

PLANS AND DOCUMENTS  
referred to in the PDA  
DEVELOPMENT APPROVAL

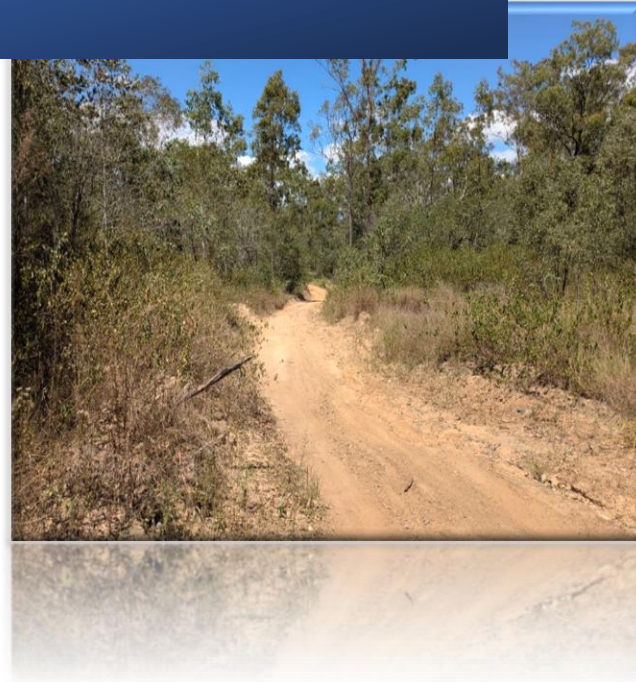
Approval no: DEV2024/1549

Date: 23 October 2025



Gallagher Environmental

# Dispersive Soil Management Plan (DSMP): 'Precinct A' Development, New Beith




**Client:** Frasers Property

**Report No:** GE25.021.R1a

**Date:** 7<sup>th</sup> April 2025



## DOCUMENT CONTROL

 <p><b>Gallagher Environmental</b></p> <p>23 Hooker St WINDSOR QLD 4030</p> <p>Telephone: +41 438 724 929 Email: <a href="mailto:glen@genviro.com.au">glen@genviro.com.au</a></p> <p>ABN 56 493 696 583</p>	<b>Job No.</b>	GE25.021
	<b>Document No:</b>	GE25.021.R1a.doc
	<b>Title:</b>	Dispersive Soil Management Plan (DSMP): 'Precinct A' Development, New Beith
	<b>Project Manager:</b>	Glen Gallagher
	<b>Qualifications:</b>	BScApp(EnvSc)(Hons) MEIANZ CPESC
	<b>Client:</b>	Frasers Property
	<b>Client Contact:</b>	Ms. Eliza King
<b>Synopsis:</b>	A detailed DSMP providing site-specific management protocols for the construction phase of the development.	

### REVISION & CHECKING HISTORY

Revision Number	Date	Issued by	Signature
A	7 April 2025	G Gallagher	

### DISTRIBUTION

Destination	Revision	
	Original	A
Frasers Property	1	1
GE Database	1	1

### LIMITATIONS

*This report has been prepared for the sole use of the client and the client's immediate representatives and agents. Third parties (excluding regulatory agencies assessing an application in relation to the purpose) shall not rely on this report. It is fundamental in the application of this report that the report, including appendices, is read in its entirety and fully understood. Please contact Gallagher Environmental for additional explanation if any of the report content is not fully understood. This report is not a guarantee that the site conditions will behave in accordance with the interpretation set out herein, but rather our opinion as to the correct interpretations based on the results of desktop review, site investigations, in situ testing and/or laboratory testing in accordance with generally accepted consulting practice. To the best of our knowledge, information contained in this report is accurate at the date of issue. The interpretation of scientific data, however, often involves both professional and subjective judgments. As such, interpretation is open to error. In addition, site conditions are subject to change in a limited time and there remains a risk that the site conditions will differ from these interpretations. Gallagher Environmental waives all responsibility for loss or damage where information provided by the Client (including third parties) used in the preparation of this report was insufficient, inaccurate or in error. © **Copyright Gallagher Environmental 2025.** Copyright in the whole and every part of this document belongs to Gallagher Environmental and may not be used, sold, transferred, copied or reproduced in any form other than by agreement with Gallagher Environmental.*

## TABLE OF CONTENTS

<b>1. Introduction .....</b>	<b>4</b>
1.1 DSMP Overview.....	4
1.2 Scope of Study.....	4
1.3 Objectives.....	4
1.4 DSMP Amendments.....	5
<b>2. Methodology .....</b>	<b>6</b>
<b>3. Site Description &amp; Physical Characteristics.....</b>	<b>7</b>
3.1 General Overview .....	7
3.2 Slopes & Drainage .....	7
3.3 Geology.....	7
3.4 Site Inspection.....	8
3.5 Soil Profiles.....	9
3.5.1 Lithic/Paralithic Leptic Tenosols.....	10
3.5.2 Kandosols grading to Arenosols.....	10
<b>4. Laboratory Results .....</b>	<b>11</b>
4.1 Discussion.....	14
4.1.1 Emerson Class Tests.....	14
4.1.2 Soil pH.....	14
4.1.3 Soil Salinity.....	14
4.1.4 Soil Sodicity (ESP).....	15
4.1.5 Topsoil Nutrient Results.....	16
4.1.6 Topsoil Treatment Rates .....	17
4.1.7 Subsoil Treatment Rates .....	17
4.2 Overall Soil Dispersion Risk.....	19
4.2.1 Topsoil Materials (0–150mm from Natural Surface) – Very Low Risk.....	19
4.2.2 Subsoil/Subsurface Materials – Variable Low to Moderate Risk.....	19
4.2.3 Ephemeral Waterway Areas – Variable Low to Low-Moderate Risk.....	19
<b>5. Dispersive Soil Management Plan.....</b>	<b>20</b>
<b>6. DSMP Certification.....</b>	<b>28</b>

**APPENDIX A: BORELOGS**

**APPENDIX B: LABORATORY RESULTS**

## 1. INTRODUCTION

### 1.1 DSMP Overview

Gallagher Environmental (GE) was commissioned by Frasers Property New Beith Pty Ltd to prepare a Dispersive Soil Management Plan (DSMP) for the proposed 'Precinct A' residential subdivision located at New Beith.

The purpose of the assessment is to define the overall soil dispersion risk of the site soils and to provide appropriate management principles in order to ensure that proposed earthworks do not cause land degradation, and to mitigate effects on the built environment from soil dispersion as a consequence of soil disturbance.

The report is divided into sections describing: the physical characteristics of the site; a review of detailed laboratory results, an assessment of the soil dispersion potential, and where required, subsequent management strategies for the construction phase of the development.

### 1.2 Scope of Study

The scope of the study included:

- The logging, sampling and laboratory analysis of samples recovered from nine (9) boreholes for the purposes of soil dispersion hazard testing;
- A review of the proposed development area and site inspection by qualified GE staff; and
- The detailed interpretation and analysis of the data obtained and comment on relevant recommendations.

Furthermore, the investigation, field and laboratory testing and interpretation were carried out in general accordance with the following documents and standards:

- 'Implementation Guideline No. 28 Dispersive Soils Management' (ICC, 2016);
- Best Practice Erosion & Sediment Control - Books 1, 2 & 3 (IECA, 2018);
- Australian Soil & Land Survey Field Handbook (McDonald et. al., 1998);
- AS1289 Testing of Soils for Engineering Purposes; and
- Australian Soil Classification (Isbell, 2016).

### 1.3 Objectives

The specific objectives of the assessment were as follows:

- To undertake field survey and establish the soil types and characteristics within the investigation area;
- To define the overall soil dispersion hazard of the site soils using desktop, field and laboratory analysis; and
- To provide specific strategies for the management of dispersive soils during the construction phase of the development and for inclusion with bulk earthwork/engineering and ESC plans, where required.

#### **1.4 DSMP Amendments**

The DSMP is a flexible document that shall be modified in the event that site conditions change significantly from those considered within the DSMP and as site knowledge and site construction and engineering experience allows.

In the event that a monitoring program detects a notable failure to achieve the required DSMP objectives, the source of the failure shall be appropriately investigated, including engagement of a suitably-qualified professional (e.g. CPESC; RPEQ) where required, and the DSMP suitably modified to ensure incidents do not recur.

## 2. METHODOLOGY

A total of nine (9) boreholes were drilled within the site area using solid flight auger on 25.02.25. Sampling was undertaken within each major soil horizon (i.e. texture change) encountered and bore logging undertaken in accordance with the 'Australian Soil Classification (2016). The site plan detailing the borehole locations is provided in Drawing No. GE25.021.D1.

Laboratory analysis was subsequently undertaken on representative samples in order to define soil dispersion potential and soil electro-chemistry in accordance with the following Australian Standards:

- Emerson Class Number in accordance with AS1289 3.8.1;
- pH value in accordance with AS1289 4.3.1; and
- Electrical Conductivity (1:5 soil to water suspension).

The overall soil testing regime is shown in Table 2.1 below:

Table 2.1 Soil Testing Regime

Testing Regime	Number of tests
Soil Profile Assessment	9 profiles
Emerson Class	25
Soil pH	25
Soil Electrical Conductivity (EC)	25
Exchangeable Sodium Percentage (ESP)	5
Agronomic Parameters	1

Qualified GE staff undertook Emerson Class, pH and Electrical Conductivity testing on representative samples.

On the basis of these results, a total of five (5) samples were dispatched to ALS Laboratories, Stafford, Brisbane for additional chemical analysis, including ESP and agronomic parameters. The laboratory certificates are contained in Appendix B.

### 3. SITE DESCRIPTION & PHYSICAL CHARACTERISTICS

#### 3.1 General Overview

The site is currently undeveloped rural land with existing rural residential development located to the east. The proposed development area is approximately 15ha and shall feature extensive cut to fill bulk earthworks, the construction of an internal road network, the installation of services (e.g. stormwater; sewer; water) and two (2) dedicated stormwater management areas (e.g. bio-retention/detention basins).

#### 3.2 Slopes & Drainage

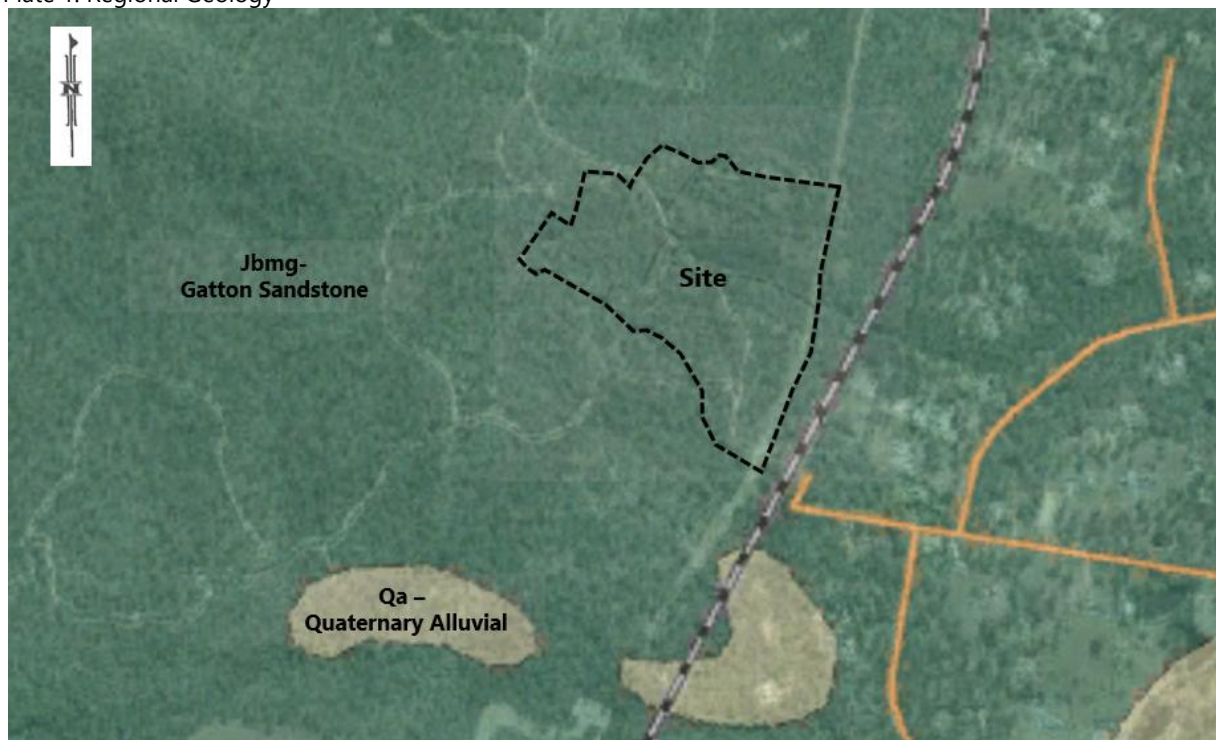
In accordance with the *'Australian Soil & Land Survey Field Handbook (1998)'*, the site contains a gently to moderately inclined topography with the majority of slopes ranging between 3 - 15% across the development area and an estimated mean slope of 7%. The site generally drains eastward/southeastward towards two (2) ephemeral watercourses that discharge along the eastern site boundary.

#### 3.3 Geology

Based on the Department of Mines 1:100,000 geological series maps, the site contains a uniform geology, detailed below (refer Plate 1):

- 'Gatton Sandstone' unit, comprising 'lithic and feldspathic labile sandstone' dating to the Jurassic Period.

Plate 1: Regional Geology



### 3.4 Site Inspection

A site inspection was undertaken by GE staff to examine the site soils and investigate areas of active erosion or evidence of dispersive soils. The site inspection revealed that the development area is predominantly characterized by a stable, non-eroded land surface with intact (non-dispersive) topsoil cover and moderate grass surface cover across the vast majority of the development area (refer Plate 2).

Plate 2: Stable land surface with intact topsoil cover and vegetative cover



Along the observed (cleared) access tracks, general and somewhat limited erosion features were observed, with no significant signs of high-risk soil dispersion potential.

Similarly, observations within the two (2) ephemeral waterways revealed generally stable conditions, limited active erosion and high surface coverage/organic matter (refer Plate 3 below).

Plate 3: High surface cover (organics) within ephemeral waterways



### 3.5 Soil Profiles

For reference purposes, the *general* soil dispersion risk of the various soil orders contained within the Australian Soil Classification (ASC, 2016) is shown in Table 3.1 below.

Table 3.1 General Soil Dispersion Risk of ASC Soil Orders

ASC Soil Order	Soil Horizon	General Soil Dispersion Risk
Sodosol	A (topsoil)	Low
	B (subsoil)	Very High
Dermosol	A (topsoil)	Low
	B (subsoil)	Moderate
Hydosol	A (topsoil)	Low - Moderate
	B (subsoil)	Moderate
Vertosol (sedimentary/alluvial)	A (topsoil)	Moderate
	B (subsoil)	Moderate - High
Vertosol (basalt)	A (topsoil)	Very Low
	B (subsoil)	Low
Kurosol	A (topsoil)	Very Low
	B (subsoil)	Low - Moderate
Chromosol	A (topsoil)	Very Low
	B (subsoil)	Low - Moderate
Kandosol / Tenosol / Rudosol / Podosol	A (topsoil)	Very Low
	B (subsoil)	Low

Based on the field and laboratory assessment, it is considered that the site contains Tenosols and Kandosols grading to Arenosols, in accordance with the Australian Soil Classification (ASC, 2016).

A description of the characteristics of the soils identified on-site are given below and borelogs are included in Appendix A.

#### *3.5.1 Lithic/Paralithic Leptic Tenosols*

Tenosols are a diverse range of soils with minimal B horizon development. Lithic/Paralithic Leptic Tenosols are underlain by weathered rock within 0.5m of the surface. These soils were associated with boreholes 1 and 2 in the northern areas of the site and were generally characterised by a loamy sand A1 horizon overlying a clayey sand B1/B2 horizon, underlain by very shallow sandstone rock.

#### *3.5.2 Kandosols grading to Arenosols*

Kandosols are soils that do not exhibit a clear or abrupt textural B horizon and also exhibit a massive/weak structure grade in the B2 horizon. Given the limited clay content, these soils also grade towards Arenosols (<15% clay in B2 horizon). These soils were associated with boreholes 3 – 9 and were generally characterised by a loamy sand A1 horizon overlying a clayey sand to sandy clay loam B2 horizon.

## 4. LABORATORY RESULTS

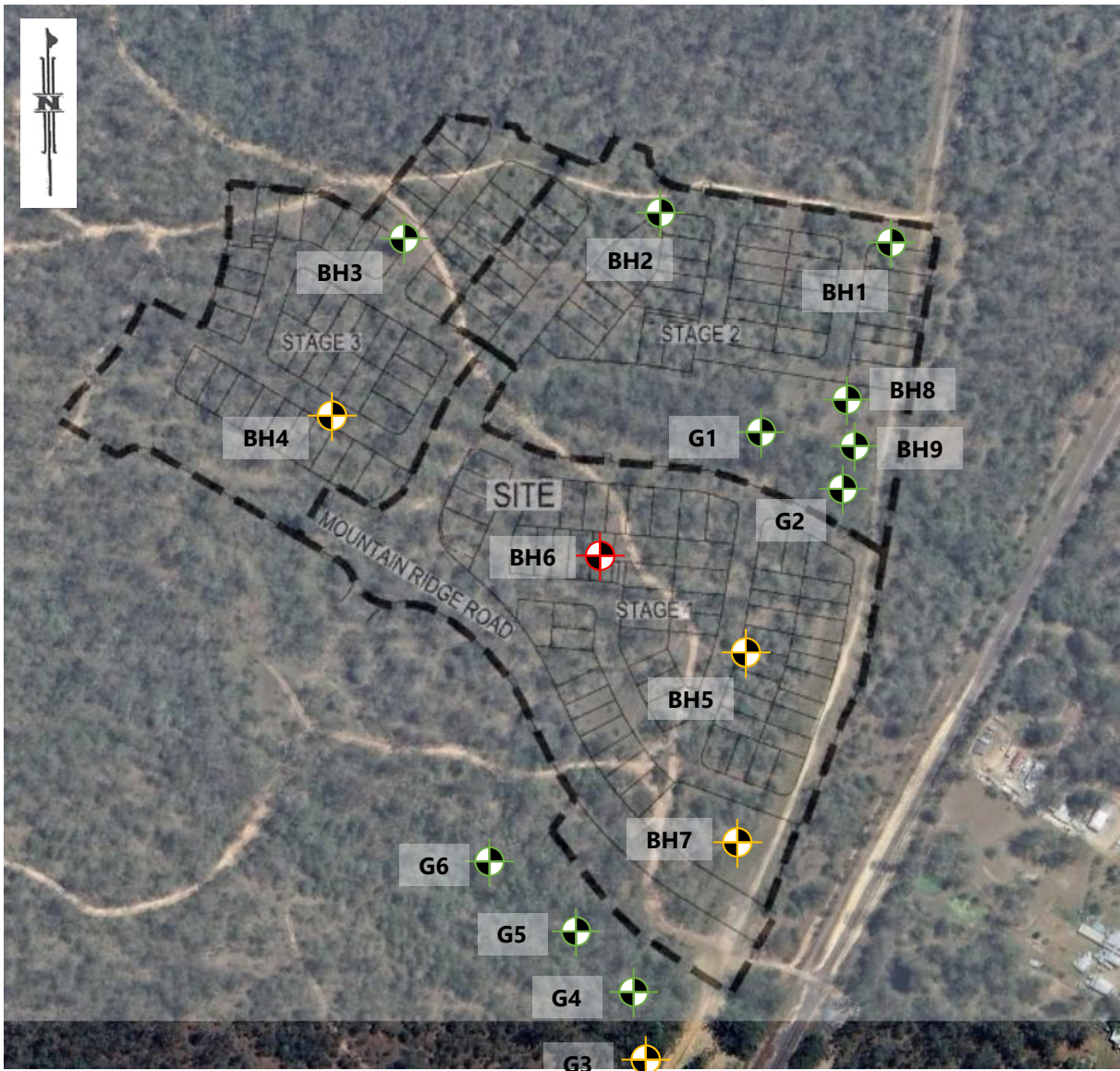
Laboratory results undertaken in order to define soil dispersion potential are shown in the following table and discussed in the following sections. The laboratory certificates are attached in Appendix B. The site plan detailing borehole locations and pertinent laboratory results is provided in Drawing No. GE25.021.D1.

Table 4.1 Dispersion Hazard Test Results




Soil Type	Sample #	Emerson Class	pH	ECe (dS/m)	ESP (%)	Interpretation
A Horizon (topsoil)	BH1: 0.0m	8	5.2	0.1		Moderately-Strongly Acidic pH
	BH2: 0.0m	8	5.3	0.1		
	BH3: 0.0m	8	5.5	0.1		Non-saline
	BH4: 0.0m	7	5.5	0.3		Non-Sodic
	BH5: 0.0m	7	5.7	0.4		Emerson Class: – Very Low Risk
	BH6: 0.0m	7	5.6	0.1	3.0	
	BH7: 0.0m	7	5.4	0.2		
	BH8: 0.0m	7	5.4	0.1		<b>Overall Very Low Dispersion Risk</b>
	BH9: 0.0m	7	5.4	0.3		
Waterway Grab Samples (Surface)	G1: 0.0m	7	5.2	1.1		Moderately-Strongly Acidic pH
	G2: 0.0m	7	5.0	0.8		Non-saline
	G3: 0.0m	3	4.9	1.4	10.6	Non-Sodic to Sodic
	G4: 0.0m	7	5.3	0.8		Emerson Class: – Very Low to Moderate Risk
	G5: 0.0m	7	5.4	1.3		
	G6: 0.0m	7	5.1	0.6		<b>Overall Low-Mod Dispersion Risk (if disturbed)</b>

Table 4.1 (cont.) Dispersion Hazard Test Results

Soil Type	Sample #	Emerson Class	pH	ECe (dS/m)	ESP (%)	Interpretation
B Horizon (subsoil)	BH1: 0.4m	6	5.5	0.01		Moderately-Strongly Acidic pH
	BH2: 0.3m	6	5.3	0.02		
	BH3: 0.4m	6	5.4	0.01	6.0	Non-saline
	BH4: 0.7m	5	5.8	0.02		Non-Sodic to Strongly Sodic
	BH5: 0.7m	3	5.8	0.02		Emerson Class: – Variable Low to High Risk
	BH6: 0.9m	3	6.0	0.04	19.2	
	BH7: 1.0m	2	5.5	0.03		
	BH8: 1.0m	3	5.9	0.03		<b>Overall Moderate Dispersion Risk</b>
	BH9: 1.0m	5	6.1	0.01	2.9	




**Key – Subsoils & Waterway Grab Samples**

-  Emerson Class 1 or 2 – High to Very High Risk
-  Emerson Class 3 – Moderate Risk
-  Emerson Class  $\geq 4$  – Very Low to Low Risk



Gallagher Environmental  
Soil Water Environment

ABN 56 493 696 583  
59 Cremorne Rd Kedron Qld 4031  
glen@genviro.com.au

TITLE Borehole & Sampling Locations		DRAWING NO. GE25.021.D1	
JOB LOCATION New Beith Precinct A		SCALE NTS	
CLIENT Fraser's Property	DATE 13.3.25	DRAWN GMG	SIGNED  GLEN GALLAGHER CPESC NO. 8346

## 4.1 Discussion

### 4.1.1 Emerson Class Tests

An Emerson number of 1 indicates a strongly dispersive soil, an Emerson number of 2 indicates a high risk of significant soil dispersion; an Emerson number of 3 indicates a moderate risk of significant soil dispersion; whilst an Emerson number ranging between 4 and 8 indicates a soil with low to negligible dispersion tendencies.

Emerson Class testing undertaken on 9 topsoil (i.e. A horizon) samples revealed Class 7 – 8 characteristics indicating a very low soil dispersion risk.

Emerson Class testing undertaken on 9 subsoil (B2 horizon) samples revealed Class 2 - 6 characteristics, revealing a variable soil dispersion risk ranging between low and high.

Six (6) samples obtained from the ephemeral waterway areas were also tested for Emerson Class. Five (5) of the six (6) returned an Emerson Class result of 7 (very low risk), with one (1) sample returning an Emerson Class result of 3 (moderate risk).

### 4.1.2 Soil pH

Soil pH is a secondary indicator in the estimation of soil dispersion hazard; where significantly alkaline pH values (e.g. pH >8.0) can indicate a higher risk of soil sodicity and subsequent soil dispersion. Conversely, strongly acidic samples (i.e. pH <5.5) can indicate high bio-available aluminum that can help counter-act soil dispersion tendencies of sodium ions in the soil.

The obtained topsoil (i.e. A horizon) pH values of 5.2 – 5.7 (median of 5.4) are generally moderately to strongly acidic, and do not indicate a higher risk of soil sodicity, and a mild benefit from bio-available aluminum levels.

The obtained subsoil (i.e. B horizon) pH values of 5.3 – 6.1 (median of 5.8) ranged from moderately acidic to strongly acidic. These levels do not indicate a higher risk of soil sodicity, and exhibit a sporadic, mild benefit from bio-available aluminum levels.

The obtained waterway surface soils exhibited pH values of 4.9 – 5.4 (median of 5.2) and are strongly acidic – they also do not indicate a higher risk of soil sodicity, with a mild to moderate benefit from bio-available aluminum levels.

### 4.1.3 Soil Salinity

Soil salinity reflects the relationship between landscape hydrology, geology, soil properties and vegetation. Soil salinity is also secondary indicator in the estimation of soil dispersion hazard. Soils with mildly saline values (or relatively higher values to comparison soils) can sometimes indicate higher levels of sodium and therefore can indicate a higher risk of soil sodicity and subsequent soil dispersion.

However, the actual soil dispersion risk is determined by the relative balance of sodium in relation to chloride levels within saline soils. Saline soils can often be sodic, but these soils will not show

indicators of sodicity. The salt content of the soil prevents dispersion of soil particles in high enough concentrations. If this salt level falls below the requirement for soil stability even a small amount of sodium can produce adverse effects. A combination of high sodium levels and overall low salt will produce extremely poor physical conditions in soils associated with dispersive soils. Soils that exhibit an  $EC_e < 4$  mS/cm are considered to be non-saline.

The soil salinity classes are shown in Table 4.2 below.

Table 4.2: Salinity classes of soils (after Richards, 1954)

Class		$EC_e$ (dS/m)	Comments
Non-saline	None	<2	Salinity effects mostly negligible
	Slight	2 – 4	Yields of very sensitive crops may be affected
Saline	Moderate	4 – 8	Yields of many crops affected
	Very	8 – 16	Only tolerant crops yield satisfactorily
	High	>16	Only a few very tolerant crops yield satisfactorily

The calculated  $EC_e$  (saturated) values for the sampled topsoil materials were 0.1 – 0.4 dS/m (median of 0.1 dS/m), indicating that the topsoil materials are non-saline.

The calculated  $EC_e$  (saturated) values for the sampled subsoil materials ranged between 0.1 – 0.4 dS/m (median of 0.2 dS/m), indicating that these materials are also non-saline.

Similarly, the calculated  $EC_e$  (saturated) values for the sampled waterway surface materials ranged between 0.6 – 1.4 dS/m (median of 1.0 dS/m), indicating that these materials are also non-saline.

#### 4.1.4 Soil Sodicity (ESP)

Soil Sodicity is a measure of exchangeable sodium in relation to other exchangeable cations and is expressed as the Exchangeable Sodium Percentage (ESP). ESP is an important primary risk indicator in the identification of dispersive soils. The common problems that may be encountered with sodic soils are lower hydraulic conductivity (i.e. water logging), higher susceptibility to tunnel erosion and severe gully erosion, poor aeration and reduction in plant-available water capacity and poor leaching (i.e. build up of salts).

The tendency for soil dispersion usually increases with increasing ESP. Sodic soil layers ( $ESP \geq 6$ ) may disperse and strongly sodic soils ( $ESP \geq 15$ ) usually do. The Australian sodicity classifications are provided in Table 4.3 below:

Table 4.3: Sodicity classes of soils

Sodicity Classification	ESP (%)
Non-sodic	≤6
Sodic	6 – 15
Strongly sodic	> 15

Source: DPI (1993)

The ESP level of the topsoil (A horizon) sample was 3.0%, indicating non-sodic soils and a very low soil dispersion risk.

The ESP levels of three (3) subsoil (B horizon) samples ranged between 2.9% and 19.2% (median of 6.0%), indicating non-sodic to strongly sodic subsoils and a variable very low to high soil dispersion risk.

#### 4.1.5 Topsoil Nutrient Results

The topsoil (agronomic) test results, interpretation and recommendations in relation to *optimum* plant growth for 'kikuyu pastures' (general grass) are detailed in Table 4.4 below:

Table 4.4: Agronomic Test Results

Parameter	Result	Guideline Level	Interpretation	Treatment Rate
pH (H <sub>2</sub> O)	5.2 – 5.7	5.5 – 8.0	<b>Low.</b> <i>Apply Ag. Lime.</i>	
Calcium (meq/100g)	1.0	≥3.00	<b>Low.</b> <i>Apply Ag. Lime.</i>	<b>Apply Ag. Lime (calcium carbonate) at 2.0 tonnes / 1000m<sup>3</sup></b>  <b>&amp;</b> <b>Apply Dolomite (calcium-magnesium carbonate) at 2.0 tonnes / 1000m<sup>3</sup></b>
Magnesium (meq/100g)	0.7	≥0.80	<b>Low.</b> <i>Apply. Dolomite.</i>	
Ca: Mg Ratio	1.4	1.5 – 8	<b>Low.</b> <i>Apply Ag. Lime.</i>	
CEC (meq/100g)	2.3	≥8	<b>Low.</b> <i>Apply Ag. Lime.</i>	
Aluminium (meq/100g)	<0.1	<1	<b>Satisfactory.</b> <i>No action required.</i>	
Sodium (base %)	3.0	<6	<b>Satisfactory.</b> <i>No action Required.</i>	
EC (dS/m)	<0.1	<0.4	<b>Satisfactory.</b> <i>No action required.</i>	
NO <sub>x</sub> - Nitrogen (ppm)	<1	≥25	<b>Very Low.</b> <i>Apply Nitrogen fertiliser</i>	<b>100 kg / 1000m<sup>3</sup></b>
Phosphorus - (Olsen)(ppm)	1.3	≥15	<b>Very Low.</b> <i>Apply Phosphorus fertiliser</i>	<b>40 kg / 1000m<sup>3</sup></b>
Potassium (meq/100g)	0.3	≥0.6	<b>Low.</b> <i>Apply Potassium fertiliser</i>	<b>50 kg / 1000m<sup>3</sup></b>

#### 4.1.6 Topsoil Treatment Rates

The recommended minimum application rates including common ameliorant products are provided in Table 4.5 below.

Table 4.5: Recommended Amelioration Strategy (kikuyu pastures/ general grass growth)

Ameliorant		Minimum Treatment Rate
Ag. Lime (fine calcium carbonate)		2.0 tonnes per 1000m <sup>3</sup>
Dolomite (fine calcium magnesium carbonate)		2.0 tonnes per 1000m <sup>3</sup>
NPK Fertiliser	Nitrogen (N)	100 kg per 1000m <sup>3</sup>
	Phosphorus (P)	40 kg per 1000m <sup>3</sup>
	Potassium (K)	50 kg per 1000m <sup>3</sup>

An NPK fertilizer product should be chosen with the approximate NPK ratios similar to the recommendations provided and the overall rate of the product calculated to ensure the minimum levels of each element are attained.

**N.B.** Additional ameliorants or treatment rates may be requested and implemented by the Landscape Consultant to suit selected plant or grass species (e.g. WSUD areas). Further testing may be undertaken to constrain these ameliorant requirements.

#### 4.1.7 Subsoil Treatment Rates

The recommended gypsum treatment rates for soil disturbances identified in Section 5 below (e.g. WSUD areas; service excavations) are shown in Table 4.6 below:

Table 4.6: Gypsum Treatment Rates

Soil	CEC (meq/100g)	ESP (%)	Gypsum Treatment Rate <sup>1</sup>
<b>Zone 1:</b> All Sub-surface materials	7.5	19.2	<b>0.9 kg per square metre</b> (@ a 150mm equivalent treatment depth)  (equiv. to 6 kg/m <sup>3</sup> )

<sup>1</sup> Assumes Soil Bulk Density of 1.6 kg/m<sup>3</sup> & Gypsum Purity of ≥80%

Overall, the recommended gypsum treatment rates are shown Drawing No. GE25.021.D2 below.

**N.B.** A suitably qualified and experienced Environmental Consultant can be engaged to further delineate the location and/or treatment rates within the nominated areas. A detailed report including additional test results, sampling locations and site plan detailing delineations shall be required to justify any reduction/delineation of soil treatment areas. Refer Section 5, page 21 of DSMP Report.



Location	Gypsum Treatment Rates (Refer 'Section 5' of DSMP)
<b>Zone 1:</b> Subsurface Materials (e.g. WSUD areas; Services)	≥ 0.9 kg per square metre (@ 150mm equivalent treatment depth)

**NOTE:** TO BE READ IN CONJUNCTION WITH 'SECTION 5. DISPERSIVE SOIL MANAGEMENT PLAN' OF THE DSMP REPORT



Gallagher Environmental  
**Soil Water Environment**

ABN 56 493 696 583  
59 Cremorne Rd Kedron Qld 4031  
glen@genviro.com.au

TITLE Subsurface Materials – Gypsum Treatment Zone		DRAWING NO. GE25.021.D2	
JOB LOCATION New Beith Precinct A		SCALE Scale Not Shown	
CLIENT Frasers Property	DATE 7.04.25	DRAWN GMG	SIGNED <i>G. Gallagher</i> GLEN GALLAGHER CPESC NO. 8346

## 4.2 Overall Soil Dispersion Risk

On the basis of the site inspection, investigated soil profiles and detailed laboratory results, it is considered that the soil dispersion risk and subsequent management requirements for the proposed development can be defined as follows.

### 4.2.1 Topsoil Materials (0–150mm from Natural Surface) – Very Low Risk

It is considered that the topsoil materials exhibit an overall very low soil dispersion risk, however, require specific soil amelioration (ag. lime/dolomite; fertilizers) in consultation with the Landscape Consultant to promote optimum re-vegetation at establishment and therefore also help mitigate soil dispersion risk of the underlying subsoils.

As per standard practice, all landscaping/stabilisation areas shall be monitored for suitable strike/cover to ensure compliance with the site ESCP requirements and LCC on-maintenance requirements.

### 4.2.2 Subsoil/Subsurface Materials – Variable Low to Moderate Risk

It is considered that the subsoil/subsurface materials (i.e. subsoils and crushed/ground rock materials) exhibit a variable soil dispersion risk; low risk within the northern areas of the development and a moderate risk within the central/southern areas of the development.

To this end, subsoil/subsurface materials within *specific and targeted* areas identified in Section 5 shall require dispersive soil amelioration, including gypsum treatment. Moreover, QUU-applicable services shall include geofabric-wrapping in accordance with QUU standard drawings.

As per standard practice, all disturbed subsoil/subsurface materials shall require soil compaction to LCC geotechnical requirements, and all subsoil/subsurface materials exposed shall be covered with hardstand or non-dispersive topsoil materials and appropriately revegetated in accordance with Landscape Design Drawings.

### 4.2.3 Ephemeral Waterway Areas – Variable Low to Low-Moderate Risk

It is considered that the surface soils within the northern ephemeral waterway area exhibits a low soil dispersion risk.

The surface soils of the southern ephemeral waterway area are considered to be low – moderate risk upon any significant soil disturbance. To this end, subsoil/subsurface materials within *specific and targeted* areas identified in Section 5 shall require dispersive soil amelioration, including gypsum treatment.

As per standard practice, all disturbed subsurface materials within all ephemeral waterway areas shall require soil compaction to LCC geotechnical requirements and all subsurface materials exposed shall be covered with hardstand or non-dispersive topsoil materials and appropriately revegetated in accordance with Landscape Design Drawings.

## 5. DISPERSIVE SOIL MANAGEMENT PLAN

<b>Responsibility</b>	Civil Contractor; Developer						
<b>Operational Policy</b>	<ul style="list-style-type: none"> <li>To mitigate the incidence of infrastructure damage and environmental harm resulting from tunnel and subsurface erosion.</li> <li>To ensure the appropriate management of water quality in order to avoid impacts on the downstream environment.</li> </ul>						
<b>Performance Criteria</b>	<p>All areas of landscaping/rehabilitation shall attain suitable grass strike/cover to ensure compliance with the site ESCP requirements and LCC on-maintenance requirements.</p> <p>All disturbed materials requiring dispersive soil amelioration ('Zone1') shall meet the specified limits:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #1a3d54; color: white;"> <th style="text-align: center;">Material</th> <th style="text-align: center;">Parameter</th> <th style="text-align: center;">Criteria</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Subsoil/subsurface Materials (≥150mm below natural NSL) &amp; Waterway Soils</td> <td style="text-align: center;">Soil Dispersion</td> <td style="text-align: center;">Emerson Class No. 4 – 8; or Exchangeable Sodium Percentage ≤6 %</td> </tr> </tbody> </table>	Material	Parameter	Criteria	Subsoil/subsurface Materials (≥150mm below natural NSL) & Waterway Soils	Soil Dispersion	Emerson Class No. 4 – 8; or Exchangeable Sodium Percentage ≤6 %
Material	Parameter	Criteria					
Subsoil/subsurface Materials (≥150mm below natural NSL) & Waterway Soils	Soil Dispersion	Emerson Class No. 4 – 8; or Exchangeable Sodium Percentage ≤6 %					
<b>Implementation Strategy</b>	<p><b><u>Topsoil Materials – All Areas</u></b></p> <ol style="list-style-type: none"> <li>A high level of care shall be required during delineation of site topsoil and subsoil materials in all areas of subsoil dispersion risk and also in order to ensure the soil texture of stripped topsoil materials is of suitable texture.</li> <li>Topsoil shall be stripped prior to bulk earthworks within the immediate construction stages and shall be stockpiled and shaped in a free draining condition to avoid long-term soil saturation.</li> <li>All topsoils materials used in landscaping/stabilisation shall be suitably ameliorated (e.g. ag. lime/dolomite and fertiliser) in consultation with a Landscaping Consultant to promote grass establishment. <i>Indicative amelioration rates for general grass growth are provided in Table 4.5, however additional testing may be required and/or alternative strategies provided by the Landscaping Consultant, particularly for selected plant or grass species (e.g. WSUD areas).</i></li> <li>All landscaping/stabilisation areas shall be visually monitored for suitable strike/cover to ensure compliance with the site ESCP requirements and LCC on-maintenance requirements.</li> </ol>						

### **Subsoil/Subsurface Materials – All Areas**

#### **General Management**

1. All exposed subsoil/subsurface materials (i.e. >150mm depth from the natural surface) during earthwork activities shall be covered with hardstand, or non-dispersive topsoil materials to a minimum depth of 150mm and appropriately revegetated in accordance with Civil Engineering or Landscape Design Drawings (or similar).
2. All excavated subsoil/surface materials used for site fill shall be adequately compacted to the appropriate Geotechnical Specification - with a minimum 95% / 98% standard compaction requirement as applicable, and in accordance with AS3798 and subsequently verified to LCC specific geotechnical requirements.
3. All water sensitive design (WSUD) (by others) shall be designed in accordance with applicable guidelines and include a geofabric liner (over compacted surface) for bio-basin systems.

#### **Import Materials**

1. Any import soil materials (fill or topsoil) shall be verified non-dispersive soils, as confirmed and appropriately documented by the supplier.
2. In the absence of the above, all import soil materials shall be tested and verified by a suitably qualified and experienced Environmental Consultant. If soil amelioration is required for import materials, an addendum DSMP Report shall be prepared by a suitably qualified and experienced Environmental Consultant.

### **Subsoil/Subsurface Materials – 'Zone 1'**

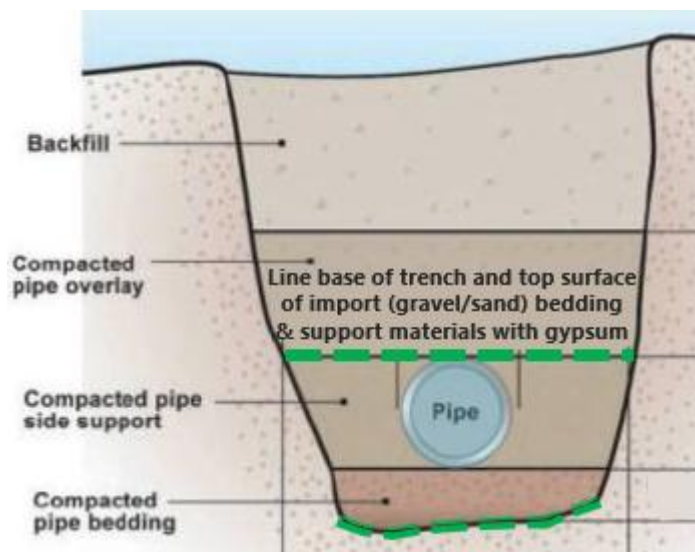
- All subsoil/subsurface materials (i.e. >150mm depth from the natural surface) and all waterway materials within 'Zone 1' shall be considered 'dispersive soils' and shall require the following targeted treatment strategies (e.g. WSUD areas; trench excavations). Alternatively, a suitably qualified and experienced Environmental Consultant can be engaged to further delineate the location and/or treatment rates within the nominated areas. A detailed report including additional test results, sampling locations and site plan detailing delineations shall be required to justify any reduction/delineation of subsoil treatment areas.
- Refer Drawing No. GE25.021.D2 for 'Zone 1' locations

#### **Trench Excavations – Default Strategy**

All trench excavations associated with Stormwater, Sewer and Water Main excavations by the Civil Contractor shall require the following:

1. Treatment with agricultural gypsum (NV >80%) at a rate of:
  - $\geq 0.9 \text{ kg/m}^2$  lining on the surface of the import (gravel/sand) bedding & support materials, as generally denoted in green below; and

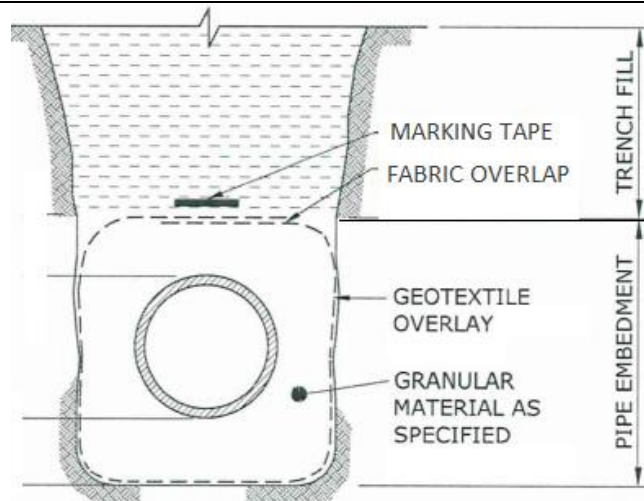
- $\geq 0.9 \text{ kg/m}^2$  lining on the base of the trench, as denoted in green below.



- The surface of the trench shall be covered with topsoil or non-dispersible (or appropriately treated) soil materials to a minimum depth of 150mm cover and covered with permanent vegetation, suitable geo-textile material, rock or similar cover in accordance with Civil Engineering or Landscape Design Drawings.
  - If the base of the trench is founded in non-erodible rock, then the base layer of gypsum shall not be required.
  - If groundwater is encountered, the gypsum treatment as specified above shall be replaced with the installation of full geofabric wrapping (i.e. QUU Type 4/D specification).
2. All excavated and backfilled dispersive subsoil materials associated with service (trench) excavations shall be adequately compacted to an appropriate Geotechnical Specification - with a minimum 95% / 98% standard compaction requirement in accordance with AS3798 and subsequently verified to LCC specific geotechnical requirements.

**'Type 4/D' Applicable Trench Excavations (QUU) & Alternative Method**

1. For all 'Type 4/D' applicable service excavations (QUU) - and otherwise as an alternative treatment method to the above - the excavated and backfilled dispersive subsurface materials shall require the following alternative requirements:
  - Geotextile overlay of the pipe embedment zone – against the trench floor and walls such that it fully encases the embedment, including a minimum 250mm overlap at all fabric joints:



- No gypsum treatment is required.
  - The surface of the trench shall be covered with hardstand, non-dispersive topsoil or non-dispersible (or appropriately treated) soil materials to a minimum depth of 150mm cover and covered with permanent vegetation, suitable geo-textile material, rock or similar cover in accordance with Civil Engineering or Landscape Design Drawings.
2. All excavated and backfilled dispersive subsurface materials associated with service excavations shall be adequately compacted to an appropriate Geotechnical Specification - with the minimum 95% / 98% standard compaction requirement, as applicable, and in accordance with AS3798 and subsequently verified to LCC specific geotechnical requirements.

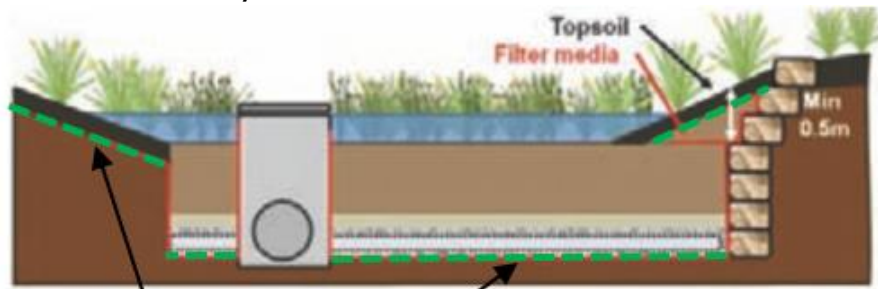
**Stormwater Detention/Bio-retention Basins, Ephemeral Watercourse Area, Stormwater Flow Paths (e.g. Swales; SW Outlets)**

1. All water sensitive design (WSUD) (by others) shall consider the dispersive soil environment in accordance with applicable guidelines and shall geofabric liner (over compacted surface) for bio-basin systems.
2. All earthworks proposed within stormwater treatment and flow path areas (including all bio-basins, watercourses, swales, headwalls, outlets and batter chutes) shall be undertaken in accordance with the Engineering Design Drawings and Landscape Design Drawings and must include the following dispersive soil management techniques:
  - All areas are covered/stabilised with a minimum 150mm of either non-dispersive topsoil and garden bed/vegetation/grass cover (rock may be incorporated), suitable geo-textile material and rock cover, erosion protection mat and vegetation/grass cover, or equivalent stabilisation/cover method;
  - Prior to implementing the cover/stabilisation methods as outlined above, the final subsoil/subsurface level within the disturbed areas shall be lined with agricultural gypsum (NV >80%) at a rate of  $\geq 0.9 \text{ kg/m}^2$  - gypsum to be

tined with roller/grader, or similar wherever practicable– as noted in *dashed green* below. **N.B.** this treatment shall not be required in any area situated directly underneath HDPE **impermeable** liner, if utilised, or non-erodible rock confirmed by Geotechnical/Environmental Consultant.

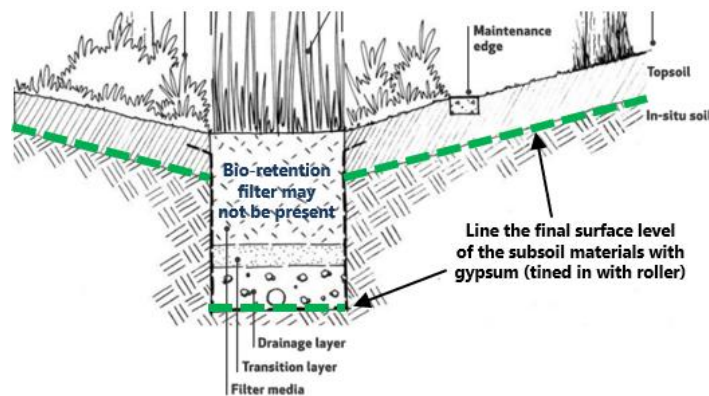
- If fill materials are proposed, they shall be adequately compacted to an appropriate Geotechnical Specification - with a minimum 95% standard compaction requirement in accordance with AS3798 and subsequently verified to LCC specific geotechnical requirements.

**Basin/Wetland Areas: Indicative Cross-section**



Line the final surface level of the subsoil materials with gypsum (tined with roller)

**Watercourse / Swale/ Flow Path Areas: Indicative Cross-section**



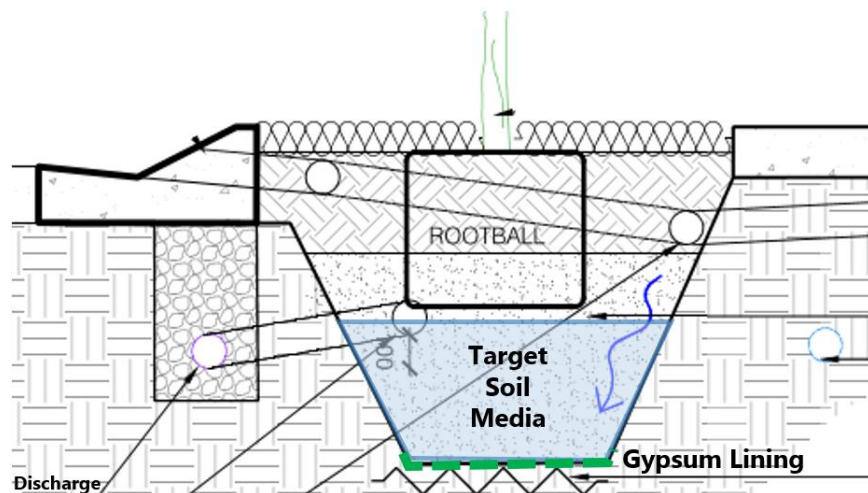
Line the final surface level of the subsoil materials with gypsum (tined in with roller)

**Passive Irrigation Systems**

1. The Landscaping Consultant shall include dispersive soil management strategies in the relevant Landscaping Design Specifications, in consultation with an appropriately qualified and experienced Environmental (Soil) Consultant, as required.
2. The dispersive soil management strategies shall include:
  - Application of gypsum agricultural gypsum (NV >80%) at a rate of 0.9 kg/m<sup>2</sup> lining on the surface of the subgrade materials, *as denoted in green below*;

- Surrounding subgrade materials adequately compacted to an appropriate Geotechnical Specification - with a minimum 95% standard compaction requirement in accordance with AS3798 and subsequently verified to LCC specific geotechnical requirements. If the above standard/requirements are not applicable, then the minimum standard compaction requirement can be lowered to >85% (at OMC) to mimic natural soil compaction.
- Passive Irrigation shall be designed to mitigate excessive flow conditions and reduce the frequency of extensive ponding in the Target Soil Media (i.e. water balance).
- The Target Soil Media (i.e. up to piped discharge height) shall require a minimum clay content of  $\geq 15\%$  to reduce the risk of significant clay fines migration from the Subgrade to the Target Soil Media.
- The Target Soil Media shall have a minimum soil calcium content of  $\geq 7.0$  meq/100g ( $\geq 1400$  mg/kg), with soil magnesium also adjusted to maintain the desired Ca: Mg ratio.

Passive Irrigation: Indicative Cross-section



**Gypsum Source**

Gypsum used in amelioration must be 'Grade 1' i.e. must contain a minimum of 15.0% sulphur (S) and a minimum of 19.0% Calcium (Ca) and must have a minimum neutralising value (NV) of 80%.

**Monitoring Requirements**

**Topsoil Materials – All Areas**

All topsoil materials shall be ameliorated to promote revegetation/rehabilitation, with interpretation and any further recommendations for ameliorants (e.g. ag. lime/dolomite and fertilizers) provided by the Landscape Consultant.

Material	Minimum Parameters	Testing Frequency
Topsoil (A horizon)	Soil pH; Macro-nutrients (N, P, K, Ca, Mg, S)	As per Landscape Consultant
<b>'Zone 1' Treatment Areas</b>		
<p>Photographs (including timestamp and location) shall be regularly taken and kept on record for all areas requiring gypsum spreading and/or geofabric wrapping within trench excavations.</p> <p>Photographs (including timestamp and location) shall be regularly taken and kept on record for all areas requiring gypsum spreading on the final subsurface material level (e.g. bio-retention basins, stormwater flow paths etc).</p> <p>Gypsum delivery dockets/invoices shall be kept by the Contractor to allow comparison to theoretical quantities and provided to Logan City Council (LCC) upon request.</p> <p>Ameliorated subsoil materials (excluding trenches) shall undergo verification testing for Emerson Class (AS1289 3.8.1) or Exchangeable Sodium Percentage (ESP) at the following testing rates:</p>		
Material	Parameter	Verification Testing Frequency
'Zone 1' Treatment Areas (excludes trenches)	Emerson Class  Or Exchangeable Sodium Percentage (ESP)	One (1) composite sample per 500m <sup>2</sup> of gypsum subsoil lining
<p>All composite (bulked) samples shall comprise a minimum of three (3) sub-samples to help ensure representativeness of the tested materials and shall be taken to represent a minimum 150mm test depth equivalent.</p> <p>Dispersion Index testing (AS1289 3.8.2) may also be used if required in conjunction with the Emerson class/ESP test results, if deemed beneficial by the Consulting Engineer/Environmental Consultant.</p> <p>Ameliorated materials that do not meet the verification criteria shall be re-treated and re-verified until compliance has been achieved.</p>		
Reporting Requirements	All results, reports, photographs and other documentation regarding dispersive soil identification/treatment/amelioration shall be kept on record by the Contractor and available for inspection at all times.	

	<p>The Contractor's Site Manager shall maintain a log of gypsum treatment (including photographs) and shall ensure that soil records are kept up to date.</p> <p>Soil test results and gypsum treatment records shall be made available to the Superintendent, Certifier and Statutory Authorities upon request.</p>
<p><b>Incident Identification</b></p>	<p>Soil verification test results not meeting the specified criteria.</p> <p>Failure to adhere to the prescribed treatment methods or verification methods, as stated above.</p> <p>Evidence of sub-surface tunnelling/erosion.</p>
<p><b>Contingency Procedures</b></p>	<p>Review of soil dispersion control measures.</p> <p>The re-application of soil ameliorants in consultation with the Environmental Consultant.</p>
<p><b>ESCP Integration</b></p>	<p>The soil dispersion results presented in the DSMP shall be utilised/considered to develop the Erosion and Sediment Control Plan (ESCP), where appropriate.</p>

## 6.DSMP CERTIFICATION

This DSMP assessment has been prepared with due reference to *Implementation Guideline No. 28 Dispersive Soils Management (ICC, 2016)* by Glen Gallagher, Environmental (Soil & Water) Scientist and Certified Professional in Erosion & Sediment Control (CPESC) No. 8346.

Please feel free to contact Gallagher Environmental on 0438 724 929 or [glen@genviro.com.au](mailto:glen@genviro.com.au) for any queries or if further elaboration is required.

Yours faithfully,



**Glen Gallagher** BScApp(Env Sc)(Hons) MEIANZ CPESC #8346  
Principal | Gallagher Environmental



## **APPENDIX A: BORE LOGS**





Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB : NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH1**

ELEVATION : -  
DEPTH : 0.4m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: LEPTIC TENOSOLS  SOIL /ROCK MATERIAL DESCRIPTION	Moisture	DCP (blows)	Emerson Class
0				<b>LOAMY SAND</b> - light greyish brown, occ organics - <i>gradual change to:</i>	D		<b>8</b>
				<b>CLAYEY SAND</b> light greyish brown, weak structure trace organics  -Tending to Weathered Sandstone Rock	D		<b>6</b>
0.5				Borehole Terminated			
1.0							
1.5							



Steady Level Groundwater



Groundwater During Drilling





Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB : NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH2**

ELEVATION : -  
DEPTH : 0.3m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: LEPTIC TENOSOLS  SOIL /ROCK MATERIAL DESCRIPTION	Moisture	DCP (blows)	Emerson Class
0				<b>LOAMY SAND</b> - light greyish brown, occ organics - <i>gradual change to:</i>	D		<b>8</b>
				<b>CLAYEY SAND</b> light greyish brown, weak structure -Tending to Weathered Sandstone Rock	D		<b>6</b>
0.5				Borehole Terminated			
1.0							
1.5							



Steady Level Groundwater



Groundwater During Drilling

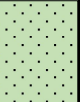



Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB : NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH3**

ELEVATION : -  
DEPTH : 0.6m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: ARENOSOLS  SOIL /ROCK MATERIAL DESCRIPTION	Moisture	DCP (blows)	Emerson Class
0				<b>LOAMY SAND</b> - light greyish brown, occ organics - <i>gradual change to:</i>	D		<b>8</b>
				<b>CLAYEY SAND</b> light greyish brown, weak structure	D		<b>6</b>
0.5				-Tending to Weathered Sandstone Rock			
				Borehole Terminated			
1.0							
1.5							



Steady Level Groundwater



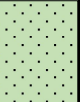

Groundwater During Drilling



Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB : NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH4**  
ELEVATION : -  
DEPTH : 0.7m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: ARENOSOLS  SOIL /ROCK MATERIAL DESCRIPTION	Moisture	DCP (blows)	Emerson Class
0				<b>LOAMY SAND</b> - light greyish brown, occ organics - <i>gradual change to:</i>	D		<b>7</b>
				<b>CLAYEY SAND</b> greyish brown, weak structure, trace. org.  -Tending to Weathered Sandstone Rock	D		<b>3</b>
				Borehole Terminated			
0.5							
1.0							
1.5							



Steady Level Groundwater



Groundwater During Drilling





Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB: NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH5**

ELEVATION : -  
DEPTH : 0.7m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: KANDOSOLS  SOIL /ROCK MATERIAL DESCRIPTION	Moisture	DCP (blows)	Emerson Class
0				<b>LOAMY SAND</b> - light greyish brown, occ organics - <i>gradual change to:</i>	D		<b>7</b>
				<b>SANDY CLAY LOAM</b> light greyish brown, weak structure, trace. org.  -Tending to Weathered Sandstone Rock	D		<b>3</b>
				Borehole Terminated			
0.5							
1.0							
1.5							



Steady Level Groundwater



Groundwater During Drilling





Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB : NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH6**

ELEVATION : -  
DEPTH : 1.0m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: KANDOSOLS  SOIL /ROCK MATERIAL DESCRIPTION	Moisture	DCP (blows)	Emerson Class
0				<b>LOAMY SAND</b> - light greyish brown, occ organics - <i>gradual change to:</i>	D		7
				<b>SANDY CLAY LOAM</b> light greyish brown and orange, weak structure	D		2
1.0				Borehole Terminated			
1.5							



Steady Level Groundwater



Groundwater During Drilling



Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB : NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH7**

ELEVATION : -  
DEPTH : 1.0m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: ARENOSOLS (TENDING TO KANDOSOLS)	Moisture	DCP (blows)	Emerson Class
				SOIL /ROCK MATERIAL DESCRIPTION			
0			<b>LOAMY SAND</b> - light greyish brown, occ organics - <i>gradual change to:</i>		D		<b>7</b>
			<b>CLAYEY SAND+</b> light greyish brown and orange, weak structure		D		
0.5							
1.0				Borehole Terminated			<b>3</b>
1.5							



Steady Level Groundwater



Groundwater During Drilling





Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB : NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH8**

ELEVATION : -  
DEPTH : 1.0m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: KANDOSOLS  SOIL /ROCK MATERIAL DESCRIPTION	Moisture	DCP (blows)	Emerson Class
0				<b>SANDY LOAM-</b> - light greyish brown, occ organics - <i>gradual change to:</i>	D		7
				<b>CLAYEY SAND</b> light greyish brown and orange, weak structure	D		
0.5				<b>SANDY CLAY LOAM</b> light greyish brown and orange, weak structure			
1.0				Borehole Terminated			5
1.5							



Steady Level Groundwater



Groundwater During Drilling





Gallagher Environmental  
Soil Water Environment

CLIENT : FRASERS PROPERTY  
ADDRESS : PRECINCT A  
SUBURB : NEW BEITH  
JOB NO : GE25.021  
DATE : 25.2.25

**PROFILE: BH9**

ELEVATION : -  
DEPTH : 1.0m NSL  
BIT TYPE: 100mm  
DRILLER : GG  
LOGGER : GG

Depth (m NSL)	Depth (m AHD)	Groundwater	Graphic Log	ASC CLASSIFICATION: KANDOSOLS  SOIL /ROCK MATERIAL DESCRIPTION	Moisture	DCP (blows)	Emerson Class
0				<b>LOAMY SAND</b> - light greyish brown, occ organics - <i>gradual change to:</i>	D		<b>7</b>
				<b>CLAYEY SAND</b> light greyish brown and orange, weak structure	D		
				<b>SANDY CLAY LOAM</b> light greyish brown and orange, weak structure			
1.0				Borehole Terminated			<b>5</b>
1.5							



Steady Level Groundwater



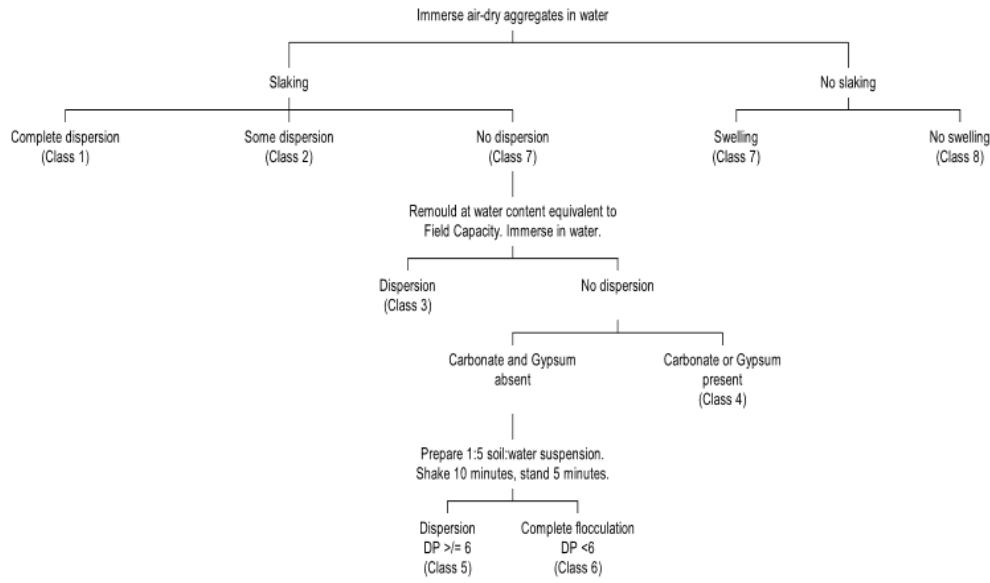
Groundwater During Drilling

## APPENDIX B: LABORATORY RESULTS

## Emerson Class Test Certificate

(Method: AS1289 3.8.1)

Figure 1. Determining the Emerson Class Number of Aggregates



Sample	Emerson Class
BH1: 0.0m	8
BH2: 0.0m	8
BH3: 0.0m	8
BH4: 0.0m	7
BH5: 0.0m	7
BH6: 0.0m	7
BH7: 0.0m	7
BH8: 0.0m	7
BH9: 0.0m	7
G1: 0.0m	7
G2: 0.0m	7
G3: 0.0m	3
G4: 0.0m	7
G5: 0.0m	7
G6: 0.0m	7



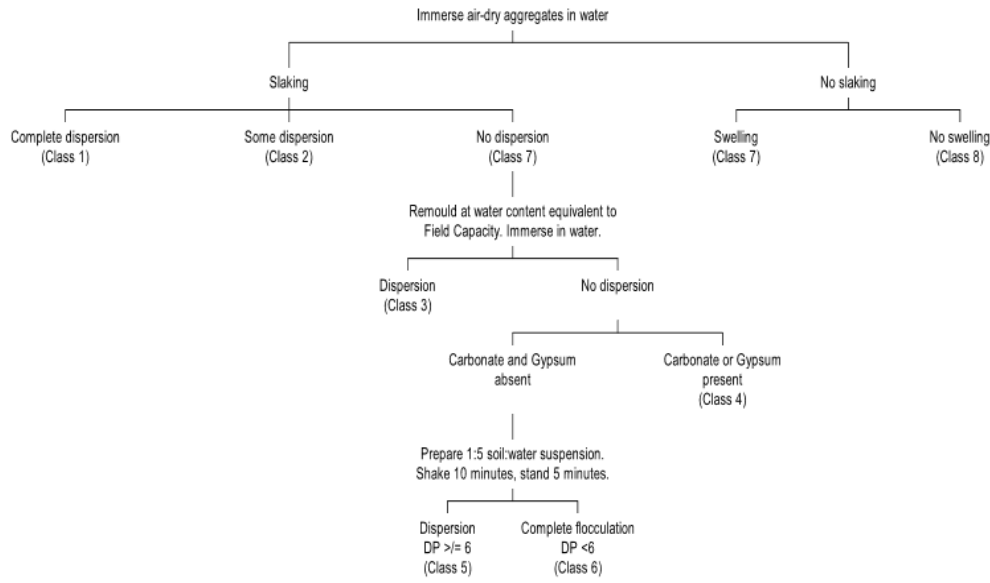
*G. Gallagher*

Glen Gallagher CPESC No. 8346

## Emerson Class Test Certificate

(Method: AS1289 3.8.1)

Figure 1. Determining the Emerson Class Number of Aggregates



Sample	Emerson Class
BH1: 0.4m	6
BH2: 0.3m	6
BH3: 0.4m	6
BH3: Weathered Rock	5
BH4: 0.7m	3
BH5: 0.7m	3
BH6: 0.9m	2
BH7: 1.0m	3
BH8: 1.0m	5
BH9: 1.0m	5

## pH & Electrical Conductivity (EC) Test Certificate

*(Soil Chemical Methods - Rayment & Lyons, 2010)*

Sample	pH <sub>1:5</sub>	EC <sub>1:5</sub> (dS/m)	Texture Factor	Estimated Ece
BH1: 0.0m	5.2	0.01	14	0.1
BH2: 0.0m	5.3	0.01	14	0.1
BH3: 0.0m	5.5	0.01	14	0.1
BH4: 0.0m	5.5	0.02	14	0.3
BH5: 0.0m	5.7	0.03	14	0.4
BH6: 0.0m	5.6	0.01	14	0.1
BH7: 0.0m	5.4	0.02	12	0.2
BH8: 0.0m	5.4	0.01	12	0.1
BH9: 0.0m	5.4	0.02	14	0.3
G1: 0.0m	5.2	0.08	14	1.1
G2: 0.0m	5.0	0.06	14	0.8
G3: 0.0m	4.9	0.10	14	1.4
G4: 0.0m	5.3	0.06	14	0.8
G5: 0.0m	5.4	0.09	14	1.3
G6: 0.0m	5.1	0.04	14	0.6
BH1: 0.4m	5.5	0.01	14	0.1
BH2: 0.3m	5.3	0.02	14	0.3
BH3: 0.4m	5.4	0.01	14	0.1
BH3: Rock	5.0	0.12	14	1.7
BH4: 0.7m	5.8	0.02	14	0.3
BH5: 0.7m	5.8	0.02	10	0.2
BH6: 0.9m	6.0	0.04	10	0.4
BH7: 1.0m	5.5	0.03	14	0.4
BH8: 1.0m	5.9	0.03	10	0.3
BH9: 1.0m	6.1	0.01	10	0.1



# CERTIFICATE OF ANALYSIS

Work Order	: EB2506937	Page	: 1 of 3
Client	: GALLAGHER ENVIRONMENTAL	Laboratory	: Environmental Division Brisbane
Contact	: MR GLEN GALLAGHER	Contact	: Customer Services EB
Address	: 23 HOOKER STREET WINDSOR 2756	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: -----	Telephone	: +61-7-3552-8685
Project	: 25/021 Precinct A - New Beith	Date Samples Received	: 27-Feb-2025 15:34
Order number	: -----	Date Analysis Commenced	: 28-Feb-2025
C-O-C number	: -----	Issue Date	: 13-Mar-2025 09:17
Sampler	: GLEN GALLAGHER		
Site	: -----		
Quote number	: EN/333		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Soil Preparation, Stafford, QLD



Accreditation No. 825  
Accredited for compliance with  
ISO/IEC 17025 - "Testing"



## General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

▲ = This result is computed from individual analyte detections at or above the level of reporting

∅ = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- ALS is not NATA accredited for the analysis of Exchangeable Aluminium and Exchange Acidity in soils when performed under ALS Method ED005.
- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- ED007 (Exchangeable Cations by ICP-AES): Unable to calculate Magnesium/Potassium Ratio for some samples as required Exchangeable Magnesium and/or Potassium results are less than the limit of reporting.
- ED007 (Exchangeable Cations): Unable to calculate Magnesium/Potassium Ratio result for sample BH6 0.0m (EB2506937-001) as required Exchangeable Potassium results are less than the limit of reporting.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Raymond & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Sample ID		BH6 0.0m	G3 0.0m	BH3 0.4m	BH6 0.9m	BH9 1.0m
Compound	GAS Number	LOR	Unit	27-Feb-2025 00:00 EB2506937-001 Result	27-Feb-2025 00:00 EB2506937-002 Result	27-Feb-2025 00:00 EB2506937-003 Result	27-Feb-2025 00:00 EB2506937-004 Result	27-Feb-2025 00:00 EB2506937-005 Result
EA002: pH 1:5 (Soils)		0.1	pH Unit	5.6	4.9	5.4	6.0	6.1
EA010: Conductivity (1:5)		1	µS/cm	14	102	10	36	10
EA055: Moisture Content (Dried @ 105-110°C)		0.1	%	0.6	----	----	----	----
<b>ED005: Exchange Acidity</b>								
Ø Exchange Acidity		0.1	meq/100g	0.3	4.5	1.4	----	----
Ø Exchangeable Aluminium		0.1	meq/100g	<0.1	<0.1	0.9	----	----
<b>ED007: Exchangeable Cations</b>								
Exchangeable Calcium		0.1	meq/100g	1.0	1.2	0.2	0.2	3.6
Exchangeable Magnesium		0.1	meq/100g	0.7	4.5	1.2	5.6	3.2
Exchangeable Potassium		0.1	meq/100g	0.3	0.3	0.1	0.2	<0.1
Exchangeable Sodium		0.1	meq/100g	<0.1	0.7	<0.1	1.4	0.2
Cation Exchange Capacity		0.1	meq/100g	2.3	11.2	2.9	----	----
Cation Exchange Capacity		0.1	meq/100g	----	----	----	7.5	7.2
Exchangeable Sodium Percent		0.1	%	3.0	10.6	6.0	19.2	2.9
Calcium/Magnesium Ratio		0.1	-	1.4	0.3	0.2	<0.1	1.1
Magnesium/Potassium Ratio		0.1	-	2.6	13.7	11.5	31.7	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	10	mg/kg	<10	----	----	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>								
Nitrite + Nitrate as N (Sol)		0.1	mg/kg	0.2	----	----	----	----
<b>EK081: Bicarbonate Extractable Phosphorus (Olsen)</b>								
Bicarbonate Extractable P (Olsen)		1.0	mg/kg	1.3	----	----	----	----