniques to continue to maintain the safety of the community.

The new facility will provide increased operational response capability and community safety functions. The station design will provide flexibility for staffing and vehicle storage requirements to meet current and future service delivery targets for the El Arish locality and greater Cassowary Coast Region.

Streamlined

The proposal was confirmed to be streamlined on 7 November 2018 by the Department of State Development Manufacturing, Infrastructure and Planning (see chapter 7, Part 2, Section 3.1.a of the Minister Guidelines and Rules).

Proposed Infrastructure (*The Planning Act 2016*)

The infrastructure is described under the *Planning Regulation 2017*, Schedule 5, Part 2 as:

(8) emergency services facilities;

Consultation Strategy

The consultation strategy as outlined in section 4 of this report, details that strategy will include a sign on the land, newspaper notice and letters to all stakeholders.

Budgetary Commitments

The QFES El Arish replacement auxiliary Fire and Rescue Station was published in the Queensland Government 2018/19 Budget Paper 3: Capital Statement. The project is expected to begin delivery in 2019/2020.

1.0 Introduction

In accordance with the requirements of *The Planning Act 2016* (PA) Chapter 2, Part 5, Section 35, it is proposed to undertake a designation of premises for development of infrastructure known as an infrastructure designation under the Minister's Guidelines and Rules (MGR) July 2017.

The proposed designation has been lodged on behalf of Queensland Fire and Emergency Services (QFES) for the purposes of the proposed replacement Auxiliary Fire and Rescue Station and is located within the Cassowary Coast Regional Council ('the Council') local government area.

GHD have prepared this Environmental Assessment Report (EAR) on behalf of Property and Facilities Management within the Public Safety and Business Agency (PSBA) for consultation and a preliminary State Interest Review to provide information in the assessment of the proposed infrastructure designation for the development of infrastructure.

As part of this Environmental Assessment Report the following documentation is provided:

- Appendix 1 – Extracts from The *Planning Act 2016* and Streamlined Designation Flow Chart
- Appendix 2 – Extent of Land holders to be consulted by direct mail
- Appendix 3 – Property Information (title search and EMR / CLR search)
- Appendix 4 – Contour and Detailed Survey
- Appendix 5 – Proposal Plan
- Appendix 6 – EPBC Protected Matters Report
- Appendix 7 – State Interest Trigger Mapping
- Appendix 8 – Geotechnical Report
- Appendix 9 – Vegetation Management Report
- Appendix 10 – Stormwater Management Plan and Flooding Report
- Appendix 11 – Site and Soil Investigation – On-site Effluent Evaluation

2.0 Detailed Infrastructure Proposal Summary

2.1 Summary

Table 1 - Infrastructure Proposal Summary	
Infrastructure Proposal	Infrastructure Designation for Replacement El Arish Auxiliary Fire and Rescue Station
Infrastructure Entity	Queensland Fire and Emergency Service
Proposal address	5-7 Ryrie Street, El Arish
Proposal lot and plan	Lot 100 on SP306470
Proposed Infrastructure	Auxiliary Fire and Rescue Station
Infrastructure Category	*(8) emergency services facilities*
Relevant State Department/s	- As no State interests are triggered no State Agencies are required to be consulted in this instance.
Pre-Lodgement Engagement	State Agencies - Department of State Development, Manufacturing, Infrastructure and Planning Local Government - Cassowary Coast Regional Council Adjoining Landholders - To be notified during consultation period

2.2 State Interests

Table 2 - State Interests	
State Interests	Nil

2.3 Native Title

Table 3 - Native Title Assessment		
Native Title	Deed of Grant #: 20889185 Date: 05/03/1942	NT Extinguished: Yes Relevant NTWP Module: Module BA Applies Dealing satisfies the requirements of Module BA.

3.0 Pre-lodgement Consultation

Prior to PSBA lodging the Infrastructure Proposal with the Department, PSBA undertook pre-lodgement consultation with the following entities.

3.1 State Agencies

Department of State Development Manufacturing Infrastructure and Planning

Pre-lodgement advice was sought from the Department, via email and meeting (17 October 2018), prior to lodging the Infrastructure Proposal. The Department provided general advice regarding applicable State Interests and identified that the infrastructure designation needed to provide landscaping on all borders adjoining residential dwellings.

The Department also identified on 7 November 2018 that the proposal would qualify for the streamlined Infrastructure Designation Process. A copy of the Streamlined MID process is provided in **Appendix 1.**

3.2 Local Government

Local Council

Pre-lodgement consultation was undertaken with Cassowary Coast Regional Council regarding the proposed use. Council advised that landscaping along the property boundaries to all adjoining neighbouring dwellings would be required to support the proposal. Indicative landscaping has been indicated on the proposed site plan (see **Appendix 5**). Furthermore, Council indicated that the two former lots being Lot 1 on RP731552 and Lot 217 on E7291 should be amalgamated. In accordance with the advice, the lots were amalgamated and now consist of a singular lot.

In this instance PSBA have sought to facilitate planning approval via the Infrastructure Designation process. The effect of the designation is that the use of the site for the designated infrastructure and service will be exempt from the local planning scheme and the Development Assessment Rules.

3.3 Private Landholders

Private landholders adjoining the site have not been engaged prior to the public notification as detailed in section 4.0 below.

4.0 Consultation Strategy

In accordance with Chapter 7, Part 4 of the Infrastructure Designation Process under the MGR, PSBA is required to undertake consultation in accordance with the approved Consultation Strategy as referenced in pre-lodgement discussions with the Department on 17 October 2018.

The consultation strategy for the proposed El Arish replacement Auxiliary Fire and Rescue Station has been outline below.

Notification Period:

- A **20 business day** Public Notification Period.

Draft sign on land:

- A sign will be placed on the Ryrie Street frontage during the notification period.

Newspaper Notice:

- Public Notification in a paper circulating locally (Cairns Post) to the area notifying of a **20 business day** submission period.

L**etters to stakeholders**

- **Directly Affected and Surrounding Landholders:**
  - Personalised letters to directly affected and surrounding land owners outlining the infrastructure designation proposal notifying of a **20 business day** submission period (including a plan that clearly illustrates the proposed development), the consultation process and applicable contact details.
  - Plan within **Appendix 2** shows extent of land holders to be consulted.
- **Elected Representatives:**
  - The Following Elected members notifying of a **20 business day** submission period:
    - Local Member for Cassowary Coast Regional Council: Cr. Wayne Kimberly
    - State Member for Hill District: Shane Knuth MP
    - Federal Member for Kennedy: Bob Katter Jr. MP
- **Native title**
  - The Following native title party notifying of a **20 business day** submission period:
    - North Queensland Lan Council Native Title Representative Body Aboriginal Corporation

It is noted that the DSDMIP will liaise with the following stakeholders as part of the minister's consultation period (all parties have been engaged by PSBA for pre-consultation comment).

- **State Agencies:**
  - In this instance, no targeted consultation with any State Agency will be required.

- **Local Council:**
  - Cassowary Coast Regional Council

5.0 Background

5.1 Project History

The existing Fire and Rescue Station currently operates its auxiliary services from the station located at 5-7 Ryrie Street, El Arish described as Lot 100 on SP306470. Whilst the site is a suitable location for current service delivery, the building is inadequate in size and functionality.

A number of minor upgrades and renovations have taken place in the fire and rescue station building over the years on an ad hoc basis however it lacks a number of contemporary operational and administrative requirements for current and future service delivery to the community.

5.2 Local Government Area

The replacement El Arish Fire and Rescue Station is located within the El Arish township area over land at 5-7 Ryrie Street, El Arish. The subject site is primarily surrounded by residential properties, with some non-residential uses including the El Arish Tavern and Australia Post El Arish located immediately south of the site.

The site has a zoning that includes the Township Zone / Residential Local Plan Precinct. The El Arish auxiliary Fire and Rescue Station's central location within the El Arish Township provides a strategic service delivery to the surrounding area.

5.3 Suburb Profile

As detailed in Figure 1, the suburb of El Arish is located approximately 100km south-south-east of Cairns. In 2016, the suburb of El Arish reported a population of 344 persons, of which 53.2% were male and 46.8% were female. The median age was 48 years old, with children making up 14.9% of the population and people aged 65 years and over making up 25.3% of the population.

There were 148 people who reported being in the labour force in the week before Census night in El Arish. Of these 64.2% were employed full time, 27% were employed part time and 4.7% were unemployed. The most common occupations in El Arish included Labourers 19%, Machinery Operators and Drivers 15.5%, Technicians and Trades Workers 14.8%, Clerical and Administrative Workers 12.7% and Community and Personal Service Workers 11.3%.

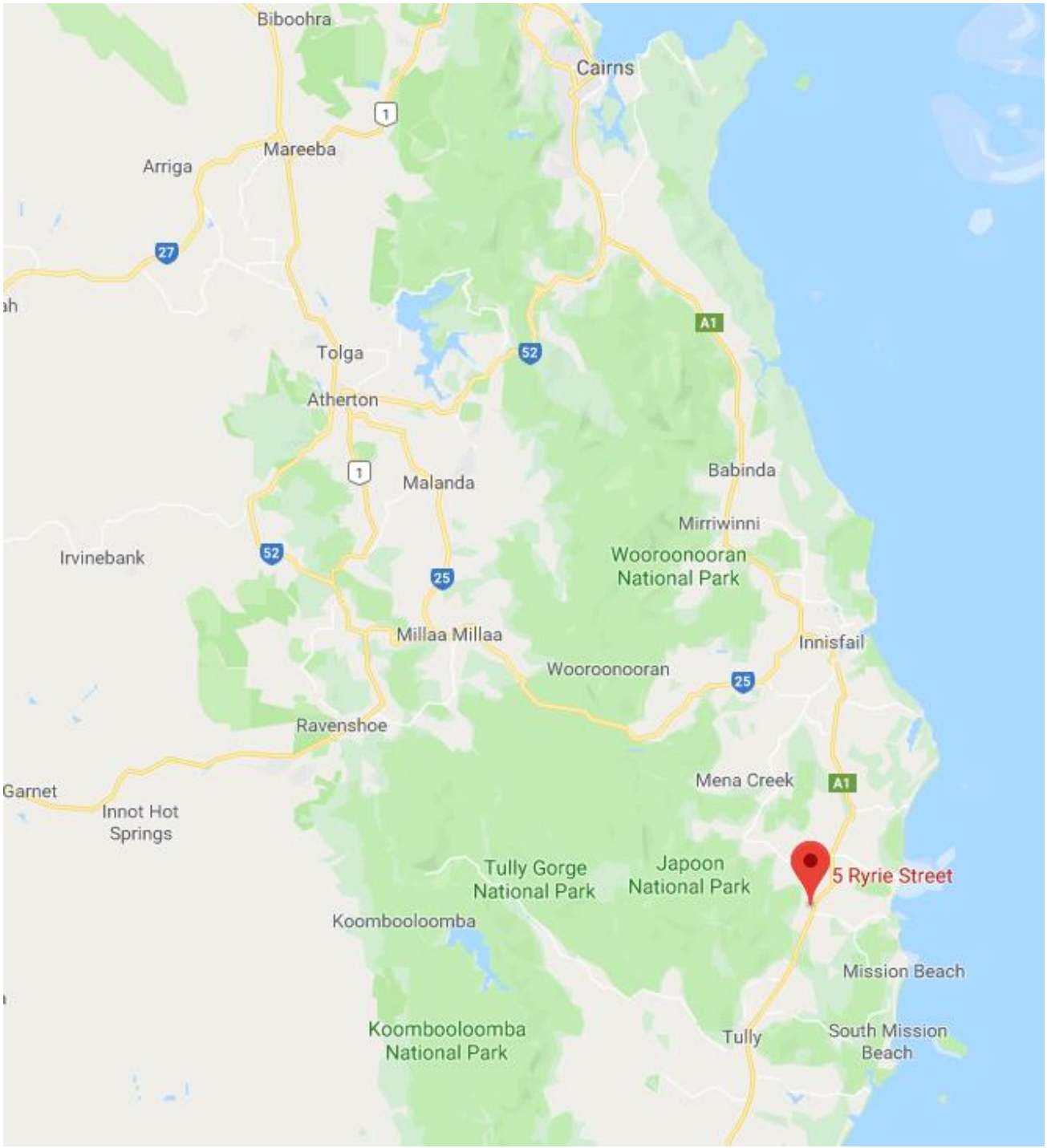


Figure 1 - El Arish Regional Context (Source: Google Maps)

6.0 Proposed Designation

The proposal seeks to designate the El Arish Auxiliary Fire and Rescue Station site as follows:

El Arish Auxiliary Fire and Rescue Station

5 – 7 Ryrie Street, El Arish

Lot 100 on SP306470

Pursuant to Chapter 2, Part 5 of the *Planning Act 2016*, it is proposed to designate the land described above for infrastructure. An infrastructure designation is proposed in order to facilitate the efficient allocation of resources and enable the timely supply of the infrastructure. The proposed infrastructure is best described in *Planning Regulation 2017 (PR)*, Schedule 5, Part 2 as:

(8) emergency services facilities

The title search is contained at **Appendix 3**, a contour and detail survey is included at **Appendix 4** and the proposal plan concerning the community infrastructure is included at **Appendix 5**.

7.0 Proposed Site

7.1 Property Overview

Table 4 - Site Overview	
Street Address	5-7 Ryrie Street, El Arish
Real Property Description	Lot 100 on SP306470
Site Area	2,023m^2
Local Government Authority	Cassowary Coast Regional Council
Planning Scheme	Cassowary Coast Planning Scheme 2015
Site Classification	Township Zone / Residential Local Plan Precinct
Planning Scheme Overlays	Nil
Regional Plan	The Far North Queensland Regional Plan 2009-2031

7.2 Site Description

The site as shown in Figure 2 is currently being used as a Fire and Rescue Station and is a regular shape with an area of 2,023m². The allotment is freehold and owned by the State of Queensland (Represented by the Public Safety Business Agency). The site has approximately 40m frontage to Ryrie Street.

Figure 2 - Site Location (Source: QLD Globe)

7.3 Vehicle Access and Parking

Access is currently provided via four (4) vehicle crossovers to Ryrie Street. The access arrangement will be upgraded to provide a single crossover for emergency services and staff vehicles entering the site, and a dedicated emergency service vehicles exit as illustrated on the proposal plan. Parking will be provided onsite to accommodate staff and limited visitors to the facility.

7.4 Pedestrian Site Access and Public Transport

No formal pedestrian pathways are provided to the site frontage, however informal pathways currently facilitate pedestrian access. As the station is not for the use of the general public, the proposed development will not generate new pedestrian movements' onsite. The proposed development will therefore not impact upon the existing flow of pedestrians on the road frontages nor generate the need to provide for new footpaths.

The El Arish Train Station is located approximately 600m south-south-west of the site, providing limited public transport. Given the rural setting of the subject site, limited public transport options are available in proximity to the site.

7.5 Easements and Encumbrances

There are no known easements or encumbrances affecting the property.

8.0 Proposed Infrastructure Designation

8.1 Intent of Designation

It is proposed to designate the site for the purposes of an Auxiliary Fire and Rescue Station which is further described below and illustrated on the proposal plan contained in **Appendix 5.** The scope of the project is to provide an emergency response capability, which meets the current and projected demand for services, and to maintain key performance indicators for vehicle response times.

8.2 Proposed Use

The proposed development is for the redevelopment of the fire and rescue station which results in the demolition of the existing building onsite and the establishment of a new one. It is not expected that there will be an increase in staff / vehicles at the new station.

The existing QFES Station primarily designed to accommodate up to 12 persons on call 24 hours a day, 7 days a week staffing model. The proposed station will accommodate the same staffing arrangement.

A number of minor upgrades and renovations have taken place in the Fire and Rescue Station building over the years on an ad hoc basis however the station lacks a number of contemporary operational and administrative requirements for current and future service delivery to the community.

8.3 Scope of Works

To accommodate current and future service delivery requirements for the El Arish community and its surrounds, the El Arish Auxiliary Fire and Rescue Station will be based on a 'FS2' standard station design as detailed in Table 5 below.

Table 5 - FS2 Inclusions

Internal Facilities	External Facilities
2 x Bay Engine Room with Associated Facilities	Covered Public Entry (from Ryrie Street)
Duty Office	Roofed Patio Area.
Training Room (with Lockers)	Secure 1.8m fencing for station perimeter
Kitchenette	Training pad
PWD bathroom including shower	Emergency service vehicle exit
Separate water closet accessed from outdoor covered area	Combined visitor and PWD car park, accessed via Ryrie Street
Seven secure staff car parks to the rear of the station, accessed via Ryrie Street	Ladder drill platform. This consist of a platform on top of the engine room which is used for ladder training purposes i.e instructing officer of the correct ladder placement. This platform connects to the ground via a ladder

8.4 Vehicle Access

Vehicle access is proposed via two crossovers, to Ryrie Street. The crossover to the east of the site will facilitate entry and exit for private and return emergency vehicles into the site, while the crossover to the west will provide a dedicated exit for emergency service vehicles. The eastern crossover will be 6.2m in width. The western crossover is 9.2m in width and is exit only.

Ingress and egress from the site will be controlled by security gates at the identified locations shown in the proposal plan in **Appendix 5**.

The proposed access locations are considered suitable for the development and is not expected to have an adverse impact on the surrounding road network.

8.5 Parking

The proposed car parking consists of one visitor and PWD space at the front of the site and seven dedicated staff car parking pays accessed from the eastern crossover.

It is expected that the proposed car parking supply will be adequate to meet demand and will not result in on-street parking or impacts to the safety, operation or amenity of the surrounding road network.

8.6 Proposed Staff Numbers

The Auxiliary Fire and Rescue Station will consist of 12 staff on call 24 hours a day, seven days a week. The staff will be at the station only when an emergency service call is received and to participate in weekly training sessions. The existing El Arish Fire and Rescue Station records an average of 85 call outs per year. Training includes group briefings and training drills on the external training pad. A portion of this training is undertaken inside the station which includes checking the appliances and suits to ensure they are operational. Major training events are only conducted once a year to keep the brigade up to date on activities such as rescuing persons from a crashed vehicle. This training is essential to ensure that the auxiliary fire fighters have the appropriate up to date knowledge and techniques to continue to maintain the safety of the community.

8.7 Hours of Operation

The proposed Fire and Rescue Station is an auxiliary station and will be capable of operating 24 hours a day 7 days a week however as the station is auxiliary, officers will only be present on the site when an emergency call out is received.

There were 85 callouts recorded for the El Arish Auxiliary Fire and Rescue Station over the last 12 month period, which averages to 1.5 callout per week. Therefore it is not anticipated that the replacement station will have an impact on surrounding uses, or residential amenity.

8.8 Sensitive Uses

The subject site is located within an established residential area, with residential properties adjoining the site's eastern, northern and western boundaries. The properties located to the southern side of Ryrie Street are also residential.

The site is in proximity to El Arish State School, located approximately 150m south of the site, along Chauvel Street. The proposed station has been designed to minimise impacts to surrounding sensitive uses by providing adequate setbacks to neighbouring properties.

Site frontage and boundaries will be appropriately treated with landscaping and fencing to minimise any potential residential amenity impacts.

Furthermore, during an emergency call out, emergency vehicle sirens will only be activated if required; such as navigating thorough heavy traffic which is considered unlikely given the proposal regional location. Solid fencing will also be provided on the boundary that adjoins a residential frontage.

8.9 Building Materials

The new station has been designed to be sympathetic with the building forms within the surrounding area. The proposed building has been set back from the street which is consistent with the existing building setbacks on Ryrie Street. External materials will potentially include a selection of Colourbond roof sheeting and external wall finished of rendered concrete fibre cement board, Colourbond sheeting and/or brick veneer.

In general, the building will complement the surrounding built form as it will be single storey and will reflect the materials of that used in surrounding development.

8.10 Disability Access

Under D3.4 of the *Building Code of Australia*, access by the general public is required to the entry, and accessible toilet / shower. All other areas of the station are accessible only to operational staff that are required to undertake tasks of a physical nature that would not be possible for a person with a mobility impairment or physical disability.

8.11 Statement of Public Benefit

The emergency services facilities are defined as infrastructure under Schedule 2 of the *Planning Regulations 2017*, providing assets necessary to support the community and for the public benefit. The proposed infrastructure will facilitate the efficient allocation of resources and satisfy statutory requirements or budgetary commitments of the State for the supply of infrastructure.

The project will be constructed and operated in a manner that avoids adverse environmental impacts on the surrounding natural environment.

9.0 Legislative Framework

The proposed development will be undertaken in accordance with Chapter 2, Part 5 of *Planning Act 2016*. The effect of the designation is that the use of the site for the designated infrastructure and service will be exempt from the local planning scheme and the Development Assessment Rules.

The Statutory State Planning Instruments for the designation of a premises for development of infrastructure are listed below:

1. *Planning Act 2016* – includes provisions for making or amending designations
2. *Planning Regulation 2017* – identifies types of infrastructure that may be designated
3. Minister's Guidelines and Rules (MGR) – Chapter 7 provides processes for making or amending designations.

9.1 State and Commonwealth Legislation

A infrastructure designation is being sought for the site, the effect of the designation is that the use of the site for the designated infrastructure will be exempt from the local planning scheme and the Development Assessment Rules.

However, it is noted that this does not exempt the State from obtaining approvals / licenses and meeting obligations under the relevant legislation.

Any future development on the site is to be carried out in a manner that avoids significant adverse impacts to the onsite and surrounding environment and which gives appropriate regard to the provisions of the following, but not limited to, commonwealth and state legislation:

- *Aboriginal Cultural Heritage Act 2003*
- *Building Act 1975*
- *Environmental Protection Act 1994*
- *Environmental Protection and Biodiversity Conservation Act 1999*
- *Nature Conservation Act 1992*
- *Queensland Heritage Act 1992*
- *Planning Act 2016*
- *Transport Infrastructure Act 1994*
- *Vegetation Management Act 1999*
- *Water Act 2000.*

9.2 Environmental Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation which commenced 16 July 2000. The EPBC Act enables the Australian Government to join with the states and territories in providing a national scheme of environment and heritage protection and biodiversity conservation. The EPBC Act focuses Australian Government interests on the protection of Matters of National Environmental Significance (MNES), with the states and territories having responsibility for matters of state and local significance.

The MNES protected under national environment law include:

- Listed threatened species and communities

- Listed migratory species
- Ramsar wetlands of international importance
- Commonwealth marine environment
- World heritage properties
- National heritage places
- The Great Barrier Reef Marine Park
- Nuclear actions
- A water resource, in relation to coal seam gas development and large coal mining development.

Where a proposed development could have a significant impact on any MNES, including National Heritage values, a referral may be required to the Australian Government Minister for the Environment for assessment. The owner or manager of the place, or person proposing to take the action, is required to decide whether or not the action proposed has the potential to have a significant impact on National Heritage values.

An EPBC Act Protected Matters Report identified one listed threatened ecological communities which may be present and a number of threatened and migratory species which may also be present in the area (see **Appendix 6** for the EPBC Protected Matters Report).

Generally, a significant impact is an action that has an important, notable consequence. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value and quality of the environment that is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. All these factors should be considered when determining whether an action is likely to have a significant impact on the National Heritage values of a place.

The subject site is located within an established urban area and does not exhibit any vegetation or habitat of value. The proposed development is not found to have a likely significant impact upon MNES.

9.3 The Planning Act 2016

The key purpose of an infrastructure designation is to facilitate the efficient and cost-effective provision of significant infrastructure for the State. Infrastructure required for the benefit of a community may be facilitated through a designation process prescribed under The Planning Act 2016 (PA).

9.4 The Planning Regulation 2017

A list of infrastructure is set out in Schedule 5 of the *Planning Regulations 2017* (PR).

> *(8) emergency services facilities.*

9.5 The Ministers Guidelines and Rules

One way in which the requirements for adequate environmental assessment and public consultation may be met is for the assessment of the proposal to be carried out in accordance with the guidelines as made by the Chief Executive under Section 283 of the *Planning Act 2016* and prescribed by the *Planning Regulation 2017*.

The applicable guideline is the Ministers Guidelines and Rules (July 2017), with *Chapter 7—Guidelines for the process for environmental assessment and consultation for making or amending an infrastructure designation* being the relevant Chapter. The proposed infrastructure is to be assessed under the streamlined designation process.

In this instance, the Department of State Development, Manufacturing, Infrastructure and Planning

DSDMIP has confirmed that the application will qualify for the streamlined process. Under the streamlined process not all steps as outlined in MGR apply. The amended streamlined process is outlined as below:

- Part 1 – Prelodgement with Department
- **Part 2 – Submission of EAR (current step)**
- Part 3 – DSDMIP Preliminary Assessment
- Part 4 – Consultation (Minister and Infrastructure Entity) + State Assessment
- Part 5 – DSDMIP Final Assessment and Recommendations
- Part 6 – Minister's Decision.

The streamlined process bypasses the requirement for the Infrastructure Entity (IE) to submit an 'Infrastructure Proposal'. Rather DSDMIP provide pre-lodgement advice to the IE, in this instance the DSDMIP have advised the next step in the streamlined process will involve submitting the EAR to the Department for the preliminary assessment of the following:

- s36 criteria
- State Interests
- Relevant Planning Instruments
- Consultation Strategy
- Draft Consultation Material.

Once DSDMIP has undertaken the preliminary assessment the IE will commence consultation with stakeholders and the general public, the Minister will also consult with land owners and Cassowary Coast Regional Council. Whilst this consultation is being undertaken the Department will be concurrently undertaking the State Assessment. A copy of the streamlined Ministers Guidelines and Rules Flowchart is provided in **Appendix 1**.

9.6 State Planning Policy

The Queensland Government established the State Planning Policy (SPP) in July 2017 to simplify and clarify matters of state interest in land use planning and development.

In accordance with Chapter 2, Part 5, section 36 of PA, as outlined above the designator must have regard to 'all planning instruments that relate to the premises'. For all state interests, when deciding the designation of land for infrastructure, the designator must have regard to the relevant parts of the SPP as shown below and identified in Part B of the SPP:

Table 6 - SPP relevance to designation								
Application of the SPP	**Who is Responsible**	**Parts of the SPP that are applicable to the extent relevant**						
		PART A: Introduction and context **PART B:** Application and operation, & **PART C:** Purpose and guiding principals	**PART D:** State interest statements	**PART E:** State Interest Policies	**PART E:** Assessment Benchmarks	**PART F:** Glossary	**PART G** SPP Appendix 1	**PART G** SPP Appendix 1
Designating a premise for infrastructure	**State and Local Government**	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable

The relevant parts of the SPP are addressed below. Part A, B and C of the SPP are regarding the introduction and context; application and operation; and purpose and guiding principles of the SPP respectively are noted.

9.6.1 Part C of the SPP

The SPP outlines the guiding principles and state interests that underpin the delivery of local and regional plans, and development that will advance the social, economic and environmental needs of all Queenslanders. The guiding principles should be read in conjunction with each state interest and are as important as the state interests expressed in the SPP and include the following:

- Outcomes focused
- Integrated
- Efficient
- Positive
- Accountable

The above guiding interests has been considered when the proposed development is assessed against the individual State Interests, and therefore are not required to be individually addressed.

9.6.2 Part D and E of the SPP

There are seventeen (17) state interests arranged under the following five (5) broad themes:

- Liveable Communities and Housing
- Economic Growth
- Environment and Heritage
- Safety and Resilience to Hazards
- Infrastructure

In accordance with Part D of the SPP, the proposed infrastructure designation has considered the following plan making provisions.

Table 7 - State Planning Policy Overview	
State Interest	**PSBA Comments**
LIVEABLE COMMUNITIES AND HOUSING	
- Housing Supply and Diversity	Not Applicable
- Liveable Communities	Not Applicable
ECONOMIC GROWTH	
- Agriculture	Not Applicable
- Development and Construction	Not Applicable
- Mining and Extractive Resources	Not Applicable
- Tourism	Not Applicable
ENVIRONMENT AND HERITAGE	
- Biodiversity	Not Applicable
- Coastal Environment	Not Applicable
- Cultural Heritage	Not Applicable
- Water Quality	Not Applicable
SAFETY AND RESILIENCE TO HAZARDS	
- Emissions and Hazardous Activities	Not Applicable
- Natural Hazards, Risk and Resilience	Applies – Flood Hazard Area – Level 1 – QLD Floodplain Assessment Overlay
INFRASTRUCTURE	
- Energy and Water Supply	Not Applicable
- Infrastructure integration	Not Applicable
- Transport infrastructure	Not Applicable
- Strategic airports and aviation facilities	Not Applicable
- Strategic ports	Not Applicable

Part E of the SPP, lists the state interests, policies and assessment benchmarks. Below is a statement on how the proposed development has been assessed against each state interest, and policy and assessment benchmark where relevant.

Table 8 - Part E: State Interest Assessment Benchmarks	
State interest	**Comment**
Liveable communities and Housing	
Liveable Communities This state interest aims to ensure that "planning delivers liveable, well designed and services communities that support wellbeing and enhance quality of life".	The proposal complies with the above intent as it provides for the delivery of an essential community infrastructure and service to support communities and promotes best practice urban design. The current proposal complies with the state interest of consolidating urban development in and around existing settlements.

Housing Supply and Diversity This state interest aims to ensure that "diverse, accessible and well serviced housing and land for housing is provided".	The proposal is for an Auxiliary Fire and Rescue Station and therefore this state interest has no relevance to the proposed designation.
Economic Growth	
Agriculture This state interest aims to ensure that "planning protects the resources on which agriculture depends and supports the long-term viability and growth of the agricultural sector".	The proposal complies with the above intent as it provides an essential community infrastructure and service necessary to support a strong agriculture industry and associated agricultural supply chains. Additionally, the land surrounding the proposed Auxiliary Fire and Rescue Station is generally urban.
Development and Construction This state interest aims to ensure that a broad range of economic development opportunities can grow in response to current and projected economic demand, and to meet the needs of the communities in which they operate.	The proposal complies with the above intent as the proposed location is suitable land for the proposed community infrastructure activity, which is considered essential to support the surrounding land uses.
Mining and Extractive Resources This state interest aims to ensure that the issues and opportunities generated by resources development are considered as part of the planning process.	The proposal is does not involve a resource activity and is not located within proximity to a key resource area, therefore this state interest has no relevance to the proposed designation.
Tourism The state interest in tourism seeks to support these economic opportunities for local communities, regions and the state.	The proposal does not involve a tourism related activity and therefore, this state interest has no relevance to the proposed designation.
Environment and Heritage	
Biodiversity This state interest aims to safeguard biodiversity at the national, state and local level, and to build ecological resilience.	The current proposal has considered matters of national environmental significance, state environmental significance and local environmental significance. The construction of the proposed Auxiliary Fire and Rescue Station presents minimal risk and impact to the ecological communities in the wider region.
Coastal Environment This state interest aims to ensure that the coastal environment, including offshore islands, along with its natural processes and resources, is appropriately considered.	This state interest has no relevance to the proposed designation, as the site is not partially or wholly located in the coastal zone.
Cultural heritage This state interest aims to ensure that development affecting a place of cultural heritage significance supports its long-term conservation through preservation, restoration, reconstruction or adaptive reuse and renewal.	This proposal does not involve a matter of cultural heritage significance and therefore this state interest has no relevance to the proposed designation.
Water Quality This state interest aims to ensure the enhancement of the environmental values of Queensland waters.	The enhancement of environment values has been considered and appropriate storm water design will be adopted as part of the proposed development.
Safety and resilience to Hazards	

Emissions and hazardous activities This state interest aims to ensure that the risk to the health and safety of communities and individuals, and the natural and built environment is adequately managed to avoid potential adverse impacts.	This state interest has no relevance to the proposed designation, as there will be no hazardous materials stored on site.
Natural hazards, risk and resilience This state interest aims to ensure that natural hazards are properly considered, community resilience is increased, and hazards are avoided or the risks are mitigated to an acceptable or tolerable level.	The subject site is located within the Flood Hazard Area – Level 1 – Queensland Flood Plain assessment overlay. In support of the designation, a Flooding Study has been prepared, which has not found the site to be impacted upon by local or regional flooding. The flood study considered the 100 year and 500 year ARI design events and did not find the site as being impacted by flood risk in either scenario. The state interest therefore has no bearing upon the proposed designation, as there is not any onsite flooding value.
Infrastructure	
Energy and Water Supply This state interest aims to ensure that provision is made for safe, reliable and affordable energy and water supply to communities.	The proposal does not require any alteration to existing energy and water supply arrangements and therefore this state interest has no relevance to the proposed designation.
Infrastructure integration This state interest aims to ensure that the benefits of past and ongoing investment in infrastructure and facilities are maximised through integrated land use planning.	This state interest has no relevance to the proposed designation, as the proposed development will not have a significant impact on surrounding infrastructure. Where relevant PSBA consults with other State Agencies and infrastructure providers.
State Transport Infrastructure This state interest aims to ensure that developments are integrated with state transport infrastructure to ensure transport networks are used safely, efficiently and sustainably, and our communities are connected, prosperous and liveable.	This state interest has no relevance to the proposed designation, as the proposed development will not impact on state controlled transport infrastructure.
Strategic airports and aviation facilities This state interest aims to ensure that development does not impact on the safe and efficient operation of these facilities will support continued growth of the state's economy, regional communities and national defence.	This state interest has no relevance to the proposed designation, as the building height will remain as a single storey and will not compromise the safety and efficiency of aviation facilities.
Strategic Ports This state interest aims to ensure that development does not impact on the safe and efficient operation of sea ports will support continued growth of the state economy and the national defence system.	The subject site is not identified as being near a strategic port, therefore this state interest has no relevance to the proposed designation.

A copy of the SPP mapping is provided at **Appendix 7**.

9.7 Regional Planning

The site as illustrated in **Figure 3** is included within the boundaries of the Far North Queensland Regional Plan 2009-2031. The Far North Queensland Regional Plan 2009-2031, incorporates a comprehensive policy framework making decision about managing the region's development. The plan:

- Identifies sufficient developable land to meet future growth
- prepares for growth in a way that progresses the Queensland Government's Q2 objectives, and protects and enhances the region's natural environment, biodiversity and natural resources
- resolves conflicts between state and local planning policies at a regional level
- establishes sound urban development principles that support a compact, well serviced and efficient urban form
- promotes infrastructure delivery that is timely and cost–effective, and supports community and economic development
- maintains and enhances the quality of life for existing and future communities
- ensures the region's growth is responsive to the possible impacts of climate change and oil vulnerability
- promotes safe, efficient and effective movement of goods and people, and facilitates access to places and services
- supports a viable and diverse economy with well-located employment opportunities and economic activity centres
- gives the private sector greater certainty of future growth and development objectives when they make business investment decisions.

The site is located within the Urban Footprint; the Urban Footprint identifies land within which the region's urban development needs to 2031 can be accommodated in a way consistent with the goals, elements and strategies of The Far North Queensland Regional Plan 2009-2031

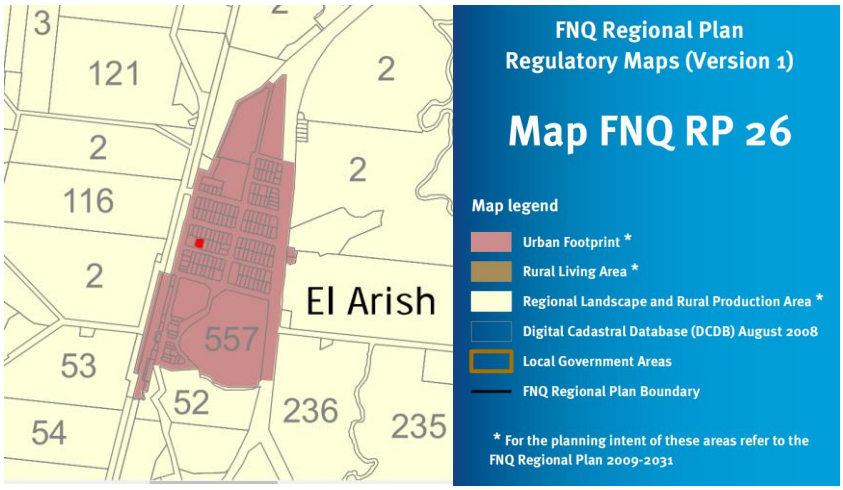


Figure 3 - The Far North Queensland Regional Plan 2009 -2031
(Source - The Far North Queensland Regional Plan 2009 - 2031)

9.8 Building Works

Building works, will be accepted development in accordance with Schedule 7, Part 1, of the *Planning Regulations 2017* being:

Building work, other than building work mentioned in section 1, carried out by or for the State or a public-sector entity, to the extent the building work complies with the relevant provisions for the building work.

9.9 Local Planning Assessment

Where land is not designated for infrastructure, any development involving a material change of use of premises should have regard to the requirements of the relevant planning scheme. Whilst the intended designation results in the development being exempt from assessment against this planning scheme, consideration must still be given to its relevant provisions. The Cassowary Coast Planning Scheme commenced 3 July 2015, this is the relevant scheme for the site.

9.9.1 Planning Scheme Summary

Table 9 - Planning Scheme Information (additional assessment below)	
Planning Scheme	Cassowary Coast Planning Scheme
Zone/Precinct/Area	Township Zone / Residential Local Plan
Defined Use	Emergency Services
Applicable Planning Scheme Overlays	Nil
Approval Required	Material Change of Use
Assessment Category	Impact Assessment

9.9.2 Use Definition

Under the Planning Scheme, the proposed El Arish Auxiliary Fire and Rescue Station is defined as:

Emergency Services: 'Premises used by government bodies or community organisations to provide essential emergency services or disaster management services including management support facilities for the protection of persons, property and the environment'.

9.9.3 Planning Scheme Zone

The Planning Scheme identifies the subject site as being within the Township Zoning and further identified within the Local Plan Precincts – Residential area as depicted in Figure 3.

It is noted that the council online mapping has not been updated yet to reflect the recent property amalgamation of the site.

Figure 4 - Planning Scheme Zoning (Source – Cassowary Coast Regional Council PD Online)

Township Zoning

The purpose of the township zone is to:

- *provide for the consolidation of urban land uses in the township zone*
- *define the urban extent of the region's towns and villages and allow for the future expansion of these towns and villages for at least the next 10 years*
- *provide a mix of uses including residential, retail, business, education, industrial, community purpose, recreation and open space that support the needs of the local community*

The subject site currently accommodates the El Arish auxiliary fire and rescue station which directly caters to the needs of the El Arish and wider community. The proposed replacement El Arish Auxiliary Fire and Rescue Station will provide an improved level of services to the surrounding residential catchment.

The site is located in a township area and the proposed replacement station ensures the efficient consolidation of land uses within the El Arish Village area.

9.9.4 Planning Scheme Overlays

The site is not subject to any planning scheme overlays.

9.9.5 Level of Assessment

The proposed development is defined as a material change of use, being a material increase in the intensity or scale of the use of the premises. The use of the premises for an Emergency Service (Replacement Auxiliary Fire and Rescue Station) is considered assessable development and requires a development permit to undertake the use on the premises. The category of assessment for this application is Impact Assessable.

As an Infrastructure Designation if being sought a Development Application will not be required to be lodged with the Cassowary Coast Regional Council. Additionally, the effect of the designation is that the use of the site for the designated infrastructure and service will be exempt from the local government's planning scheme and the Development Assessment Rules.

10.0 Environmental Assessment and Management

Before designating land for infrastructure, an assessment must be made of:

- Any environmental impacts that the development or use may generate
- Ways in which those environmental impacts are being managed or mitigated.

Regard is given to natural and physical resources, as well as short and long term effects and impacts on the environment and community from both the construction and operational phase of the proposed community infrastructure. The range of matters considered includes:

- Soils and geology
- Flora and fauna
- Natural hazards
- Conservation values
- Historical and cultural heritage
- Health, safety, amenity, social and economic impacts;
- Municipal infrastructure.

These matters are considered and addressed in the following sections of this report.

10.1 Soils and Geology

A geotechnical investigation was carried out by PDR / SMEC (PDR) 29 May 2018 (refer to **Appendix 8**) The soil testing and sampling investigated the nature and type of subsurface material at the site to allow engineering assessment of site classification, foundation recommendations, earthworks and site management. The assessment reported a top soil of Silty Clay extending to a depth of 0.1 to 0.3m which was underlain by a layer of brown Clayey Sand to a depth of between 1.1 and 1.5m.

Recommendations from the Geotechnical Report will be provided to the contractor at the time detailed design and construction.

10.2 Erosion and Sediment Control

The release of sediments or other contaminants to water is an offence under Section 440ZG of the *Environmental Protection Act 1994*. All activities that expose soil have the potential to result in the release of sediment to waterways or stormwater systems. To minimise the risk of releasing sediment and other contaminants to waters during construction and to the meet the general environmental duty under the EP Act, a Site Erosion and Sediment Control Plan (ESCP) will be prepared in accordance with the IEA Best Practice Erosion and Sediment Control prior to commencing construction. The ESCP will address the erosion risks identified for the site.

The ESCP will be implemented and monitored throughout the construction phase.

10.3 Flora and Fauna

The site is not mapped as containing remnant nor regrowth vegetation refer to **Appendix 9** for the vegetation management report. Limited tree clearing is necessary for the development to occur and all trees are to be inspected for hollows and nests during planning and design. All trees are to be inspected for hollows and nests during planning and design. If hollows, nests or potential other

breeding places are present they will be assessed by a suitably qualified person to determine if they are breeding places in accordance with the *Nature Conservation Act 1992*. If any breeding places are located within the development footprint a species management program will be lodged with the Department of Environment and Science (DES) prior to impacting on the breeding place.

Immediately prior to removal, vegetation will be inspected for fauna. If fauna is present vegetation clearing is to cease and fauna allowed to move out of the vegetation clearing area of its own accord.

Vegetation that is not required to be cleared for the proposed development should be protected from construction impacts in accordance with the AS 4970-2009 *Protection of Trees on Development Sites*.

10.4 Natural Hazards

10.4.1 Stormwater Management

The proposed replacement Auxiliary Fire and Rescue Station is to be constructed on land which comprises a mix of pervious and non-pervious area. The proposed infrastructure designation will result in a similar amount of impervious area as currently present.

The project design has been guided by the recommendations of a stormwater management plan, contained in **Appendix 10**. The current method of discharge as detailed in the report, is to the existing Council controlled infrastructure on Ryrie Street, forming the site's lawful point of discharge.

The report detailed that there would be an insignificant change to the impervious area onsite through the establishment of proposed replacement station, and therefore a minimal change to peak stormwater discharge rates. Maintaining the current method of discharge to Ryrie Street will therefor result in a 'non-worsening' in flow conditions on the site.

If groundwater is encountered during construction or if dewatering practice is required at the site, the contractor shall arrange for the analysis of the water to verify that it is suitable for release in line with Local Authority guidelines.

10.4.2 Flooding

The Flood report (refer **to Appendix 10**) indicates the site is not within a flood hazard area. The report investigated ARI 100 and 500 flood levels and found that the site was entirely free of any flood value.

10.4.3 Bushfire

The planning scheme bushfire overlay indicates the site is not mapped as being within a bushfire hazard area. Therefore a formal bushfire assessment is not considered necessary for this project.

10.4.4 Landslip

The risk of landslide on the site is considered minimal due to the topography of the site.

10.5 Conservation Values

10.5.1 Protected and Vulnerable Areas

The site is not located within close proximity to any protected and / or vulnerable areas.

10.6 Historical and Cultural Heritage

10.6.1 Historical Heritage

The site is not listed on the local, state or national heritage registers.

10.6.2 Cultural Heritage

It is noted that any Aboriginal cultural heritage, if found, is protected under the terms of the *Aboriginal Cultural Heritage Act 2003* even if Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) has no record relating to it. Contract documents will include provisions for works to cease and the relevant Aboriginal Party to be contacted if evidence of Aboriginal cultural heritage is encountered during site works.

10.6.3 Native Title

Native Title has been extinguished by virtue of Deed Of Grant 20361233 issued 5/03/1942.

10.7 Health, Safety, Amenity, Social and Economic Impacts

10.7.1 Construction Impacts

The construction of the proposed development is likely to create nuisance for the neighbouring properties during and throughout the construction phase. It is possible that dust, noise and lighting impacts on surrounding residences will need to be considered during design, construction and operation of any future development within the site.

A construction environmental management plan should be prepared for the development. The plan will include at a minimum default noise standards detailed in the Environmental Protection Act 1999, dust mitigation methods, waste control and erosion and sediment control plans.

Unless otherwise approved in any development approvals and/or statutory permits, works must comply as a minimum with default noise standards detailed in the Environmental Protection Act 1999 including:

- Building work should be restricted to Monday to Saturday (excluding public holidays) between 6:30am and 6:30pm
- Operation of regulated devices such as chainsaws, mulches and electrical, mechanical or pneumatic power tools should be restricted to Monday to Saturday (excluding public holidays) between 7 am and 7 pm
- Work should not be undertaken on public holidays.

10.7.2 Air Quality

Owing to the nature of the proposed use no negative air quality impacts are likely to be generated from the new Queensland Fire and Rescue Station.

10.7.3 Site Contamination

The subject site is not listed on the Environmental Management Register (EMR), or on the Contaminated Land Register (CLR) refer **to Appendix 3**. No notifiable activities have been identified on the site and it is considered unlikely that any notifiable activities would be conducted as part of the proposed development.

10.7.4 Noise and Light

The proposal is not considered to result in the generation of adverse noise or light. The use of Emergency Service vehicle lights and sirens during an emergency call out, will only be activated if required to navigate through heavy traffic which is considered highly unlikely for this location. The Appliance will not leave the site with sirens engaged unless there is a hazard on the road, and sirens are required.

Given the auxiliary nature of the proposed station, the number of vehicles exiting the site is not expected to significantly impact on surrounding land uses or road network.

Lighting will be provided to the station including parking area in accordance with the applicable Australian Standards (AS). This Australian Standard (AS) addresses obtrusive outdoor lighting from car parking lots, parks and reserves, sports lighting, floodlighting and yard lighting that that can give rise to discomfort or pose a safety hazard to neighbours in accordance with the applicable Australian Standards.

The construction of the proposal may create nuisance for neighbouring properties. Possible dust, noise and lighting impacts on existing site uses and surrounding land uses will be considered during design, construction and operation of proposed development within the subject lot.

Measures will be put in place by the contractors to manage dust which may potentially be generated from tree removal (if required) and construction activities through the Construction Environment Management Plan.

10.7.5 Visual and Scenic Amenity

The site is not identified by the planning scheme as an area of high visual amenity or scenic value.

10.7.6 Social Impacts

The proposed replacement auxiliary fire and rescue station will benefit the local and broader community through the provision of a new and well-designed station. The new station constitutes essential emergency services infrastructure which is required to meet service delivery needs in the public interest.

Negative impacts associated with the emergency services facility are anticipated to be minimal given the its existing nature and need for the use on site.

10.7.7 Economic Impacts

The proposed location is suitable land for the community infrastructure activity, which is considered essential to support the surrounding land uses and economic viability of the area by contributing to

the health, safety and well-being of all residents. There are considered to be no negative economic impacts that the projects will create.

10.8 Municipal Infrastructure

10.8.1 Water and Sewer

Municipal water infrastructure is available to the site. Checks by the design team will be undertaken to verify location, condition and capacity of all services to ensure these are adequate to service demands and that they are compatible with the future design.

Reticulated sewer infrastructure is not available to the site and an on-site effluent disposal system supports the current El Arish Auxiliary Fire and Rescue Station. As per the Site and Soil Investigation – On-site Effluent Evaluation Report contained in **Appendix 11**, an Advanced Secondary Treatment System is recommended. The treatment system will occupy an area of 33.4m^2 as shown in the proposal plan **Appendix 5** and ensures best practice treatment occurs onsite.

No new connections will be required to be established to infrastructure along Ryrie Street.

10.8.2 Power, Gas and Telecommunications

Electricity and telecommunication services are available to the site.

10.8.3 Road Infrastructure, Site Access and Traffic

A formal traffic study is not considered necessary due to the limited amount of traffic generated by the use and the existing use operating from the site.

11.0 Conclusion

This EAR has been prepared by GHD on behalf of PSBA, seeking an Infrastructure Designation of land for the proposed replacement El Arish Auxiliary Fire and Rescue Station. The proposed designation applies to land located at 5-7 Ryrie Street being more formally described as Lot 100 on SP306470.

The PA prescribes the way in which a designation can be undertaken. Chapter 2, Part 5 of the PA prescribes that a Minister, before designating land for infrastructure, must be satisfied that for development the subject of the proposed designation:

- *the infrastructure will satisfy statutory requirements, or budgetary commitments, for the supply of the infrastructure; or*
- *there is, or will be, a need for the efficient and timely supply of the infrastructure.*

A Fire and Rescue Station is defined as Infrastructure under Schedule 5, Part 2 of the Planning Regulation 2017, being assets necessary to support the community and for the public benefit.

The proposed designation as part of this proposal is therefore best described as:

(8) emergency services facilities;

The proposed designation will facilitate the efficient and timely supply of infrastructure; and satisfy statutory requirements and budgetary commitments of the State for the supply of community infrastructure. The assessment provided within the EAR provides key details with respect to the Auxiliary Fire and Rescue Station and has undertaken an assessment of the proposed infrastructure against the relevant statutory frameworks, incorporating local and state assessment criteria and Commonwealth legislation.

12.0 Appendices

The following is a list of appendices to this Environmental Assessment Report:

- Appendix 1 – Extracts from The *Planning Act 2016* and streamlined Designation Flow Chart
- Appendix 2 – Extent of Land holders to be consulted by direct mail
- Appendix 3 – Property Information (title search and EMR / CLR search)
- Appendix 4 – Contour and Detailed Survey
- Appendix 5 – Proposal Plan
- Appendix 6 – EPBC Protected Matters Report
- Appendix 7 – State Interest Trigger Mapping
- Appendix 8 – Geotechnical Report
- Appendix 9 – Vegetation Management Report
- Appendix 10 – Stormwater Management Plan and Flooding Report
- Appendix 11 – Site and Soil Investigation – On-site Effluent Evaluation

Appendix 1

Extracts from the Planning Act 2016 and Designation Flow Chart

Part 5 Designation of premises for development of infrastructure

35 What is a designation

(1) A ***designation*** is a decision of the Minister, or a local government, (a ***designator***) that identifies premises for the development of 1 or more types of infrastructure that are prescribed by regulation.

(2) A designation may include requirements about any or all of the following—

(a) works for the infrastructure (the height, shape, bulk, landscaping, or location of works, for example);

(b) the use of premises, for example—

(i) vehicular and pedestrian access to, and circulation on, premises; and

(ii) operating times for the use; and

(iii) ancillary uses;

(c) lessening the impact of the works or use (environmental management procedures, for example).

(3) The chief executive may, by notice, require a local government to include a matter in subsection (2) in a designation made by the local government.

Note—

For the effect of a designation on the categorisation of development, see section 44(6)(b).

36 Criteria for making or amending designations

(1) To make a designation, a designator must be satisfied that—

(a) the infrastructure will satisfy statutory requirements, or budgetary commitments, for the supply of the infrastructure; or

(b) there is or will be a need for the efficient and timely supply of the infrastructure.

(2) To make or amend a designation, if the designator is the Minister, the Minister must also be satisfied that adequate environmental assessment, including adequate consultation, has been carried out in relation to the development that is the subject of the designation or amendment.

(3) The Minister may, in guidelines prescribed by regulation, set out the process for the environmental assessment and consultation.

(4) The Minister is taken to be satisfied of the matters in subsection (2) if the process in the guidelines is followed.

(5) However, the Minister may be satisfied of the matters in another way.

(6) Sections 10 and 11 apply to the making or amendment of the guidelines as if the guidelines were a State planning policy.

(7) To make or amend a designation, a designator must have regard to—

(a) all planning instruments that relate to the premises; and

(b) any assessment benchmarks, other than in planning instruments, that relate to the development that is the subject of the designation or amendment; and

(c) if the premises are in a State development area under the State Development Act—any approved development scheme for the premises under that Act; and

(ca) if the premises are in a priority development area under the *Economic Development Act 2012*—any development scheme for the priority development area under that Act; and

(d) any properly made submissions made as part of the consultation carried out under section 37; and

(e) the written submissions of any local government.

37 Process for making or amending designation

(1) This section is about the process for—

(a) making a designation for premises; or

(b) amending a designation for premises, including by amending—

(i) the area of the premises; or

(ii) the type of infrastructure for which the premises were designated.

(2) If the Minister proposes to make or amend a designation, the Minister must give notice of the proposal to the affected parties.

(3) However, the Minister need not give the notice to an owner of premises if—

(a) a notice has already been given to the owner as part of the consultation for an assessment under section 36(2); or

(b) the Minister can not notify the owner after making reasonable efforts.

(4) The notice must invite the affected parties to make submissions about the proposal to the Minister within a period of at least 15 business days after the notice is given.

(5) If, after considering any properly made submissions, the Minister decides not to proceed with the proposal, the Minister must give a decision notice to the affected parties.

(6) If a local government proposes to make or amend a designation, the local government must follow the process in the designation process rules, before the local government makes or amends the designation.

(7) Sections 10 and 11 apply to the making or amendment of the designation process rules as if the designation process rules were a State planning policy.

(8) In this section—

designation process rules means rules made by the Minister and prescribed by regulation.

38 Process after making or amending designation

(1) If, after considering any properly made submissions, the designator decides to make or amend a designation, the designator must publish a gazette notice that states—

(a) that the designation has been made or amended; and

(b) a description of the designated premises; and

(c) the type of infrastructure for which the premises were designated; and

(d) for an amendment—the nature of the amendment.

(2) The designator must give the following things to each affected party and the chief executive—

(a) a copy of the gazette notice;

(b) a notice of any requirements included in the designation under section 35(2);

(c) a notice of how the designator dealt with any properly made submissions.

39 Duration of designation

(1) A designation stops having effect on the day (the ***end day***) that is 6 years after the designation starts to have effect, unless—

(a) on the end day—

(i) a public sector entity owns, or has an easement for the same purpose as the designation over, the designated premises; or

(ii) another entity owns, or has an easement over, the designated premises and construction of the infrastructure for which the premises were designated started before the end day; or

(b) before the end day—

(i) a public sector entity gave a notice of intention to resume the designated premises under the Acquisition Act, section 7; or

(ii) a public sector entity signed an agreement to take designated premises under the Acquisition Act or to otherwise buy the premises; or

(iii) the designator complies with subsection (3).

(2) The designator may extend the duration of a designation, for up to 6 years, by publishing a gazette notice about the extension before the designation stops having effect.

(3) The designator must give notice of the extension of the designation to—

(a) if the Minister is the designator—each of the affected parties and the chief executive; or

(b) if a local government is the designator—the owner of the premises and the chief executive.

(4) If a public sector entity discontinues proceedings to resume designated premises, either before or after the end day, the designation stops having effect on the day when the proceedings are discontinued.

40 Repealing designation—designator

(1) A designator may repeal a designation made by the designator by publishing a gazette notice that states—

(a) that the designation is repealed; and

(b) a description of the designated premises; and

(c) the type of infrastructure for which the premises were designated; and

(d) the reasons for the repeal.

(2) The designator must give a copy of the notice to—

(a) if the Minister is the designator—each of the affected parties and the chief executive; or

(b) if a local government is the designator—the owner of the premises and the chief executive.

(3) Any development started under the designation may be completed as if the designation had not been repealed.

(4) Subject to any requirements under section 35(2), a use of the premises that is the natural and ordinary consequence of the development is taken to be a lawful use.

41 Repealing designation—owner's request

(1) An owner of an interest in designated premises may request a designator to repeal a designation made by the designator on the basis that the designation is causing the owner hardship.

(2) Subsection (1) does not apply if—

(a) the premises are subject to an easement for the infrastructure for which the premises are designated; or

(b) the designation also applies to other premises and relates to a land corridor for the infrastructure; or

(c) the premises are a road.

(3) The request must be in writing, and contain any information that the guidelines made under section 36(3) require.

(4) The designator must, within 40 business days after receiving the request—

(a) repeal the designation, using the process under section 40; or

(b) decide to refuse the request; or

(c) decide to take other action that the designator considers appropriate in the circumstances.

(5) The designator must, within 5 business days after making a decision under subsection (4)(b) or (c), give a decision notice to the owner.

42 Noting designation in planning scheme

(1) This section applies if a local government—

(a) makes, amends, extends or repeals a designation; or

(b) receives a notice about the Minister making, amending, extending or repealing a designation.

(2) The local government must include a note about the making, amendment, extension or repeal in—

(a) the local government's planning scheme; and

(b) any planning scheme that the local government makes before the designation stops having effect.

(3) The note must—

(a) identify the premises that were designated; and

(b) describe the type of infrastructure for which the premises were designated; and

(c) state the day when the designation, amendment, extension or repeal started to have effect.

(4) The local government must include the note in the planning scheme in a way that ensures the other provisions of the scheme that apply to the designated premises remain effective.

(5) To remove any doubt, it is declared that—

(a) the note is not an amendment of a planning scheme; and

(b) a designation is taken to be part of a planning scheme; and

(c) a designation is not the only way that a planning scheme may identify infrastructure; and

(d) a designation does not affect the provisions of a planning scheme that apply to designated premises, even after the designation stops having effect.

Streamlined Ministerial Infrastructure Designation (MID) process

Pre-lodgement

Pre-lodgement process to confirm:

- Proposal details
- State interests
- Consultation strategy
- Key issues
- Endorsement to apply streamlined process

Lodgement of EAR

Entity submits Environmental Assessment Report to DSDMIP via online portal

DSDMIP Preliminary Assessment

DSDMIP review of EAR:

- s36 criteria
- State interests
- Planning instruments
- Consultation strategy
- Draft consultation material

Consultation by Minister and DSDMIP Assessment

Minister gives s37 notice of proposal

Minister's consultation with:

- local government
- landowner/s
- general public

Consultation includes:

- sign on land
- notice in newspaper
- letters to neighbours
- available on website

DSDMIP undertakes State assessment concurrently

DSDMIP Final Assessment and Recommendations to Minister

DSDMIP carries out:

- Final assessment
- Review of submissions
- Preparation of recommendations
- Preparation of decision package (notice, gazette, requirements, address of submissions)

Minister's decision

Minister makes s37 decision

Actions following Minister's Decision

Minister provides following material to **local government, land owners and the chief executive**:

- Gazette notice
- Decision notice – including approved plans, requirements and address of all submissions

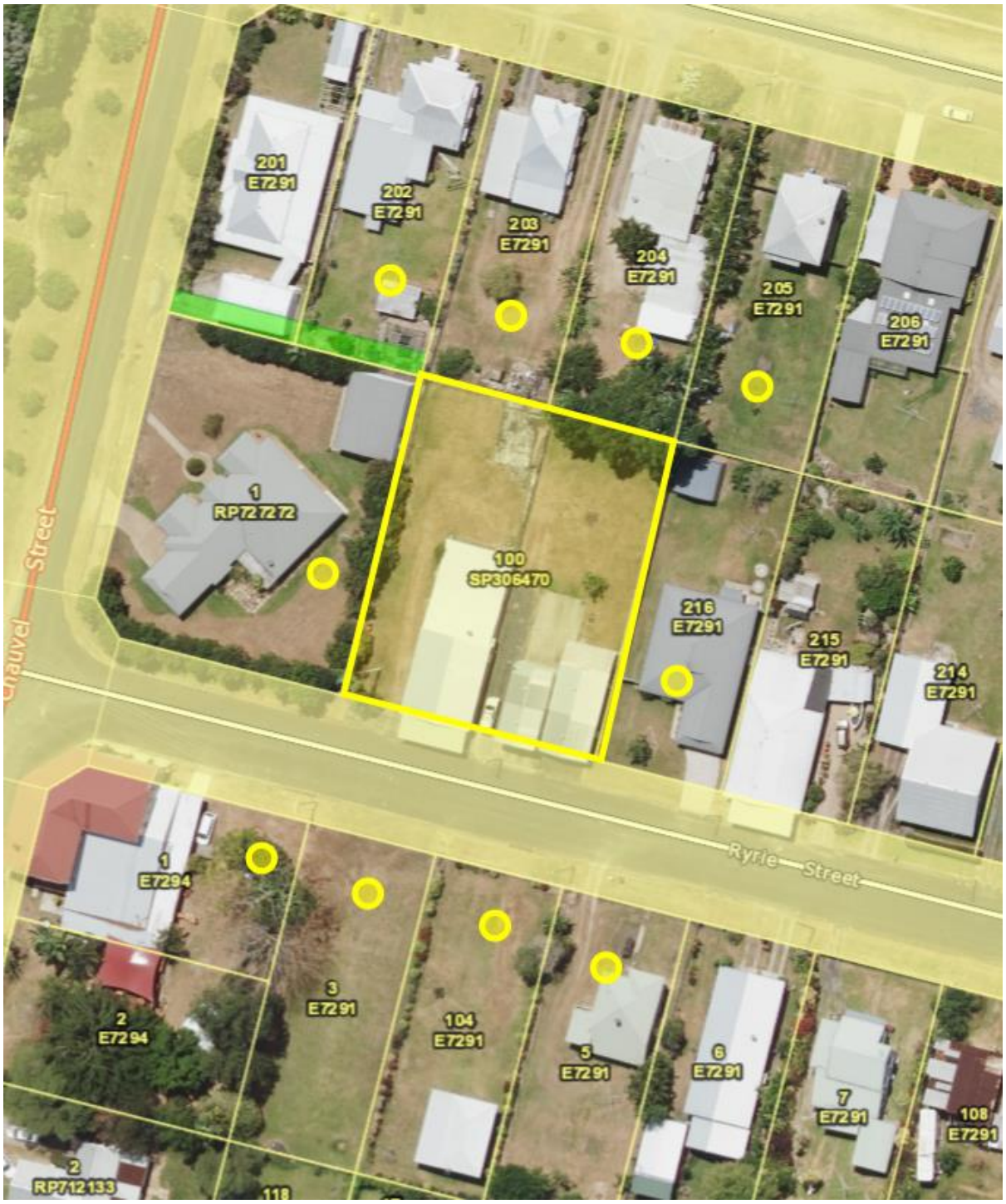
DSDMIP publishes following material (**publicly available**):

- Gazette notice
- Decision notice – including approved plans, requirements and address of all submissions
- Spatial data - mapping layer

Appendix 2

Extent of Landowners to be consulted

El Arish



LEGEND

	Proposed facility location
	Property to be notified

Appendix 3

Property Information (title search and EMR / CLR search)

CURRENT TITLE SEARCH

NATURAL RESOURCES, MINES AND ENERGY, QUEENSLAND

Request No: 29961225
Search Date: 08/11/2018 17:06 **Title Reference: 51158784**
Date Created: 12/09/2018

Previous Title: 20448066
21049041

REGISTERED OWNER

Dealing No: 718977152 07/09/2018

THE STATE OF QUEENSLAND
(REPRESENTED BY PUBLIC SAFETY BUSINESS AGENCY)

ESTATE AND LAND

Estate in Fee Simple

LOT 100 SURVEY PLAN 306470
Local Government: CASSOWARY COAST

EASEMENTS, ENCUMBRANCES AND INTERESTS

1. Rights and interests reserved to the Crown by
Deed of Grant No. 20361233 (ALLOT 17 SEC 2)
Deed of Grant No. 20889185 (ALLOT 18 SEC 2)
Deed of Grant No. 20889186 (ALLOT 21 SEC 2)

ADMINISTRATIVE ADVICES - NIL
UNREGISTERED DEALINGS - NIL

CERTIFICATE OF TITLE ISSUED - No

** End of Current Title Search **

Requested By: SMIS .

Department of Environment and Science (DES)
ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454 Brisbane QLD 4001 AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

Transaction ID: 50495935 EMR Site Id: 09 November 2018
This response relates to a search request received for the site:
Lot: 100 Plan: SP306470

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

Appendix 4

Contour and Detail Survey

SURVEY STATIONS				
STATION #	EASTING	NORTHING	HEIGHT	DESCRIPTION
2	394382.825	8031006.598	20.639	NIC
3	394400.752	8031003.946	20.550	DPY
4	394416.107	8031001.675	20.422	DPY
6	394405.879	8031037.824	20.034	DPY
7	394388.978	8031045.160	20.020	DPY

The survey information on this plan conforms to the minimum accuracies as per the Public Safety Business Agency Survey Brief Item 14

....
Surveyor/Director Date

LEGEND

SIGN	SGN
KERB OUTLET	KO
POSSIBLE GREASE TRAP	SM
INSPECTION OPENING	IO
FIRE HYDRANT	FH
WATER METER	WM
POWER POLE	PP
COMMUNICATIONS MH	TIB
SURVEY MARK	△
SURVEY STATION	STN
TREE	⊛
SURFACE LEVEL	+
OVERHEAD POWER	—e—e—e—
COMMUNICATIONS CABLE -FROM RECORDS	— TE — TE —
CHANGE OF GRADE	.....
BUILDING	
EDGE OF CONCRETE	
FENCE	—//—//—//—
EAVE LINE	
ROAD CROWN	
WATER MAIN - FROM RECORDS	—W—W—W—

This plan has been prepared for the PUBLIC SAFETY BUSINESS AGENCY from a combination of field survey and existing records for the purpose of showing the physical features of the land to assist in designing future development, and should not be used for any other purpose.

The title boundaries shown hereon were surveyed as part of IS269929.

Services shown hereon where located where possible by field survey completed on 07-03-2018. If not able to be located, known services have been shown from the records of the relevant authorities or service providers where available and have been noted accordingly on this plan. All services shown from records only will need verification prior to, or during work on site.
Prior to any demolition, excavation or construction on site, the relevant authority should be contacted for:

- Verification of all services plotted from records only; and
- Possible location of any services altered since this survey was completed or any new services installed either on or adjacent to the site.

Before starting any demolition, excavation or construction on the site, the relevant person should make an independence and updated enquiry of 'dial before you dig' and any relevant service providers to ascertain the existence of further services (if any) and the accurate location of those not able to have been surveyed at the time of preparing this plan (or data).

- No responsibility can be accepted by TerraModus Surveying Pty Ltd for any damage caused to any underground service or any loss or injury so suffered if enquiry and verification have not been completed in accordance with this note.
- This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

NOTES

PROPERTY DESCRIPTION: Lot 1 ON RP731552 AND LOT 217 ON E7291

PROPERTY AREA: 2024m²

LOCAL AUTHORITY: CASSOWARY COAST REGIONAL COUNCIL

LEVEL DATUM: AHD

ORIGIN OF LEVELS: OPM 9327 (RL 20.027m)

CO-ORDINATE DATUM: ARBITRARY

ORIGIN OF CO-ORDINATES: OPM 9327
E 394530.297
N 8030971.124

MERIDIAN: Vide IS269929

CONTOUR INTERVALS: 0.25m
MAJOR CONTOURS: 1.0m
MINOR CONTOURS: 0.25m

Minimum Floor Level: NA

ANNUAL RETURN INTERVAL (ARI) FLOOD EVENTS DO NOT REACH THE PROPERTY

SOME RL'S MAY BE OMITTED FOR CLARITY

REFER TO IS269929 FOR ENCROACHMENT DETAILS

Scale 1:200 at A1
0 1 2 5 10

AMENDMENTS

ISSUE	DATE	SUBJECT	AUTHORISED
A	16-03-2018	PRELIMINARY	ELP

DRAWING INDEX SYSTEM
FOR BUILDING and ASSET SERVICES USE ONLY

- ☐ BUILDING PLATFORM
- ☐ CARPARK
- ☐ COURTS
- ☐ EARTHWORKS
- ☐ OTHER
- ☐ RETAINING WALLS
- ☐ ROADWORKS/ACCESS ROADS
- ☐ SEWERAGE PLANS
- ☐ SPORTS FACILITIES
- ☐ STANDARDS
- ☐ STORMWATER PLANS
- ☒ SURVEY PLAN
- ☐ WATER RETICULATION SITE PLAN
- ☐ WATER RETICULATION

Queensland Government

PUBLIC SAFETY BUSINESS AGENCY

TerraModus SURVEYING
A.C.N. 125 086 973
PO BOX 6594, CAIRNS QLD 4870
PH 0413 580 146
www.terramodus.com.au

DRAWN: ELP DATE: 12-03-2018

DISCIPLINE TEAM LEADER: ELP DATE: 16-03-2018

AUTHORISED FOR ISSUE DATE: 16-03-2018

5 - 7 RYRIE STREET
EL ARISH

CONTOUR AND DETAIL SURVEY

SCALE 1:200 AT A1 SIZE

MASTER SITE NUMBER

CLIENT REFERENCE NUMBER

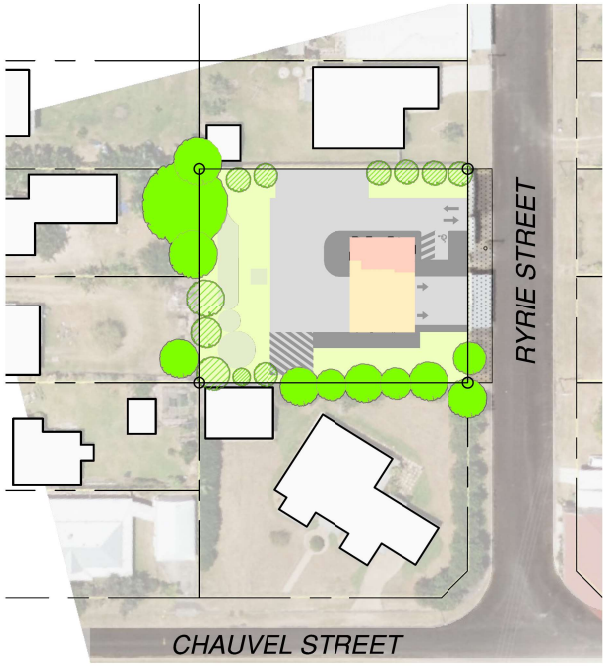
DRAWING NUMBER 1387 /SD / SV01

ISSUE A

SHEET NO 01

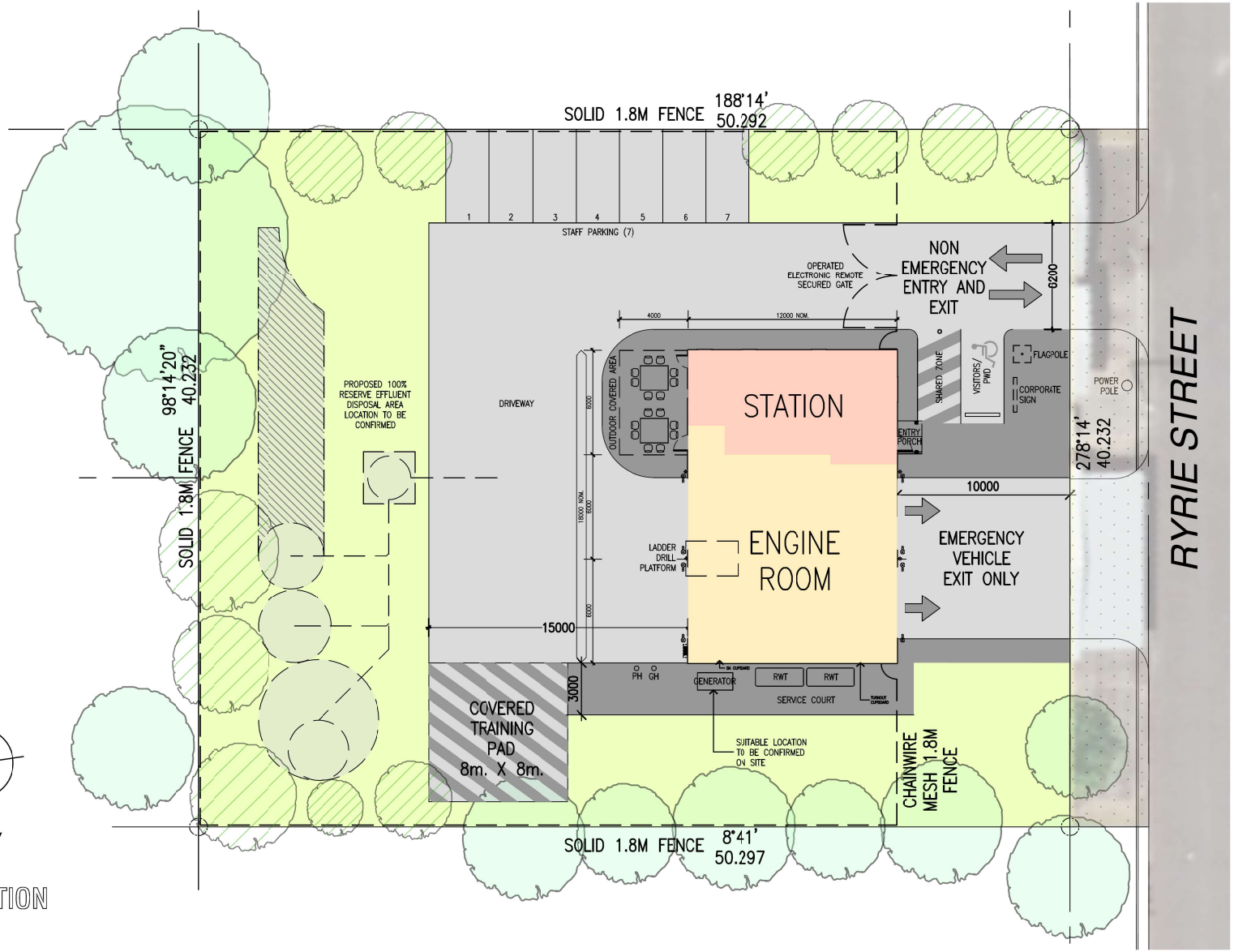
Appendix 5

Proposal Plan



LOCATION PLAN

SCALE 1:1000@A3



ALL DIMENSIONS AND LAYOUTS ARE **INDICATIVE ONLY** SUBJECT TO CONFIRMATION ON SITE AND CONSULTATION WITH THE CLIENT IN DETAILED DESIGN

LANDSCAPING **INDICATIVE ONLY** SIZE AND TYPE OF PLANTING TO BE DETERMINED AT DETAILED DESIGN PHASE

EXISTING FOLIAGE

PROPOSED LANDSCAPING

PRELIMINARY

NOT FOR CONSTRUCTION

AMENDMENTS

ISSUE	DATE	SUBJECT	CHECKED BY
A	22.06.2018	PRELIMINARY ISSUE	N. SAPPHOKHA
B	18.09.2018	REISSUE	N. SWAINSTON
C	05.10.2018	ADJUSTED PLAN TO FEEDBACK	N. SWAINSTON
D	08.10.2018	PLAN APPENDED DUE TO POWER POLE	N. SAPPHOKHA
E	01.11.2018	ADJUSTED PLAN TO FEEDBACK	N. SWAINSTON

Queensland Government
Public Safety Business Agency

ASSET & PROCUREMENT SERVICES

IN PARTNERSHIP WITH

QUEENSLAND FIRE & EMERGENCY SERVICES

PROPERTY AND/OR FACILITY

EL ARISH AUXILIARY FIRE AND RESCUE STATION

ADDRESS

5-7 RYRIE STREET, EL ARISH.
LOT 100 ON SP306470

SHEET DESCRIPTION

PROPOSED SITE PLAN

SCALE	AT
1:250	A3

CAD FILE PATHWAY

...\EL ARISH FS1\181101_Arish

DRAWING NO.	SHEET NO.	ISSUE
SD01	1 of 2	E

Appendix 6

EPBC Protected Matters Report

Australian Government
Department of the Environment and Energy

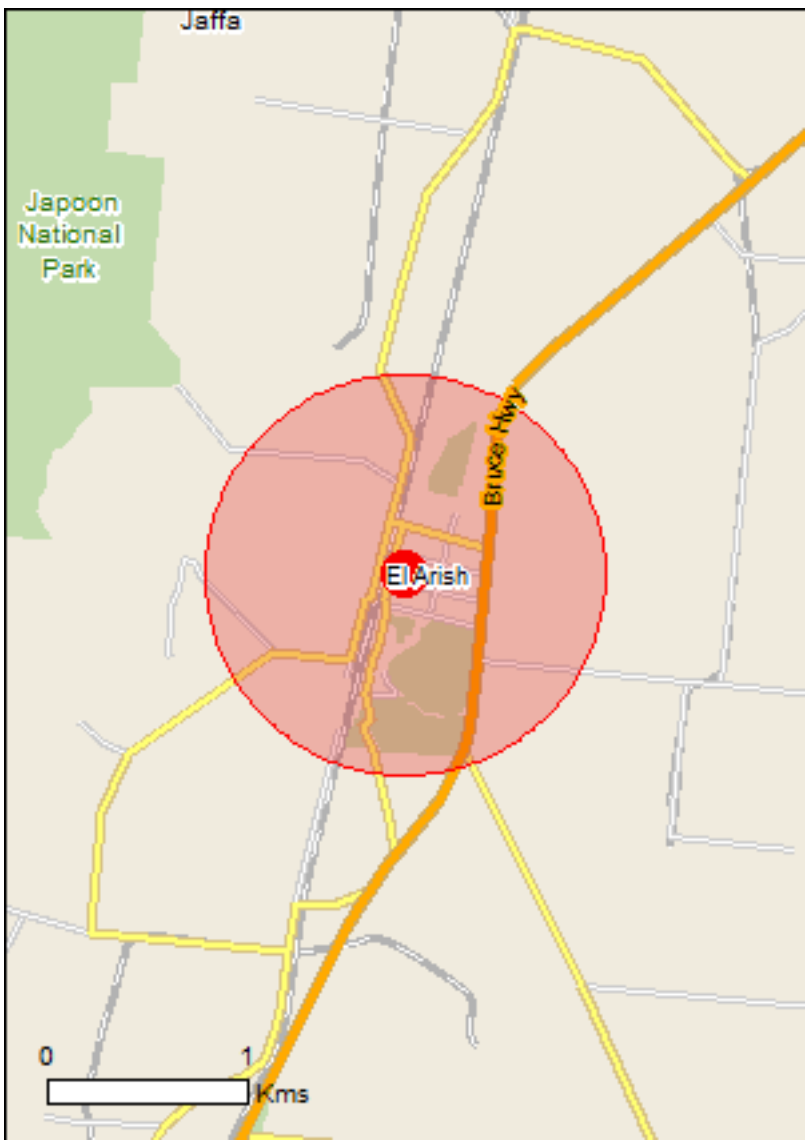
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

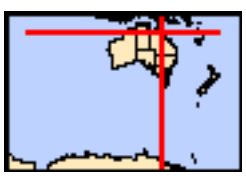
Report created: 21/12/18 15:20:09



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	24
Listed Migratory Species:	18

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	24
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	26
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities		[Resource Information]
For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.		
Name	Status	Type of Presence
Broad leaf tea-tree (Melaleuca viridiflora) woodlands in high rainfall coastal north Queensland	Endangered	Community may occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Casuarius casuarius johnsonii Southern Cassowary, Australian Cassowary, Double-wattled Cassowary [25986]	Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria dayi Australian Lace-lid, Lace-eyed Tree Frog, Day's Big-eyed Treefrog [86707]	Endangered	Species or species habitat likely to occur within area
Litoria nannotis Waterfall Frog, Torrent Tree Frog [1817]	Endangered	Species or species habitat likely to occur within area
Litoria rheocola Common Mistfrog [1802]	Endangered	Species or species habitat likely to occur within area
Mammals		

Name	Status	Type of Presence
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat may occur within area
Dasyurus maculatus gracilis Spotted-tailed Quoll (North Queensland), Yarri [64475]	Endangered	Species or species habitat may occur within area
Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat [180]	Vulnerable	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Mesembriomys gouldii rattoides Black-footed Tree-rat (north Queensland), Shaggy Rabbit-rat [87620]	Vulnerable	Species or species habitat may occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Pteropus conspicillatus Spectacled Flying-fox [185]	Vulnerable	Species or species habitat known to occur within area
Rhinolophus robertsi Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat may occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Canarium acutifolium [23956]	Vulnerable	Species or species habitat likely to occur within area
Carronia pedicellata [24178]	Endangered	Species or species habitat likely to occur within area
Myrmecodia beccarii Ant Plant [11852]	Vulnerable	Species or species habitat likely to occur within area
Phaius pictus [22564]	Vulnerable	Species or species habitat likely to occur within area
Polyphlebium endlicherianum Middle Filmy Fern [87494]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species	[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.	
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		

Name	Threatened	Type of Presence
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat likely to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Reptiles		
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Plants		
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Sage, Wild Sage [10892]		
Parthenium hysterophorus		
Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Sagittaria platyphylla		
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area
Lepidodactylus lugubris		
Mourning Gecko [1712]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-17.80557 146.00365

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix 7

State Interest Trigger Mapping

State Planning Policy

Making or amending a local planning instrument and designating land for community infrastructure

Date: 21/12/2018

Department of State Development, Manufacturing, Infrastructure and Planning

Queensland Government

0 10 20 30 40

Metres

Disclaimer:
This map has been prepared with due care based on the best available information at the time of publication. However, the State of Queensland (acting through the department) makes no representations, either express or implied, that the map is free from errors, inconsistencies or omissions. Reliance on information contained in this map is the sole responsibility of the user. The State disclaims responsibility for any loss, damage or inconvenience caused as a result of reliance on information or data contained in this map.

Legend

Drawn Polygon Layer

Override 1

Cadastre

Cadastre

Important agricultural areas

Important agricultural areas

Flood hazard area - Level 1 - Queensland floodplain assessment overlay

Flood hazard area - Level 1 - Queensland floodplain assessment overlay

Date: 21/12/2018

State Planning Policy

Making or amending a local planning instrument and designating land for community infrastructure

Department of State Development, Manufacturing, Infrastructure and Planning

Appendix 8

Geotechnical Report

Public Safety Business Agency

c/- Business Services Division
GPO Box 1440
Brisbane QLD 4001

29 May 2018

Report No. 18280_1

Attention: Julie Huynh

GEOTECHNICAL INVESTIGATION
Soil Testing for 5-7 Ryrie St, El Arish

1. INTRODUCTION

PDR | SMEC (PDR) was engaged by the Public Safety Business Agency (PSBA) to undertake a geotechnical investigation for the proposed fire station at 5-7 Ryrie St, El Arish.

5 Ryrie St (the western lot) contains an existing residence with an attached open shed/garage and a concrete pad adjacent the rear boundary. There are mature trees along the western boundary. 7 Ryrie St (the eastern lot) contains the existing fire station. There are mature trees along the northern boundary, and one tree within the yard. Both sites have maintained yards of short grass.

Preliminary designs for the proposed fire station were supplied to PDR on 24 April 2018. These designs show the majority of the building and pavement constructed on what is currently 5 Ryrie St. The designs show the on-site septic system and beds near the eastern boundary of 7 Ryrie St.

The aim of our investigation is to provide a site classification for foundation design in accordance with AS2870-2011 *Residential slabs and footings*. PDR were also commissioned to provide a site and soil evaluation for on-site effluent disposal. Refer to PDR report 18280_2 dated 29 May 2018.

2. SITE INSPECTION AND FIELD OBSERVATIONS

The site inspection and field testing was undertaken on 1 May 2018, and comprised the following:

- Verification of the underground services in the area where testing was to occur
- Excavation of four (4) Test Pits (TP1 to TP4) within the lot and easement for sampling and logging
- Undertaking of four (4) Dynamic Cone Penetrometer (DCP) tests adjacent TP1 to TP4 and three (3) additional DCP test at locations where excavator access was not possible (DCP5 – DCP7)

Correspondence PO Box 2551 Cairns 4870
Ph: (07) 4051 5599
Fax: (07) 4051 5455
Email: admin@pdrengineers.com.au

- Collection of three (3) disturbed soil samples from TP2 and TP4 for the purpose of Atterberg limits testing
- Collection of three (3) disturbed soil samples from TP2 and TP3 for the purpose of Emerson testing
- Collection of three (3) disturbed soil samples from TP2, TP3 and TP4 for the purpose of California Bearing Ratio (CBR) testing
- Collection of two (2) topsoil samples from TP1 and TP4 for the purpose of an Agricultural testing suite and Agronomist's report.

Soil conditions were relatively consistent throughout 5-7 Ryrie St, with only minor differences in depth to certain layers. A topsoil comprising Silty CLAY extended to a depth of 0.1 to 0.3m. This was underlain by brown to dark brown Clayey SAND to a depth of between 1.1 and 1.5m where grey mottled brown Sandy CLAY and Silty CLAY were encountered. This was underlain by a layer of SAND or Gravelly SAND at a depth of 1.95 to 2.45m, which was underlain by hard Silty CLAY to test pit termination at 3.0m.

Reference to Test pit and DCP logs are attached as Appendix A. Site photographs associated with excavations of Test Pits is provided as Appendix B, with Appendix C consisting of Laboratory data.

3. LABORATORY RESULTS

Laboratory testing of the soil samples indicate samples are predominately Sandy CLAYs and Clayey SANDs. Due to an undisturbed sample being unable to be collected, a shrink/swell analysis was not conducted. Notwithstanding, samples were provided to the laboratory to undertake Atterberg limits where necessary for foundations. A summary of the Laboratory Results are provided in Table 1. Complete results are provided in Appendix C.

Topsoil sampling was taken in order to conduct an Agronomist's Report for reuse of the topsoil. Results of the Agronomist's Report and recommendations for treatment are attached and indicate treatment will be required if reused for trafficable grassed fields.

Emerson testing indicates a low to medium dispersibility. Earthworks at the time of construction will need to consider the effect of soil transportation during rain events.

Table 1 Summary of Laboratory Results

Location	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Moisture Content (%)	Particle Size Distribution	Emerson Class Number	California Bearing Ratio 98% Compaction (%)	Agricultural Suite
TP1 0.4m	-	-	-	-	-	82% < 2.36 41% < 0.075	-	-	-
TP2 0.4m	29	16	13	7.5	15.1	-	5	4.0	-
TP2 1.0m	31	19	12	7.5	-	-	6	-	-
TP3 0.5m	-	-	-	-	12.4	79% < 2.36 27% < 0.075	-	6.0	-
TP3 1.1m	-	-	-	-	-	80% < 2.36 24% < 0.075	6	-	-
TP4 1.2m	32	19	13	9.0	20.4	93% < 2.36 53% < 0.075	-	3.5	-
TP1 Top	-	-	-	-	-	-	-	-	See Appendix
TP4 Top	-	-	-	-	-	-	-	-	See Appendix

4. RECOMMENDED DESIGN CRITERIA

4.1 Shallow Foundation Design

Classification of a site in accordance with AS 2870 – 2011 *Residential slabs and footings* strictly applies only to single story residential structures, but can be used to assist with design and construction of foundations in similarly designed buildings by providing an approximate indication of possible reactive soil movement.

Preliminary review of the preliminary building proposal suggests the building will likely be a single story structure and associated pavements and facilities and constructed at the southern end of the site

Building Construction on Natural Surface

AS2870-2011 *Residential slabs and footings* indicates the site in its current condition must be designated **Class P** due to the low strength near surface sands and clays. In order to limit settlements within 25mm, it is suggested allowable bearing capacities be limited to 40 kPa.

Should a class S site be required, ground improvement works can be conducted by the removal of the near surface 0.6 m (where beneath the building footprint) compacted and then re-installed in accordance with Clause 6.2.2 of AS3790 Guidelines on earthworks for Commercial and Residential Developments in lifts of no more than 150 mm. In addition, corner bars to foundations will be required in accordance with AS2870 during foundation design as bearing capacities according to Laboratory and field testing may not meet 100 kPa. It is critical that retesting of the site be undertaken prior to building construction to ensure the site meets the above performance criteria.

Building Construction on Imported Fill

Supplied survey and preliminary designs indicate that there is presently no intention to fill above the natural surface level. Notwithstanding, where poor ground is present, removal and replacement with Engineered fill shall be in accordance with Clause 6.2.2 of AS3798 Guidelines on earthworks for Commercial and Residential Developments.

Where fill is to be placed, all topsoil, loose material, organic material and uncontrolled fill is to be removed from the site prior to importing of any engineered material.

In particular, the following must be considered:

- Filling is to extend beyond the building envelope a minimum of 2.5 m to ensure compactive effort beneath foundations is achieved. Trimming of compacted batter to reach desired profile is permitted
- Filling is to be provided in accordance with AS2870 Appendix C6.4.2 and AS3798 Clause 6.2.2 and is dependent on the material selected for fill

- Foundations are to be founded on good bearing soil at the appropriate depth, with bearing confirmation and subgrade compacted to a minimum dry density ratio of 98% relative to standard compaction
- Inspection is to be conducted during filling in 150 mm lifts with compaction certified by a suitably qualified person
- Removal of all vegetation and topsoil is to be undertaken prior to import, placement and compaction of fill
- Adequate surface and sub-surface drainage should be installed where appropriate to maintain and protect excavations.

Based on the long term loadings anticipated to be present within the proposed buildings, settlement predictions based on the depth of fill may need to be undertaken following receipt of finals design levels if the foundations are not keyed into natural ground.

Alternatively, building articulation can be integrated into the buildings structural design that will allow the building to accommodate such movements.

Notwithstanding, the following will need to be considered in the final design:

- Final fill levels relative to finished floor area
- Receipt of live loads
- Building dead loads
- Fill type and compaction method adopted by contractor

4.2 Deep Foundations

Should a shallow foundation system not meet the required performance criteria, bored pier foundations can be considered. Where a combination of bored piers and shallow foundations are implemented within one structure, a method of articulation may be required to account for differential settlement.

Uncased bored piers can usually be constructed in stiff to hard clays using an excavator-mounted boring attachment or a truck-mounted boring rig, although these methods have several restrictions. Alternatively, a large capacity truck-mounted or track-mounted short flight hydraulic rotary rig can be used. Excavated trenches suggest cave in and/or collapse is unlikely.

The design of bored pier foundations, with a founding depth of greater than four pier diameters should be based on the preliminary parameters shown in Table 2 below. It is noted that the parameters are based on the worst case results identified within TP4/DCP4 and can be refined during construction by a suitably qualified Geotechnical Engineer or Engineering Geologist.

Table 2 Parameters for long bored pier foundations at 5-7 Ryrie St El Arish

Depth Range (m)	Ultimate Strength		Bulk Unit Weight (kN/m^3)
	End Bearing Pressure (kPa)	Shaft Adhesion (kPa)	
0 – 0.8	0	0	20
0.8 – 1.5	75	0	20
1.5 – 2.5	250	30	22
> 2.5	700	45	22

A geotechnical reduction factor (Øg) of 0.4 should be applied to the above values of end bearing and shaft adhesion to obtain the design geotechnical strength (Rug) for limit state design of piles, or a factor of safety of 2.5 applied for working stress design.

The parameters given above are reliant on clean rough sockets which are free of loose debris on the base of the hole and smear on the sides of the hole. Excavations should be poured immediately after drilling, prior to any groundwater accumulation and softening of the excavated socket. The shaft adhesion developed over the upper 0.8m should be ignored in pile capacity calculations due to seasonal soil cracking.

4.3 Flexible/Rigid Pavements

Preliminary designs indicate a paved carpark and driveway around the proposed structure. The results of DCP indicate poor bearing capacity based on in-situ conditions, while results from CBR tests in TP2 and TP4 were 4.0 and 3.5% respectively. As a result, the same compaction regime as described in Section 4.1 should be undertaken to ensure suitable pavement construction.

Notes:

RESPONSIBILITIES (A.S. 2870 Supp 1). Footing design and construction involves a number of steps; site classification, selection of the footing system, structural design, construction in accordance with the required design details and construction methods, and proper maintenance. In addition to the builder, this process may involve an engineer, the Building Authority, the owner, and all parties who share responsibilities for any failure. In particular, the owner has a responsibility to ensure the site is properly maintained.

Note: Because the investigation is limited in scope and extent, it is possible that areas may exist which differ from those shown in the test records and used in the site classification. Should any variation from the reported conditions be encountered during excavation work, a Building Services Authority Registered Site Classifier or a Registered Practicing Engineer must be notified immediately so that reappraisal of the classification can be made. Attention is drawn to the present or any future owners of their responsibilities for foundation maintenance as detailed in A.S. 2870 and CSIRO Brochure “Foundation Maintenance and Footing Performance: A Homeowner’s Guide.”

APPENDIX A

Test Pit Logs

Test Pit and DCP Locations –

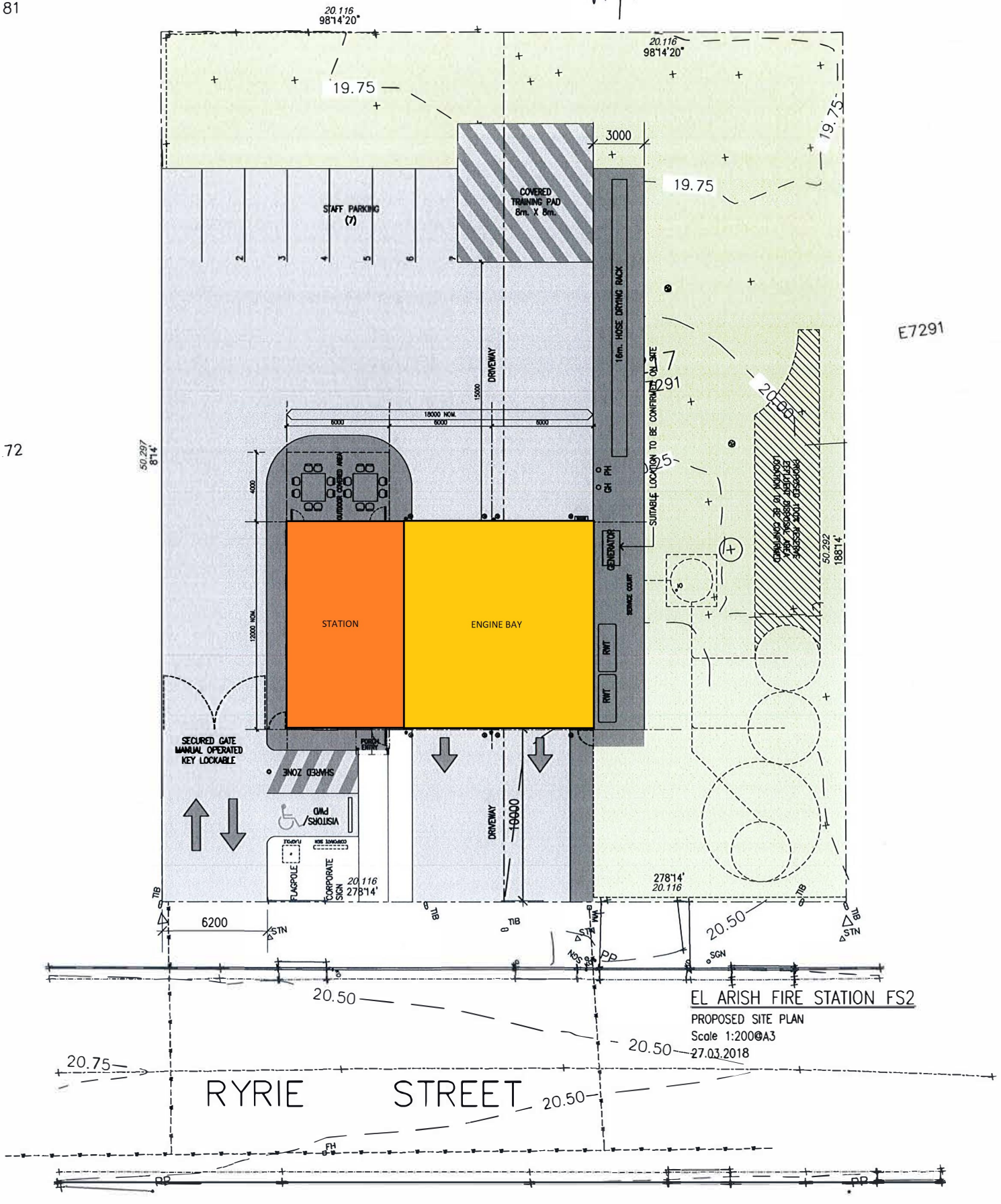
JOHN BOLGER
ASSISTANT COMMISSIONER
FAR NORTHERN REGION

E7291

Adam Gwin
A/AC 28/4/18.

E7291

81



EL ARISH FIRE STATION FS2
PROPOSED SITE PLAN
Scale 1:200@A3
27.03.2018

72

81

Test Pit:	TP1 / DCP1	Checked:	CT
Client:	Public Safety Business Agency	GW (m):	1.95m
Project:	5-7 Ryrie St, El Arish	Job No:	18280
Logged by:	AH	Date:	01/05/2018
Machine:	4t Excavator (300mm Bucket)	Location:	See attached plan

Depth (m)	Lithology	Description/Comments	Sample	Density	Dynamic Cone Penetration (per 100mm)	Depth (m)
0.00	TOP	TOPSOIL comprising Silty CLAY (CI), medium plasticity, dark brown, moist.	D Topsoil	F	2	0.00
0.10					2	0.10
0.20					3	0.20
0.30	SC	Clayey SAND (SC), well graded, brown, sub-rounded to sub-angular, moist.		MD	2	0.30
0.40			D 0.4m		2	0.40
0.50					3	0.50
0.60					3	0.60
0.70					5	0.70
0.80					6	0.80
0.90					6	0.90
1.00					5	1.00
1.10	CL	Silty CLAY (CL), low plasticity, brown-grey, moist.		F	4	1.10
1.20					1	1.20
1.30					2	1.30
1.40					4	1.40
1.50				VSt	8	1.50
1.60					9	1.60
1.70	CL	Sandy CLAY (CL), low plasticity, grey mottled brown, moist.	D 1.7m	F	4	1.70
1.80					2	1.80
1.90					2	1.90
2.00	SW	Gravelly SAND (SW), well graded, brown, sub-rounded to sub-angular, wet, fine grained gravel, trace clay. Groundwater at 1.95m, significant inflow.		MD	3	2.00
2.10			D 2.1m		7	2.10
2.20	CL	Silty CLAY (CL), low plasticity, grey mottled brown, wet.		H	6	2.20
2.30					12	2.30
2.40					15	2.40
2.50					17	2.50
2.60					15	2.60
2.70	CI	Sandy CLAY (CI), medium plasticity, grey mottled brown, wet, fine grained sand.		H	15	2.70
2.80		Test Pit terminated at 2.8m due to cave in.			8	2.80
2.90					7	2.90
3.00						3.00
3.10					82	3.10

Test Pit:	TP2 / DCP2	Checked:	CT
Client:	Public Safety Business Agency	GW (m):	2.1m
Project:	5-7 Ryrie St, El Arish	Job No:	18280
Logged by:	VS	Date:	01/05/2018
Machine:	4t Excavator (300mm Bucket)	Location:	See attached plan

Depth (m)	Lithology	Description/Comments	Sample	Density	Dynamic Cone Penetration (per 100mm)	Depth (m)
0.00	TOP	TOPSOIL comprising Silty Sandy CLAY (CH), high plasticity, black, moist, contains roots up to 15mm.	D Top	S	2	0.00
0.10					1	0.10
0.20					1	0.20
0.30					1	0.30
0.40	CL	Silty CLAY (CL), low plasticity, grey-brown, some gravel, moist.	B 0.4m	F	1	0.40
0.50					1	0.50
0.60					2	0.60
0.70					2	0.70
0.80					1	0.80
0.90					3	0.90
1.00	CL	Sandy CLAY (CL), low plasticity, brown, moist, fine to medium grained sand.	D 1.0m	St	3	1.00
1.10					3	1.10
1.20					4	1.20
1.30					5	1.30
1.40					6	1.40
1.50	CL	Gravelly CLAY (CL), low plasticity, brown-red, moist.	D 1.5m	VSt-H	6	1.50
1.60					11	1.60
1.70					7	1.70
1.80					8	1.80
1.90					14	1.90
2.00	CI	Sandy CLAY (CI), medium plasticity, grey mottled brown, wet.	D 2.0m	H	25	2.00
2.10		Groundwater at 2.0m, significant inflow.			12DB(20mm)	2.10
2.20						2.20
2.30	SW	SAND (SW), well graded, brown, sub-rounded to sub-angular, wet.	D 2.3m	VD		2.30
2.40						2.40
2.50						2.50
2.60	CL	Sandy CLAY (CL), low plasticity, grey mottled brown, fine grained sand, trace medium grained sand, moist to wet.		H		2.60
2.70		Test pit terminated at 2.7m due to cave in.				2.70
2.80						2.80
2.90						2.90
3.00						3.00
3.10					83	3.10

Test Pit:	TP3 / DCP3	Checked:	CT
Client:	Public Safety Business Agency	GW (m):	2.3m
Project:	5-7 Ryrie St, El Arish	Job No:	18280
Logged by:	AH	Date:	01/05/2018
Machine:	4t Excavator (300mm Bucket)	Location:	See attached plan

Depth (m)	Lithology	Description/Comments	Sample	Density	Dynamic Cone Penetration (per 100mm)	Depth (m)
0.00	TOP	TOPSOIL comprising Silty CLAY (CI), medium plasticity, dark brown, moist.	D Topsoil	F	2	0.00
0.10					2	0.10
0.20	TOP	Brown-red.		St	5	0.20
0.30		Sandy CLAY (CL), low plasticity, dark brown, moist, fine to medium grained sand.		F	3	0.30
0.40					3	0.40
0.50	CL		D 0.5m		2	0.50
0.60					2	0.60
0.70					1	0.70
0.80		Grey mottled brown, fine grained sand.		St	1	0.80
0.90					2	0.90
1.00					5	1.00
1.10	SP		D 1.1m		3	1.10
1.20					3	1.20
1.30					3	1.30
1.40					5	1.40
1.50					8	1.50
1.60		Silty CLAY (CL), low plasticity, grey mottled brown, trace white coarse grained sand.		H	10	1.60
1.70					11	1.70
1.80					15	1.80
1.90					16	1.90
2.00	CL		D 2.0m		11	2.00
2.10					8	2.10
2.20					9	2.20
2.30		Groundwater at 2.3m, significant inflow.			7	2.30
2.40					5	2.40
2.50	SW	Gravelly SAND (SW), well graded, brown, sub-rounded to sub-angular, wet.		D	6	2.50
2.60					5	2.60
2.70		Silty CLAY (CL), low plasticity, grey mottled brown, moist to wet.		H	10	2.70
2.80	CL				8	2.80
2.90			D 2.9m		8	2.90
3.00		Test pit terminated at 3.0m due to target depth.				3.00
3.10						3.10

Test Pit:	TP4 / DCP4	Checked:	CT
Client:	Public Safety Business Agency	GW (m):	2.0m
Project:	5-7 Ryrie St, El Arish	Job No:	18280
Logged by:	AH	Date:	01/05/2018
Machine:	4t Excavator (300mm Bucket)	Location:	See attached plan

Depth (m)	Lithology	Description/Comments	Sample	Density	Dynamic Cone Penetration (per 100mm)	Depth (m)
0.00	TOP	TOPSOIL comprising Sandy CLAY (CI), medium plasticity, dark brown, moist.	D Topsoil	S	1	0.00
0.10		Dark brown-red.		S	2	0.10
0.20					2	0.20
0.30					2	0.30
0.40	TOP				2	0.40
0.50					1	0.50
0.60					0	0.60
0.70	CL	Silty CLAY (CL), low plasticity, brown mottled orange-brown, moist.		S-F	2	0.70
0.80					1	0.80
0.90					2	0.90
1.00					2	1.00
1.10					2	1.10
1.20			B 1.2m		1	1.20
1.30					3	1.30
1.40					1	1.40
1.50		Grey mottled brown.		VSt	3	1.50
1.60					4	1.60
1.70					6	1.70
1.80	CL				4	1.80
1.90					6	1.90
2.00		Groundwater, significant inflow at 2.0m.			2	2.00
2.10	SC	Clayey SAND with gravel (SC), well graded, brown, sub-rounded to sub-angular, wet.	D 2.1m	D	3	2.10
2.20					5	2.20
2.30					4	2.30
2.40					7	2.40
2.50					10	2.50
2.60		Silty CLAY (CL), low plasticity, brown mottled orange-brown, moist to wet.		H	10	2.60
2.70					9	2.70
2.80	CL				9	2.80
2.90			D 2.9m		10	2.90
3.00		Test pit terminated at 3.0m due to target depth.				3.00
3.10					85	3.10

PDR ENGINEERS PTY LTD
258 Mulgrave Road
Cairns QLD 4870
ABN: 88 126 211 461
Telephone: (07) 4051 5599
Facsimile: (07) 4051 5455
PO Box 2551
Cairns QLD 4870

CLIENT	Public Safety Business Agency
JOB NO	18280
PROJECT	5-7 Ryrie St, El Arish
SAMPLE LOCATION	
SAMPLE DESCRIPTION	

REPORT NUMBER	18280
REPORT DATE	24/05/2018
TEST DATE	1/05/2018
TECHNICIAN	AH
CLIENT ORDER NO	
CLIENT JOB NO	

DEPTH (Meters)	*TEST COMMENCED AT NATURAL SURFACE									
	DCP1		DCP2		DCP3		DCP4			
	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np
0.0 -- -- 0.1	2		2		2		1			
0.1 -- -- 0.2	2		1		2		2			
0.2 -- --0.3	3		1		5		2			
0.3 -- --0.4	2		1		3		2			
0.4 -- --0.5	2		1		3		2			
0.5 -- --0.6	3		1		2		1			
0.6 -- --0.7	3		2		2		0			
0.7 -- -- 0.8	5		2		1		2			
0.8 -- --0.9	6		1		1		1			
0.9 -- -- 1.0	6		3		2		2			
1.0 -- --1.1	5		3		5		2			
1.1 -- --1.2	4		3		3		2			
1.2 -- --1.3	1		4		3		1			
1.3 -- -- 1.4	2		5		3		3			
1.4 -- --1.5	4		6		5		1			
1.5 -- --1.6	8		6		8		3			
1.6 -- --1.7	9		11		10		4			
1.7 -- -- 1.8	4		7		11		6			
1.8 -- --1.9	2		8		15		4			
1.9 -- --2.0	2		14		16		6			
2.0 -- --2.1	3		25		11		2			
2.1 -- --2.2	7		12DB(20mm)		8		3			
2.2 -- --2.3	6				9		5			
2.3 -- --2.4	12				7		4			
2.4 -- --2.5	15				5		7			
2.5 -- -- 2.6	17				6		10			
2.6 -- --2.7	15				5		10			
2.7 -- -- 2.8	15				10		9			
2.8 -- --2.9	8				8		9			
2.9 -- -- 3.0	7				8		10			
3.0 -- -- 3.1										
3.1 -- --3.2										
3.2 -- -- 3.3										
3.3 -- -- 3.4										
3.4 -- -- 3.5										
WATER INFLOW:										

PDR ENGINEERS PTY LTD
258 Mulgrave Road
Cairns QLD 4870
ABN: 88 126 211 461
Telephone: (07) 4051 5599
Facsimile: (07) 4051 5455
PO Box 2551
Cairns QLD 4870

CLIENT	Public Safety Business Agency
JOB NO	18280
PROJECT	5-7 Ryrie St, El Arish
SAMPLE LOCATION	
SAMPLE DESCRIPTION	

REPORT NUMBER	18280
REPORT DATE	24/05/2018
TEST DATE	1/05/2018
TECHNICIAN	AH
CLIENT ORDER NO	
CLIENT JOB NO	

DEPTH (Meters)	*TEST COMMENCED AT NATURAL SURFACE									
	DCP5		DCP6		DCP7					
	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np
0.0 -- -- 0.1	1		1		1					
0.1 -- -- 0.2	3		1		1					
0.2 -- --0.3	3		2		2					
0.3 -- --0.4	3		3		1					
0.4 -- --0.5	1		2		1					
0.5 -- --0.6	3		2		2					
0.6 -- --0.7	3		3		1					
0.7 -- -- 0.8	3		3		2					
0.8 -- --0.9	4		4		3					
0.9 -- -- 1.0	3		3		6					
1.0 -- --1.1	4		4		7					
1.1 -- --1.2	3		5		7					
1.2 -- --1.3	4		7		5					
1.3 -- -- 1.4	3		7		2					
1.4 -- --1.5	3		4		3					
1.5 -- --1.6	3		4		3					
1.6 -- --1.7	7		6		3					
1.7 -- -- 1.8	7		4		4					
1.8 -- --1.9	9		5		4					
1.9 -- --2.0	4		4		4					
2.0 -- --2.1	2		5		3					
2.1 -- --2.2	4		5		6					
2.2 -- --2.3	6		18		5					
2.3 -- --2.4	12		12		3					
2.4 -- --2.5	10		11		4					
2.5 -- -- 2.6	9		6		9					
2.6 -- --2.7	12		9		18					
2.7 -- -- 2.8	11		6		19					
2.8 -- --2.9	11		8		24					
2.9 -- -- 3.0	7		8		28					
3.0 -- -- 3.1										
3.1 -- --3.2										
3.2 -- -- 3.3										
3.3 -- -- 3.4										
3.4 -- -- 3.5										
WATER INFLOW:										

APPENDIX B

Site Photographs

Photo 1 – 5 Ryrie St, El Arish

Photo 2 – 7 Ryrie St, El Arish

Photo 3 – TP1 excavation

Photo 4 – TP2 excavation

Photo 5 – TP3 excavation

Photo 6 – TP4 excavation

APPENDIX C

Laboratory Results

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: **Cairns Laboratory**
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

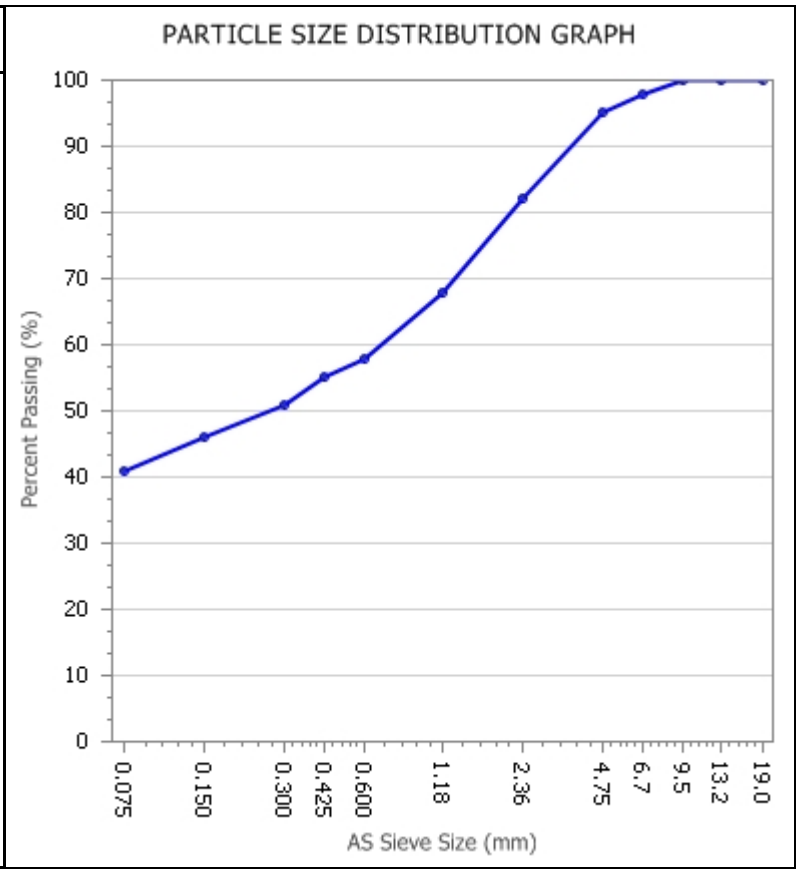
PARTICLE SIZE DISTRIBUTION REPORT

Client:	PDR Engineers	Report Number:	11512/R/18825-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP1 0.4m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.6.1

Sample Number	11512/S/50670	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP1
Date Sampled	4/05/2018	From (m)	0.4m
Sampled By	Client Sampled		
Date Tested	8/05/2018		
Material Source	Client Supplied	Material Type	Supplied Samples

AS Sieve (mm)	Specification Minimum	**Percent Passing (%)**	Specification Maximum
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**98**	
4.75		**95**	
2.36		**82**	
1.18		**68**	
0.600		**58**	
0.425		**55**	
0.300		**51**	
0.150		**46**	
0.075		**41**	



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W9Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

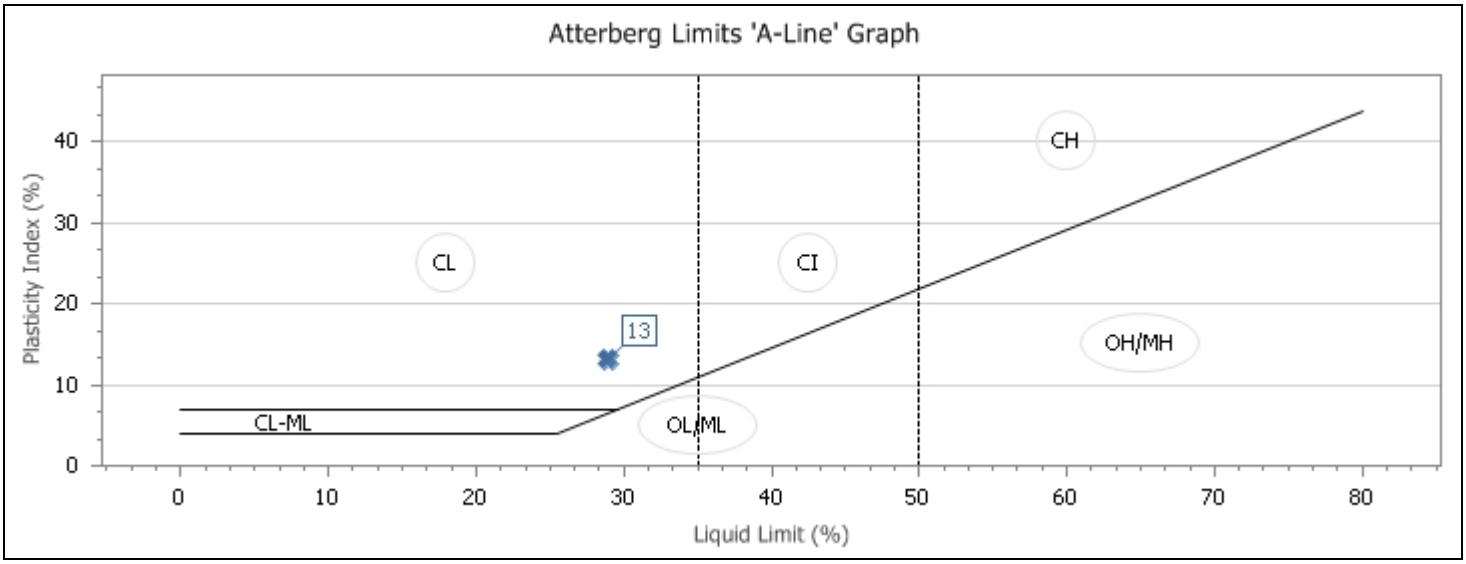
ATTERBERG LIMITS REPORT

Client:	PDR Engineers	Report Number:	11512/R/18821-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 0.4m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.1.2, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS1726 (App. A)		
Sample Number	11512/S/50667	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP2
Date Sampled	4/05/2018	From (m)	0.4m
Sampled By	Client Sampled		
Date Tested	15/05/2018		
Att. Drying Method	Oven Dried	Material Source	Client Supplied
Atterberg Preparation	Dry Sieved	Material Type	Supplied Samples
Material Description	Sandy Silt - Light Brown		

Atterberg Limits Results

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**29**	
Plastic Limit (%)		**16**	
Plasticity Index (%)		**13**	
Linear Shrinkage (%)		**7.5**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 250.2mm / Cracking		



Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W11Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

EMERSON CLASS NUMBER REPORT

Client:	PDR Engineers	Report Number:	11512/R/18822-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 0.4m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.8.1

Sample Number	11512/S/50667			
ID / Client ID	-			
Lot Number	TP2 0.4m			
Date / Time Sampled	4/05/2018			
Material Source	Client Supplied			
Material Type	Supplied Samples			
Sampling Method	Tested As Received			
Water Type	Distilled			
Water Temperature (C°)	26			
Sample Description	TP2			
From (m)	0.4m			
Soil Description	Sandy Silt - Light Brown			
Emerson Class Number	**5**			

Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W34Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

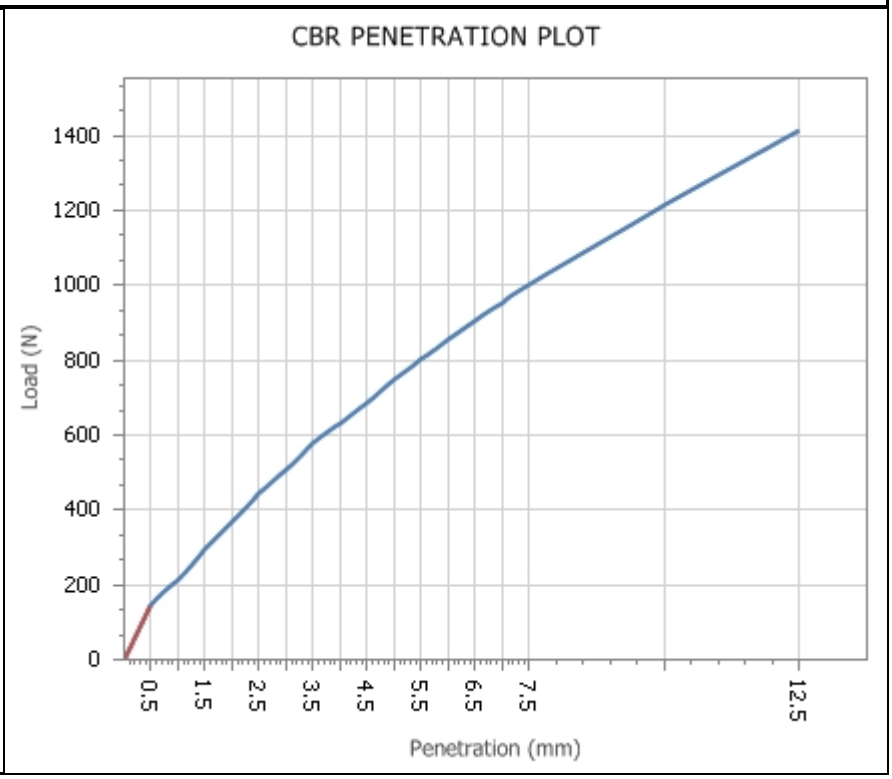
Client:	PDR Engineers	Report Number:	11512/R/18925-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 0.4m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	21/05/2018 Page 1 of 1

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1

		Sample Location	
Sample Number	11512/S/50667	Sample Description	TP2
Sampling Method	Tested As Received	From (m)	0.4m
Date Sampled	4/05/2018		
Sampled By	Client Sampled		
Date Tested	18/05/2018		
Material Source	Client Supplied	Material Limit Start	-
Material Type	Supplied Samples	Material Limit End	-
Client Reference	-	Compactive Effort	Standard

Material Description	Sandy Silt - Light Brown

Maximum Dry Density (t/m³):	1.90
Optimum Moisture Content (%):	12.5
Field Moisture Content (%):	15.1
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	98
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.86
Placement Dry Density Ratio (%):	98.0
Placement Moisture Content (%):	12.6
Placement Moisture Ratio (%):	100.0
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.85
Total Curing Time (hrs)	108.1
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	14.1
Moisture (remainder) After Soak (%)	13.6
CBR Swell (%):	1.0
Minimum CBR Specification (%):	-
CBR Value @ 5.0mm (%):	**4.0**



Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W2ASRep Rev2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

EMERSON CLASS NUMBER REPORT

Client:	PDR Engineers	Report Number:	11512/R/18827-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 1.0m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.8.1

Sample Number	11512/S/50671			
ID / Client ID	-			
Lot Number	TP2 1.0m			
Date / Time Sampled	4/05/2018			
Material Source	Client Supplied			
Material Type	Supplied Samples			
Sampling Method	Tested As Received			
Water Type	Distilled			
Water Temperature (C°)	26			
Sample Description	TP2			
From (m)	1.0m			
Soil Description	Sandy Silt			
Emerson Class Number	**6**			

Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W34Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

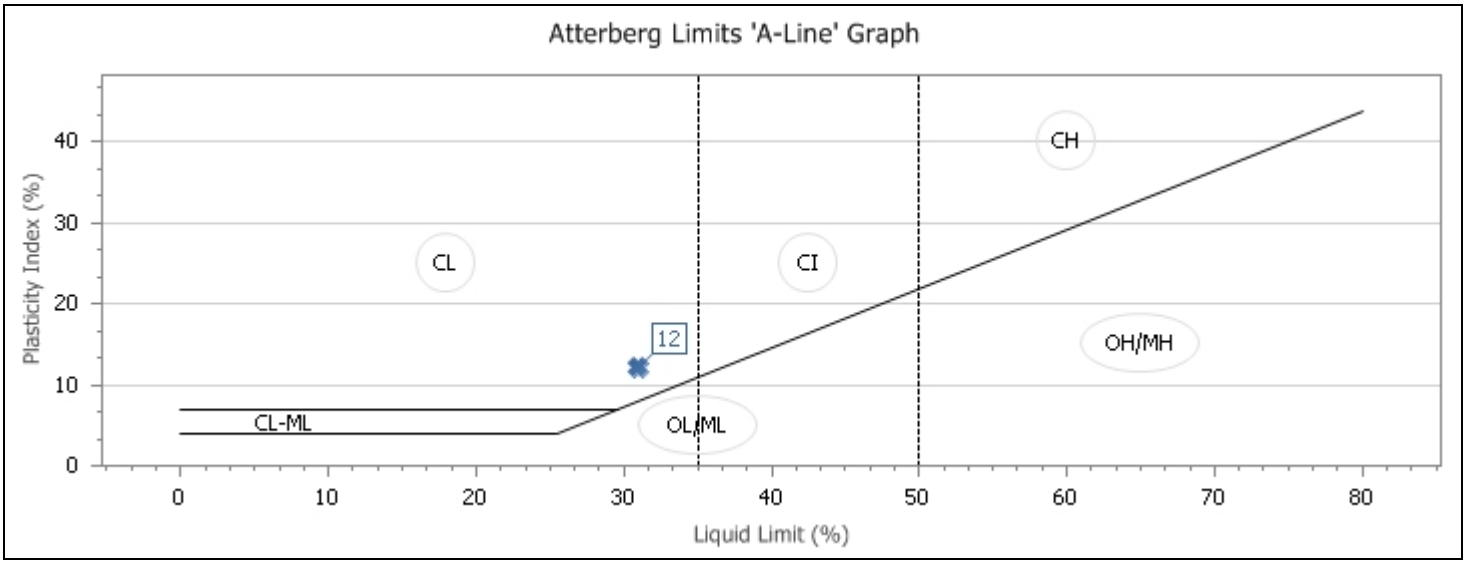
ATTERBERG LIMITS REPORT

Client:	PDR Engineers	Report Number:	11512/R/18826-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 1.0m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.1.2, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS1726 (App. A)		
Sample Number	11512/S/50671	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP2
Date Sampled	4/05/2018	From (m)	1.0m
Sampled By	Client Sampled		
Date Tested	9/05/2018		
Att. Drying Method	Oven Dried	Material Source	Client Supplied
Atterberg Preparation	Dry Sieved	Material Type	Supplied Samples
Material Description	Sandy Silt		

Atterberg Limits Results

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**31**	
Plastic Limit (%)		**19**	
Plasticity Index (%)		**12**	
Linear Shrinkage (%)		**7.5**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 253.9mm / Cracking		



Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W11Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: **Cairns Laboratory**
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

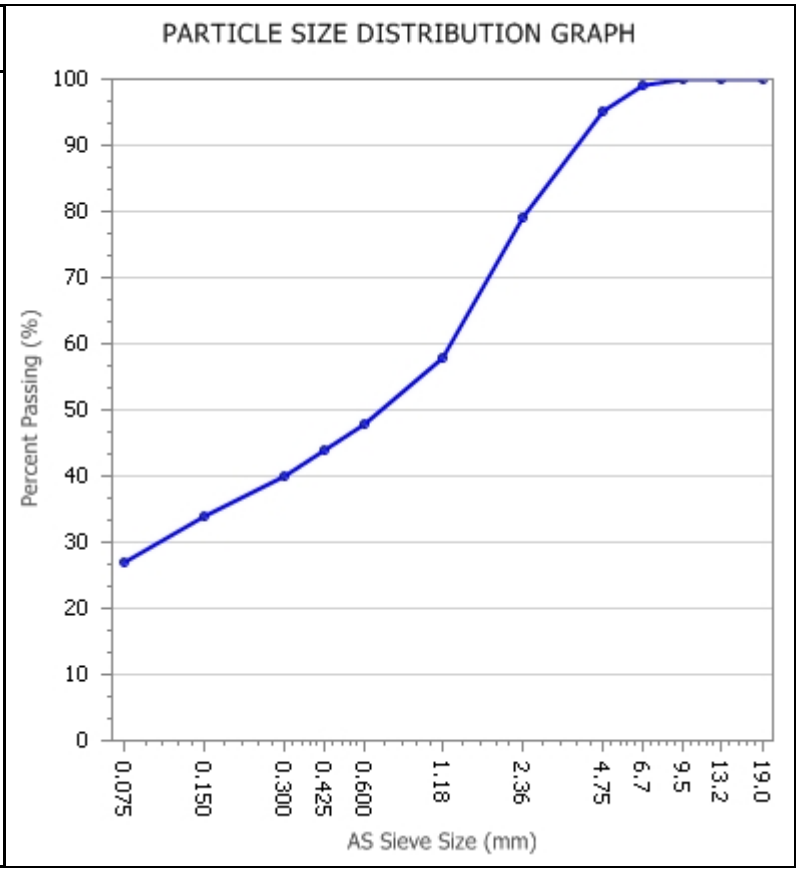
PARTICLE SIZE DISTRIBUTION REPORT

Client:	PDR Engineers	Report Number:	11512/R/18823-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP3 0.5m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.6.1

Sample Number	11512/S/50668	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP3
Date Sampled	4/05/2018	From (m)	0.5m
Sampled By	Client Sampled		
Date Tested	9/05/2018		
Material Source	Client Supplied	Material Type	Supplied Samples

AS Sieve (mm)	Specification Minimum	**Percent Passing (%)**	Specification Maximum
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**99**	
4.75		**95**	
2.36		**79**	
1.18		**58**	
0.600		**48**	
0.425		**44**	
0.300		**40**	
0.150		**34**	
0.075		**27**	



Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W9Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

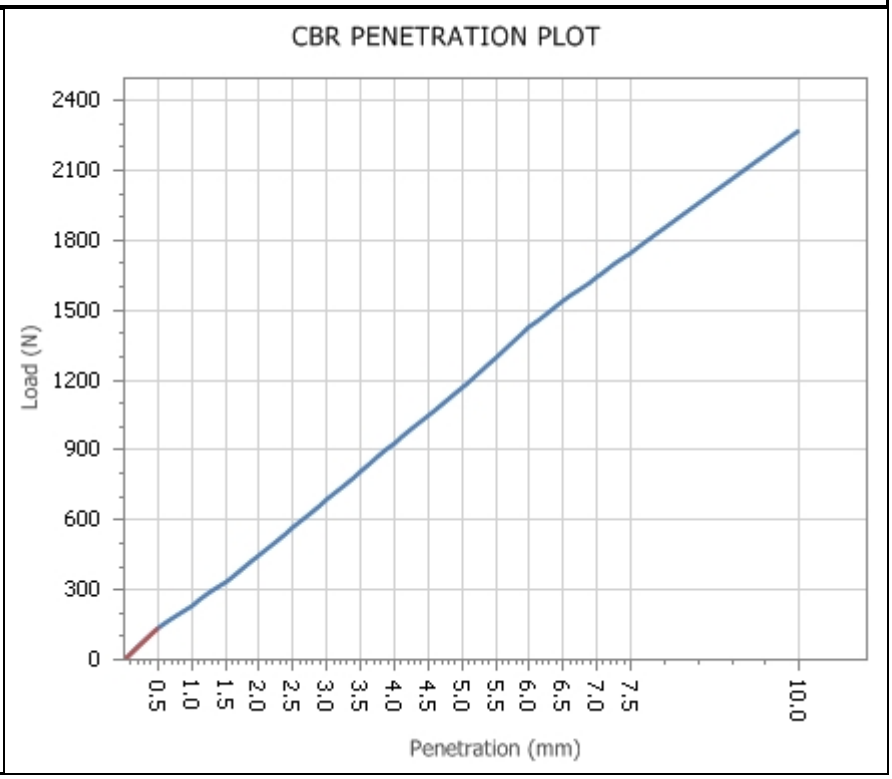
Client:	PDR Engineers	Report Number:	11512/R/18926-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP3 0.5m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	21/05/2018 Page 1 of 1

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1

		Sample Location	
Sample Number	11512/S/50668	Sample Description	TP3
Sampling Method	Tested As Received	From (m)	0.5m
Date Sampled	4/05/2018		
Sampled By	Client Sampled		
Date Tested	18/05/2018		
Material Source	Client Supplied	Material Limit Start	-
Material Type	Supplied Samples	Material Limit End	-
Client Reference	-	Compactive Effort	Standard

Material Description	Sandy Clay - Black

Maximum Dry Density (t/m³):	1.93
Optimum Moisture Content (%):	11.5
Field Moisture Content (%):	12.4
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	98
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.88
Placement Dry Density Ratio (%):	98.0
Placement Moisture Content (%):	11.5
Placement Moisture Ratio (%):	101.0
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.88
Total Curing Time (hrs)	94.9
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	13.0
Moisture (remainder) After Soak (%)	13.0
CBR Swell (%):	0.0
Minimum CBR Specification (%):	-
CBR Value @ 5.0mm (%):	**6**



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W2ASRep Rev2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: **Cairns Laboratory**
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

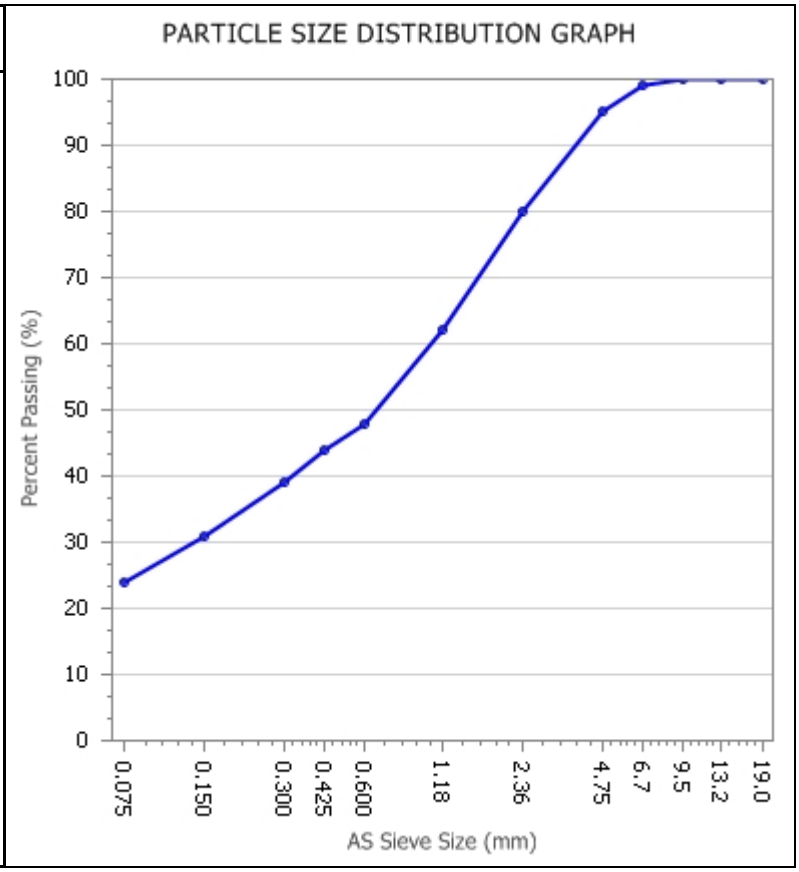
PARTICLE SIZE DISTRIBUTION REPORT

Client:	PDR Engineers	Report Number:	11512/R/18828-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP3 1.1m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.6.1

Sample Number	11512/S/50672	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP3
Date Sampled	4/05/2018	From (m)	1.1m
Sampled By	Client Sampled		
Date Tested	8/05/2018		
Material Source	Client Supplied	Material Type	Supplied Samples

AS Sieve (mm)	Specification Minimum	**Percent Passing (%)**	Specification Maximum
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**99**	
4.75		**95**	
2.36		**80**	
1.18		**62**	
0.600		**48**	
0.425		**44**	
0.300		**39**	
0.150		**31**	
0.075		**24**	



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W9Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

EMERSON CLASS NUMBER REPORT

Client:	PDR Engineers	Report Number:	11512/R/18829-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP3 1.1m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.8.1

Sample Number	11512/S/50672			
ID / Client ID	-			
Lot Number	TP3 1.1m			
Date / Time Sampled	4/05/2018			
Material Source	Client Supplied			
Material Type	Supplied Samples			
Sampling Method	Tested As Received			
Water Type	Distilled			
Water Temperature (C°)	26			
Sample Description	TP3			
From (m)	1.1m			
Soil Description	Sandy Silt			
Emerson Class Number	**6**			

Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W34Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

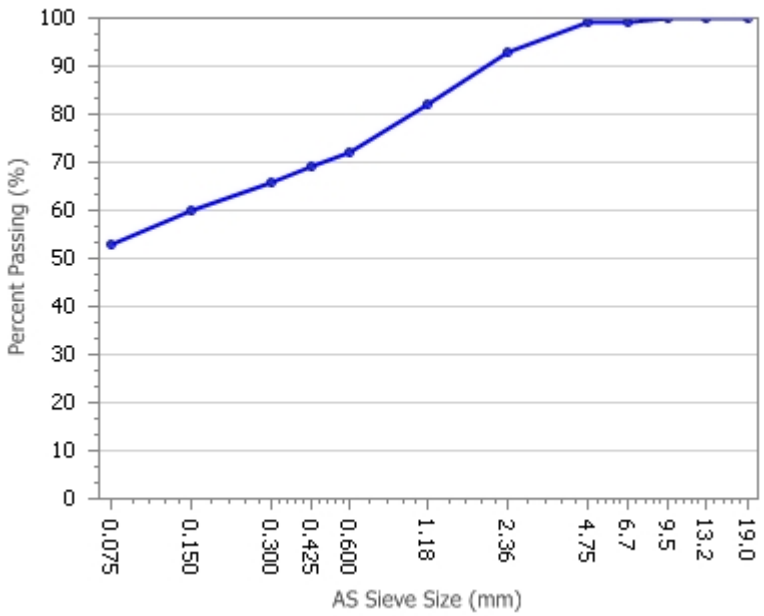
QUALITY OF MATERIALS REPORT

Client:	PDR Engineers	Report Number:	11512/R/18824-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP4 1.2m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	11512/S/50669	Sample Description	TP4
Sampling Method	Tested As Received	From (m)	1.2m
Date Sampled	4/05/2018		
Sampled By	Client Sampled		
Date Tested	8/05/2018	Material Source	Client Supplied
Att. Drying Method	Oven Dried	Material Type	Supplied Samples
Atterberg Preparation	Dry Sieved	Material Description	CL Sandy CLAY, with trace gravel, pale brown

AS Sieve (mm)	Specification Minimum	**Percent Passing (%)**	Specification Maximum
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**99**	
4.75		**99**	
2.36		**93**	
1.18		**82**	
0.600		**72**	
0.425		**69**	
0.300		**66**	
0.150		**60**	
0.075		**53**	

PARTICLE SIZE DISTRIBUTION GRAPH



Test Result	Specification Minimum	**Result**	Specification Maximum	Test Result	Specification Minimum	**Result**	Specification Maximum
Liquid Limit (%)		**32**		0.075/0.425 Fines Ratio		**0.78**	
Plastic Limit (%)		**19**		PI x 0.425 Ratio (%)		**895.7**	
Plastic Index (%)		**13**		LS x 0.425 Ratio (%)		**620.1**	
Linear Shrinkage (%)		**9.0**		Linear Shrinkage Defects	Nil		

Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W85Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

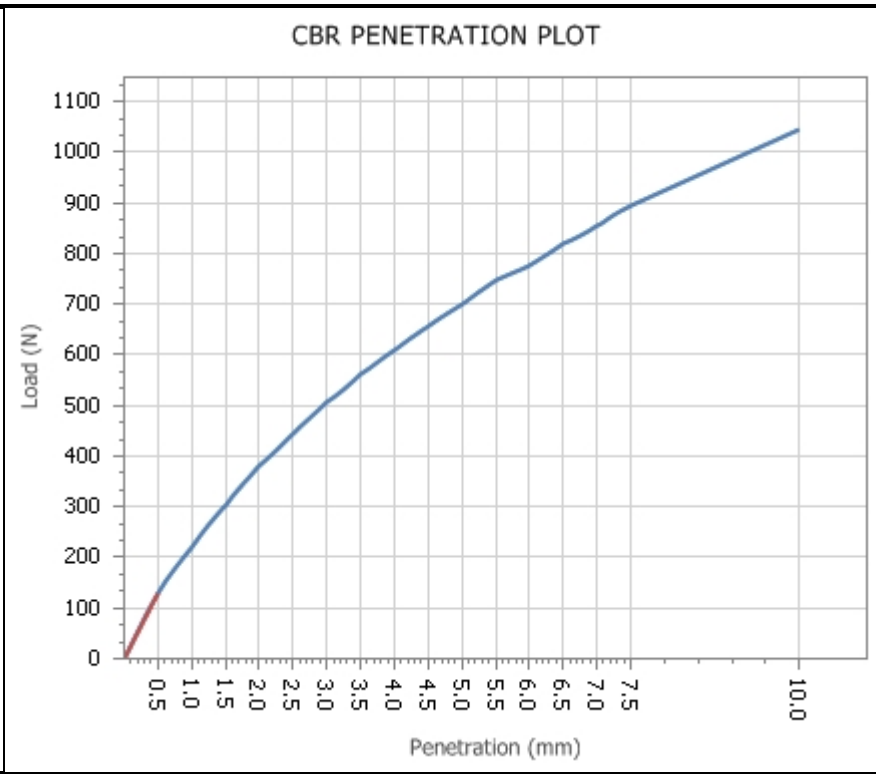
Client:	PDR Engineers	Report Number:	11512/R/18927-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP4 1.2m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	21/05/2018 Page 1 of 1

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1

		Sample Location	
Sample Number	11512/S/50669	Sample Description	TP4
Sampling Method	Tested As Received	From (m)	1.2m
Date Sampled	4/05/2018		
Sampled By	Client Sampled		
Date Tested	18/05/2018		
Material Source	Client Supplied	Material Limit Start	-
Material Type	Supplied Samples	Material Limit End	-
Client Reference	-	Compactive Effort	Standard

Material Description	CL Sandy CLAY, with trace gravel, pale brown

Maximum Dry Density (t/m³):	1.77
Optimum Moisture Content (%):	15.5
Field Moisture Content (%):	20.4
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	98
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.74
Placement Dry Density Ratio (%):	98.0
Placement Moisture Content (%):	15.5
Placement Moisture Ratio (%):	100.5
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.72
Total Curing Time (hrs)	110.3
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	17.8
Moisture (remainder) After Soak (%)	17.8
CBR Swell (%):	1.0
Minimum CBR Specification (%):	-
CBR Value @ 5.0mm (%):	**3.5**



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W2ASRep Rev2

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Adam Huey	Manager	Jon Dicker
Client	PDR ENGINEERS PTY LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 2551 CAIRNS QLD 4870	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	0411846301	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	ahuey@pdrengineers.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**Ryrie St / Ontario**	SGS Reference	**CE133360 R0**
Order Number	(Not specified)	Date Received	04 May 2018
Samples	4	Date Reported	22 May 2018

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146).

Requires Agron. Report

SIGNATORIES

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Leanne Orsmond
Quality & Microbiology Coordinator

Mark Ayers
Team Leader - Agri Plant/Soil

Parameter	Units	LOR	Sample Number: CE133360.001 Sample Matrix: Soil Sample Date: 01 May 2018 Sample Name: Ryrie St TP1 Topsoil	Sample Number: CE133360.002 Sample Matrix: Soil Sample Date: 01 May 2018 Sample Name: Ryrie St TP4 Topsoil	Sample Number: CE133360.003 Sample Matrix: Soil Sample Date: Ontario Sample 2 Sample Name:	Sample Number: CE133360.004 Sample Matrix: Soil Sample Date: Ontario Sample 6 Sample Name:
Moisture Content Method: AN002 Tested: 8/5/2018						
% Moisture	%w/w	0.5	**25**	**15**	-	-
pH in soil (1:5) Method: AN101 Tested: 15/5/2018						
pH	pH Units	-	**5.8**	**6.2**	-	-
pH (CaCl2)*	pH Units	-	**4.8**	**5.3**	-	-
Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 15/5/2018						
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	**50**	**40**	-	-
Total Dissolved Solids (by calculation)	mg/kg	5	**150**	**120**	-	-
Chloride (water extractable) Method: AN274 Tested: 15/5/2018						
Chloride (water extractable 1:5)	mg/kg	5	**19**	**7**	-	-
Total Kjeldahl Nitrogen and Total Nitrogen in Soil/Sludges Method: AN281 Tested: 17/5/2018						
Total Kjeldahl Nitrogen	mg/kg	5	**2200**	**1200**	-	-
Total Nitrogen	mg/kg	10	**2200**	**1200**	-	-
Carbon:Nitrogen Ratio*	No unit	0.1	**14**	**14**	-	-
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser in Soil Method: AN248 Tested: 11/5/2018						
Nitrate/Nitrite Nitrogen, NOx as N	mg/kg	0.1	**5.9**	**8.7**	-	-

Parameter	Units	LOR	Sample Number: CE133360.001 Sample Matrix: Soil Sample Date: 01 May 2018 Sample Name: Ryrie St TP1 Topsoil	CE133360.002 Soil 01 May 2018 Ryrie St TP4 Topsoil	CE133360.003 Soil Ontario Sample 2	CE133360.004 Soil Ontario Sample 6
Colwell Phosphorus Method: AN015 Tested: 15/5/2018						
Colwell Phosphorus	mg/kg	1	**230**	**240**	-	-
Total Organic Carbon by Heanes Oxidation Method: AN273 Tested: 11/5/2018						
Total Organic Carbon	%w/w	0.05	**3.2**	**1.7**	**0.21**	<0.05
Organic Matter	%w/w	0.1	**5.5**	**2.8**	**0.36**	<0.10
Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 15/5/2018						
Exchangeable Sodium, Na	mg/kg	2	**10**	**7**	**6**	**510**
Exchangeable Sodium, Na	meq/100g	0.01	**0.05**	**0.03**	**0.03**	**2.2**
Exchangeable Sodium Percentage*	%	0.1	**1.2**	**0.6**	**2.2**	**28.0**
Exchangeable Potassium, K	mg/kg	2	**140**	**61**	**34**	**55**
Exchangeable Potassium, K	meq/100g	0.01	**0.35**	**0.16**	**0.09**	**0.14**
Exchangeable Potassium Percentage*	%	0.1	**9.3**	**3.0**	**7.4**	**1.8**
Exchangeable Calcium Percentage*	%	0.1	**64.4**	**86.0**	**62.9**	**1.2**
Exchangeable Calcium, Ca	mg/kg	2	**480**	**900**	**150**	**19**
Exchangeable Calcium, Ca	meq/100g	0.01	**2.4**	**4.5**	**0.73**	**0.10**
Exchangeable Magnesium, Mg	mg/kg	2	**110**	**66**	**39**	**670**
Exchangeable Magnesium, Mg	meq/100g	0.02	**0.93**	**0.54**	**0.32**	**5.5**
Exchangeable Magnesium Percentage*	%	0.1	**25.1**	**10.4**	**27.5**	**69.0**
Cation Exchange Capacity	meq/100g	0.02	**3.7**	**5.2**	**1.2**	**7.9**
Cation Exchange Capacity (soluble salts removed)	meq/100g	0.02	-	-	-	-
Sodium Adsorption Ratio*	No unit	0.1	<0.1	<0.1	<0.1	**1.3**
Exchangeable Calcium/Exchangeable Magnesium Ratio*	No unit	0.1	**2.6**	**8.3**	**2.3**	<0.1
Soil - Aluminium (KCL Extraction) Method: SOL061 Tested: 18/5/2018						
Exchangeable Aluminium*	mg/kg	1	-	-	-	-
Exchangeable Aluminium*	cmol (+)/kg	0.01	-	-	-	-
DTPA Extractable Metals in Soil Method: AN025/AN320 Tested: 16/5/2018						
Copper, Cu	mg/kg	0.05	**1.6**	**2.6**	-	-
Zinc, Zn	mg/kg	0.05	**53**	**88**	-	-
Manganese, Mn	mg/kg	0.5	**5.3**	**7.1**	-	-
Iron, Fe	mg/kg	0.5	**160**	**99**	-	-
Total Phosphorus by Kjeldahl Digestion DA in Soil Method: AN279/AN293(Sydney only) Tested: 17/5/2018						
Total Phosphorus (Kjeldahl Digestion)	mg/kg	2	**1300**	**2100**	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE133360.001 Soil 01 May 2018 Ryrie St TP1 Topsoil	CE133360.002 Soil 01 May 2018 Ryrie St TP4 Topsoil	CE133360.003 Soil Ontario Sample 2	CE133360.004 Soil Ontario Sample 6
Calcium Chloride Extractable Boron Method: RL 12C2/AN320 Tested: 15/5/2018							
CaCl2-extractable Boron, B*	mg/kg	0.05		**0.18**	**0.13**	-	-
Potassium Chloride Extractable Sulphur Method: RL 10D1/AN320 Tested: 16/5/2018							
KCl-40-extractable Sulphur, S*	mg/kg	1		**6**	**2**	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Calcium Chloride Extractable Boron **Method: RL 12C2/AN320**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
CaCl2-extractable Boron, B*	LB056356	mg/kg	0.05	<0.05	17%	NA

Chloride (water extractable) **Method: ME-(AU)-[ENV]AN274**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride (water extractable 1:5)	LB056247	mg/kg	5	<5	5%	106%

Colwell Phosphorus **Method: ME-(AU)-[ENV]AN015**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Colwell Phosphorus	LB056340	mg/kg	1	<1	10%	111%

DTPA Extractable Metals in Soil **Method: ME-(AU)-[ENV]AN025/AN320**

Parameter	QC Reference	Units	LOR	DUP %RPD
Copper, Cu	LB056373	mg/kg	0.05	0%
Zinc, Zn	LB056373	mg/kg	0.05	6%
Manganese, Mn	LB056373	mg/kg	0.5	17%
Iron, Fe	LB056373	mg/kg	0.5	14%

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) **Method: ME-(AU)-[ENV]AN122**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Exchangeable Sodium, Na	LB056336	mg/kg	2		2 - 9%	102%
Exchangeable Sodium, Na	LB056336	meq/100g	0.01	<0.01		
Exchangeable Sodium Percentage*	LB056336	%	0.1	<0.1		
Exchangeable Potassium, K	LB056336	mg/kg	2		1 - 6%	105%
Exchangeable Potassium, K	LB056336	meq/100g	0.01	<0.01		
Exchangeable Potassium Percentage*	LB056336	%	0.1	<0.1		
Exchangeable Calcium Percentage*	LB056336	%	0.1	149.6		
Exchangeable Calcium, Ca	LB056336	mg/kg	2		1 - 2%	103%
Exchangeable Calcium, Ca	LB056336	meq/100g	0.01	<0.01		
Exchangeable Magnesium, Mg	LB056336	mg/kg	2		2 - 4%	102%
Exchangeable Magnesium, Mg	LB056336	meq/100g	0.02	<0.02		
Exchangeable Magnesium Percentage*	LB056336	%	0.1	<0.1		
Cation Exchange Capacity	LB056336	meq/100g	0.02	<0.02		
Sodium Adsorption Ratio*	LB056336	No unit	0.1	<0.1		
Exchangeable Calcium/Exchangeable Magnesium Ratio*	LB056336	No unit	0.1	<0.1		

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser in Soil **Method: ME-(AU)-[ENV]AN248**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB056243	mg/kg	0.1	<0.1	1%	99%

pH in soil (1:5) **Method: ME-(AU)-[ENV]AN101**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
pH	LB056358	pH Units	-	5.6	100%

Potassium Chloride Extractable Sulphur **Method: RL 10D1/AN320**

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
KCl-40-extractable Sulphur, S*	LB056379	mg/kg	1	3%	105%

Total Kjeldahl Nitrogen and Total Nitrogen in Soil/Sludges **Method: ME-(AU)-[ENV]AN281**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Kjeldahl Nitrogen	LB056278	mg/kg	5	<5	1%	99%

Total Organic Carbon by Heanes Oxidation **Method: ME-(AU)-[ENV]AN273**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Organic Carbon	LB056195	%w/w	0.05	<0.05	2%	102%	102%
Organic Matter	LB056195	%w/w	0.1	<0.10	2%	NA	NA

Total Phosphorus by Kjeldahl Digestion DA in Soil **Method: ME-(AU)-[ENV]AN279/AN293(Sydney only)**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB056278	mg/kg	2	<2	0%	106%

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN015	Soil sample is extracted in an end over end roller in 0.5 N sodium bicarbonate at pH 8.5 with the supernatant liquor analysed for Phosphorous. Orthophosphate anion (PO43-) is reacted with ammonium molybdate and potassium antimony tartrate in sulfuric acid solution. The resulting phospho-molybdate complex is reduced, using ascorbic acid, to an intense blue coloured complex Molybdenum Blue. The absorbance of this complex is measured at 880 nm by Discrete Analyser, and compared with calibration standards to obtain the concentration of orthophosphate in the sample. Based on Rayment & Higginson 9B1.
AN025/AN320	A chelating agent is used to complex metal ions in solution. The extracted elements are determined byICP OES.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN103	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.
AN122	Exchangeable Cations, CEC and ESP: Soil sample is extracted in 1 M Ammonium Acetate at pH=7 (or 1M Ammonium Chloride at pH=7) with cations (Na, K, Ca & Mg) then determined by ICP OES/ICP MS and reported as Exchangeable Cations. For saline soils, these results can be corrected for water soluble cations and reported as Exchangeable cations in meq/100g or soil can be pre-treated (aqueous ethanol/aqueous glycerol) prior to extraction. Cation Exchange Capacity (CEC) is the sum of the exchangeable cations in meq/100g.
AN122	The Exchangeable Sodium Percentage (ESP) is calculated as the exchangeable sodium divided by the CEC (all in meq/100g) times 100. ESP can be used to categorise the sodicity of the soil as below: ESP < 6% non-sodic ESP 6-15% sodic ESP >15% strongly sodic Method is referenced to Rayment and Lyons, 2011, sections 15D3 and 15N1.-
AN248	Nitrate / Nitrite in extract by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN273	The sample is digested in Dichromate / Sulfuric Acid to oxidise the organic carbon. The determination is completed colourimetrically by Aquakem Discrete Analyser at 600 nm. Based on Rayment & Higginson 6B1.
AN274	Chloride by Aquakem DA following 1:5 or 1:2 DI water extraction: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Results reported on dry sample basis. Reference APHA 4500Cl-

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN281	The sample is heated in the presence of Sulphuric acid, K2SO4 and CuSO4 for two and half hours using a temperature controlled digestion block. Amino Nitrogen of many organic materials is converted to ammonium ion. Free ammonia also is converted to ammonium. The digest is cooled and placed on the Aquakem 250 discrete analyser for Ammonia determination.
RL 10D1/AN320	Air dried <2mm soil is extractedin 0.25M KCl at 40 deg C followed by analysis of filtrate for S by ICP OES. Referenced to Rayment and Lyons method 10D1.
RL 12C2/AN320	Air dried <2mm soil is extracted in 0.01M CaCl2 by refluxing gently for 10 minutes. Extract is then filtered and analysed by ICP OES. Referenced method Rayment and Lyon, 12C2.
SOL061	Soil sample is extrcated 1:10 in 1MKCl with aluminium determined by ICP OES.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

G.L.T. HORTICULTURAL SERVICES PTY. LTD.

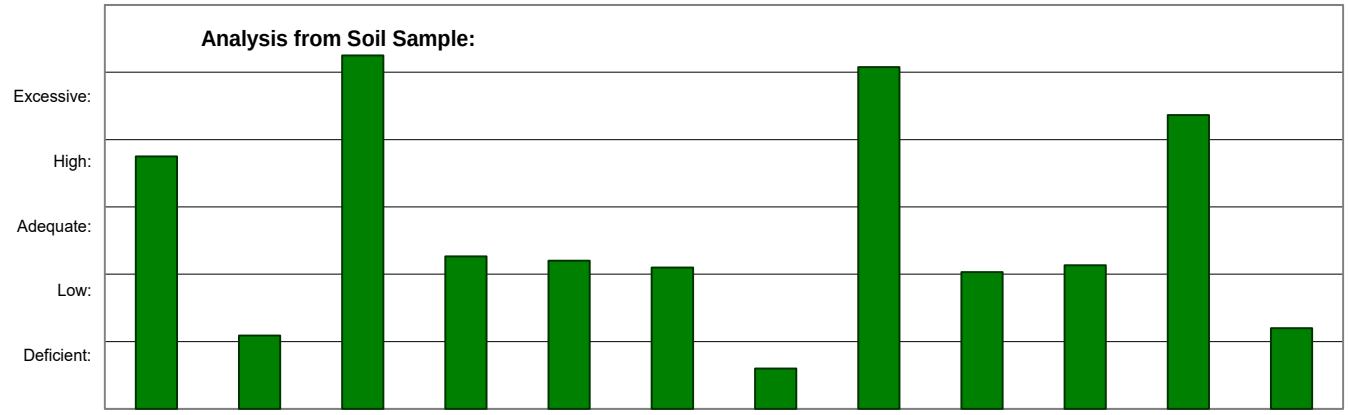
A.B.N. 14 009 695 550

Graeme Thomas H.D. App. Sc. (Ag)
Horticulturist
20 Geoffrey Partridge Place
Frederickton
NSW 2440

Telephone : 02 6566 8002
Mobile: 0419 977 267
Email: glthort@bigpond.com

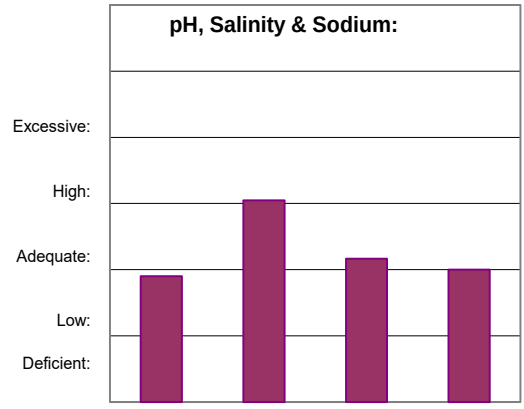
SOIL ANALYSIS REPORT

Name:	**PDR Engineers Pty. Ltd.**			***Date Sampled:***	01/05/18
Address:	**P.O. Box 2551 Cairns Qld 4870**			***Date Received:***	04/05/18
Block Name:	Ryrie St TP1 Topsoil	***Existing Crop:***	Topsoil	***Future Crop:***	Topsoil
Area Sampled:		***Irrigation type:***		***Soil type:***	
Drainage:				***Sample Number:***	**CE133360.001**



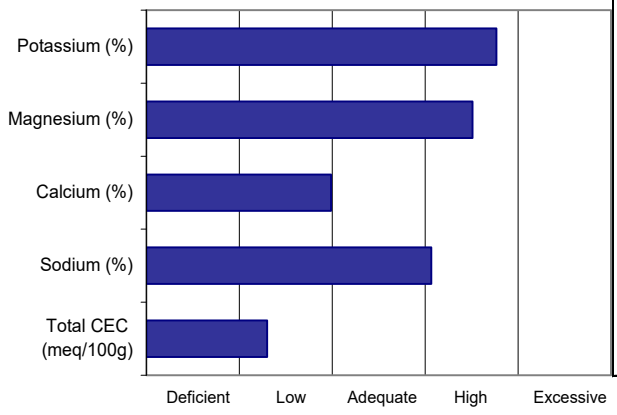
Results:

Organic Matter %	Nitrate mg/kg	Phosphorus mg/kg	Potassium mg/kg	Calcium mg/kg	Magnesium mg/kg	Sulphur mg/kg	Zinc mg/kg	Manganese mg/kg	Copper mg/kg	Iron mg/kg	Boron mg/kg
5.5	5.9	230	140	480	110	6	53	5.3	1.6	160	0.18



Results:

Soil PH	Chloride mg/kg	Sodium mg/kg	Electrical Conductivity
5.8	19	10	0.05



	Suggested % of Total CEC
9.3	3 - 7%
25.1	15-20%
64.4	65-75%
1.2	0-5%
3.7	

Recommendations:

Apply 1.5 tonnes / Ha. Gypsum
Apply 450 Kg / Ha. Calcium Nitrate and repeat 6 months post plant (45g. / sq. m.)

G.L.T. HORTICULTURAL SERVICES PTY. LTD.

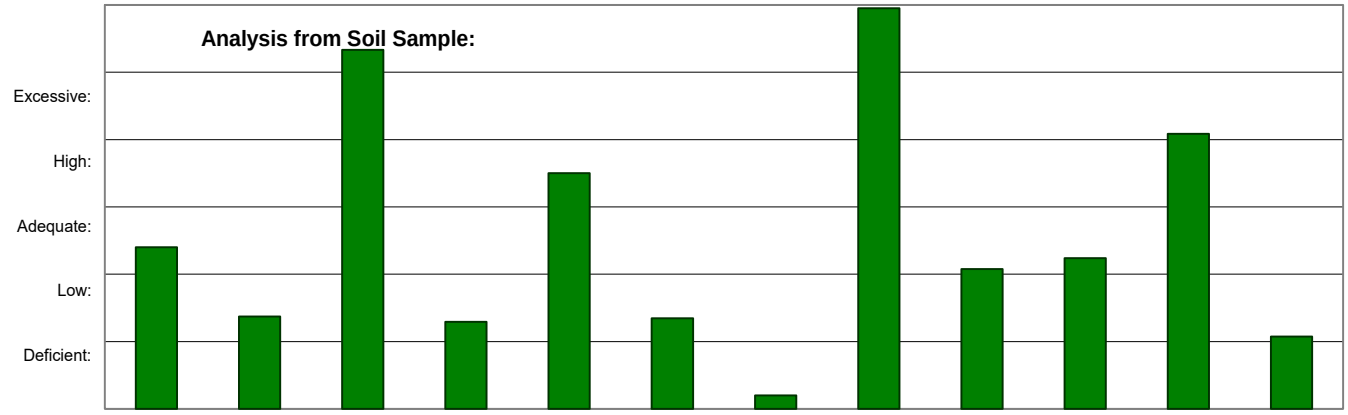
A.B.N. 14 009 695 550

Graeme Thomas H.D. App. Sc. (Ag)
Horticulturist
20 Geoffrey Partridge Place
Frederickton
NSW 2440

Telephone : 02 6566 8002
Mobile: 0419 977 267
Email: glthort@bigpond.com

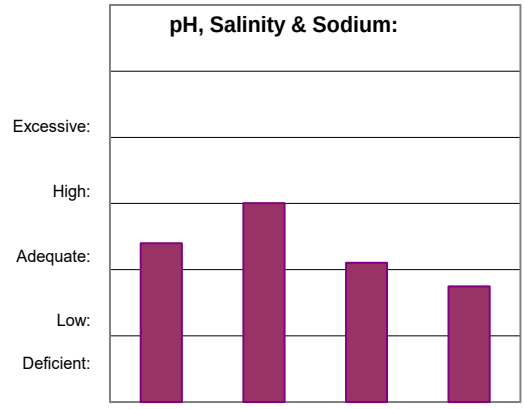
SOIL ANALYSIS REPORT

Name:	**PDR Engineers Pty. Ltd.**			***Date Sampled:***	01/05/18
Address:	**P.O. Box 2551 Cairns Qld 4870**			***Date Received:***	04/05/18
Block Name:	Ryrie St TP4 Topsoil	***Existing Crop:***	Topsoil	***Future Crop:***	Topsoil
Area Sampled:		***Irrigation type:***		***Soil type:***	
Drainage:				***Sample Number:***	**CE133360.002**



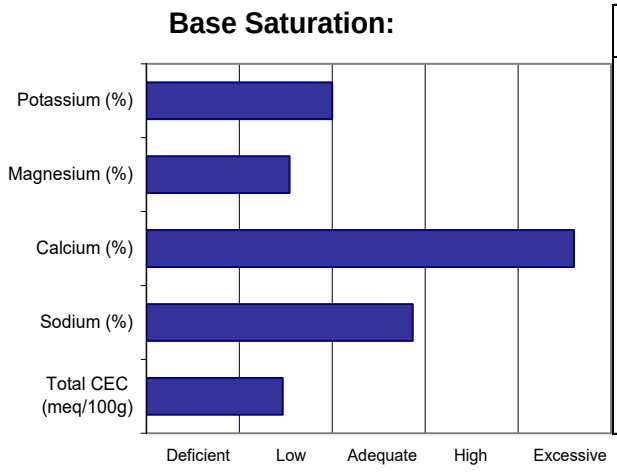
Results:

Organic Matter %	Nitrate mg/kg	Phosphorus mg/kg	Potassium mg/kg	Calcium mg/kg	Magnesium mg/kg	Sulphur mg/kg	Zinc mg/kg	Manganese mg/kg	Copper mg/kg	Iron mg/kg	Boron mg/kg
2.8	8.7	240	61	900	66	2	88	7.1	2.6	99	0.13



Results:

Soil PH	Chloride mg/kg	Sodium mg/kg	Electrical Conductivity
6.2	7	7	0.04



	Suggested % of Total CEC
3	3 - 7%
10.4	15-20%
86	65-75%
0.6	0-5%
5.2	

Recommendations:

Apply 500 Kg. / Ha. Magnesium Sulphate
Apply 450 Kg / Ha. Potassium Nitrate and repeat 6 months post plant (45g. / sq. m.)

Appendix 9

Vegetation Management Report

Vegetation management report

For Lot: 100 Plan: SP306470

Current as at 21/12/2018

Queensland Government

Recent changes

New vegetation clearing laws

New vegetation management laws were passed by the Queensland Parliament on 3 May 2018 and may affect the clearing you can undertake on your property.

For more information, read about the new vegetation management laws (https://www.dnrme.qld.gov.au/land-water/initiatives/vegetation-management-laws/) or call 135VEG (13 58 34) between 8.30am and 4.30pm Monday to Friday.

Updated mapping

The Regulated Vegetation Management Map and Supporting Map was updated in March 2018 to reflect the most up to date information available in relation to regional ecosystems, essential habitat and wetland mapping (Version 10).

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

- *Vegetation management framework* - an explanation of the application of the framework.
- *Property details* - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s), catchment(s), coastal or non coastal status, and any applicable area management plans associated with your property.
- *Vegetation management details for the specified Lot on Plan* - specific information about your property including vegetation categories, regional ecosystems, watercourses, wetlands, essential habitat, and protected plants.
- *Contact information.*
- *Maps* - a series of colour maps to assist in identifying regulated vegetation on your property.
- *Other legislation contact information.*

This information will assist you to determine your options for managing vegetation under the vegetation management framework, which may include:

- exempt clearing work
- accepted development vegetation clearing code
- an area management plan
- a development approval.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as Queensland's Protected Plants framework or the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 6 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

Table of Contents

1. Vegetation management framework

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

1.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify DNRME or obtain an approval approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 5.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval approval under the vegetation management framework. For all other land tenures, contact DNRME before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/vegetation/exemptions/.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Contact DNRME prior to clearing in any of these areas.

1.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/vegetation/codes/

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify DNRME before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

1.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

As a result of the new laws, AMPs for fodder harvesting, managing thickened vegetation and managing encroachment will continue for 2 years. New notifications cannot be made for these AMPs.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an area management plan applies to your property for which you can make a new notification, it will be listed in Section 2.2 of this report. Before clearing under one of these AMPs, you must first notify the DNRME and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/vegetation/area-plans/

1.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/vegetation/applying/

2. Property details

2.1 Tenure

All of the lot, plan and tenure information associated with property Lot: 100 Plan: SP306470, including links to relevant Smart Maps, are listed in Table 1. The tenure of the property (whether it is freehold, leasehold, or other) may be viewed by clicking on the Smart Map link(s) provided.

Table 1: Lot, plan and tenure information for the property

Lot	Plan	Tenure	Link to property on SmartMap
100	SP306470	Freehold	https://apps.information.qld.gov.au/data/cadastre/GenerateSmartMap?q=100\SP306470

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

2.2 Property location

Table 2 provides a summary of the locations for property Lot: 100 Plan: SP306470, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Cassowary Coast Regional

Bioregion(s)	Subregion(s)
Wet Tropics	Innisfail

Catchment(s)
Johnstone

For the purposes of the accepted development vegetation clearing codes and the State Development Assessment Provisions (SDAP), this property is regarded as*
Coastal

*See also Map 5.4

Area Management Plan(s): Nil

3. Vegetation management details for Lot: 100 Plan: SP306470

3.1 Vegetation categories

Vegetation categories are shown on the regulated vegetation management map in section 5.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 0.2ha

Vegetation category	Area (ha)
Category X	0.2

Table 4

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact DNRME to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact DNRME to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

This report does not confirm if a Property Map of Assessable Vegetation (PMAV) exists on a lot. To confirm whether or not a PMAV exists on a lot, please check the PMAV layer on the Queensland Globe2, or contact DNRME on 135VEG (135 834).

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 5.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
non-rem	None	X	0.20	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work
- accepted development vegetation clearing codes
- performance outcomes in State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 5.2.

3.4 Wetlands

There are no vegetation management wetlands present on this property.

3.5 Essential habitat

Protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA), and includes endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 5.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map as assessable vegetation -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

No records

3.6 Protected plants (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA), with clearing of protected plants in the wild regulated by the Nature Conservation (Wildlife Management) Regulation 2006. These requirements apply irrespective of the classification of the vegetation under the *Vegetation Management Act 1999*.

Prior to clearing, if the plants proposed to be cleared are in the wild (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') and the exemptions under the Nature Conservation (Wildlife Management) Regulation 2006 are not applicable to the proposed clearing, you must check the flora survey trigger map to determine if any part of the area to be cleared is within a high risk area. The trigger map for this property is provided in section 5.5. The exemptions relate to:

- imminent risk of death or serious injury (refer s261A)
- imminent risk of serious damage to a building or other structure on land, or to personal property (refer s261B)
- *Fire and Emergency Service Act 1990* (refer 261C)
- previously cleared areas (refer s261ZB)
- maintenance activities (refer s261ZC)
- firebreak or fire management line (refer s261ZD)
- accepted development vegetation clearing code (refer s261ZE)
- conservation purposes (refer s261ZG)
- authorised in particular circumstances (refer s385).

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) from the *Vegetation Management Act 1999* (i.e. listed in the Planning Regulations 2017) while some are different.

If the proposed area to be cleared is shown as blue (i.e. high risk) on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken in accordance with the flora survey guidelines. The main objective of a flora survey is to locate any endangered, vulnerable or near threatened plants (EVNT plants) that may be present in the clearing impact area.

If a flora survey identifies that EVNT plants are not present within the clearing impact area or clearing within 100m of EVNT plants can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing. The clearing must be conducted within two years after the flora survey report was submitted.

If a flora survey identifies that EVNT plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the application form clearing permit.

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that EVNT plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

Further information on protected plants is available at
http://www.ehp.qld.gov.au/licences-permits/plants-animals/protected-plants/

For assistance on the protected plants flora survey trigger map for this property, please contact the Department of Environment and Science at palm@des.qld.gov.au.

3.7 Emissions Reduction Fund (ERF)

The ERF is an Australian Government scheme which offers incentives for businesses and communities across the economy to reduce emissions.

Under the ERF, landholders can earn money from activities such as planting (and keeping) trees, managing regrowth vegetation and adopting more sustainable agricultural practices.

The purpose of a project is to remove greenhouse gases from the atmosphere. Each project will provide new economic opportunities for farmers, forest growers and land managers.

Further information on ERF is available at https://www.qld.gov.au/environment/land/state/use/carbon-rights/.

4. Contact information for DNRME

For further information on vegetation management:
Phone 135VEG (135 834)
Email vegetation@dnrme.qld.gov.au
Visit www.dnrme.qld.gov.au/our-department/contact-us/vegetation-contacts to submit an online enquiry.

For contact details for other State and Commonwealth agencies, please see Section 6.

5. Maps

The maps included in this report may also be requested individually at:

https://www.dnrme.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form
and
http://www.ehp.qld.gov.au/licences-permits/plants-animals/protected-plants/map-request.php

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

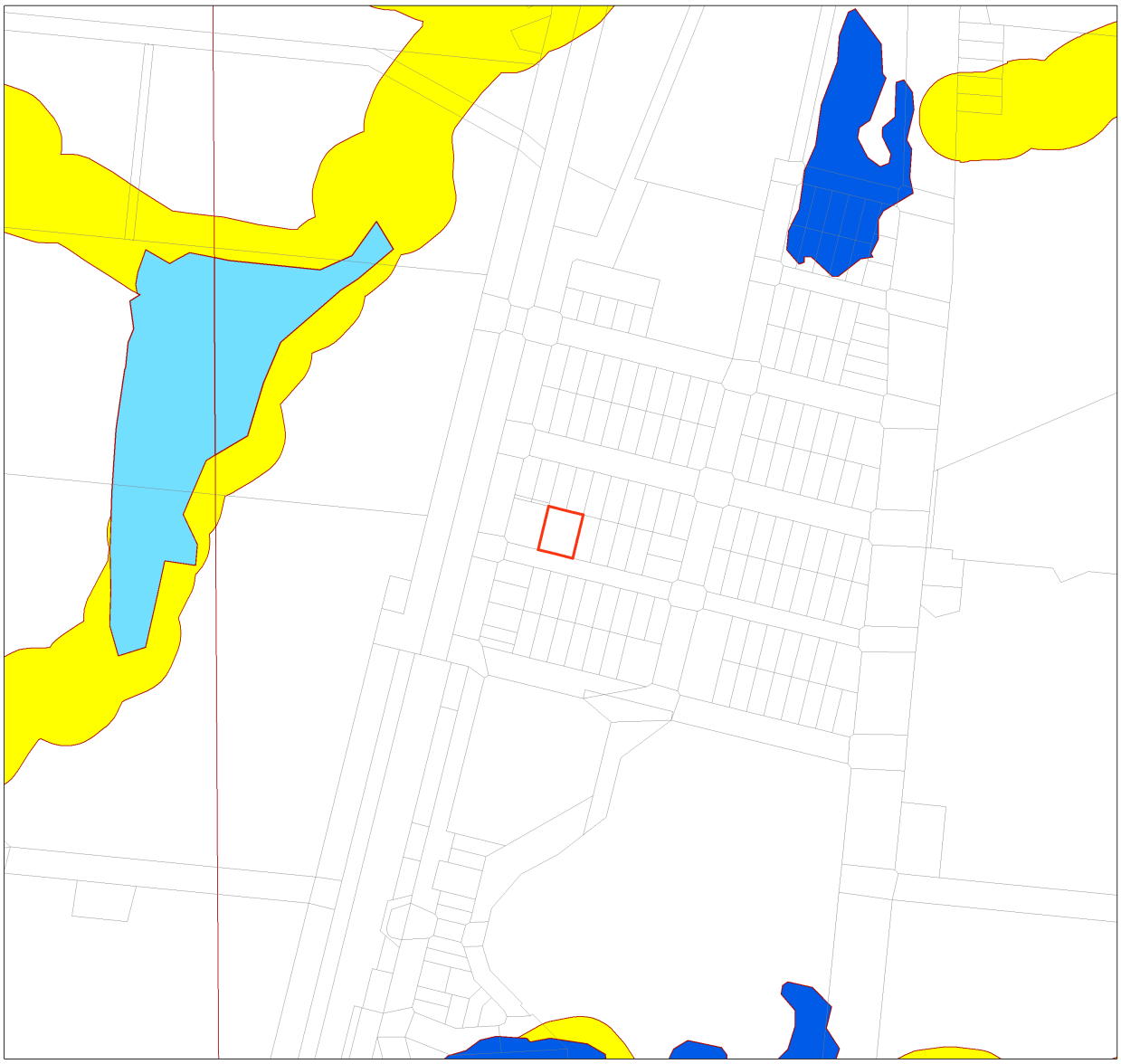
Coastal/non coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and the State Development Assessment Provisions (SDAP).

Protected plants map

The protected plants map shows areas where particular provisions of the *Nature Conservation Act 1992* apply to the clearing of protected plants.

5.1 Regulated vegetation management map



Regulated Vegetation Management Map

Legend

- Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Area not categorised
- Cadastral line
  Property boundaries shown are provided as a locational aid only

LOCALITY DIAGRAM

N

0 60 120 180 240 300 m

This product is projected into:
GDA 1994 MGA Zone 55

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources, Mines and Energy makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

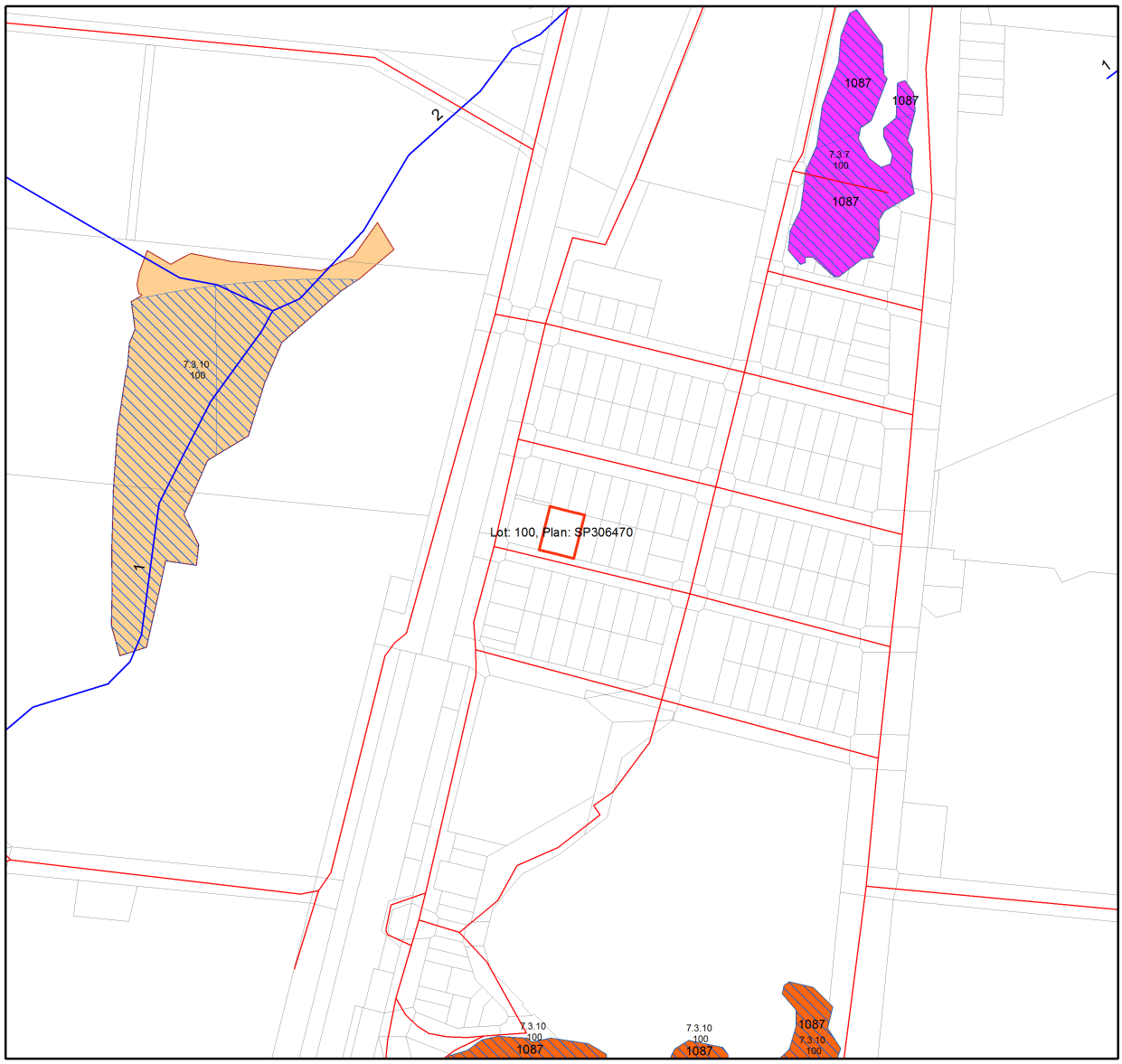
Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.dnrme.qld.gov.au or contact the Department of Natural Resources, Mines and Energy.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government

5.2 Vegetation management supporting map



Vegetation Management Supporting Map

Legend

- Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area under Section 20AH
  These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area under Section 20AI
  These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map
  (Stream order shown as black number against stream where available)
- Roads
- National Parks, State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only

Queensland Government

LOCALITY DIAGRAM

N

0 40 80 120 160 200 m

This product is projected into:
GDA 1994 MGA Zone 55

Labels for Essential Habitat are centred on the area of enquiry.

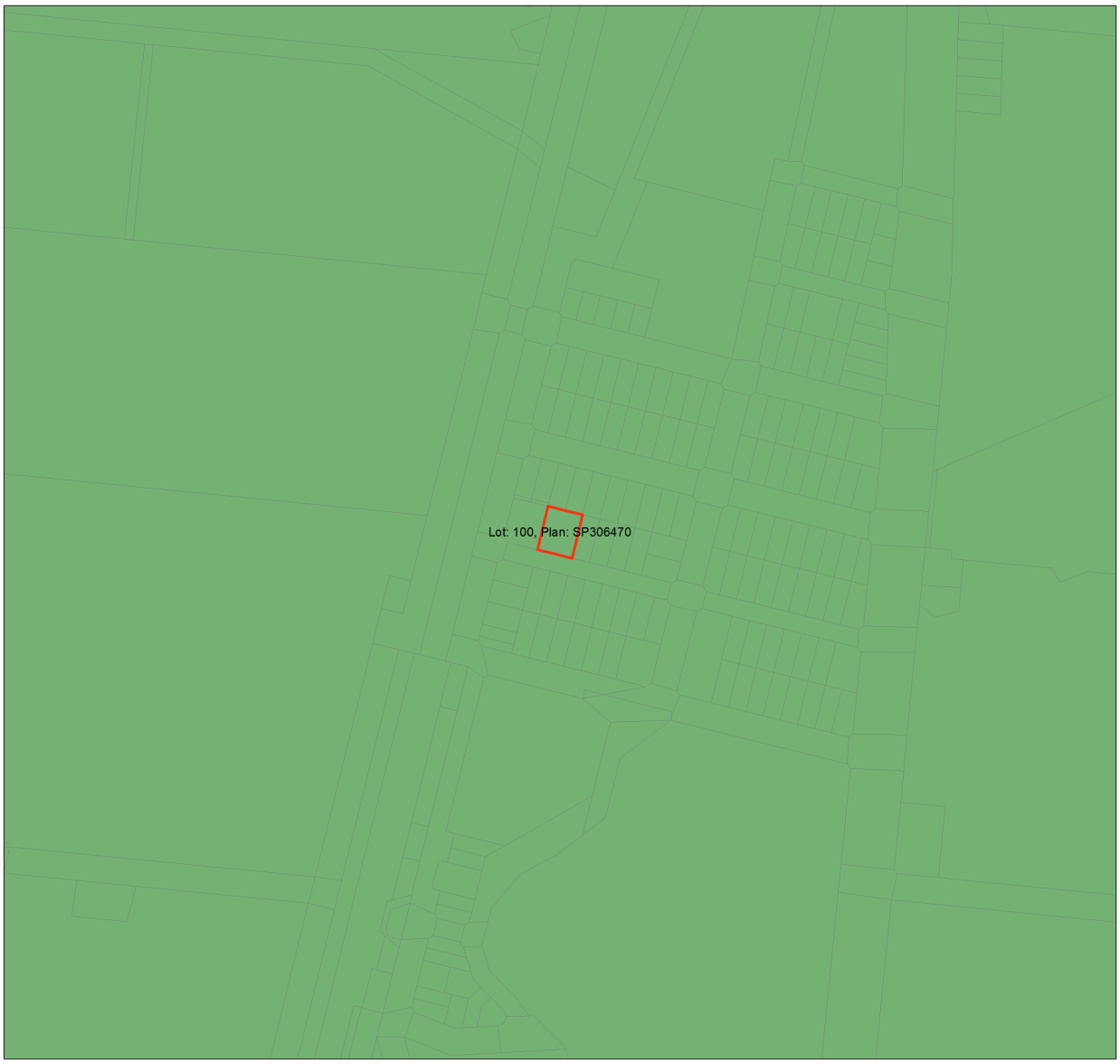
Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources, Mines and Energy makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.dnrme.qld.gov.au or contact the Department of Natural Resources, Mines and Energy.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

5.3 Coastal/non coastal map

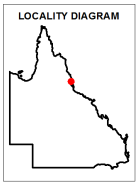


Coastal/Non Coastal Map

Legend

- Lot and Plan
- Coastal
- Non Coastal
- Cadastral line
  Property boundaries shown are provided as a locational aid only

LOCALITY DIAGRAM



Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources, Mines and Energy makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

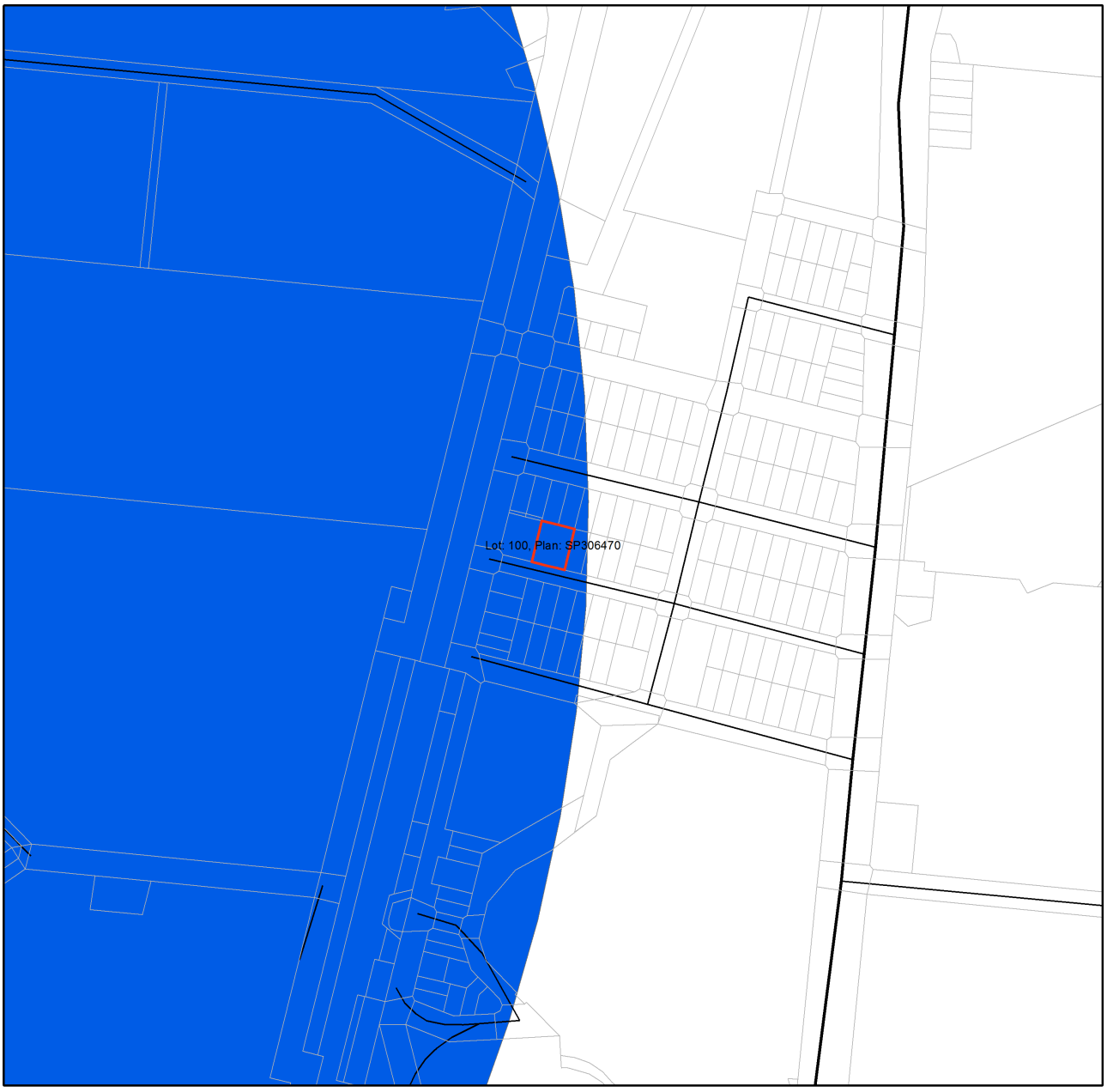
N

0 60 120 180 240 300 m

Queensland Government

This product is projected into:
GDA 1994 MGA Zone 55

5.4 Protected plants map administered by DES



Protected Plants Flora Survey Trigger Map

Legend

- Lot and Plan
- High risk area
- Cadastral line
  Property boundaries shown are provided as a locational aid only
- Freeways / motorways / highways
- Secondary roads / streets

LOCALITY DIAGRAM

N

0 40 80 120 160 200 m

This product is projected into:
GDA 1994 MGA Zone 55

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@ehp.qld.gov.au

Disclaimer:
While every care is taken to ensure the accuracy of the data used to generate this product, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damages) and costs which might be incurred as a consequence of reliance on the data, or as a result of the data being inaccurate or incomplete in any way and for any reason.

6. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
Interference with overland flow Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Natural Resources, Mines and Energy (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dnrme.qld.gov.au
Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Aboriginal and Torres Strait Islander Partnerships (Queensland Government)	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
Mining and environmentally relevant activities Infrastructure development (coastal) Heritage issues Protected plants and protected areas[1]	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992* *Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
Interference with fish passage in a watercourse, mangroves Forestry activities[2]	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Manufacturing, Infrastructure and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
Local government requirements	*Local Government Act 2009* *Planning Act 2016*	Department of Local Government, Racing and Multicultural Affairs (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office

1. In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992*, which endeavours to ensure that protected plants (whether whole plants or protected plants parts) are not illegally removed from the wild, or illegally traded. Prior to clearing, you should check the flora survey trigger map to determine if the clearing is within a high-risk area by visiting www.des.qld.gov.au. For further information or assistance on the protected plants flora survey trigger map for your property, please contact the Department of Environment and Science on 13QGOV (13 74 68) or email palm@des.qld.gov.au.

2. Contact the Department of Agriculture and Fisheries before clearing:

- Any sandalwood on state-owned land (including leasehold land)
- On freehold land in a 'forest consent area'
- More than five hectares on state-owned land (including leasehold land) containing commercial timber species listed in parts 2 or 3 of Schedule 6 of the Vegetation Management Regulation 2012 and located within any of the following local government management areas-Banana, Bundaberg Regional, Fraser Coast Regional, Gladstone Regional, Isaac Regional, North Burnett Regional, Somerset Regional, South Burnett Regional, Southern Downs Regional, Tablelands Regional, Toowoomba Regional, Western Downs Regional.

Appendix 10

Stormwater Management Plan and Flood Report

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

Final Report

El Arish – Stormwater Management Plan

Public Safety Business Agency

11 February 2019

Document Status

Version	Doc type	Reviewed by	Approved by	Date issued
V01a	Draft	Tony McAlister	Steve Clark	04/08/2018
V01	Final	Tony McAlister	Steve Clark	04/10/2018
V02	Final	Tony McAlister	Steve Clark	11/02/2019

Project Details

Project Name	El Arish – Stormwater Management Plan
Client	Public Safety Business Agency
Client Project Manager	Julie Huynh
Water Technology Project Manager	Jo Tinnion
Water Technology Project Director	Steve Clark
Authors	Greg Hansell
Document Number	4984-01_R09_V02

Level 3, 43 Peel Street
South Brisbane QLD 4101
Telephone (07) 3105 1460
Fax (07) 3846 5144
ACN 093 377 283
ABN 60 093 377 283

CONTENTS

APPENDICES

LIST OF FIGURES

1 INTRODUCTION

1.1 Overview

Water Technology has been engaged by the Public Safety Business Agency to prepare a Stormwater Management Plan (SMP) for the proposed re-development of the existing fire and rescue station at El Arish. The proposed development encompasses 5 and 7 Ryrie St, El Arish (referred to hereafter as the site). The site has an area of approximately 2,044m^2 and is illustrated in Figure 1-1 below. The site is located within the Cassowary Coast Regional Council (Council) local government area.

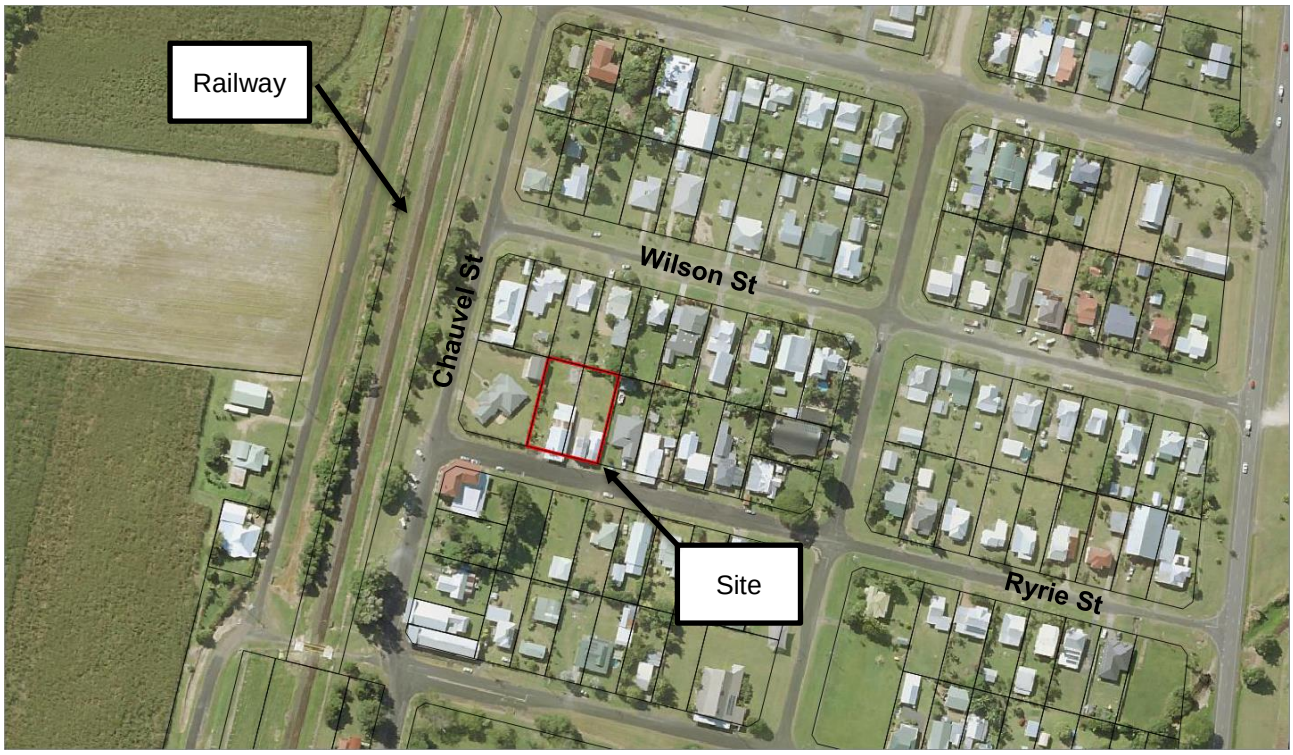


FIGURE 1-1 SITE LOCALITY

1.2 Existing Site Details

The proposed site is based across 5 and 7 Ryrie Street. 7 Ryrie Street contains the existing fire and rescue station, which consists of two adjacent buildings and hardstand area. 5 Ryrie Street contains a single structure, which appears to have been a commercial (potentially retail) structure at some point in the past. The most recent available Google street view imagery, from 2008, is provided in Figure 1-2 and Figure 1-3. A detailed site survey has also been completed which has been provided in Appendix A.

FIGURE 1-2 EXISITNG SITE – 5 RYRIE STREET, EL ARISH

FIGURE 1-3 EXISITNG SITE – 7 RYRIE STREET, EL ARISH

1.3 Proposed Development

The proposed development features several enhancements to the existing fire and rescue centre. The proposed development is illustrated in Figure 1-4 and includes:

- Demolition of the existing structures on both 5 and 7 Ryrie Street;
- Construction of a combined shed/office and storage facility;
- Provision of hardstand area for:
  - Driveways;
  - Staff parking; and
  - Training facilities
- Construction of a front fence with gate for security; and
- Greenspace adjacent to the northern, eastern and western property boundaries and incorporating a new septic waste water treatment system and effluent disposal area.

We understand that the carpark area will require filling/regrading to allow stormwater to drain towards Ryrie Street.

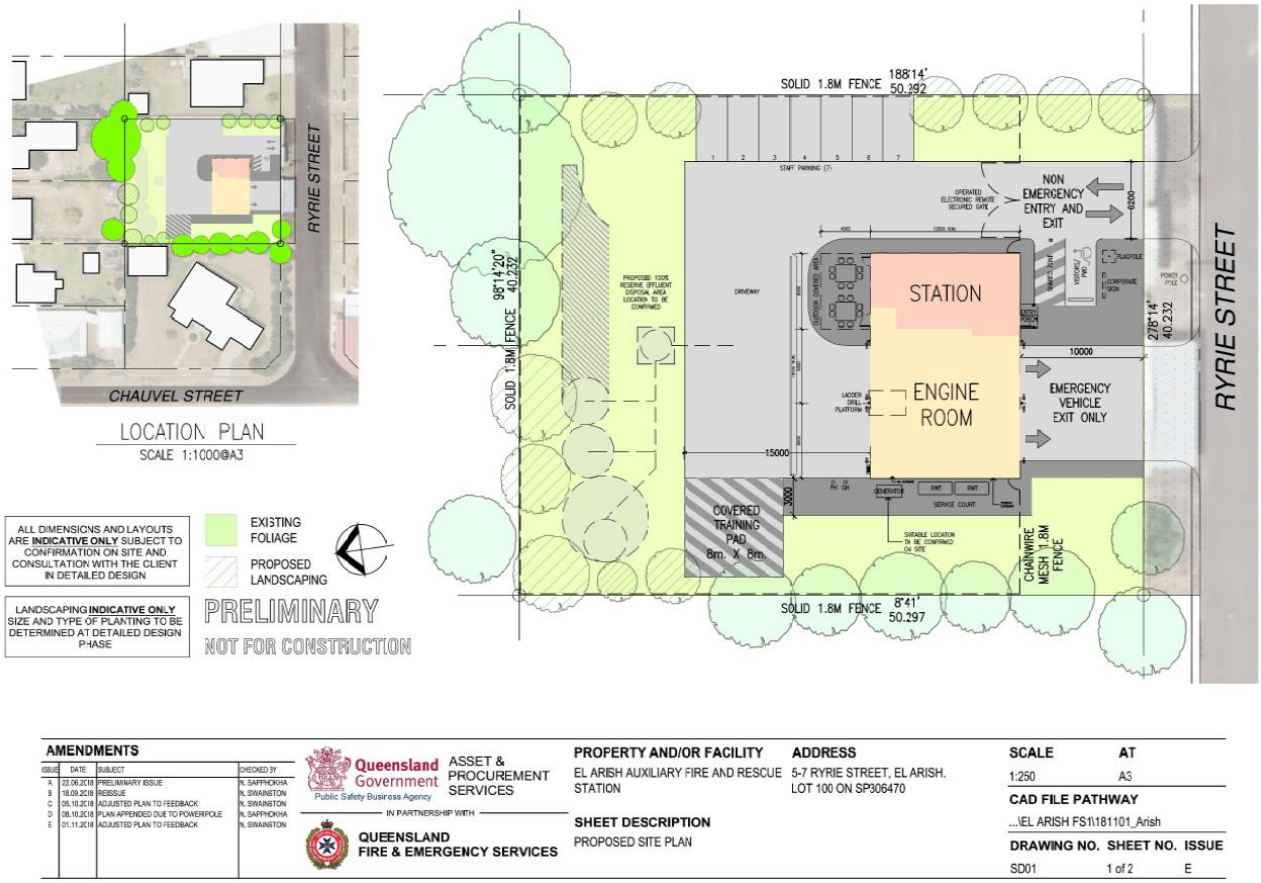


FIGURE 1-4 PROPOSED DEVELOPMENT

2 FLOOD RISK REVIEW

2.1 Regional Flooding

Regional flood mapping indicates that the township of El Arish is generally not directly impacted by large scale flooding, as indicated on Council's Johnstone Rivers Catchment flood mapping shown in Figure 2-1. Several roads into and out of the town do however appear to become inundated. The potential for isolation of the township has not been assessed as part of this SMP.

A Flood Risk Report was extracted for 7 Ryrie Street, being representative of the site. The report indicated that no flood hazards were present at the site. The Flood Risk Report is included in Appendix B. On this basis, no further consideration of regional flood risk has been made in this SMP.

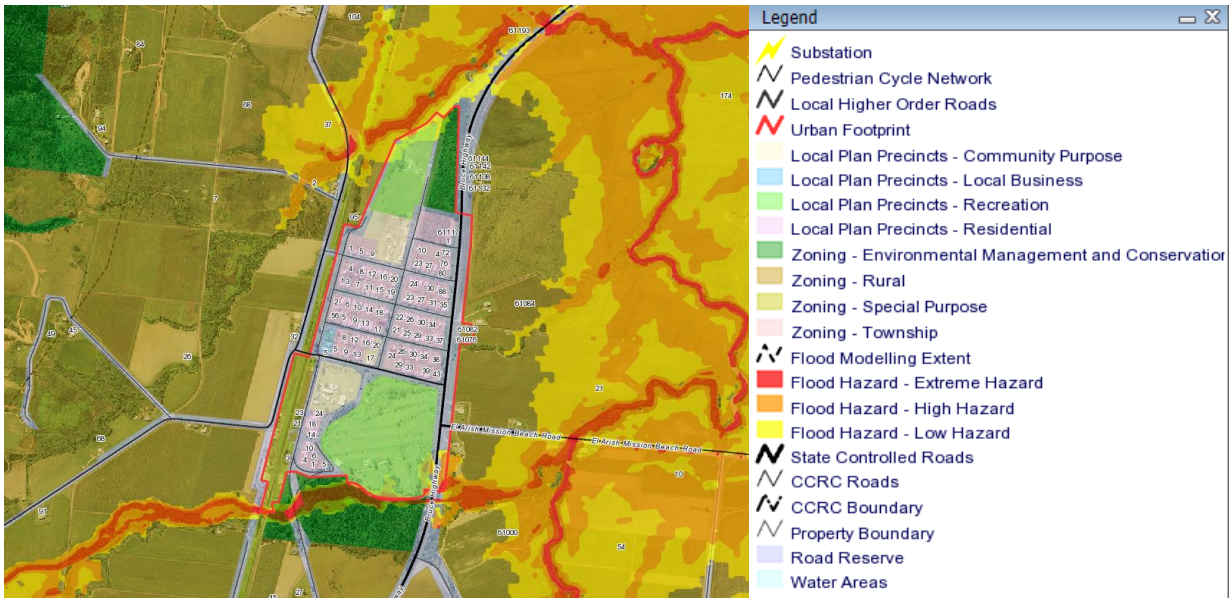


FIGURE 2-1 FLOOD HAZARD MAP

2.2 Local Flooding

The potential for the site to be impacted by overland flow flood events was assessed through a topographical assessment of the local catchment. A detailed topographical map was prepared, as indicated in Figure 2-2, which indicates that no significant external catchment is present. The railway drainage to the west of the site directs the majority of stormwater runoff from the upstream catchment further north and away from the site. The remaining catchment area, consisting of the local streets, is conveyed via surface flow on Ryrie Street to the east.

The flow capacity of Ryrie Street has not been assessed, however based on the local topography the potential for significant overland flow issues at the site is considered low. Standard building code freeboard provisions above natural surface should be adequate to prevent stormwater inundation of the finished floor of the proposed building.

FIGURE 2-2 LOCAL TOPOGRAPHY

3 STORMWATER QUANTITY ASSESSMENT

3.1 Overview

The requirements for stormwater quantity management for developments are specified in Cassowary Coast Regional Council planning scheme as:

Collect and convey stormwater in a system of natural and engineered channels, piped drainage networks and overland flow path systems to a lawful point of discharge, in a safe manner that minimises nuisance, damage and inundation of habitable rooms and protects life.

The stormwater quantity management strategy proposed for the site to address these requirements includes:

- Minimising the extent of impervious surfaces at the site. Pervious buffers along the downslope sides of the site (the northern and eastern boundaries) have been included in the site layout;
- Re-grading the site to discharge stormwater runoff from all impervious surfaces to Ryrie Street, which forms the site's Lawful Point of Discharge (LPD); and
- Ryrie Street is not serviced by a piped stormwater network; therefore, all stormwater discharge will be managed as surface flow.

The following sections outline the review of the site stormwater discharge.

3.2 Review of Site Discharge

The existing site contains two structures and areas of concrete paving as indicated in Figure 3-1, and stormwater discharge appears to occur over the northern site boundary to the adjacent private property and not to the street. The proposed development will increase the impervious fraction of the site from approximately 31% to 57%, which will result in an increase in the peak site stormwater discharge. The revised fraction impervious is considerably lower than standard industry values for industrial or commercial land uses and is consistent with the surrounding residential land use.

The proposed development will be constructed such that stormwater discharge from impervious surfaces are directed to Ryrie Street, which contains kerb and channel stormwater infrastructure. Ryrie Street is under the control of Council and therefore forms the LPD for the site. The redirection of stormwater discharge to Ryrie Street will result in a reduction of peak stormwater discharge across the northern property boundary and therefore will not result in actionable nuisance to the downstream property.

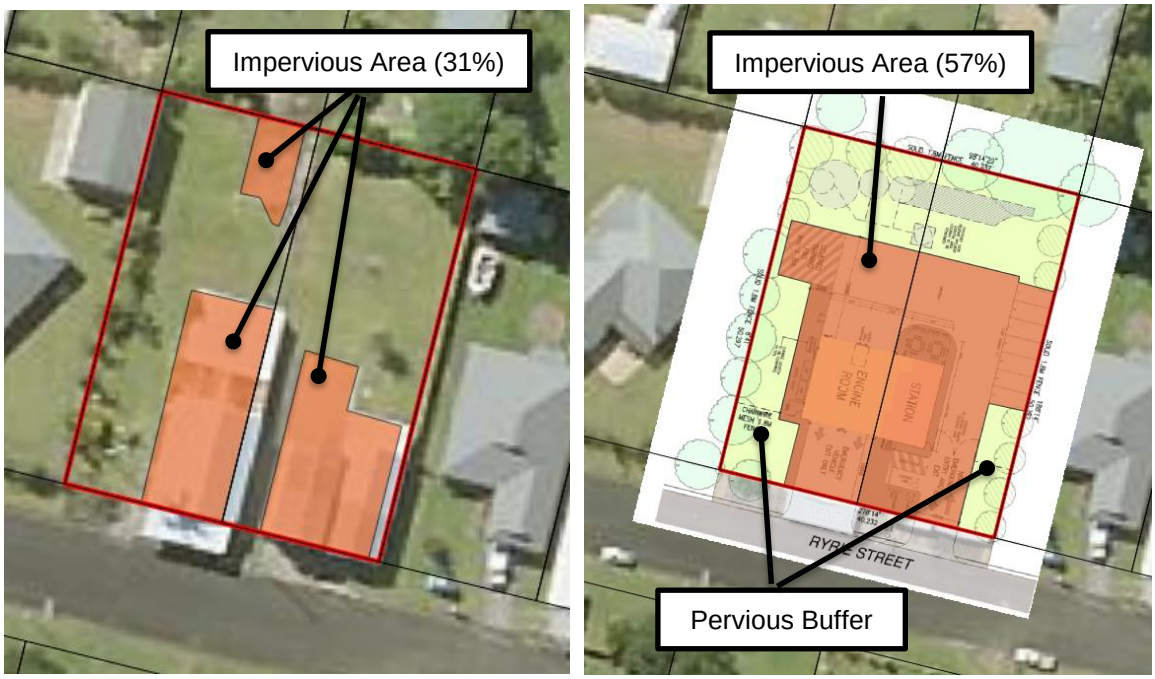


FIGURE 3-1 FRACTION IMPERVIOUS REVIEW – EXISTING (LHS) V DEVELOPED (RHS)

3.3 Summary

Stormwater discharge mitigation management infrastructure (detention basin(s)) are not considered necessary for the proposed development as:

- There will be an insignificant change to the impervious area of the site and therefore minimal change to peak stormwater discharge rates, which are also consistent with the residential land use in the area, and
- The proposed development will direct the majority of stormwater runoff to Ryrie Street,
  - Ryrie Street is under the control of Council, and forms the LPD for the site, and
  - Re-direction of impervious catchment runoff to Ryrie St will reduce peak discharge across private property boundaries, resulting in a 'non-worsening' in flow conditions on private property.

4 STORMWATER QUALITY ASSESSMENT

4.1 Overview

The requirements for stormwater quantity management for developments are specified in Cassowary Coast Regional Council planning scheme as:

The water quality of urban catchments and waterways is managed to protect and enhance environmental values and pose no health risk to the community.

The reference standards for achieving the above requirements are listed as:

- Planning Scheme Policy SC6.2 FNQROC Development Manual;
- Queensland Water Quality Guidelines 2009— Department of Environment and Heritage Protection;
- National Water Quality Guidelines—National Water Quality Management Strategy;
- Urban Stormwater Quality Planning Guidelines 2010;
- Queensland Urban Drainage Manual—Department of Energy and Water Supply

The above list does not include the State Planning Policy 2017 (Department of Infrastructure, Local Government and Planning) (SPP), which is the current over-arching state policy document which outlines the water quality outcomes to be achieved for development in Queensland.

Under the SPP, only premises 2500m^2 and over are subject to the stormwater management design objectives. On this basis, no dedicated stormwater quality infrastructure is required for the site.

4.2 Summary

Dedicated stormwater quality improvement devices are not considered necessary for the proposed development based on:

- The SPP, being the over-arching State planning document, does not require the proposed development to achieve benchmark water quality targets as the scale of the development below the threshold for applying the SPP water quality objectives;
- The proposed development is ‘like for like’ in nature, in that the existing fire and rescue station is being re-developed into a new, more modern facility and there is in fact no ‘new’ land use being proposed at the site;
- The new facility will have improved water quality outcomes through the provision of a new septic system, which will replace the existing aging system;
- The site is located within the centre of the El Arish township, and is therefore not adjacent to a sensitive waterway receiver; and
- The FNQROC Development Manual (stormwater drainage) Version No. 03/17 indicates that lots are to drain towards the road reserve, however as there is no piped system to connect to, all site discharge must be a surface flow. Significant filling of the site would be required to achieve enough grade to discharge a SQID to the road reserve as surface flow, which is not considered worthwhile given the limited water quality improvement which would be achieved for the overall catchment of Digger Creek.

5 SUMMARY

Water Technology has been engaged by the Public Safety Business Agency to prepare a Stormwater Management Plan (SMP) for the proposed re-development of the existing fire and rescue station at El Arish. The proposed development encompasses 5 and 7 Ryrie St, El Arish. The site has an area of approximately 2044m^2. This SMP has reviewed the major stormwater factors for the site, being flooding, stormwater quantity and stormwater quality. A summary of the findings for each of these factors is outlined below.

Regarding flooding:

- The site is not impacted by regional flooding; and
- The site has an insignificant external catchment area, and therefore local flooding issues are not a concern for the site.

Regarding stormwater quantity management:

- There will be an insignificant change to the impervious area of the site and therefore minimal change to peak stormwater discharge rates, which are also consistent with the residential land use in the area; and
- The proposed development will direct the majority of stormwater runoff to Ryrie Street and:
  - Ryrie Street is under the control of Council, and forms the LPD for the site; and
  - Re-direction of impervious catchment runoff to Ryrie St will reduce peak discharge across private property boundaries, resulting in a 'non-worsening' in flow conditions on private property.

Regarding stormwater quality management:

- The SPP, being the over-arching State planning document, does not require the proposed development to achieve benchmark water quality targets as the scale of the development is below the threshold for applying the SPP water quality objectives;
- The proposed development is 'like for like' in nature, in that the existing fire and rescue station is being re-developed into a new, more modern facility and there is in fact no 'new' land use being proposed at the site;
- The new facility will have improved water quality outcomes through the provision of a new septic system, which will replace the existing aging system;
- The site is located within the centre of the El Arish township, and is therefore not adjacent to a sensitive receiving waterway; and
- The Development Manual (stormwater drainage) indicates that lots are to drain towards the road reserve, however as there is no piped system to connect to, all site discharge must be a surface flow. Significant filling of the site would be required to achieve enough grade to discharge a SQID to the road reserve as surface flow, which is not considered worthwhile given the limited water quality improvement which would be achieved for the overall catchment of Digger Creek.

Based on the above review, the site should not require any dedicated stormwater quantity or quality mitigation infrastructure beyond the stormwater management strategies outlined in this SMP to achieve the requirements of the Planning Scheme.

APPENDIX A
SITE SURVEY

This plan has been prepared for the PUBLIC SAFETY BUSINESS AGENCY from a combination of field survey and existing records for the purpose of showing the physical features of the land to assist in designing future development, and should not be used for any other purpose.

The title boundaries shown hereon were surveyed as part of IS269929.

Services shown hereon where located where possible by field survey completed on 07-03-2018. If not able to be located, known services have been shown from the records of the relevant authorities or service providers where available and have been noted accordingly on this plan. All services shown from records only will need verification prior to, or during work on site.
Prior to any demolition, excavation or construction on site, the relevant authority should be contacted for:

- Verification of all services plotted from records only; and
- Possible location of any services altered since this survey was completed or any new services installed either on or adjacent to the site.

Before starting any demolition, excavation or construction on the site, the relevant person should make an independence and updated enquiry of 'dial before you dig' and any relevant service providers to ascertain the existence of further services (if any) and the accurate location of those not able to have been surveyed at the time of preparing this plan (or data).

- No responsibility can be accepted by TerraModus Surveying Pty Ltd for any damage caused to any underground service or any loss or injury so suffered if enquiry and verification have not been completed in accordance with this note.
- This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

The survey information on this plan conforms to the minimum accuracies as per the Public Safety Business Agency Survey Brief Item 14

Surveyor/Director ..... Date .....

LEGEND

SIGN
KERB OUTLET
POSSIBLE GREASE TRAP
INSPECTION OPENING
FIRE HYDRANT
WATER METER
POWER POLE
COMMUNICATIONS MH
SURVEY MARK
SURVEY STATION
TREE
SURFACE LEVEL
OVERHEAD POWER
COMMUNICATIONS CABLE -FROM RECORDS
CHANGE OF GRADE
BUILDING
EDGE OF CONCRETE
FENCE
EAVE LINE
ROAD CROWN
WATER MAIN - FROM RECORDS

4984-01_R09_V02_ElArish_SWMP.docx

APPENDIX B
FLOOD RISK REPORT

Cassowary Coast Regional Council
Flood Risk Report for 217E7291

Lot 217 on plan E7291; Parcel area 1,011 sq m.
217E7291 is within the Johnstone River flood study area.
100, 50, 20, 10, 5 and 2 year ARI flood events do not reach this parcel.

AHD - Australian Height Datum - Approximately equal to Mean Sea Level

Historical Foods
5% or 20 year - 1918, 1927, 1932, 1946, 1967, 1986, 1999
2% or 50 year - 1911, 1935
1% or 100 year - 1894, 1913
Possible maximum flood - 1878

	Annual Exceedence Probability (AEP)	Annual Return Interval (ARI)
The likelihood of a flood event can be expressed in either Annual Exceedence Probability (AEP) or Annual Recurrence Interval (ARI).	39%	2 years
	18%	5 years
	10%	10 years
	5%	20 years
	2%	50 years
	1%	100 years

It is the enquirer's responsibility to interpret the effects on particular properties using the information provided in the Flood Level Maps. Precise surveys of individual land parcels would be required to assess current property levels and vulnerability to flooding. Please note that this data is indicative only and is based on available coarse ground model data at the time of assessment (Johnstone River 2002, Tully River 2008). Cassowary Coast Regional Council gives no warranty as to the accuracy, reliability, completeness or suitability of the data included in this website and accepts no liability for any loss, damage or costs including consequential damage relating to any use of the data.

LEGEND
- Subject parcel
- Parks and Reserves
- Roads
- LGA Boundaries
- Property Boundaries

Melbourne

15 Business Park Drive
Notting Hill VIC 3168
Telephone (03) 8526 0800
Fax (03) 9558 9365

Brisbane

Level 3, 43 Peel Street
South Brisbane QLD 4101
Telephone (07) 3105 1460
Fax (07) 3846 5144

Adelaide

1/198 Greenhill Road
Eastwood SA 5063
Telephone (08) 8378 8000
Fax (08) 8357 8988

Perth

Ground Floor
430 Roberts Road
Subiaco WA 6008
Telephone 0438 347 968

Geelong

PO Box 436
Geelong VIC 3220
Telephone 0458 015 664

Gippsland

154 Macleod Street
Bairnsdale VIC 3875
Telephone (03) 5152 5833

Wangaratta

First Floor, 40 Rowan Street
Wangaratta VIC 3677
Telephone (03) 5721 2650

Wimmera

PO Box 584
Stawell VIC 3380
Telephone 0438 510 240

www.watertech.com.au

info@watertech.com.au

Appendix 11

Site and Soil Investigation – On-site Effluent Evaluation

Public Safety Business Agency
c/- Business Services Division
GPO Box 1440
Brisbane QLD 4001

29 May 2018
Report No. 18280_2

Attention: Julie Huynh

SITE AND SOIL INVESTIGATION
On-site Effluent Evaluation for 5-7 Ryrie St, El Arish

1. PROJECT DESCRIPTION

PDR | SMEC (PDR) has been engaged to carry out a site and soil investigation at 5-7 Ryrie St, El Arish. Preliminary designs show the two sites combined into one, with the structure and pavement extending over both sites and a provisional location of the on-site septic tank and beds to the eastern side of 7 Ryrie St. The site investigation was conducted on 1 May 2018.

Investigation, testing and reporting has been undertaken in accordance with the following:

- AS/NZS 1547:2012 *On-site Domestic Wastewater Management*
- FNQROC Development Manual – *Operation Works Design Manual – D7 Sewerage System*
- *Queensland Plumbing & Wastewater Code*

PDR were also commissioned to provide a geotechnical evaluation including site classification. This report is intended to be read in conjunction with PDR report 18280_1 dated 29 May 2018.

2. SITE AND SOIL EVALUATION

The site investigation comprised a visual examination of site, laboratory testing and field soil permeability testing. There is one tree and one stump in the yard of 7 Ryrie St, while 5 Ryrie St contains trees and bushes along the western boundary but is clear elsewhere. From survey data, a slope of approximately 1V:32H is present, with fall toward the north of the site.

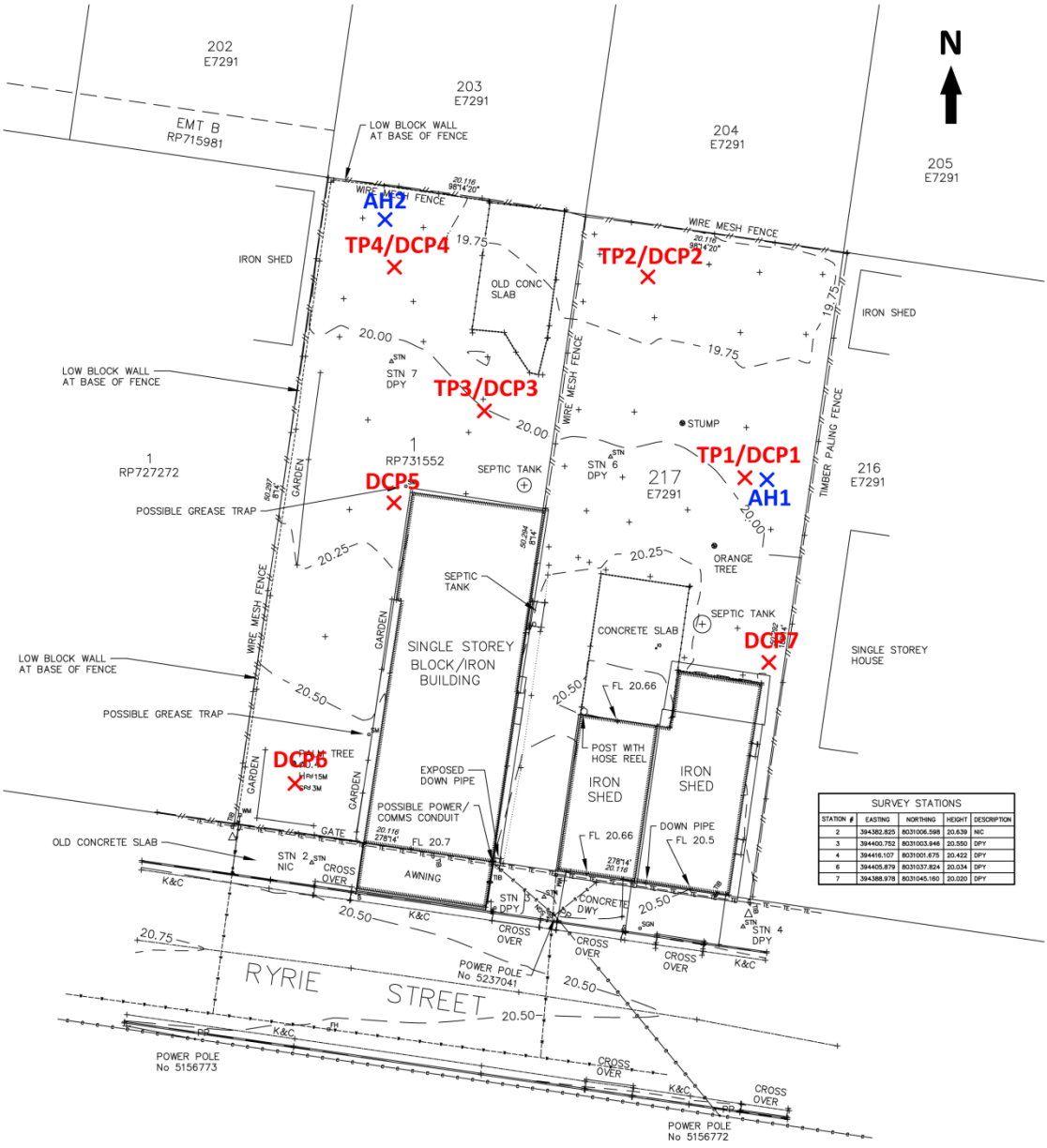
Surface stormwater flows are directed toward the northern boundary. Stormwater management is not discussed herein.

Two (2) soil permeability tests were conducted within the proposed single site. AH1 was located near the eastern boundary of 7 Ryrie St, near where the preliminary designs show the planned septic beds. AH2 was located towards the north-west of

Correspondence PO Box 2551 Cairns 4870
Ph: (07) 4051 5599
Fax: (07) 4051 5455
Email: admin@pdrengineers.com.au

5 Ryrie St, where another grassed area is shown in the preliminary designs. Figure 1 shows the two test locations. The tests were conducted adopting a constant head permeameter test, from which the Saturated Hydraulic Conductivity (K_{sat}) value could be determined in accordance with AS/NZS1547.

Figure 1 – Auger Hole and Test Pit Locations



Site observations are summarised in Table 1, with a summary of the soil assessment provided in Table 2.

Table 1 – 5-7 Ryrie St Site Assessment (extract from AS/NZS 1547 Table D1)

Site Factor	**Result**
Slope	1H:32V and flatter (based on survey data)
Shape	Planar
Aspect	North
Exposure	Open
Erosion/movements	Nil identified
Boulders/rock outcrops	Nil identified
Vegetation	Sparse trees in yard, shrubline/small trees along western boundary
Watercourse	Nil
Soil water regime / bores	Water table at 2-2.3m, no bores on site
Fill	Nil identified
Run-on/Flooding	Nil
Channelled run-off	Nil
Soil Surface conditions	Soft to approximately 1m, Very Stiff to Hard/Dense to 2.5-3m
Other site specific factors	Nil

Table 2 – 5-7 Ryrie St Soil Assessment to 1m (extract from AS/NZS 1547 Table B2)

Soil Property	**Result**
Colour	Brown to dark brown
Texture	Fine, soft
Coarse Fragments	N/A
Structure	N/A
Measured Permeability K_{sat} (m/d)	**0.53 (AH1) – 0.99 (AH2)** (AS/NZS 1547 Equation G1)
Dispersion	Emerson Class 5 & 6
Soil Category	**4** (refer to Table 3)

Following determination of K_{sat} and the Soil category, Table 3 provides parameters useful for the design of the treatment system.

Table 3 – Recommended Design Loading Rates (extract from AS/NZS 1547 Table 5.2

Soil Category	Soil Texture	Structure	Indicative Permeability (K_{sat}) (m/d)	Design Irrigation/Loading rate (DIR.DLR) (mm/day)						
				Trenches and beds			ETA/ETS beds and trenches	Drip and spray irrigation	Lped irrigation	Mounds (basal area)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	>3.0	(See Note 1, Appendix B for DLR values)			(See note 4, Appendix B)	5 (See Note 7, Appendix B)	(See Note 8, Appendix B)	32
2	Sandy loams	Weakly structured massive	>3.0	15	25	50			4	24
3	Loams	High/moderate structured	1.4-3.0	15	25	50		4 (See Note 6, Appendix B)	3.5	24
		Weakly structured or massive	1.5-3.0	10	15	30				16
4	Clay loams	High/moderate structured	0.5-1.5	10	15	30	12	3.5 (See Note 6, Appendix B)	3	16
		Weakly structured	0.12-0.5	6	10	20	8			8
		Massive	0.06-0.12	4	5	10	5			(See Note 10, Appendix B)
5	Light clays	Strongly Structured	0.12-0.5	5	8	12	8	3 (See Note 6, Appendix B)	2.5 (See Note 9, Appendix B)	8
		Moderately Structured	0.06-0.12	(See Notes 2 and 3, Appendix B)	5	10	5 (See notes 2,3 and 5, Appendix B)			(See Note 10, Appendix B)
		Weakly structured or massive	<0.06		(See Notes 2 and 3, Appendix B)	8				
6	Medium to heavy clays	Strongly Structured	0.06-0.5			(See Notes 2 and 3, Appendix B)		2 (See Note 7, Appendix B)	(See Note 8, Appendix B)	
		Moderately Structured	<0.06							
		Weakly structured or massive	<0.06							

3. SYSTEM SELECTION

3.1 System Design

The most commonly used system in comparable sites is a conventional septic bed or trench. This design allows for a versatile system with a relatively high Design Load Rate (DLR) and does not require vegetation to assist in the treatment process. It is suitable for use in Category 4 soils and has a simple installation procedure and low ongoing maintenance relative to other designs.

Other methods that may be considered but have distinct disadvantages are ETA/ETS beds and trenches. In addition to increased complexity, they have a lower DLR relative to conventional trenches and beds and require select vegetation to assist in the effluent treatment. In the case of Category 4 Moderately Structured material, an area increase of 2.5 times that of a conventional bed or trench may be necessary.

Drip/spray and LPED irrigation systems would be impractical for this site as they require the irrigation region to be sectioned off from use by people and animals and have a much lower DLR. Similarly, a mound system has been discounted as it is impractical for a relatively small lot in a built up area.

Advantages and disadvantages of each system type can be seen and compared in Appendix C. The system may be a primary, secondary or advanced secondary treated effluent system.

3.2 System Setback Distances

Based on the *Queensland Plumbing and Wastewater Code*, typical setback distances for the treatment system must be at least 2m from upslope property boundaries, paths, footings and walkways, 2m from level property boundaries, paths, footings and walkways, and 4m from downslope property boundaries, paths, footings and walkways. Due to the very light incline of the site, all directions can be considered to be level. Additionally, the base of the trenches/beds must be 1.2m above the seasonal water table for primary treated effluent, down to 0.3m above the seasonal water table for advanced secondary treatment. Appendix D provides further parameters for the final system location.

Additionally, the system must form part of a minimum 2000 m^2 area above the Q50 flood level. This minimum area must contain no land required for access, service or drainage easements. A flood study is recommended to ensure the lot is above the Q50 flood level.

No registered bores or swimming pools were identified within minimum setback distance of the site.

When considering system setback distances, AS/NZS 1547 states that any relevant regulatory authority policies or guidelines override those in the standard. For this site the relevant authority is FNQROC, who produce a development

manual which states that the Queensland Plumbing and Wastewater Code must be followed.

Due to the built up nature of the region and relatively shallow water table, it is recommended that an **Advanced Secondary Treatment** system be considered that will allow a reduction of the minimum setback to 10 m between the proposed system and kerb and maintain 0.3m above the water table.

3.3 System Sizing Factors

Preliminary designs show two toilets, one shower and a kitchenette. This design shows 16 spaces available in the training room and two in the duty office indicating a maximum capacity of 18 persons, however this would represent an irregular peak loading over a training day of approximately 10-12 hours.

Due to this irregular loading the system is required to handle a peak load only occasionally for a period of 10-12 hours, however will have semi-regular loads during call-outs. This irregular loading makes it impossible to treat the site in the same manner as a permanently occupied residential building. Design loads for commercial buildings are typically estimated by square footage, however the small footprint of the enclosed region in the preliminary design results in a loading of less than one (1) equivalent person. As a result, it has been decided to work backwards from a peak loading factor of 18 persons.

The tank must be designed to ensure it will be suitable for the peak load experienced during training days. *Planning Guidelines for Water Supply and Sewerage* nominates Equation 1 below to assist in determining the peak loading factor of a sewerage system. Working backwards from an assumed peak equivalent persons of 18, a peak loading factor of 4.0 and equivalent persons of 4.5 is achieved. This may be achieved through either a single large tank or a primary and secondary tank set-up.

$$C_2 = 4.7 \times EP^{-0.105} \qquad \text{(Equation 1)}$$

where:

C_2 = Peak loading factor
EP = Equivalent Persons

As this load is over a short period with breaks in which the system will be well below capacity, it is suggested that the minimum allowable residential design flow of five (5) equivalent persons should be used for the land application sizing and system selection.

A dosing system may also be used to ensure regular flow from the tank to the land application area.

Based on visual inspection and results of the permeameter testing, the soil is Categorised as **Category 4**, Clayey Loam, Moderately Structured. As described in

Table 3, a DLR of 30 mm/d has been selected based on the site conditions and installation of a conventional bed or trench system. The total Design Daily Flow (Q) is 200L/equivalent person or 1000L/day for this site.

AS/NZS 1547:2012 Appendix L provides the following equation to calculate the required trench/bed length of a conventional system;

$$\mathbf{L} = \frac{\mathbf{Q}}{\mathbf{DLR} \times \mathbf{W}} \qquad \text{(Equation 2)}$$

where:
L = Length in m
Q = Design daily flow in L/day
DLR = Design Loading Rate in mm/d
W = Width in m

As the length and width of beds/trenches varies by system manufacturer, it is difficult to provide length and width dimensions whilst maintaining the appropriate setback distances. Upon receipt of the above parameters, and selection of the system manufacturer, an appropriate number of bed rows may be selected to ensure width and length are appropriate for the site.

Notwithstanding, an area can be provided from which an appropriate length and width may be chosen following determination of the building envelope within the proposed lot.

Rearranging the above equation for L and W yields the following:

$$\mathbf{L} \times \mathbf{W} = \frac{Q}{DLR}$$
$$\mathbf{A} = \frac{\mathbf{1000}}{\mathbf{30}}$$
$$\mathbf{A} = \mathbf{33.4\ m^2}$$

Manufacturers provide online tools that allow the designer to input the number of rows or trenches (based on their proprietary products) to suit the site constraints and ground conditions. This ensures that a width is selected that complies with the limitations of full bed widths. Following input into the tool, a design is provided. For example, Advanced Enviro-Septic have an online calculator that will determine design area in the manner described in this section. Then, by selecting a number of rows, the user is provided with the length and width of bed necessary for this design.

In addition to the bed sizing area, a further reserve area that is 100% of the design area must be set aside. This requirement is outlined in AS/NZS 1547 <Cl 5.5.3.4>. The reserve area must satisfy the setback requirements noted earlier and not be constructed upon. Based on the above calculations, a total reserve area of 33.4 m^2 is to be allowed for, with the reserve space as one parcel to the side of the system.

4. RECOMMENDATIONS

Due to the setback exclusion zone required to the site, an Advanced Secondary Treatment system is recommended. Setbacks from property boundaries applicable to the site and system are as follows:

- 2m from level boundaries
- 10 m from catch drains (grassed swale and concrete lined)

Figure 1 diagrammatically represents the exclusion zone to which the treatment system cannot be installed and the zone within which construction cannot occur based on an example land application area location.

Setback distances of the treatment system with respect to the proposed building are as follows:

- 2 m from level footings/pavements

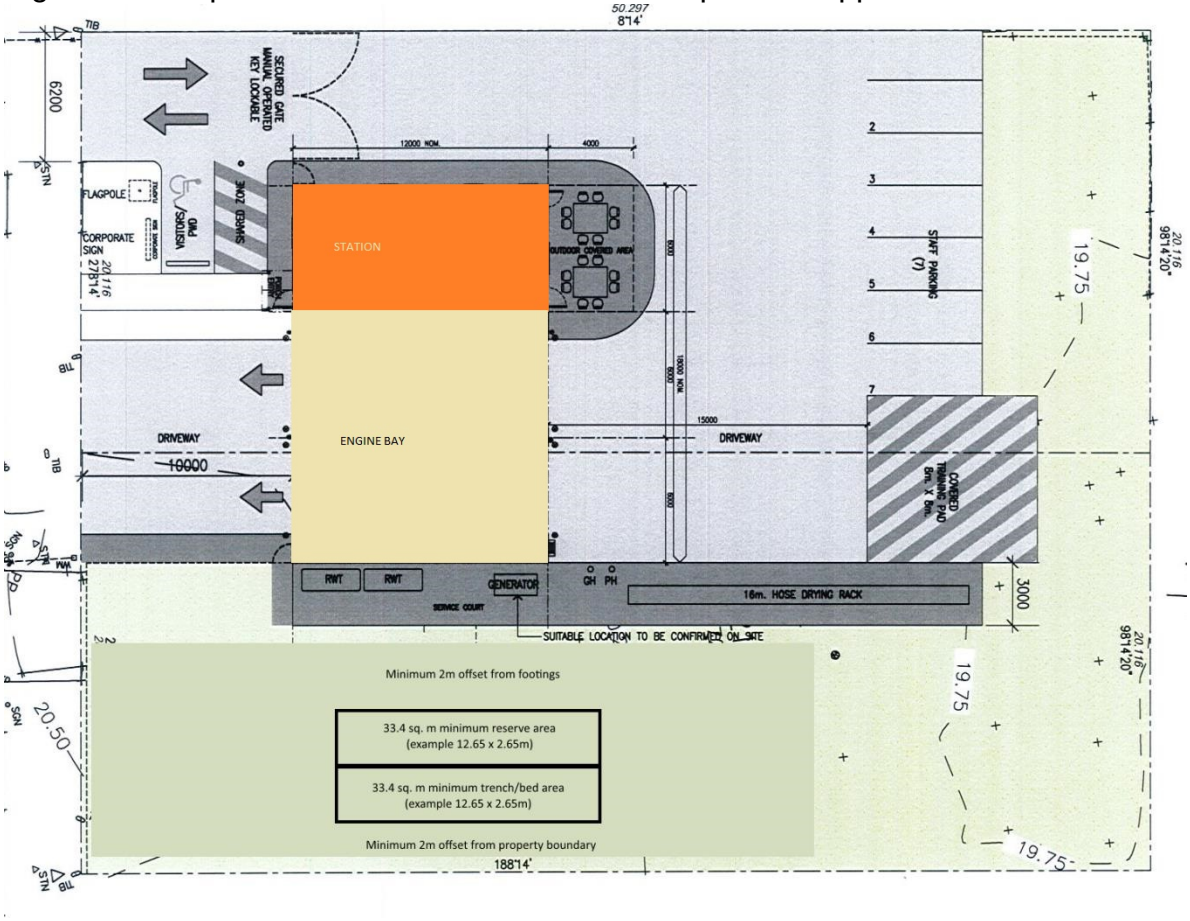
Depth limitations are as follows:

- 0.3 m above seasonal groundwater table

Due to the highly permeable nature of the sands identified near the groundwater table a shallower depth than the minimum may be advisable.

The total system area required is 33.4m^2 based on an equivalent number of persons of five (5) to account for short term peak loads. An additional 33.4m^2 reserve area adjacent to the system must be allowed for upon which no construction may occur (total of 66.8m^2). This reserve area must comply with the setbacks noted above.

Figure 1 – Required setback distances and example land application area location.



APPENDIX A

Site Assessment Factors

Table A1 – Site Assessment Factors (extract from AS/NZS 1547 Table D1)

Site Factor	Minimum Investigation	Method
Slope Shape Shape Aspect	Measure over 20 slope length Concave, convex or planar Divergence/convergence Note direction slope faces	Inclinometer or Abney level Visual assessment Visual assessment Compass
Exposure (sun, wind)	Exposure assessment – identify on site plan	
Erosion, mass movements, land slip	Note location and detail on site plan	Visual assessment and aerial photo inspection
Boulders, rock, outcrops	Note location on site plan	Visual assessment
Vegetation	Record type on site-and-soil evaluation form Record cover area on site plan	Visual assessment and sampling if necessary for subsequent identification of species
Watercourse	Note locations of standing water and watercourses including flow direction on site plan Locate ephemeral flow paths and flow direction	Visual assessment
Soil water regime	Frequency and duration of seasonal shallow water logging(perched water tables) Depth to permanent dry weather groundwater table	Anecdotal information from landholders; monitoring boreholes if available n locality, soil profile inspection determination of mottling; any available records of groundwater tables
Fill	Note location, depth and type on the site plan	From inspection of soil pits
Run-on/flooding	Note location of run-off producing or flood prone areas on site plan	Examine site for flood debris and silt deposits; visual assessment of topography of adjacent upslope areas
Channelled (concentrated) run-off	Note location of areas on site plan and those which produce concentrated run-off towards the neighbouring properties	Visual assessment of site topography
Soil surface condition	Note crack, hardness, previous compaction, dampness and the location of seepage areas	Inspection of topsoil with hand tools and by visual appearance
Salinity	Record salt tolerant vegetation, bare ground or presence of salt crystals on surface	Visual assessment
Other site-specific factors	As per site-and-soil evaluation form	

APPENDIX B

System Selection Notes

NOTES (extracts from AS/NZS 1547 Tables L1, M1 and N1)

1 – Primary (Conservative), 20 mm/d, Primary (Maximum), 35 mm/d, Secondary, 50 mm/d. The treatment capacity of the soil and not the hydraulic capacity of the soil or the growth of the clogging layer govern the effluent loading rate in Category 1 and Weakly Structured Category 2 soils. Land application systems in these soils require design by a suitably qualified and experienced person, and distribution techniques to help achieve even distribution of effluent over the full design surface (see AS/NZS 1547 L6.2 and Figure L4 of recommended discharge method by discharge control trench). These soils have low nutrient retention capacities, often allowing accession of nutrients to groundwater.

2 – To enable use of such soils for on-site wastewater land application systems, special design requirements and distribution techniques or soil modification procedures will be necessary. For any system designed for these soils, the effluent absorption rate shall be based upon soil permeability testing. Specialist soils advice and special design techniques will be required for clay dominated soils having dispersive (sodic) or shrink/swell behaviour. Such soils shall be treated as Category 6 soils. In most situations, the design will need to rely on more processes than just absorption by the soil.

3 – If K_{sat} < 0.06 m/d, a full water balance for the land application can be used to calculate trench/bed size (See AS/NZS 1547, Appendix Q).

4 – ETA/ETS systems are not normally used on soil Categories 1 to 3.

5 – For Category 6 soils ETA/ETS systems are suitable only for use with secondary treated effluent.

6 – For Category 3 to 5 soils (loams to light clays), the drip irrigation system needs to be installed in an adequate depth of topsoil (in the order of 150 - 250 mm of *in situ* or imported good quality topsoil) to slow the soakage and assist with nutrient reduction.

7 – For Category 1, 2 and 6 soils, the drip irrigation system has a depth of 100 – 150 mm in good quality topsoil (see AS/NZS 1547 CM1 and M3.1).

8 – LPED irrigation is not advised for Category 1 or Category 6 soils – drip irrigation of secondary effluent is the preferred irrigation method.

9 – LPED irrigation for Category 5 soils needs a minimum depth of 250 mm of good quality topsoil (see AS/NZS 1547 M5 and CM7.1).

10 – To enable the use of such soils for on-site wastewater land application, special design requirements and distribution techniques or soil modification techniques will be necessary. For any system designed for these soils, the effluent absorption rate shall be based upon soil permeability testing. Specialist soils advice and special design techniques will be required for clay dominated soils having dispersive (sodic) or shrink/swell behaviour. Such soils shall be treated as Category 6 soils. In most situations, the design will need to rely on more processes than just absorption by the soil.

APPENDIX C

System Selection Advantages and Disadvantages

The following tables are extracts from AS/NZS 1547 Table K1

Table C1 – Conventional absorption trenches – Limitations due to site, soil and climatic factors

Land application system	Slope gradient (see Note 2)	Soil depth (see Note 3)	Soil category number (see Note 4)	Depth to seasonal water table (see Note 4)	Duration of continuous seasonal soil saturation (see Note 5)	Dispersive (sodic) soil (as defined)	High content of stones, cobbles or boulders	Climatic factors	Lot size
Conventional absorption trenches	System: Trenches can be more difficult to install on slopes >15% Environment: More soil disturbance and erosion during construction on steep slopes	System: Depth has to be adequate for final effluent treatment; preferably >1.2 m for trenches of 0.6 m depth but further separation may be required if soils are highly permeable of have preferential pathways Environment: Has to be deep enough to store effluent during periods of wet weather and low evapo-transpiration	System: Category 5 and 6 soils require large trench systems per unit volume effluent Environment: Categories 1 and 2 can cause ground-water pollution; minimise risk by effluent dosing by a pumped distribution system	System: Preferably >1.2m; but further separation may be required if soils are highly permeable or have preferential pathways. Depth has to be adequate for sufficient seepage path under saturated conditions Environment: <1.2m may cause increased soil wetness if lateral groundwater flow is slow	System: Prolonged saturation of upper soil impedes treatment and hinders absorption Environment: Increased risk of polluted surface run-off	System: Soil may lose permeability during life of system, causing failure; large trench lengths required Environment: Increased risk of polluted surface run-off	System: Stones and boulders have no or little water storage capacity and reduce water storage in the soil around trenches; also increases difficulty of excavation Environment: High proportion of stones cobbles and boulders increases risk of trench overflows or may provide flow paths that promote short circuiting to groundwater	System: Not significant will operate in high or low rainfall areas. Surface and groundwater controls required in wet areas. Environment: N/A	System: Small lot size unfavourable as absorption trench system is relatively inefficient disturbing effluent over the land application area Environment: Setback distances to water resources, water bodies and watercourses.

Table C2 – Evapo-transporation/absorption/seepage trenches and beds – Limitations due to site, soil and climatic factors

Land application system	Slope gradient (see Note 2)	Soil depth (see Note 3)	Soil category number (see Note 4)	Depth to seasonal water table (see Note 4)	Duration of continuous seasonal soil saturation (see Note 5)	Dispersive (sodic) soil (as defined)	High content of stones, cobbles or boulders	Climatic factors	Lot size
Evapo-transporation/ absorption/ seepage trenches and beds	System: As above. Recommended maximum slope for a bed 10%	System: As above. Effluent storage capacity of the trench/ bed and the surrounding soil is important	System: Categories 4 to 6 are suitable for ETA/ETS systems if climatic factors are suitable	System: Preferably >1.2m but further may be required if soils are highly permeable or have preferential pathways, no empirical data available; duration of seasonal perched water tables is important (see appendix R)	System: Prolonged saturation of upper soil impedes treatment and hinders absorption. Evapo-transpiration cannot overcome prolonged soil water logging.	System: As for conventional absorption trenches	System: As for conventional absorption trenches	System: Not necessary for annual evaporation to exceed annual precipitation (rain and snow) for systems to work	System: As for conventional absorption trench systems but more so. Smaller area required if evapo-transpiration is much greater than precipitation.
	Environment: As above	Environment: As above. Not favoured for soil categories 1 to 3 as can cause groundwater pollution – require special design	Environment: As above. Not favoured for soil categories 1 to 3 as can cause groundwater pollution – require special design	Environment: As for conventional absorption trenches	Environment: Much increased risk of polluted surface run-off	Environment: As for conventional absorption trenches	Environment: As for conventional absorption trenches	Environment: The risk of system failure is increased if high rainfall month coincide with low evapo-transportation months and with the number of such months per year. Surface and groundwater controls required in wet areas. Provide for winter storage capacity in the bed media. Maximise exposure to sun and wind. Plant high transpiration species appropriates to the locality.	Environment: Setback to distances to water resources, water bodies and water courses

Table C3 – Mounds – Limitations due to site, soil and climatic factors

Land application system	Slope gradient (see Note 2)	Soil depth (see Note 3)	Soil category number (see Note 4)	Depth to seasonal water table (see Note 4)	Duration of continuous seasonal soil saturation (see Note 5)	Dispersive (sodic) soil (as defined)	High content of stones, cobbles or boulders	Climatic factors	Lot size
Mounds	System: Large increase in imported sand is needed on steep slopes; max, practical slope 15%.Risk of toe seepage on steep slopes. Environment: As above	System: Less important mounds are designed to overcome shallow soil limitations Environment: N/A	System: Mounds are specially designed to overcome limitations of categories 4 to 6; may also be used for categories 1 to 3 Environment: N/A	System: Mound can be specially designed to overcome shallow water table; >0.6m is preferable but higher separation distances may be required for category 1 soil, or if preferential pathways are present (see Appendix R) Environment: May increase soil wetness in immediate vicinity	System: Prolonged saturation of upper soil necessities building up treatment area Environment: Minimise risk of polluted surface run-off	System: May be limited by low effluent infiltration in underlying natural soil Environment: Seepage may emerge along the toe of the mound	System: Probably not relevant in practice Environment: N/A	System: As for conventional absorption trench systems Environment: Not relevant	System: Mounds can take up much space if constructed on relatively steep land Environment: Not relevant

Table C4 – Subsurface irrigation systems – Limitations due to site, soil and climatic factors

Land application system	Slope gradient (see Note 2)	Soil depth (see Note 3)	Soil category number (see Note 4)	Depth to seasonal water table (see Note 4)	Duration of continuous seasonal soil saturation (see Note 5)	Dispersive (sodic) soil (as defined)	High content of stones, cobbles or boulders	Climatic factors	Lot size
Subsurface irrigation systems	System: Maximum slope without specific design 30% Environment: As for conventional trenches	System As for conventional trench systems; a minimum of 0.65m below bottom of dripper lines is desirable Environment: As for trench systems	System: Categories 4 to 6 require extensive dripper line systems as well as surface soil preparation Environment: Categories 1 and 2 may lead to nutrients reaching groundwater	System: As for conventional absorption trench systems but less so due to shallow application of effluent and lower areal loading rates Environment: As for conventional absorption trench systems	System: Prolonged saturation of upper soil impedes treatment and hinders absorption Environment: Increased risk of polluted surfaces run-off	System: As for conventional absorption trench systems but is in most topsoils Environment: Increased risk polluted surface run-off as dispersive tendency increases	System: As for conventional absorption trench systems Environment: As for conventional absorption trench systems	System: Not significant; will operate in high or low rainfall areas, but more efficient in low rainfall and high evapo-transpiration areas Depth of cover may be an issue in freezing conditions Environment: Not relevant	System: Requires more space than the conventional absorption trench or ETA/ETS systems, all other factors being identical Environment: Setback distances to water resources, water bodies and watercourses

Table C5 – Surface irrigation systems (spray and drip) – Limitations due to site, soil and climatic factors

Land application system	Slope gradient (see Note 2)	Soil depth (see Note 3)	Soil category number (see Note 4)	Depth to seasonal water table (see Note 4)	Duration of continuous seasonal soil saturation (see Note 5)	Dispersive (sodic) soil (as defined)	High content of stones, cobbles or boulders	Climatic factors	Lot size
Surface irrigation systems (spray and drip)	System: Steep slopes can cause greater run-off during wet weather max. Recommended slope 10% Environment: Very little disturbance during construction; Slope angle not very important if application rate is less than natural infiltration rate; even distribution is very important	System: As for subsurface irrigation systems	System: As for subsurface irrigation systems	System: As for subsurface irrigation systems Environment: Increased risk of nutrient run-off during wet weather	System: Prolonged saturation of upper soil impedes treatment and hinders absorption Environment: Increased risk of polluted surface run-off	System: As for subsurface irrigation Environment: As for subsurface irrigation	Systems: Unless extremely stony or covered in boulders, not as relevant as delivery pipes need not be dug in soil in straight line Environment: As for subsurface irrigation	System: Best in climates where intense rainfall events are uncommon and evapo-transpiration exceeds rainfall in most months; windy conditions can create spray drift. Environment: Nutrient laden run-off may be generated under intense rainstorms	System: Spray irrigation requires wide buffer zone; if space is limiting use surface drip irrigation Environment: Setback distances to water resources, water bodies and watercourses

Notes:
1. This table is a guide and summary. See the text of AS/NZS1547 (Appendices K-N) to fully evaluate any constraint
2. See AS/NZS 1547 Table 1.1 for conversion of slope per cent grade into slope angle and slope ratio.
3. Desirable depth depends on soil type. See AS/NZS 1547 Appendix R for guidance on vertical setbacks to ensure adequate treatment of effluent in the unsaturated soil column above maximum level of groundwater (the seasonal water table)
4. The duration of a seasonal shallow water table is of much greater importance than its minimum depth at any one time. Therefore a flexible interpretation of this criterion should be made, with an emphasis on a dynamic water balance rather than a status system. A permanent water table at shallow depth is a severe limitation.
5. Periods of continuous saturation of the upper 0.4m of the soil should not exceed several weeks at any one time. If soil is continuously saturated for several months or longer it is classed as poorly drained or very poorly drained and should not be used for land application systems unless the soil drainage problems can be overcome. Intermittent seasonal water logging of periods of several weeks, falls in the 'imperfectly drained' drainage class.

APPENDIX D

Setback Distance Determination

Table D1 – Setback distances for subsurface land application area for an on-site sewage treatment plan (extract from *Queensland Plumbing & Wastewater Code* Table T4)

Feature	Horizontal Separation Distance (metres)		
Distance from the edge of trench/bed excavation or subsurface irrigation distribution pipe work to the nearest point of the feature	Up Slope	Down Slope	Level
Property boundaries, pedestrian paths, footings of buildings, walkways, recreation areas, retaining wall footings	2	4	2
In ground swimming pools	6	6	6
In ground potable water tank	6*	6*	6*

*Note: For primary effluent the distance from an in-ground potable water tank must be 15 metres.

Table D2 – Setback distance for on-site sewerage facilities (extract from *Queensland Plumbing & Wastewater Code* Table T7)

Feature	Separation Distance (metres)		
	Advanced Secondary	Secondary	Primary*
Top of bank permanent water course; or Top of bank of Intermittent water course; or Top of bank of a lake, bay or estuary or, Top water level of a surface water course used for agricultures, aquacultures or stock purposes, or Easement boundary of unlined open stormwater drainage channel or drain Bore or a dam used or likely to be used for human and domestic consumption	10	30	50
Unsaturated soil depth to a permanent water table (vertically)	0.3	0.6	1.2

*Note: Primary effluent typically has a BOD (Biochemical Oxygen Demand) of between 120-240 mg/L and Total Suspended Solids of between 65-180mg/L.

Table D3 – Guidelines for horizontal and vertical setback distances (extract from AS/NZS 1547 Table R1)

Site Feature	Setback distance range (m) (See Note 1)	Site Constraint items of specific concern (from Table D4) (see Note 1)
	Horizontal setback distance (m)	
Property boundary	1.5 – 50 (see Note 2)	A, D, J
Buildings/houses	2.0 – >6.0	A, D, J
Surface water (see Note 4)	15 – 100	A, B, D, E, F, G, J
Bore, well (see Notes 5 and 6)	15 – 50	A, C, H, J
Recreational areas (Children's play areas, swimming pools and so on) (see Note 7)	3 – 15 (see Notes 8 and 9)	A, E, J
In-ground water tank	4 – 15 (see Note 10)	A, E, J
Retaining wall and embankments, escarpments, cuttings (see Note 11)	3.0m or 45° angle from toe of wall (whichever is greatest)	D, G, H
	Vertical setback distance (m)	
Groundwater (see Notes 5, 6, and 12)	0.5 – >1.5	A, C, F, H, I, J
Hardpan or bedrock	0.5 – ≥1.5	A, C, J

Notes:
1 – The overall setback distance should be commensurate with the level of risk to public health and the environment. For example, the maximum setback distance should be based on an evaluation of the constraint items and corresponding sensitive features in Table D4 and how these interact to provide a pathway or barrier for wastewater movement.
2 – Subject to local regulatory rules and design by a suitably qualified and experienced person, the separation of a drip line system from an upslope boundary, for slopes greater than 5%, may be reduced to 0.5m.
3 – Setback distances of less than 3m from houses are appropriate only where a drip irrigation land application system is being used with low design irrigation rates, where shallow subsurface systems are being used with equivalent low areal loading rates, where the risk of reducing the bearing capacity of the foundation or damaging the structure is low, or where an effective barrier (designed by a suitably qualified and experienced person) can be installed. This may require consent from the regulatory authority.
4 – Setback distance from surface water is defined as the areal edge of the land application system to the edge of the water. Where land application areas are planned in a water supply catchment, advice on adequate buffer distances should be sought from the relevant water authority and a hydrogeologist. Surface water, in this case, refers to any fresh water or geothermal water in a river, lake, stream, or wetland that may be permanently or intermittently flowing. Surface water also includes water in the coastal marine area and water in man-made drains, channels, and dams unless these are to specifically divert surface water away from the land application area. Surface water excludes any water in a pipe or tank.
5 – Highly permeable stony soils and gravel aquifers potentially allow microorganisms to be readily transported up to hundreds of metres down the gradient of an on-site system (see AS 1547:2012 R3, Table 1 in Pang et al. 2005). Maximum setback distances are recommended where site constraints are identified at the high scale for items A, C, and H. For reading and guidance on setback distances in highly permeable soils and coarse-grained aquifers see AS 1547:2012 R3. As microbial removal is not linear with distance, data extrapolation of experiments should not be relied upon unless the data has been verified in the field. Advice on adequate buffer distances should be sought from the relevant water authority and a hydrogeologist.
6 – Setback distances from water supply bores should be reviewed on a cas-by-case basis. Distances can depend on many factors including soil type, rainfall, depth and casing of bore, direction of groundwater flow,

type of microorganisms, existing quality of receiving waters, and resource value of waters.
7 – Where effluent is applied to the surface by covered drip or spray irrigation, the maximum value is recommended.
8 – In the case of subsurface application of primary treated effluent by LPED irrigation, the upper value is recommended.
9 – In the case of surface spray, the setback distances are based on a spray plume with a diameter not exceeding 2m or a plume height not exceeding 0.5m above finished surface. level. The potential for aerosols being carried by the wind also needs to be taken into account.
10 – It is recommended that land application of primary treated effluent be down gradient of in-ground water tanks.
11 – When determining minimum distances from retaining walls, embankments, or cut slopes, the type of land application system, soil types, and soil layering should also be taken into account to avoid wastewater collecting in the subsoil drains or seepage through cuts and embankments. Where these situations occur setback clearances may need to be increased. In areas where slope stability is of concern, advice from a suitably qualified and experienced person may be required.
12 – Groundwater setback distance (depth) assumes unsaturated flow and is defined as the vertical distance from the base of the land application systems to the highest seasonal water table level. To minimise potential for adverse impacts on groundwater quality, minimum setback distances should ensure unsaturated, aerobic conditions in the soil. These minimum depths will vary depending on the scale of site constraints identified in Table E4. Where groundwater setback is insufficient, the ground level can be raised by importing suitable topsoil and improving effluent treatment. The regulatory authority should make the final decision in this instance. (See also the guidance on soil depth and groundwater clearance in Tables C1 and C2).

Table D4 – Site constraint scale for development of setback distances (extract from AS/NZS 1547 Table R2)

Item	Site/System feature	Lower constraint	Higher constraint	Sensitive features
A	Microbial quality of effluent (see Note 3)	Effluent quality consistently producing ≤ 10cfu/100mL E. coli (secondary treated effluent with disinfection)	Effluent quality consistently producing ≥ 10^6 cfu/100mL *E.coli* (for example, primary treated effluent)	Groundwater and surface pollution hazard, public health hazard
B	Surface water (see Note 4)	Category 1 to 3 soils (see Note 5) no surface water down gradient within >100m, low rainfall area	Category 4 to 6 soils, permanent surface water <50m down gradient, high rainfall area, high resource/environmental value (see Note 6)	Surface water pollution hazard for low permeable soils, low lying or poorly draining areas
C	Groundwater	Category 5 and 6 soils, low resource/environmental value	Category 1 and 2 soils, gravel aquifers, high resource/environmental value	Groundwater pollution hazard
D	Slope	0 – 6% (surface effluent application) 0 – 10% (subsurface effluent application)	> 10% (surface effluent application), > 30% (subsurface effluent application)	Off-site export of effluent, erosion
E	Position of land application are in landscape (see Note 6)	Down gradient of surface water, property boundary, recreational area	Up gradient of surface water, property boundary, recreational area	Surface water pollution hazard, off-site export of effluent
F	Drainage	Category 1 and 2 soils, gently sloping area	Category 6 soils, sites with visible seepage, moisture tolerant vegetation, low lying area	Groundwater pollution hazard
G	Flood potential	Above 1 in 20 year flood contour	Below 1 in 20 year flood contour	Off-site export of effluent, system failure, mechanical faults
H	Geology and soils	Category 3 and 4 soils, low porous regolith, deep, uniform soils	Category 1 and 6 soils, fractured rock, gravel aquifers, highly porous regolith	Groundwater pollution hazard for porous regolith and permeable soils
I	Landform	Hill rests, convex side slopes, and plains	Drainage plains and incise channels	Groundwater pollution hazard, resurfacing hazard
J	Application method	Drip irrigation or subsurface application of effluent	Surface/above ground application of effluent	Off-site export of effluent, surface water pollution

Notes:
1 – Scale shows the level of constraint to siting an on-site system due to the constraints identified by SSE evaluator or regulatory authority.
2 – Examples of typical siting constraint factors that may be identified by SSE or regulatory authority. Site constraints are not limited to this table. Other site constraints may be identified and taken into consideration when determining setback distances.
3 – The level of microbial removal for any on-site treatment system needs to be determined and it should be assumed that unless disinfection is reliably used then the microbial levels will be similar to primary treatment. Low risk microbial quality value is based on the values given in ARC (2004), ANZECC and ARMCANZ (2000), and EPA Victoria (*Guidelines for environmental management: Use of reclaimed water* 2003).
4 – Surface water, in this case, refers to any fresh water or geothermal water in a river, lake stream, or wetland that may be permanently or intermittently flowing. Surface water also includes water in the coastal marine area and water in man-made drains, channels, and dams unless these are to specifically divert surface water away from the land application area. Surface water excludes any water in a pipe or tank.
5 – The soil categories 1 to 6 are described in AS/NZS 11547 Table 1. Surface water or groundwater that has high resource value may include potable (human or animal) water supplies, bores, wells and water used for recreational purposes. Surface water or groundwater of high environmental value include undisturbed or slightly disturbed aquatic ecosystems as described in ANZECC and ARMCANZ (2000).
6 – The regulatory authority may reduce or increase setback distances at their discretion based on the distances of the land application up or down gradient of sensitive receptors.

APPENDIX E

Trench and Bed Spacing

Table E1 – Typical dimensions of conventional trenches and beds (extract from AS/NZS 1547 Table L2)

	Typical dimensions (mm)	Maximum (mm)	Minimum (mm)
Trench dimensions			
Width	300 – 450	600	200
Depth of aggregate	200 – 400	400	200
Depth of topsoil	100 – 150	150	100
Spacing between adjacent trenches (sidewall to sidewall)	-	N/A	1000
Bed dimensions			
Width	1000 - 4000	4000	1000
Depth of aggregate	300 – 600	600	300
Depth of topsoil	100 – 150	150	100
Spacing between adjacent trenches (sidewall to sidewall)	-	N/A	1000

APPENDIX F

Laboratory Results

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

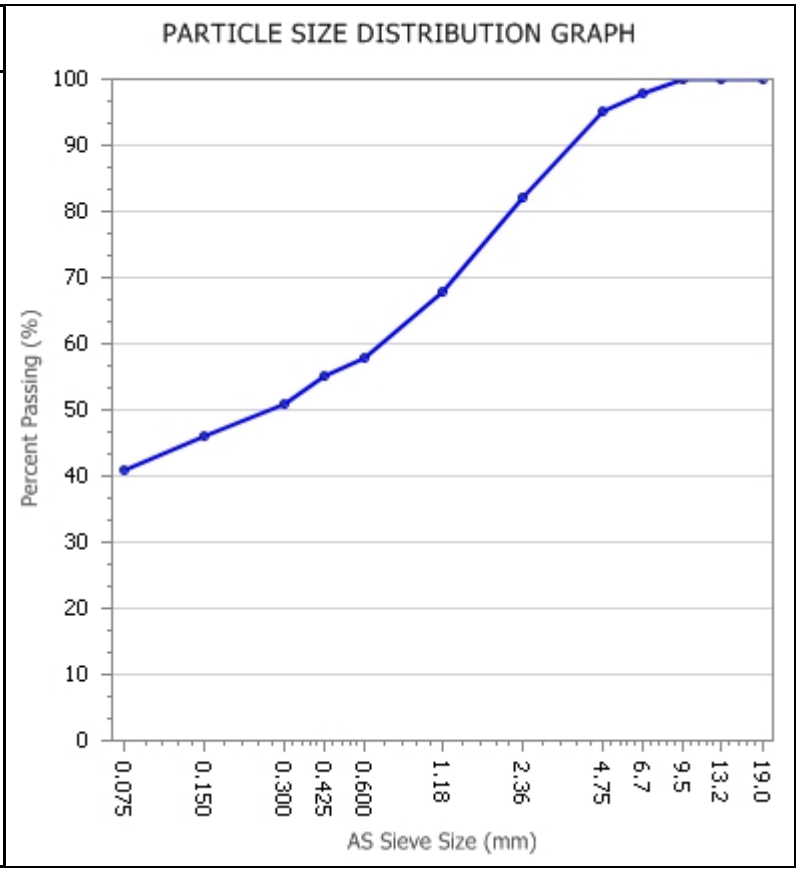
PARTICLE SIZE DISTRIBUTION REPORT

Client:	PDR Engineers	Report Number:	11512/R/18825-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP1 0.4m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.6.1

Sample Number	11512/S/50670	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP1
Date Sampled	4/05/2018	From (m)	0.4m
Sampled By	Client Sampled		
Date Tested	8/05/2018		
Material Source	Client Supplied	Material Type	Supplied Samples

AS Sieve (mm)	Specification Minimum	**Percent Passing (%)**	Specification Maximum
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**98**	
4.75		**95**	
2.36		**82**	
1.18		**68**	
0.600		**58**	
0.425		**55**	
0.300		**51**	
0.150		**46**	
0.075		**41**	



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W9Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

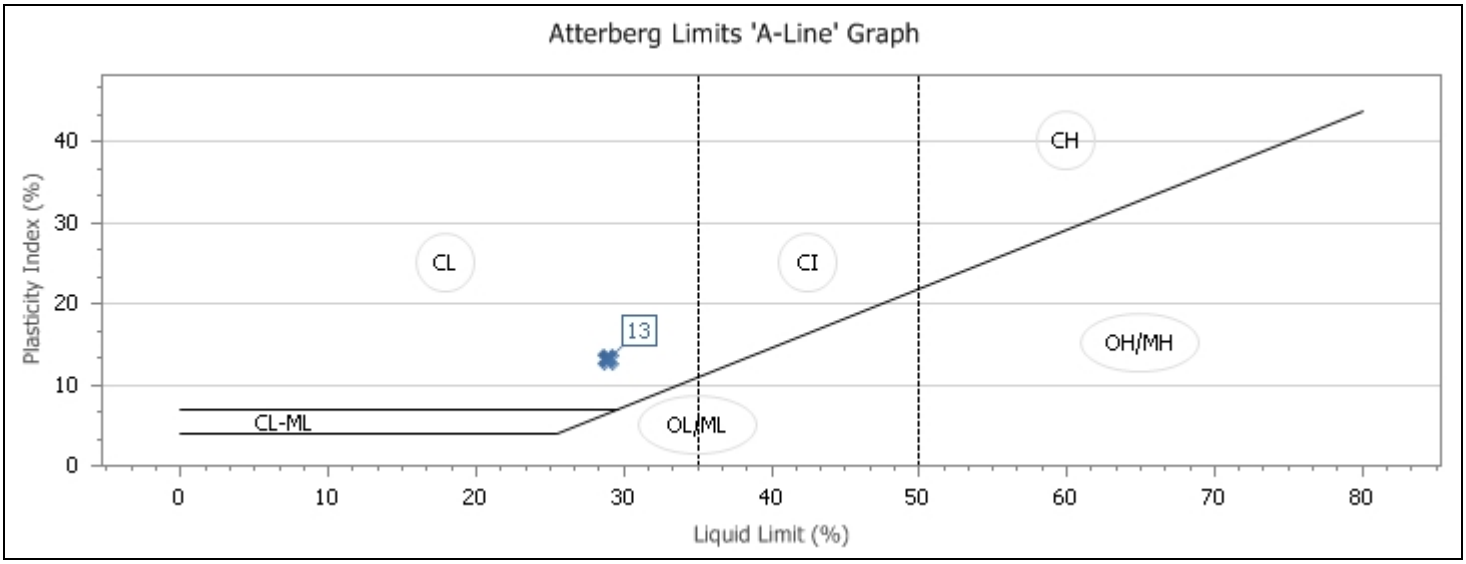
ATTERBERG LIMITS REPORT

Client:	PDR Engineers	Report Number:	11512/R/18821-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 0.4m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.1.2, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS1726 (App. A)		
Sample Number	11512/S/50667	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP2
Date Sampled	4/05/2018	From (m)	0.4m
Sampled By	Client Sampled		
Date Tested	15/05/2018		
Att. Drying Method	Oven Dried	Material Source	Client Supplied
Atterberg Preparation	Dry Sieved	Material Type	Supplied Samples
Material Description	Sandy Silt - Light Brown		

Atterberg Limits Results

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**29**	
Plastic Limit (%)		**16**	
Plasticity Index (%)		**13**	
Linear Shrinkage (%)		**7.5**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 250.2mm / Cracking		



Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W11Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

EMERSON CLASS NUMBER REPORT

Client:	PDR Engineers	Report Number:	11512/R/18822-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 0.4m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.8.1

Sample Number	11512/S/50667			
ID / Client ID	-			
Lot Number	TP2 0.4m			
Date / Time Sampled	4/05/2018			
Material Source	Client Supplied			
Material Type	Supplied Samples			
Sampling Method	Tested As Received			
Water Type	Distilled			
Water Temperature (C°)	26			
Sample Description	TP2			
From (m)	0.4m			
Soil Description	Sandy Silt - Light Brown			
Emerson Class Number	**5**			

Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W34Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

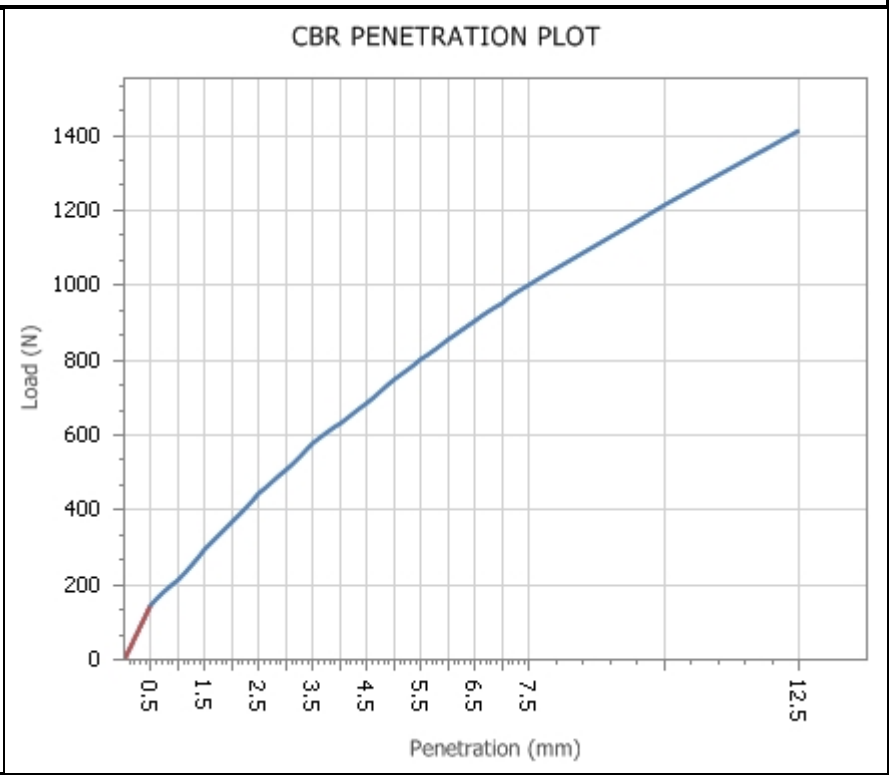
Client:	PDR Engineers	Report Number:	11512/R/18925-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 0.4m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	21/05/2018 Page 1 of 1

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1

		Sample Location	
Sample Number	11512/S/50667	Sample Description	TP2
Sampling Method	Tested As Received	From (m)	0.4m
Date Sampled	4/05/2018		
Sampled By	Client Sampled		
Date Tested	18/05/2018		
Material Source	Client Supplied	Material Limit Start	-
Material Type	Supplied Samples	Material Limit End	-
Client Reference	-	Compactive Effort	Standard

Material Description	Sandy Silt - Light Brown

Maximum Dry Density (t/m³):	1.90
Optimum Moisture Content (%):	12.5
Field Moisture Content (%):	15.1
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	98
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.86
Placement Dry Density Ratio (%):	98.0
Placement Moisture Content (%):	12.6
Placement Moisture Ratio (%):	100.0
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.85
Total Curing Time (hrs)	108.1
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	14.1
Moisture (remainder) After Soak (%)	13.6
CBR Swell (%):	1.0
Minimum CBR Specification (%):	-
CBR Value @ 5.0mm (%):	**4.0**



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W2ASRep Rev2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

EMERSON CLASS NUMBER REPORT

Client:	PDR Engineers	Report Number:	11512/R/18827-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 1.0m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.8.1

Sample Number	11512/S/50671			
ID / Client ID	-			
Lot Number	TP2 1.0m			
Date / Time Sampled	4/05/2018			
Material Source	Client Supplied			
Material Type	Supplied Samples			
Sampling Method	Tested As Received			
Water Type	Distilled			
Water Temperature (C°)	26			
Sample Description	TP2			
From (m)	1.0m			
Soil Description	Sandy Silt			
Emerson Class Number	**6**			

Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W34Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

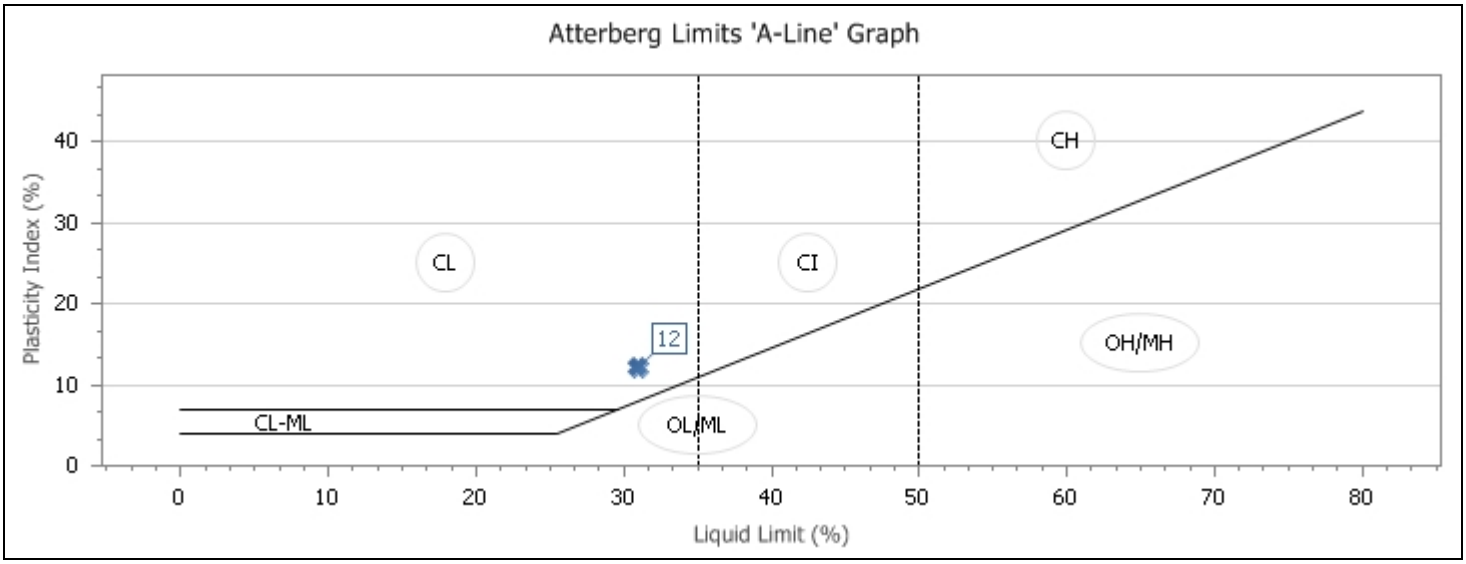
Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

ATTERBERG LIMITS REPORT

Client:	PDR Engineers	Report Number:	11512/R/18826-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP2 1.0m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.1.2, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS1726 (App. A)		
Sample Number	11512/S/50671	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP2
Date Sampled	4/05/2018	From (m)	1.0m
Sampled By	Client Sampled		
Date Tested	9/05/2018		
Att. Drying Method	Oven Dried	Material Source	Client Supplied
Atterberg Preparation	Dry Sieved	Material Type	Supplied Samples
Material Description	Sandy Silt		

Atterberg Limits Results			
Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**31**	
Plastic Limit (%)		**19**	
Plasticity Index (%)		**12**	
Linear Shrinkage (%)		**7.5**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 253.9mm / Cracking		



Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W11Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

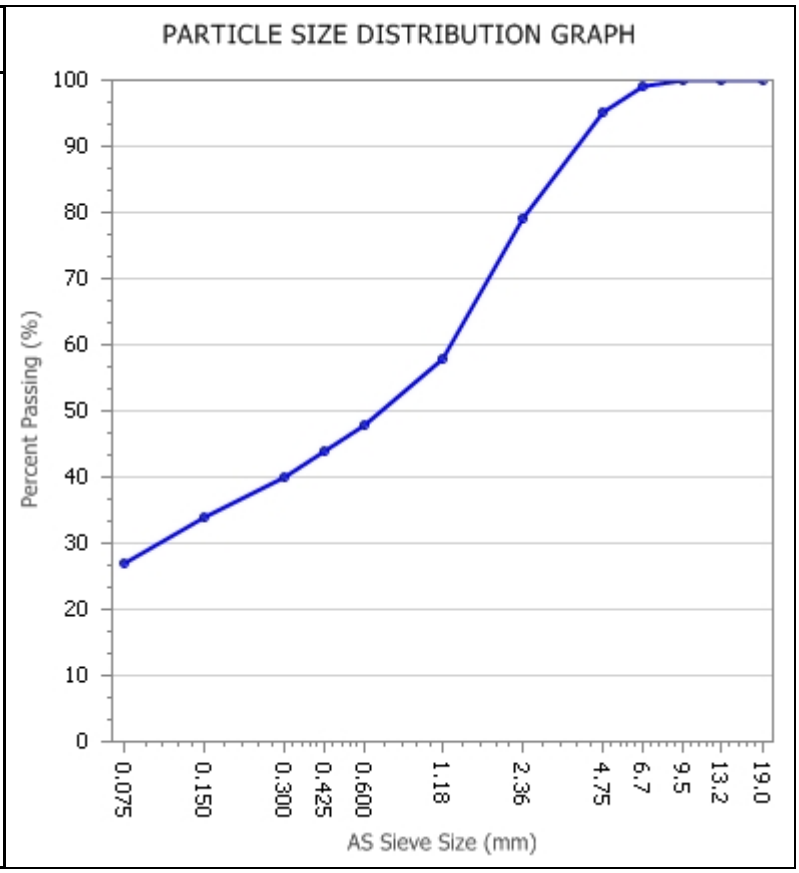
PARTICLE SIZE DISTRIBUTION REPORT

Client:	PDR Engineers	Report Number:	11512/R/18823-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP3 0.5m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.6.1

Sample Number	11512/S/50668	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP3
Date Sampled	4/05/2018	From (m)	0.5m
Sampled By	Client Sampled		
Date Tested	9/05/2018		
Material Source	Client Supplied	Material Type	Supplied Samples

AS Sieve (mm)	Specification Minimum	**Percent Passing (%)**	Specification Maximum
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**99**	
4.75		**95**	
2.36		**79**	
1.18		**58**	
0.600		**48**	
0.425		**44**	
0.300		**40**	
0.150		**34**	
0.075		**27**	



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W9Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

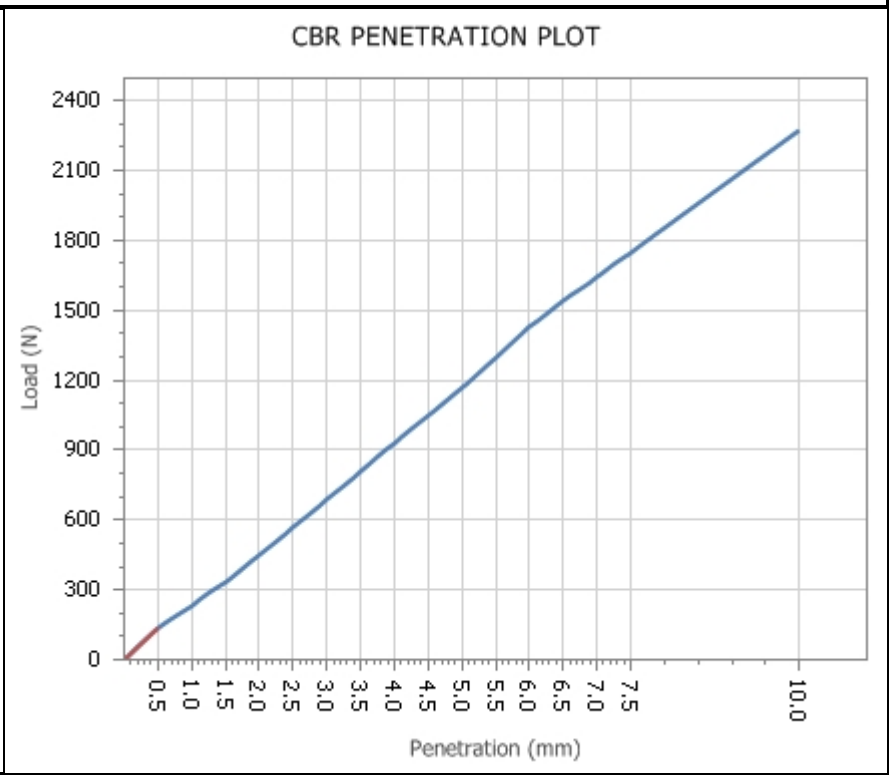
Client:	PDR Engineers	Report Number:	11512/R/18926-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP3 0.5m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	21/05/2018 Page 1 of 1

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1

		Sample Location	
Sample Number	11512/S/50668	Sample Description	TP3
Sampling Method	Tested As Received	From (m)	0.5m
Date Sampled	4/05/2018		
Sampled By	Client Sampled		
Date Tested	18/05/2018		
Material Source	Client Supplied	Material Limit Start	-
Material Type	Supplied Samples	Material Limit End	-
Client Reference	-	Compactive Effort	Standard

Material Description	Sandy Clay - Black

Maximum Dry Density (t/m³):	1.93
Optimum Moisture Content (%):	11.5
Field Moisture Content (%):	12.4
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	98
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.88
Placement Dry Density Ratio (%):	98.0
Placement Moisture Content (%):	11.5
Placement Moisture Ratio (%):	101.0
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.88
Total Curing Time (hrs)	94.9
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	13.0
Moisture (remainder) After Soak (%)	13.0
CBR Swell (%):	0.0
Minimum CBR Specification (%):	-
CBR Value @ 5.0mm (%):	**6**



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W2ASRep Rev2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

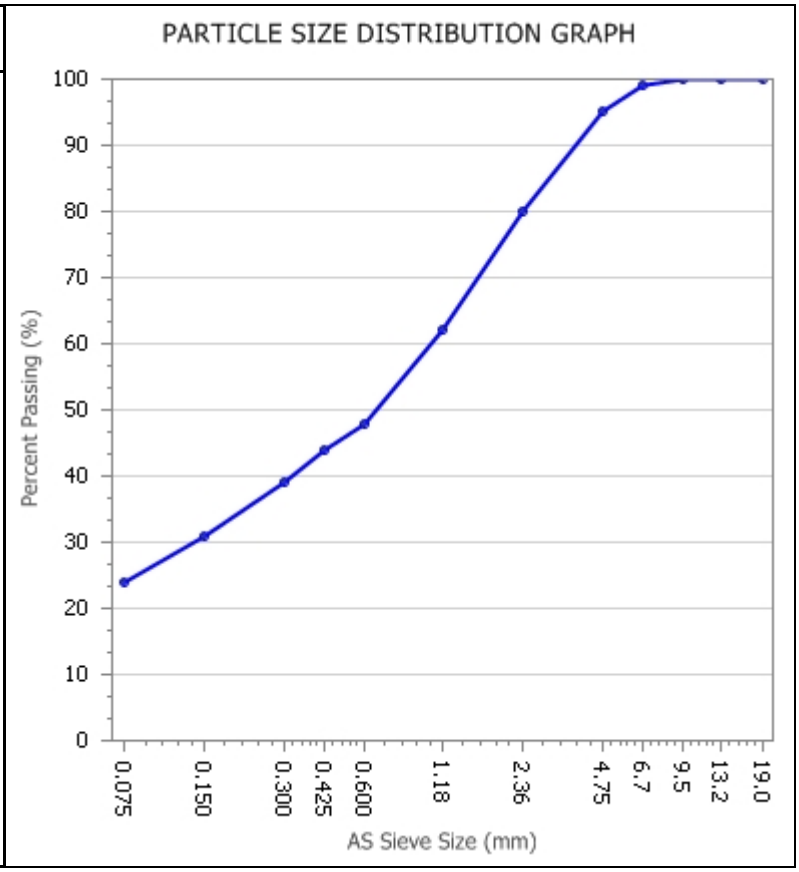
PARTICLE SIZE DISTRIBUTION REPORT

Client:	PDR Engineers	Report Number:	11512/R/18828-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP3 1.1m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.6.1

Sample Number	11512/S/50672	Sample Location	
Sampling Method	Tested As Received	Sample Description	TP3
Date Sampled	4/05/2018	From (m)	1.1m
Sampled By	Client Sampled		
Date Tested	8/05/2018		
Material Source	Client Supplied	Material Type	Supplied Samples

AS Sieve (mm)	Specification Minimum	**Percent Passing (%)**	Specification Maximum
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**99**	
4.75		**95**	
2.36		**80**	
1.18		**62**	
0.600		**48**	
0.425		**44**	
0.300		**39**	
0.150		**31**	
0.075		**24**	



Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W9Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: **Cairns Laboratory**
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

EMERSON CLASS NUMBER REPORT

Client:	PDR Engineers	Report Number:	11512/R/18829-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP3 1.1m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures:	AS1289.3.8.1

Sample Number	11512/S/50672			
ID / Client ID	-			
Lot Number	TP3 1.1m			
Date / Time Sampled	4/05/2018			
Material Source	Client Supplied			
Material Type	Supplied Samples			
Sampling Method	Tested As Received			
Water Type	Distilled			
Water Temperature (C°)	26			
Sample Description	TP3			
From (m)	1.1m			
Soil Description	Sandy Silt			
Emerson Class Number	**6**			

Remarks

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W34Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

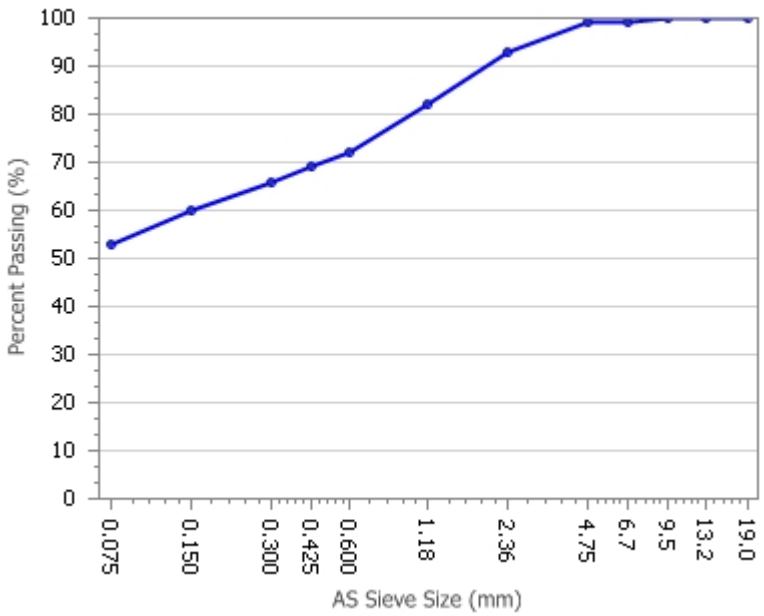
QUALITY OF MATERIALS REPORT

Client:	PDR Engineers	Report Number:	11512/R/18824-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP4 1.2m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	16/05/2018 Page 1 of 1

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	11512/S/50669	Sample Description	TP4
Sampling Method	Tested As Received	From (m)	1.2m
Date Sampled	4/05/2018		
Sampled By	Client Sampled		
Date Tested	8/05/2018	Material Source	Client Supplied
Att. Drying Method	Oven Dried	Material Type	Supplied Samples
Atterberg Preparation	Dry Sieved	Material Description	CL Sandy CLAY, with trace gravel, pale brown

AS Sieve (mm)	Specification Minimum	**Percent Passing (%)**	Specification Maximum
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**99**	
4.75		**99**	
2.36		**93**	
1.18		**82**	
0.600		**72**	
0.425		**69**	
0.300		**66**	
0.150		**60**	
0.075		**53**	

PARTICLE SIZE DISTRIBUTION GRAPH



Test Result	Specification Minimum	**Result**	Specification Maximum	Test Result	Specification Minimum	**Result**	Specification Maximum
Liquid Limit (%)		**32**		0.075/0.425 Fines Ratio		**0.78**	
Plastic Limit (%)		**19**		PI x 0.425 Ratio (%)		**895.7**	
Plastic Index (%)		**13**		LS x 0.425 Ratio (%)		**620.1**	
Linear Shrinkage (%)		**9.0**		Linear Shrinkage Defects	Nil		

Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W85Rep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Shed 3, 5 Commercial Place
Earlville QLD 4870

Laboratory: Cairns Laboratory
Phone: 0740337815
Fax: 0740546632
Email: Cairns@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

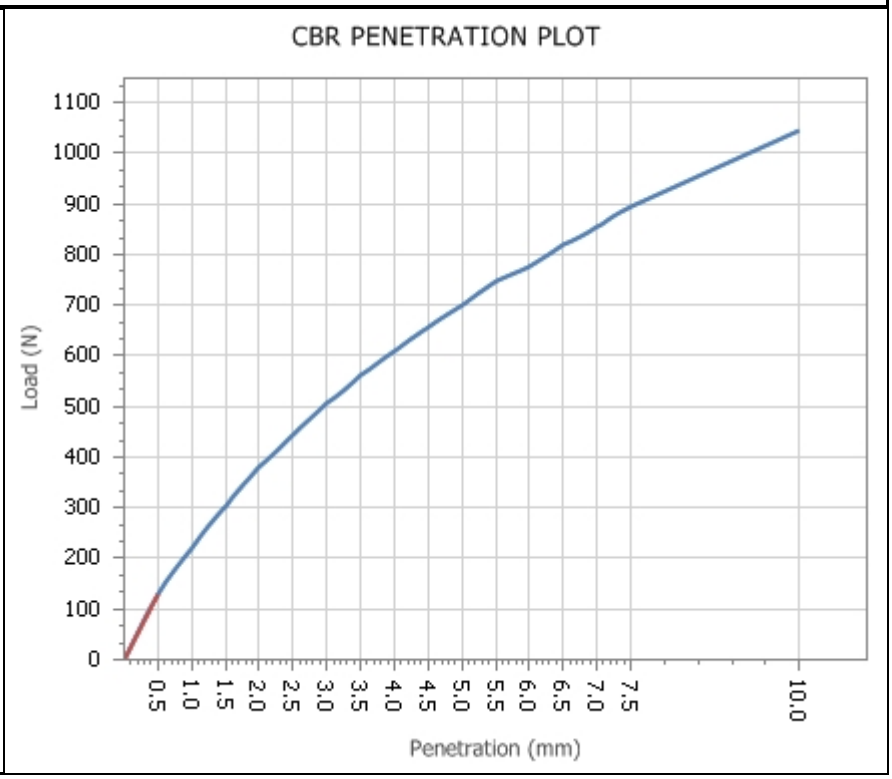
Client:	PDR Engineers	Report Number:	11512/R/18927-1
Client Address:	PO Box 2551, Level 1 258 Mulgrave Road, Cairns	Project Number:	11512/P/763
Project:	5-7 Ryrie St, El Arish	Lot Number:	TP4 1.2m
Location:	Cairns	Internal Test Request:	11512/T/10034
Component:	Compliance Testing	Client Reference/s:	5-7 Ryrie Street, El Arish
Area Description:	5-7 Ryrie St, El Arish	Report Date / Page:	21/05/2018 Page 1 of 1

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1

		Sample Location	
Sample Number	11512/S/50669	Sample Description	TP4
Sampling Method	Tested As Received	From (m)	1.2m
Date Sampled	4/05/2018		
Sampled By	Client Sampled		
Date Tested	18/05/2018		
Material Source	Client Supplied	Material Limit Start	-
Material Type	Supplied Samples	Material Limit End	-
Client Reference	-	Compactive Effort	Standard

Material Description	CL Sandy CLAY, with trace gravel, pale brown

Maximum Dry Density (t/m³):	1.77
Optimum Moisture Content (%):	15.5
Field Moisture Content (%):	20.4
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	98
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.74
Placement Dry Density Ratio (%):	98.0
Placement Moisture Content (%):	15.5
Placement Moisture Ratio (%):	100.5
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.72
Total Curing Time (hrs)	110.3
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	17.8
Moisture (remainder) After Soak (%)	17.8
CBR Swell (%):	1.0
Minimum CBR Specification (%):	-
CBR Value @ 5.0mm (%):	**3.5**



Remarks

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: 1986
Corporate Site Number: 11512

Approved Signatory: Craig Wilson
Form ID: W2ASRep Rev2

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Adam Huey	Manager	Jon Dicker
Client	PDR ENGINEERS PTY LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 2551 CAIRNS QLD 4870	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	0411846301	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	ahuey@pdrengineers.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**Ryrie St / Ontario**	SGS Reference	**CE133360 R0**
Order Number	(Not specified)	Date Received	04 May 2018
Samples	4	Date Reported	22 May 2018

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146).

Requires Agron. Report

SIGNATORIES

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Leanne Orsmond
Quality & Microbiology Coordinator

Mark Ayers
Team Leader - Agri Plant/Soil

Parameter	Units	LOR	Sample Number: CE133360.001 Sample Matrix: Soil Sample Date: 01 May 2018 Sample Name: Ryrie St TP1 Topsoil	Sample Number: CE133360.002 Sample Matrix: Soil Sample Date: 01 May 2018 Sample Name: Ryrie St TP4 Topsoil	Sample Number: CE133360.003 Sample Matrix: Soil Sample Date: Ontario Sample Sample Name: 2	Sample Number: CE133360.004 Sample Matrix: Soil Sample Date: Ontario Sample Sample Name: 6
Moisture Content Method: AN002 Tested: 8/5/2018						
% Moisture	%w/w	0.5	**25**	**15**	-	-
pH in soil (1:5) Method: AN101 Tested: 15/5/2018						
pH	pH Units	-	**5.8**	**6.2**	-	-
pH (CaCl2)*	pH Units	-	**4.8**	**5.3**	-	-
Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 15/5/2018						
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	**50**	**40**	-	-
Total Dissolved Solids (by calculation)	mg/kg	5	**150**	**120**	-	-
Chloride (water extractable) Method: AN274 Tested: 15/5/2018						
Chloride (water extractable 1:5)	mg/kg	5	**19**	**7**	-	-
Total Kjeldahl Nitrogen and Total Nitrogen in Soil/Sludges Method: AN281 Tested: 17/5/2018						
Total Kjeldahl Nitrogen	mg/kg	5	**2200**	**1200**	-	-
Total Nitrogen	mg/kg	10	**2200**	**1200**	-	-
Carbon:Nitrogen Ratio*	No unit	0.1	**14**	**14**	-	-
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser in Soil Method: AN248 Tested: 11/5/2018						
Nitrate/Nitrite Nitrogen, NOx as N	mg/kg	0.1	**5.9**	**8.7**	-	-

Parameter	Units	LOR	Sample Number: CE133360.001 Sample Matrix: Soil Sample Date: 01 May 2018 Sample Name: Ryrie St TP1 Topsoil	CE133360.002 Soil 01 May 2018 Ryrie St TP4 Topsoil	CE133360.003 Soil Ontario Sample 2	CE133360.004 Soil Ontario Sample 6
Colwell Phosphorus Method: AN015 Tested: 15/5/2018						
Colwell Phosphorus	mg/kg	1	**230**	**240**	-	-
Total Organic Carbon by Heanes Oxidation Method: AN273 Tested: 11/5/2018						
Total Organic Carbon	%w/w	0.05	**3.2**	**1.7**	**0.21**	<0.05
Organic Matter	%w/w	0.1	**5.5**	**2.8**	**0.36**	<0.10
Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 15/5/2018						
Exchangeable Sodium, Na	mg/kg	2	**10**	**7**	**6**	**510**
Exchangeable Sodium, Na	meq/100g	0.01	**0.05**	**0.03**	**0.03**	**2.2**
Exchangeable Sodium Percentage*	%	0.1	**1.2**	**0.6**	**2.2**	**28.0**
Exchangeable Potassium, K	mg/kg	2	**140**	**61**	**34**	**55**
Exchangeable Potassium, K	meq/100g	0.01	**0.35**	**0.16**	**0.09**	**0.14**
Exchangeable Potassium Percentage*	%	0.1	**9.3**	**3.0**	**7.4**	**1.8**
Exchangeable Calcium Percentage*	%	0.1	**64.4**	**86.0**	**62.9**	**1.2**
Exchangeable Calcium, Ca	mg/kg	2	**480**	**900**	**150**	**19**
Exchangeable Calcium, Ca	meq/100g	0.01	**2.4**	**4.5**	**0.73**	**0.10**
Exchangeable Magnesium, Mg	mg/kg	2	**110**	**66**	**39**	**670**
Exchangeable Magnesium, Mg	meq/100g	0.02	**0.93**	**0.54**	**0.32**	**5.5**
Exchangeable Magnesium Percentage*	%	0.1	**25.1**	**10.4**	**27.5**	**69.0**
Cation Exchange Capacity	meq/100g	0.02	**3.7**	**5.2**	**1.2**	**7.9**
Cation Exchange Capacity (soluble salts removed)	meq/100g	0.02	-	-	-	-
Sodium Adsorption Ratio*	No unit	0.1	<0.1	<0.1	<0.1	**1.3**
Exchangeable Calcium/Exchangeable Magnesium Ratio*	No unit	0.1	**2.6**	**8.3**	**2.3**	<0.1
Soil - Aluminium (KCL Extraction) Method: SOL061 Tested: 18/5/2018						
Exchangeable Aluminium*	mg/kg	1	-	-	-	-
Exchangeable Aluminium*	cmol (+)/kg	0.01	-	-	-	-
DTPA Extractable Metals in Soil Method: AN025/AN320 Tested: 16/5/2018						
Copper, Cu	mg/kg	0.05	**1.6**	**2.6**	-	-
Zinc, Zn	mg/kg	0.05	**53**	**88**	-	-
Manganese, Mn	mg/kg	0.5	**5.3**	**7.1**	-	-
Iron, Fe	mg/kg	0.5	**160**	**99**	-	-
Total Phosphorus by Kjeldahl Digestion DA in Soil Method: AN279/AN293(Sydney only) Tested: 17/5/2018						
Total Phosphorus (Kjeldahl Digestion)	mg/kg	2	**1300**	**2100**	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE133360.001 Soil 01 May 2018 Ryrie St TP1 Topsoil	CE133360.002 Soil 01 May 2018 Ryrie St TP4 Topsoil	CE133360.003 Soil Ontario Sample 2	CE133360.004 Soil Ontario Sample 6
Calcium Chloride Extractable Boron Method: RL 12C2/AN320 Tested: 15/5/2018							
CaCl2-extractable Boron, B*	mg/kg	0.05		**0.18**	**0.13**	-	-
Potassium Chloride Extractable Sulphur Method: RL 10D1/AN320 Tested: 16/5/2018							
KCl-40-extractable Sulphur, S*	mg/kg	1		**6**	**2**	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Calcium Chloride Extractable Boron **Method: RL 12C2/AN320**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
CaCl2-extractable Boron, B*	LB056356	mg/kg	0.05	<0.05	17%	NA

Chloride (water extractable) **Method: ME-(AU)-[ENV]AN274**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride (water extractable 1:5)	LB056247	mg/kg	5	<5	5%	106%

Colwell Phosphorus **Method: ME-(AU)-[ENV]AN015**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Colwell Phosphorus	LB056340	mg/kg	1	<1	10%	111%

DTPA Extractable Metals in Soil **Method: ME-(AU)-[ENV]AN025/AN320**

Parameter	QC Reference	Units	LOR	DUP %RPD
Copper, Cu	LB056373	mg/kg	0.05	0%
Zinc, Zn	LB056373	mg/kg	0.05	6%
Manganese, Mn	LB056373	mg/kg	0.5	17%
Iron, Fe	LB056373	mg/kg	0.5	14%

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) **Method: ME-(AU)-[ENV]AN122**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Exchangeable Sodium, Na	LB056336	mg/kg	2		2 - 9%	102%
Exchangeable Sodium, Na	LB056336	meq/100g	0.01	<0.01		
Exchangeable Sodium Percentage*	LB056336	%	0.1	<0.1		
Exchangeable Potassium, K	LB056336	mg/kg	2		1 - 6%	105%
Exchangeable Potassium, K	LB056336	meq/100g	0.01	<0.01		
Exchangeable Potassium Percentage*	LB056336	%	0.1	<0.1		
Exchangeable Calcium Percentage*	LB056336	%	0.1	149.6		
Exchangeable Calcium, Ca	LB056336	mg/kg	2		1 - 2%	103%
Exchangeable Calcium, Ca	LB056336	meq/100g	0.01	<0.01		
Exchangeable Magnesium, Mg	LB056336	mg/kg	2		2 - 4%	102%
Exchangeable Magnesium, Mg	LB056336	meq/100g	0.02	<0.02		
Exchangeable Magnesium Percentage*	LB056336	%	0.1	<0.1		
Cation Exchange Capacity	LB056336	meq/100g	0.02	<0.02		
Sodium Adsorption Ratio*	LB056336	No unit	0.1	<0.1		
Exchangeable Calcium/Exchangeable Magnesium Ratio*	LB056336	No unit	0.1	<0.1		

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser in Soil **Method: ME-(AU)-[ENV]AN248**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB056243	mg/kg	0.1	<0.1	1%	99%

pH in soil (1:5) **Method: ME-(AU)-[ENV]AN101**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
pH	LB056358	pH Units	-	5.6	100%

Potassium Chloride Extractable Sulphur **Method: RL 10D1/AN320**

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
KCl-40-extractable Sulphur, S*	LB056379	mg/kg	1	3%	105%

Total Kjeldahl Nitrogen and Total Nitrogen in Soil/Sludges **Method: ME-(AU)-[ENV]AN281**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Kjeldahl Nitrogen	LB056278	mg/kg	5	<5	1%	99%

Total Organic Carbon by Heanes Oxidation **Method: ME-(AU)-[ENV]AN273**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Organic Carbon	LB056195	%w/w	0.05	<0.05	2%	102%	102%
Organic Matter	LB056195	%w/w	0.1	<0.10	2%	NA	NA

Total Phosphorus by Kjeldahl Digestion DA in Soil **Method: ME-(AU)-[ENV]AN279/AN293(Sydney only)**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB056278	mg/kg	2	<2	0%	106%

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN015	Soil sample is extracted in an end over end roller in 0.5 N sodium bicarbonate at pH 8.5 with the supernatant liquor analysed for Phosphorous. Orthophosphate anion (PO43-) is reacted with ammonium molybdate and potassium antimony tartrate in sulfuric acid solution. The resulting phospho-molybdate complex is reduced, using ascorbic acid, to an intense blue coloured complex Molybdenum Blue. The absorbance of this complex is measured at 880 nm by Discrete Analyser, and compared with calibration standards to obtain the concentration of orthophosphate in the sample. Based on Rayment & Higginson 9B1.
AN025/AN320	A chelating agent is used to complex metal ions in solution. The extracted elements are determined byICP OES.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN103	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.
AN122	Exchangeable Cations, CEC and ESP: Soil sample is extracted in 1 M Ammonium Acetate at pH=7 (or 1M Ammonium Chloride at pH=7) with cations (Na, K, Ca & Mg) then determined by ICP OES/ICP MS and reported as Exchangeable Cations. For saline soils, these results can be corrected for water soluble cations and reported as Exchangeable cations in meq/100g or soil can be pre-treated (aqueous ethanol/aqueous glycerol) prior to extraction. Cation Exchange Capacity (CEC) is the sum of the exchangeable cations in meq/100g.
AN122	The Exchangeable Sodium Percentage (ESP) is calculated as the exchangeable sodium divided by the CEC (all in meq/100g) times 100. ESP can be used to categorise the sodicity of the soil as below: ESP < 6% non-sodic ESP 6-15% sodic ESP >15% strongly sodic Method is referenced to Rayment and Lyons, 2011, sections 15D3 and 15N1.-
AN248	Nitrate / Nitrite in extract by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN273	The sample is digested in Dichromate / Sulfuric Acid to oxidise the organic carbon. The determination is completed colourimetrically by Aquakem Discrete Analyser at 600 nm. Based on Rayment & Higginson 6B1.
AN274	Chloride by Aquakem DA following 1:5 or 1:2 DI water extraction: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Results reported on dry sample basis. Reference APHA 4500Cl-

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN281	The sample is heated in the presence of Sulphuric acid, K2SO4 and CuSO4 for two and half hours using a temperature controlled digestion block. Amino Nitrogen of many organic materials is converted to ammonium ion. Free ammonia also is converted to ammonium. The digest is cooled and placed on the Aquakem 250 discrete analyser for Ammonia determination.
RL 10D1/AN320	Air dried <2mm soil is extractedin 0.25M KCl at 40 deg C followed by analysis of filtrate for S by ICP OES. Referenced to Rayment and Lyons method 10D1.
RL 12C2/AN320	Air dried <2mm soil is extracted in 0.01M CaCl2 by refluxing gently for 10 minutes. Extract is then filtered and analysed by ICP OES. Referenced method Rayment and Lyon, 12C2.
SOL061	Soil sample is extrcated 1:10 in 1MKCl with aluminium determined by ICP OES.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf