Appendix Q
Conceptual Erosion and Sediment Control Plan

PROJECT

CONCEPTUAL EROSION & SEDIMENT CONTROL PLAN ELYSIAN DEVELOPMENT BILAMBIL HEIGHTS, NEW SOUTH WALES

PREPARED FOR

GREENLAND DEVELOPMENT PTY LTD

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CLIENT Greenland Development PTY LTD

CLIENT CONTACT

CLIENT REFERENCE –

SYNOPSIS This report describes assessments of the erosion risk of the site and measures required to ensure that the stormwater runoff from the proposed development meets Tweed Shire Council's water quality objectives during the construction phase.

REVISION HISTORY

REVISION #	DATE	EDITION BY	APPROVED BY
1	04/09	A. Genn	L. Varcoe & A. Genn
2	08/10	A. Genn	L. Varcoe & A. Genn
3	04/20	M. Clayton	C. Anderson & L. Varcoe
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SUMMARY

Gilbert & Sutherland Pty Ltd (G&S) was commissioned by Greenland Development Pty Ltd, ('the applicant') to prepare an Erosion and Sediment Control Plan for consideration by the Department of Planning, Housing and Infrastructure (DPHI) to modify the Major Project ('Concept Plan') Approval No. 08_0234 for Elysian, formerly known as the 'Rise'.

The proposal seeks approval to modify the State Significant Development (SSD) consent pursuant to accordance with clause 3BA(5) of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017* (Transitional Regulation).

The modification seeks changes to the land uses of the approved project and the conditions of the consent. It is proposed to modify the approval by consolidating and simplifying land uses, omitting inappropriate uses and removal of the detailed layout to allow for flexibility at the detailed design stage.

It is considered that the proposed changes are substantially the same development for which the consent was originally granted.

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GLOSSARY

TERM	MEANING
Australian Height Datum (AHD)	National reference for relative height measurement in Australia
Average Recurrence Interval (ARI)	The average or expected length of time between exceedances of a given variable, such as rainfall.
Bund	An embankment constructed around an area to prevent the inflow or outflow of liquids. Also called Bunding.
Catchment	The area above a given point which contributes to the runoff.
Clay	Very fine-grained sediment or soil (often defined as having a particle size less than 0.002 mm, or 2 microns, in diameter).
Ephemeral	A stream that flows briefly only in direct response to precipitation in the immediate locality and the channel of which is at all times above the watertable.
Erosion	The process by which material (such as rock or soil) is worn away or removed (as by wind or water).
Groundwater	The water contained in interconnected pores located below the watertable in an unconfined aquifer or located in a confined aquifer.
Intermittent	A stream in which the flow is seasonal, usually in response to rainfall in the immediate area (see ephemeral).
Loam	Medium-textured soil composed of approximately 10% to 25% clay, 25% to 50% silt and less than 50% sand.
pH	The degree of acidity or alkalinity measured on a scale of 1 to 14 with 7 as neutral. From 0 to 7 is acidic; from 7 to 14 is alkaline.
Scouring	The action of removing sediment from stream banks, particle by particle. This is a more destructive process than collapse when viewed over time due to incremental effects.
Sediment	Unconsolidated, fine-grained material (typically derived from the weathering of rocks), that is transported by water and settles on the floor of seas, rivers streams and other bodies of water.

1 Introduction

Gilbert & Sutherland Pty Ltd (G&S) was commissioned by Greenland Development Pty Ltd, ('the applicant') to prepare an Erosion and Sediment Control Plan for consideration by the Department of Planning, Housing and Infrastructure (DPHI) to modify the Major Project ('Concept Plan') Approval No. 08_0234 for Elysian, formerly known as the 'Rise'.

The site is located at Marana Street, Bilambil Heights NSW 2486 (formally described as Lot 32//DP1085109, Lot 33//DP1085109, Lot 31//DP850230, Lot 2//DP867486, Lot 4//DP822786, Lot 1//DP1033807, Lot 1//DP595529 and Lot 1//DP1033810, Lot 2//DP1156202 and Lot 1//DP1033811). The site location is shown on Drawing No 12286_001, included as Appendix 1.

The proposal seeks approval to modify the Major Project consent pursuant to accordance with clause 3BA (5) of Schedule 2 of the Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017 (Transitional Regulation).

The modification seeks changes to the land uses of the approved project and the conditions of the consent. It is proposed to modify the approval by consolidating and simplifying land uses, omitting inappropriate uses and removal of the detailed layout to allow for flexibility at the detailed design stage.

A summary of the proposed changes include:

- Consolidation and updating of land uses and precincts
- Change of residential product type and density
- Increase in residential areas with an overall reduction in the yield of the development
- Deletion of precincts for a private school and nursing home
- Increase in open space overall, including additional land for conservation
- Reduced village centre precinct area
- Reduction in the number of precincts allocated for retirement living
- Realignment of major spine road and internal roads
- Relocation and consolidation of the reservoirs
- Change in tenure from Community title scheme/ Body corporate to Freehold

The Major Project Approval No. 08_0234 was originally approved on 29 June 2010, with two subsequent modifications approved on 4 April 2018 (Mod 1) and 31 October 2022 (Mod 2). It is proposed to change the approval description as follows:

- Concept plan for the development of a mixed residential development including approximately 1,300 residential dwellings, 2,400m^2 gross floor area of retail space, 4,250m^2 gross floor area of commercial space, and associated infrastructure and landscaping.

It is considered that the proposed changes are substantially the same development for which the consent was originally granted.

1.1 Proposed development

The development includes bulk earthworks, roadworks and land subdivision including the following key elements:

- Road works comprising:
  - construction of a central spine road,
  - construction of an intersection to the site on Cobaki Road and Marana Street,
  - construction of local access roads.
- Construction of infrastructure comprising:
  - stormwater drains and management structures,
  - sewer and water reticulation mains,
  - other ancillary services
- Subdivision of the site into a total of approximately 1,300 lots comprising:
  - Village (mixed use);
  - Residential neighbourhoods;
  - Retirement living;

- Open space areas consisting of neighbourhood, local, linear and scenic parks, and structured open space, and
- Conservation areas.

The development concept is shown on the Elysian Concept Plan - Overall Site Concept (RPS Drawing No. 12122-050, revision D, dated 1 November 2024 and included in Appendix 2).

2 Site characteristics

2.1 Site description

The Elysian site is located in New South Wales just south of the border with Queensland and approximately 10km south-west of Tweed Heads in the township of Bilambil Heights. The site comprises:

- Lots in the ownership of the proponent, Greenland Development Pty Ltd being Lots 33 on DP1085109, Lot 31 on DP850230, Lot 2 on DP867486 and Lot 4 on DP822786;
- Lots owned by Tweed Shire Council specifically Lot 1 on DP1033810, Lot 1 on DP1033811 and Lot 1 on DP595529); and
- Crown Road separating Lot 2 on DP867486, Lot 33 on DP1085109 and Lot 2 on DP555026.

It is noted that Concept Approval CP08_0234 also encompasses Lot 32 on DP1085109 which is now under different ownership and the subject of separate applications. This lot is not considered further in this report.

The location of the site is shown on Drawing No. 12286_001, included as Appendix 1.

With a total land area of approximately 176ha owned by the applicant, the subject site contains an area of some 126ha of development footprint (excluding conservation area of 50ha) and is characterised by undulating land ranging from 2m to 216m Australian Height Datum (AHD).

A number of small dams currently exist on the site.

2.2 Vegetation

The majority of the proposed development will occur in areas that have been cleared of native vegetation for past agricultural activities and a golf course (which currently occupies the south-eastern portion of the development footprint) as shown on the aerial photograph in Drawing No. 12286_002, included in Appendix 1.

For a detailed description of the current vegetation on site, refer to the reports by JWA Ecological Consultants Pty Ltd included as part of this modification application.

2.3 Geology

A review of the Geological Survey of Queensland Geology, 1:100,000 series – Murwillumbah sheet indicates that the site is underlain by two rock unit types, Tertiary Kyogle basalt and Devonian-Carboniferous age Neranleigh Fernvale beds.

The Kyogle basalt underlies the southern part of the site and typically comprises greenish hawaiite with minor alkali olivine basalt and basanite and rare tholelitic basalt.

The northern part of the site is underlain by Devonian-Carboniferous age Neranleigh Fernvale beds typically comprising of mudstone, shale, arenite, chert, jasper, basic metavolcanics, pillow lava and conglomerate.

2.4 Soil landscapes

Soils in the region have been mapped and described in 'Soil landscapes of the Murwillumbah – Tweed Heads 1:100,000 Sheet'[1] (Morand 1996). The soil landscapes within and surrounding the site are shown on Drawing No. 12286_003, included in Appendix 1. This mapping indicates that the proposed development will be within three landscapes being Carool (ca), Disturbed (xx) and Burringbar (bu) while the land to the north of Cobaki Creek Road is within the Crabbes Creek (cr) soils landscape.

The general soil profile over the site was described by Morand as friable clays overlying light medium to medium heavy clays or sandy clays. Emerson Aggregate Test results ranged from Class 6 to 8

[1] *Soil landscapes of the Murwillumbah – Tweed Heads 1:100,000 Sheet*, NSW Department of Land & Water Conservation, Morand D.T. 1996.

and the proportion of clay ranged from 43% to 58%.

Morand indicates that the topsoils are likely to have low to moderate erodibility (K=0.006) while the subsoils may have a very high erodibility (K=0.065 to 0.067).

These results indicate that the soils should be classified as 'Type D' soils in accordance with Section 3.2.7 of 'Managing Urban Stormwater, Soils and Construction, Volume 1'.

2.5 Soil classification

To characterise the site soils, G&S undertook a soil survey of the site in 1997 and again in 2005. These studies incorporated a total of 15 detailed boreholes and additional soil observations to an average depth of 0.6m.

Soil sampling and profile description was undertaken according to the Australian Soil and Land Survey Field Handbook (McDonald et al, 1990) with the soils classified according to the Australian Soil Classification (Revised) (Isbell, 1996;2002). The updated soil borelogs are presented in Appendix 3 with the borehole locations shown on Drawing included as Appendix 1.

The soils within the CP08-0234 area were identified predominantly as Ferrosols, with a smaller portion of Kurosols and Dermosols also present.

Ferrosols are described by Isbell (2002) as soils other than Vertosols, Hydrosols and Calcarosols that:

i. Have B2 horizons in which the major part has a free iron oxide content greater than 5% Fe in the fine earth fraction (<2mm); and

ii. Do not have clear or abrupt textural B horizons or a B2 horizon in which at least 0.3m has vertic properties.

These soils correspond with the Carool soil landscape described by Morand (1996) and are predominantly associated with dark reddish brown clay loams to light medium clays overlying reddish brown medium clays with moderate structure.

Kurosols and Dermosols were differentiated by either a clear and abrupt B horizon (as in the case of Kurosols) or less than 5% Fe in the fine earth fraction, as indicated by colour (in the case of Dermosols). These soils correspond with the Disturbed and Burringbar soil landscapes described by Morand (1996).

2.6 Soil dispersivity

Dispersion describes the tendency for the clay fraction of a soil to go into colloidal suspension where unlimited swelling and disintegration of some of the clay particles forms a colloidal cloud around the sample (Emerson & Seedsman, undated). These attributes provide an indication of the soil's erosion potential with a dispersive soil being (obviously) more susceptible to erosion.

The results of Modified Emerson Class testing of the samples collected from the site are detailed in Table 2.6.1.

Table 2.6.1 Emerson Class testing results

Borehole	Depth (m)	Emerson
BH1	0.00 - 0.05	4/7M
BH1	0.05 - 0.65	4/7M
BH2	0.00 - 0.05	4/7M
BH2	0.05 - 0.65	4/7M
BH3	0.00 - 0.05	4/7M
BH3	0.05 - 0.45	4/7M
BH4	0.00 - 0.05	4/7M
BH4	0.05 - 0.50	4/7M
BH5	0.00 - 0.10	4/7M
BH5	0.10 - 0.65	4/7M
BH6	0.00 - 0.10	4/7M
BH6	0.10 - 0.60	4/7M
BH7	0.00 - 0.05	8M
BH7	0.05 - 0.65	4/7M
BH8	0.00 - 0.05	8M
BH8	0.05 - 0.50	4/7M
BH9	0.00 - 0.05	8M
BH9	0.05 - 0.65	4/7M
BH10	0.00 - 0.05	8M
BH10	0.05 - 0.65	4/7M

These results confirm the findings of Morand that the soils should be classified as 'Type D' soils in

accordance with Section 3.2.7 of 'Managing Urban Stormwater, Soils and Construction, Volume 1'.[2]

2.7 Soil erodibility and erosion hazard rating

2.7.1 Current erosion

The site shows little sign of any accelerated soil erosion, due primarily to the prevalent vegetative cover present across the site.

[2] *Managing Urban Stormwater, Soils and Construction* 4th Edition, Landcon, 2004.

3 Erosion & sediment control plan

3.1 Objectives

The main objective of this conceptual ESCP is to demonstrate that the requirements of Tweed Shire Council's 'Code of Practice for Soil and Water Management on Construction Works' as required in Council's 'Development Design Specification, D7, Stormwater Quality' can be implemented at the site. Additionally, the ESCP provides information on site specific management issues to minimise potential environmental impacts from the proposed bulk and civil earthworks at the site.

The control measures detailed in this ESCP have been developed to minimise impacts on the receiving environment and achieve the following objectives:

- minimise soil erosion and exposure,
- minimise transportation of eroded soil by air and water,
- limit suspended solids concentration in stormwater discharges to no more than 50mg/L,
- limit/minimise the area of site disturbance at any one time,
- isolate the site by diverting clean upstream 'run on' water around disturbed areas,
- Control runoff and sediment at its source rather than sole reliance on end-of-line measures,
- stage ground disturbance/earthworks and progressively revegetate the site where possible to reduce the area contributing sediment,
- retain topsoil for revegetation works,
- locate sediment control structures where they are most effective and efficient.

3.2 Implementation

The ESCP requires the Proponent to mitigate the potential environmental impacts associated with the proposed works. The Proponent is responsible for erosion and sediment control management throughout the construction phases (bulk and civil earthworks) of site development. The Proponent is also responsible for all persons, including employees, plant operators, contractors, subcontractors etc., who may cause erosion and sediment generation at the site or impacts to the receiving environment as a result of works on site.

It is intended that the conceptual ESCP will provide a set of performance criteria and guiding principles with which the future detailed engineering designs for the subdivision will seek to comply. The plans and specifications forming part of the construction contract for each future development stage should also include these performance criteria.

The project should be developed in Precincts and stages of Precincts to minimise the potential for soil erosion and water pollution and this would enable the site to be progressively rehabilitated as the development proceeds. As soon as is practicable, after the completion of the earthworks in each stage, the lots will be topsoiled and reseeded to establish a fast growing cover crop to minimise erosion and movement of sediment across and off the site. On steeper slopes, hydromulching or other suitable stabilisation methods may be required.

Wherever possible the site will remain vegetated and otherwise undisturbed until construction commences.

3.2.1 Self-auditing system

According to Tweed Shire Council's 'Development Design Specification, D7, Stormwater Quality' Section D7.A11 Operation, Maintenance, Clause 11.2, where more than 2,500m^2 of land is disturbed, a self-auditing program is to be developed for the site.

The self audit shall be undertaken routinely onsite and include a review of the following:

- installation/removal of any erosion and sediment control devices,
- the condition of each device and its performance,
- storage capacity available in sediment control structures, including (where applicable):
  - trash racks,
  - sediment barriers and traps,
  - gross pollutant traps,
  - temporary sedimentation basins.
- time, date, volume and type of any flocculant use on site,
- the volumes of sediment removed from sediment retention systems, and where this sediment has been disposed of,
- maintenance or repair requirements (if any) for each device,
- circumstances contributing to the damage of any device, accidental or otherwise, and steps taken to rectify the issue.

3.2.2 Construction phase ESC measures

This conceptual ESCP provides an overview of the types of measures to be implemented at the site and the objectives to be achieved by future detailed ESCPs.

In general, Type 1 sediment basins should be used in catchments where grades permit. If traditional sediment basins are not feasible, alternative Type 2 and 3 devices will be relied upon in that catchment to achieve the site's stormwater discharge objectives. It is anticipated that a combination of Type 1, 2 and 3 devices will be implemented in each catchment. Such control measures should be installed and maintained in accordance with the recommendations contained in 'Managing Urban Stormwater, Soils and Construction' Landcom, March 2004 (Landcom guideline) and could will include appropriate combinations of the following devices;

- sediment basins, traps or weirs
- compost/mulch berms,
- coir logs,
- soil binders and surface stabilisers,
- erosion control blankets,
- mulching,
- silt fences,
- flow diversion banks,
- clean water diversion drains,
- chute and channel linings,
- lining surfaces with flocculants such as gypsum.

Prior to commencement of bulk earthworks, temporary erosion and sediment controls will be installed. Where practicable, runoff from undisturbed areas will be diverted around disturbed areas and away from the temporary sedimentation basins. As work progresses, runoff from the disturbed areas will be diverted by means of surface slopes and V-drains to the temporary sedimentation basins described below.

Indicative temporary sedimentation basin detention volumes have been included for each catchment where the area to be developed exceeds 2,500 m[2][3] and are shown on Drawing No. 12286_004, included in Appendix 1. The catchment areas and associated temporary sedimentation basin sizes are also tabulated in Appendix 4.

The sediment basins have been designed in accordance with requirements detailed within the Landcom guideline. Based on the site soils and the likely operational techniques across the site, a Type D basin has been sized for each of the catchments. Type D sedimentation basins are designed for catchments where there are fine

[3] In accordance with 'Managing Urban Stormwater, Soils and Construction' Landcom, March 2004.

grained soils which contain a significant proportion of ‘erodible’ clay materials. These types of sedimentation basins may require the addition of a flocculant to assist in the settling process.

Gypsum is the most commonly used flocculant. Gypsum application rates are site specific and the appropriate rate for the ‘Elysian’ site will need to be determined once construction commences. As a guide, Landcom provides a maximum rate of 70kg of gypsum per 100 cubic metres of water. Previous experience with soils similar to those found on this site indicates that an application rate of 30kg per 100 cubic metres should be adequate.

The sedimentation basins will be relocated and/or removed as the bulk earthworks progressively re-establish vegetated cover. It is typical practice to utilise the end of line water quality treatment devices (such as bioretention basins) as sediment basins. Once 80% of the catchment has been developed, the sediment basins would be converted into end of line water quality treatment devices. However the other control measures mentioned above must be installed in disturbed areas during the building construction phase and maintained until landscaping has been completed and becomes established.

It is noted that sediment basins may not be a practical control device in some areas of the site as the steep grades limit the practicality of completing these excavations. Alternate combinations of Type 2 and 3 devices will be adopted in these constrained areas. The exact number, location and size of the sedimentation basins will be determined at the detailed design stage concurrently with the development of the Precinct staging as it evolves over time.

4 Management of potential impacts – Construction phase

4.1 ESCP Structure

This ESCP acknowledges the environmental impacts associated with the subdivision and details strategies to mitigate them.

Each control strategy is based upon proven environmental management methods and is presented as a commitment. The commitments made within this document will form the basis of future assessments, which will be made available to the Tweed Shire Council for review as part of the future Construction Certificate applications for each Precinct or part thereof.

The ESCP is based on a series of tables for the construction phase of the development. The person responsible for the implementation of the measures detailed is written on the table itself. The tables then detail the issue, the performance criteria, the Implementation strategy, monitoring, auditing, reporting, failure identification and the corrective action. The detachable pages within each section detail the provisions of the ESCP. The format is presented below for reference purposes;

#.# Title

Person responsible	This is the person who has accepted the responsibility of implementing the ESCP provisions detailed on this page

Issue	The Issue that the table deals with
Operational policy	The operational policy or management objective that applies to the element.
Performance criteria	Performance criteria (outcomes) for each element of the operation.
Implementation strategy	The strategies or tasks (to nominated operational design standards) that will be implemented to achieve the performance criteria
Monitoring	The monitoring requirements which will measure actual performance (i.e. specified limits to pre-selected indicators of change).
Auditing	The auditing requirements, which will verify implementation of agreed construction and operation phase environmental management strategies and compliance with agreed performance criteria.
Reporting	Content, timing and responsibility for reporting and auditing of monitoring results.
Identification of incident or failure	The circumstances under which the agreed performance criteria are unlikely to be met and environmental harm is likely to result.
Corrective action	The action to be implemented in case a performance requirement is not reached and the company(s) responsible for action.

Commitment #

A promise made by management.

An objective of the tabular format is to allow for change and allow the management plan to be a working document. If items need altering, changes may be made (after the appropriate consultation with the statutory authorities) to the individual tables.

4.2 General commitments

Commitment 1

The Proponents undertake to comply with the environmental implementation strategy as contained within the approved Erosion and Sediment Control Plan (ESCP) on a Precinct by Precinct (or part thereof) basis.

Commitment 2

The Proponents undertake to fulfil all commitments made in this ESCP and to carry on their activities on the project site in accordance with relevant current statutory requirements and approved amendments.

4.3 Definitions

In this ESCP the terms have the following meanings:

ESCP means the approved Erosion and Sediment Control Plan and includes any amendments that may be approved from time to time,

Development means the development of the CP08-0234 area in accordance with the approved Concept Plan;

TSC means Tweed Shire Council;

Proponent means the person undertaking the development of the land and includes the person nominated by the Proponent as having the responsibility for implementing the provisions of the ESCP.

4.4 Construction phase vegetation clearing/soil disturbance

Applies to	Bulk earthworks and civil construction phases
Person responsible	Contractor's Site Manager

Issue	Minimisation of the removal or disturbance of trees, shrubs and ground covers
Operational policy	To maintain existing vegetation as long as possible during construction works.
Performance criteria	No vegetation is to be removed prior to Consent Approval being granted.
Implementation strategy	No vegetation removal prior to receipt of Consent Approval shall be undertaken. Trees to be conserved are to be flagged with surveyors marking tape. Compaction of ground in the dripline of trees to be retained shall be minimised. The area of disturbance shall be clearly delineated to keep vehicles, building materials and refuse away from areas to be conserved. The number of access points onto the site shall be minimised. Vegetation buffer zones shall be maintained where possible. Where practicable vegetative debris shall be salvaged as logs or woodchip. Where possible, shakedown devices shall be utilised at each access point to minimise sediment transport onto public roads. Newly completed hardstand areas shall be swept to prevent excess aggregate or gravel entering street drains.
Monitoring	Regular inspections shall be carried out to ensure that construction work areas are kept within stage boundaries.
Auditing	Management to examine the boundary of the works weekly.
Reporting	No reporting is necessary unless areas are inadvertently cleared outside approved stage boundaries.
Identification of incident or failure	Clearing outside of stage boundaries.
Corrective Action	Reinstate and revegetate over-cleared areas where necessary, unless the area is to be used for future staging.

4.5 Construction phase dust management

Applies to	Bulk earthworks and civil construction phases
Person responsible	Contractor's Site Manager

Issue	Minimisation of movement of dust offsite in accordance with Landcom 2004 Soils and Construction 'Managing Urban Stormwater' (Landcom Guideline)
Operational policy	To achieve acceptable air quality standards through the control of the movement of dust offsite from site works.
Performance criteria	The target level for complaints by nearby residents is no more than one in any seven-day period. Ambient air quality should not deteriorate by more than 30% over a period of seven consecutive days. Dust deposition at any nearby residence should not exceed 100mg/m^2/day.
Implementation strategy	Construction works shall be staged where appropriate to limit the areas exposed at any one time. All permanent bunds and reshaped areas will be revegetated within 10 days after completion of earthworks (including excavation and backfilling of services trenches). Stockpiling onsite will be minimised where possible. Ground surfaces will be kept damp (not wet). Surfaces shall be left in a rough cloddy condition to increase roughness and slow surface wind speed. An on-site water cart will be available at all times. All dust creating work to cease if wind speed exceeds 10m/sec (36km/hour). Contractors staff to be trained to implement dust minimisation measures. Protective ground covers shall be provided, including mulches, vegetation, organic binders or dust retardants. Traffic movements on any disturbed areas shall be minimised.
Monitoring	Daily inspections will be carried out to verify that dust mitigation measures are being implemented. Dust monitoring will be conducted upon receipt of verified complaints (as per performance criteria) by residents. If dust monitoring is to take place, the following will occur: • temporary dust deposition gauges will monitor the movement of dust offsite at; - the residence/s from which the compliant has been received,

	- at the boundary of the construction site, in line with the residence/s (ideal in the predominant wind directions); and - at a suitable 'regional background' location which is not be affected by construction dust, to provide background context for analysis and interpretation. • monitoring will be undertaken in accordance with AS 3580.10.1(2016).
Auditing	Management to examine the complaints register weekly and review corrective action taken.
Reporting	Within 24 hours of detecting any incidents during construction that causes (or may cause) significant harm to the environment, the Proponent shall notify the Council and other relevant agencies of the incident and identify the following: • Describe the date, time, and nature of the incident. • Identify the cause (or likely case) of the incident. • Describe what action has been taken to date. • Describe any proposed measures to address the incident. A record of Complaints received shall be maintained in a Complaints Register and kept onsite for inspection by statutory authorities upon request.
Identification of incident or failure	Any dust-related complaints by residents will indicate a failure of the dust control measures.
Corrective Action	Locate the source of the dust and implement the following measures: • apply water sprays to vegetation • cover or water exposed areas • Monitor and log the wind direction and speed. • if dust persists, cease the dust creating activities All dust complaints to be addressed in consultation with Council Officers.

Commitment 3

Dust generated during the construction of the development works will be managed to ensure that dust movement offsite is controlled.

4.6 Construction phase erosion controls

Applies to	Bulk earthworks and civil construction phases
Person responsible	Contractor's Site Manager, Consulting Engineer

Issue	Erosion controls
Operational policy	To prevent the displacement of sediment and soil across and offsite during storm events.
Performance criteria	Off-site discharges to comply with requirements for suspended sediments as detailed in Section 4.8 of the ESCP. No visual indication of erosion on stages under construction, including evidence of rilling (an indicator of sheet erosion).
Implementation strategy	Erosion and sediment control devices shall be installed prior to commencement of work in each stage in accordance with the approved engineering plans and to the reasonable satisfaction of TSC. No site disturbance shall commence until the appropriate approvals have been obtained. Where possible, the construction programme shall be scheduled to minimise the potential for soil loss to occur. Where construction activities cannot be altered, additional controls shall be implemented in the areas of high erosion potential. Runoff and erosion controls shall be installed prior to clearing and include: • Diversion of upslope runoff around cleared and/or disturbed areas in a way that minimises erosion, minimises the upslope catchment and diverts waters to a legal point of discharge. • Sediment control fences or other measures at the downslope perimeter of cleared and/or disturbed areas. • Maintenance of all erosion control measures at operational capacity until land is effectively rehabilitated. Temporary erosion measures (e.g. hay bales, straw fences) are to be employed onsite during construction where reasonably deemed necessary by TSC from an assessment of slope and soil type. Such measures shall be maintained at, or above their design capacity. Such measures should be in accordance with the recommendations in the Landcom Guideline. On sites where more than 1000 m^2 are to be disturbed, runoff controls are also to include: • The use of barrier fencing,

	• The utilisation of exclusions zones, and • Minimising slope lengths of disturbed, uncontrolled areas. Stripped topsoil shall be separated from subsoil materials and shall only be stripped from the areas designated on the appropriate plans. Stockpiled soil should be stored taking into account the following considerations: • They are not to be located on public footpaths, nature strips, roads, road shoulders or any other public land. • Be located at least 2m away from any hazard areas. • Be protected from upslope surface flows, and • Be provided with sediment filters downslope. Fill batters shall be located to avoid established trees. Unless otherwise specified, trenches must be backfilled and compacted to 95% standard compaction and capped with topsoil. Excess spoil may be retained onsite provided the stockpile area is prepared by stripping topsoil from beneath the fill site for further use in revegetation. Outside the construction area of each stage existing surface water conditions should be maintained wherever possible.
Monitoring	Where more than 2,500 m^2 of land is disturbed, a self auditing program shall be developed for the site. A site inspection and self audit and monitoring program shall include: • weekly site inspections, • inspections immediately following rainfall events that cause runoff, and • inspections immediately before site closure. Surface water quality to be monitored during rainfall events (refer to the section titled 'Surface Water Monitoring' which details monitoring of surface water and stormwater quality including during storm events).
Auditing	Regular self-audits shall be carried out in accordance with the above monitoring requirements. Additional visual inspections to be carried out monthly and after rainfall events to verify that control measures are in place and properly maintained.
Reporting	Signed, completed self-audits, original test results, weekly and other result sheets shall be kept on site and made available on request to Council officers and other relevant statutory authorities.

Identification of incident or failure	1. Signs of erosion on site. 2. Damaged or failed erosion control devices. 3. Deterioration in water quality as identified by Environmental Consultant.
Corrective action	Apply remedial measures to Improve sediment and erosion measures, for example; hay bales, silt fences and flocculation of the temporary sedimentation basin.

Commitment 4

Best management practices will be implemented into work practices throughout the bulk earthworks and civil construction phases to minimise erosion.

4.7 Construction phase sediment control

Applies to	Bulk earthworks and civil construction phases
Person responsible	Contractor's Site Manager, Consulting Engineer

Issue	Sediment Control
Operational policy	To prevent the displacement of sediment and soil across and offsite during storm events.
Performance criteria	Off-site discharges to comply with requirements for suspended sediments as detailed in Section 4.9 of the ESCP.
Implementation strategy	All sediment control measures and facilities must be installed and stabilised prior to the commencement of site construction activities. No site disturbance shall commence until the appropriate approvals have been obtained. Sedimentation basins shall be constructed where the area to be developed exceeds 1 hectare. Temporary erosion measures (e.g. hay bales, silt fences) are to be employed onsite during construction where reasonably deemed necessary by TSC from an assessment of slope and soil type. Such measures should be in accordance with the recommendations in the Landcom guideline. Sediment is to be removed after each rainfall event and weirs are to be regularly maintained and cleaned. Straw bales and silt fence geotextiles are to be replaced when damaged or permanently blocked. Sediment basins shall be constructed upstream of watercourses or receiving waters and preferably offline. Level markers shall be installed within all sediment basins. Sediment basins shall be dosed with flocculating agents when required to ensure that discharge water quality meets required limits. Sediment shall be cleaned out of sediment basins when accumulated sediment volume reaches 70%. Removed materials must be disposed of in a manner that does not cause pollution. All weather access tracks shall be constructed to all sediment basins. Where practical, surface waters from undisturbed lands shall be diverted away from construction areas. When sediment controls are required outside the construction site: • where increased stormwater runoff is likely to accelerate erosion of any downstream watercourse, the necessary remedial work

	shall be undertaken, • all immediate downstream drainage inlets shall have appropriate controls installed. • all disturbed areas on other property are to be reinstated to the original condition. • All external works are to be complete prior to the release of the linen plan of subdivision or building certificate. Outside the construction area of each stage, existing surface water conditions should be maintained wherever possible.
Monitoring	Where more than 2,500m^2 of land are disturbed, a self-auditing program shall be developed for the site. A site inspection and self-audit and monitoring program shall include: • weekly site inspections, • inspections immediately following rainfall events that cause runoff, and • inspections immediately before site closure. Surface water quality to be monitored during rainfall events (refer to the section titled 'Surface Water Monitoring' which details monitoring of surface water and stormwater quality including during storm events).
Auditing	Regular self audits shall be carried out in accordance with the above monitoring requirements. Additional visual inspections to be carried out monthly and after rainfall events to verify that control measures are in place and properly maintained.
Reporting	Signed, completed self audits, original test results, weekly and other result sheets shall be kept on site and made available on request to Council officers and other relevant statutory authorities. Copies of test results, audits and other results to be submitted to TSC monthly.
Identification of incident or failure	Falling water quality as identified by Environmental Consultant. Build-up of sediment.
Corrective action	Apply remedial measures to Improve sediment and erosion measures, for example; hay bales, silt fences and flocculation of the temporary sedimentation basin.

Commitment 5

Best management practices will be implemented into work practices throughout the bulk earthworks and civil construction phases to minimise sediment transport offsite.

4.8 Construction phase sediment basin monitoring

Applies to	Bulk earthworks and civil construction phases
Person responsible	Contractor's Site Manager, Environmental Consultant

Issue	Sediment basin monitoring and management
Operational policy	Sediment basins will be monitored and managed to ensure protection of the downstream receiving environment.
Performance criteria	Sediment basins will have sufficient capacity to capture the design rainfall event (80th percentile, 5-day rain event of 39.7 mm). Water accumulated in sediment basins will be monitored prior to active discharge of waters. Accumulated water will meet the specified concentration limits prior to discharge. Basin capacity will be restored within 5 days following the cessation of the rain event (with consideration to safety and access at all times). All water discharged from the site will comply with the following criteria:

Water Quality Parameter	Release Criteria	Criteria Type
pH	6.5 – 8.5	Range
Total Suspended Solids	<50 mg/L	Maximum
Oil and Grease	No visible film, No detectable odour	–

Implementation strategy	<u>Sediment basin construction</u> Sediment basins will have sufficient capacity to capture the design rainfall event (80th percentile, 5 day rain event of 39.7 mm). Sediment basins must have a marker that identifies the upper level of the sediment storage zone such that it is clear to the operator when sediment removal must occur. In basins that intersect the groundwater table, the typical standing groundwater level should also be indicated. The required volume for capture of runoff must be provided above the height of the groundwater table. Sediment basins must meet the design and operational standards of Managing Urban Stormwater, Soils and Construction: Volume 1. <u>Sediment basin monitoring and discharge</u> Water accumulated within sediment basins will be monitored to ensure the release criteria is met prior to active discharge (i.e. pumping) offsite. The water will be tested for pH and total suspended solids (TSS). A

	visual inspection will also to be carried out for oil and grease. Active (i.e. pumped) discharge from the sedimentation basins will only occur if water quality criteria are met. Sediment basins must be maintained and operated to ensure that; • All 5-day rainfall events up to 39.7 mm (the 80th percentile 5 day rain event) are captured. • Any discharge from the sediment basin spillways that occurs as a result of rainfall below the 5-day total of 39.7 mm must meet the required concentration limits. • The concentration limits do not apply to uncontrolled discharge from the sediment basin spillways arising from a rainfall event exceeding 39.7 mm falling over any consecutive five-day period. • Any water actively discharged (i.e. pumped) from the sediment basins spillways to the receiving environment must meet the concentration limits (regardless of rainfall volumes). • Subject to meeting the water quality requirements, accumulated water within sediment basins will be discharged within five days of cessation of rainfall to restore full design capacity for future rainfall events. • Where necessary, sediment basins will be dosed with flocculating agents (e.g. gypsum) to meet the water quality requirements specified above. • Sediment will be cleaned out of sediment basins when accumulated sediment volume reaches 50% of the basin's design capacity. A marker will be installed to delineate this level. Removed materials will be placed upgradient of a sediment basin, so that water within the sediment can drain back into the basin. The sediment is to be located such that it will not be re-entrained by stormwater flows discharging into the basin. The drained sediment will then be incorporated into products or mixed with topsoil (if necessary) and used onsite for rehabilitation.
Monitoring	Monitoring of the waters contained within the sediment basin prior to its controlled discharge (i.e. pumping) as detailed above. Daily monitoring of the waters contained within the sediment basin during controlled discharge from sedimentation basins. • The following records must be kept in respect of any samples required to be collected for the purposes of this licence; • The date(s) on which the sample was taken, • The time(S) at which the sample was collected; • The point at which the sample was taken; and

	The name of the person who collected the sample.
Auditing	Environmental Consultant to audit water quality results to ensure all discharges comply with the performance criteria.
Reporting	Result sheets to be compiled for all water quality monitoring results. These results to be kept on site for inspection by local and state government officers upon request.
Identification of incident or failure	Sediment basins that do not have sufficient capacity to capture the design rainfall event (80th percentile, 5 day rain event of 39.7 mm). Failure to monitor water accumulated in sediment basins prior to active discharge of waters. Active discharge of water that does not meet the specified concentration limits prior to discharge. Failure to restore basin capacity within 5 days following the cessation of the rain event (with consideration to safety and access at all times). Discharge of water that does not meet specified concentration limits when 5-day rainfall totals are below 39.7 mm.
Corrective action	Re-shape/expand sediment basins to ensure sufficient capacity for design event. Monitor prior to active discharge of waters. If pH is detected outside the criteria range, then such waters will be contained, and the pH adjusted to within the range of 6.5 to 8.5 prior to release. If total suspended solid levels exceed the water quality criteria for this parameter, then water will be contained on site for a period sufficient to allow suspended solids to settle out prior to release, or treated with a flocculent. Erosion control devices will be immediately inspected and cleaned if necessary. Additional devices will be installed if a need is detected to prevent future breaches of the suspended solids criteria. The placement of stockpiles and management of disturbed areas will be reviewed with regard to sediment and silt control. Restore basin capacity within 5 days following the cessation of the rain event (with consideration to safety and access at all times).

Commitment 6

Surface water quality at the discharge points will be maintained during the construction phases of the development in accordance with the discharge criteria.

4.9 Construction phase rehabilitation and landscaping

Applies to	Bulk earthworks and civil construction phases
Person responsible	Contractor's Site Manager, Environmental Consultant

Issue	Rehabilitation and landscaping
Operational policy	Progressively stabilise and rehabilitate working areas to minimise sediment transport.
Performance criteria	No sediment transport off completed areas.
Implementation strategy	Progressive stabilisation and revegetation of completed areas. The landscaping and rehabilitation program shall be programmed to ensure that minimal time delay occurs between final land shaping and permanent rehabilitation (a period of 20 days is provided). All landscaping and rehabilitation shall be completed before occupation or use of buildings or premises. All temporary erosion and sediment control works are to be removed once works are complete and revegetation is successfully established in formerly disturbed areas.
Monitoring	Regular inspections shall be carried out on completed areas to assess success of revegetation works.
Reporting	No reporting is necessary unless problems are identified.
Identification of incident or failure	Failure to rehabilitate completed works areas progressively.
Corrective action	Revegetate as soon as possible.
Contingency Plans	Test topsoil if revegetation works have been unsuccessful to determine the possible problem.

Commitment 7

The proponent will undertake all necessary actions to ensure that disturbed areas are landscaped or otherwise rehabilitated expeditiously.

4.10 Construction phase contract management

Applies to	Bulk earthworks and civil construction phases
Person responsible	Consulting Engineer

Issue	Contractor management
Operational policy	To ensure the proponents Duty of Care is met by ensuring the Contractor is aware of his responsibilities under the terms of the ESCP and the EP & A Act.
Performance criteria	Contractor is fully aware of his responsibilities under the terms of the ESCP.
Implementation strategy	Review of the ESCP and the construction phase contracts by the proponent. Periodic checks to be made by an independent Environmental Consultant. Training for construction staff in implementation of ESCP provisions.
Monitoring	Weekly site inspections to be carried out.
Auditing	Inspections will be carried out monthly during the construction phase by an Environmental Consultant for every stage of development.
Reporting	Full details to be available to the contractor together with suggested corrective actions if required.
Corrective action	To be detailed at the time.

Commitment 8

A proactive program of contractor management will be implemented

5 Administration of the ESCP

5.1 Amendment of the ESCP

The Proponent may make an application to TSC to amend the provisions of this ESCP. The application shall:

1. be in writing; and

2. specify the provisions of the ESCP to which the application relates; and

3. state how the proposed amendments achieve the objectives of the provisions to which the amendments relate.

TSC shall approve the amendment where TSC is satisfied acting reasonably that the proposed amendments achieve the objective of the provisions to which the amendment relates.

5.2 Incident management

The Proponent and any person appointed by the Proponent as having responsibility for a control strategy set out in this ESCP have clearly defined responsibilities under the Environment Planning and Assessment Act 1979 to report any incidents likely to cause material or serious environmental harm.

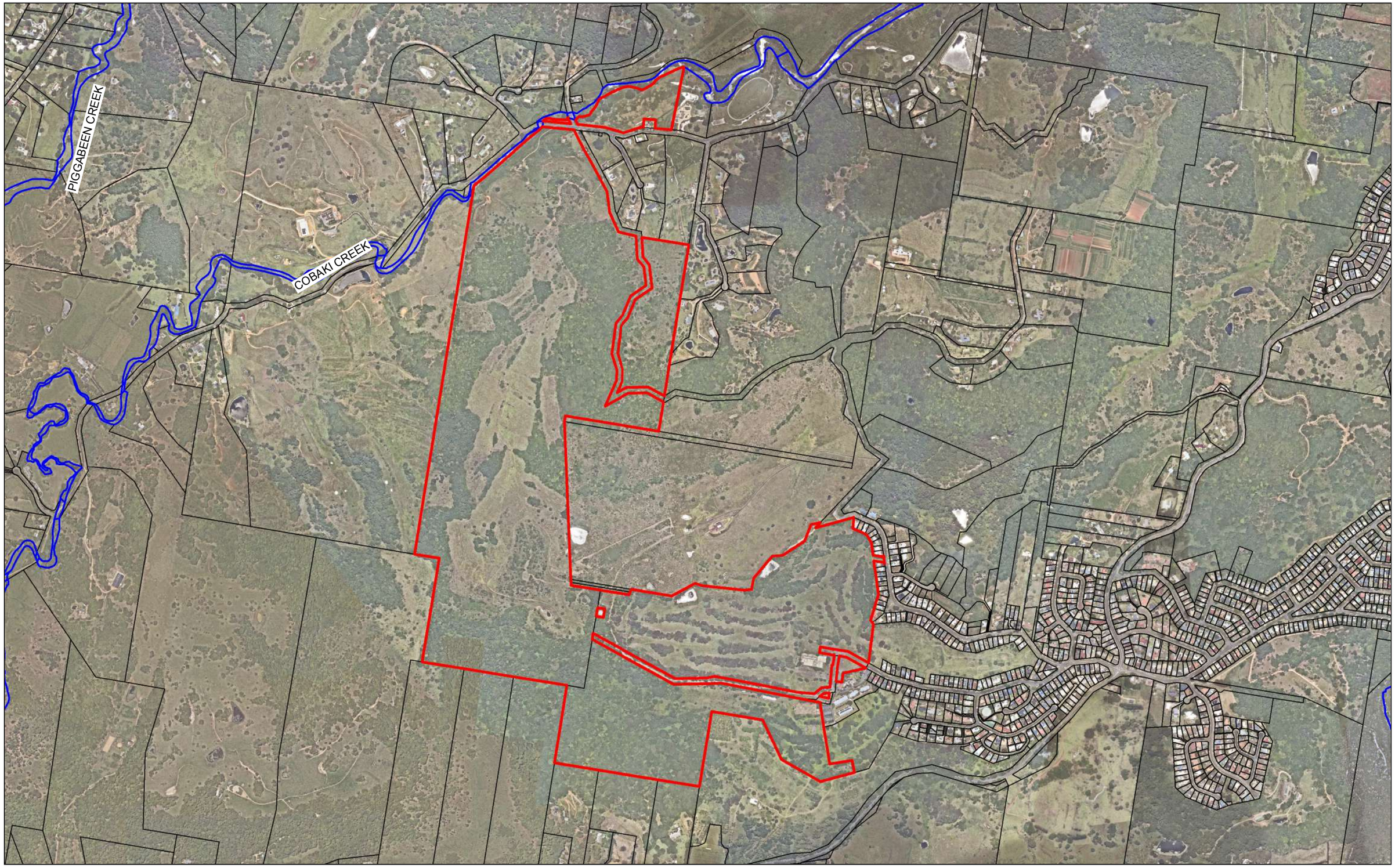
6 Limitations of reporting

Gilbert & Sutherland Pty Ltd has made every effort to ensure that the information provided in this report is accurate. The interpretation of scientific data, however, involves professional judgment, and as such is open to error.

In recognising the potential for errors in scientific interpretation, Gilbert & Sutherland Pty Ltd does not guarantee that the information is totally accurate or complete and clients are advised not to rely solely on this information when making commercial decisions. Any representation, statement, opinion or advice, expressed or implied is made in good faith and on the basis that the authors, Gilbert & Sutherland Pty Ltd, their agents or employees are not liable (whether by reason of lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement or advice referred to above.

Furthermore, this information should not be relied upon by any persons other than the client for whom this information was compiled. This information reflects the specific brief and the budget of the client concerned, who enjoys an individual tolerance of risk.

7 Appendix 1 – Drawings



ORIENTATION

SCALE

100 200 300 400 500
metres

ROBINA
PO Box 4115 Robina QLD4230 07 5578 9944
Email robina@access.gs **www.access.gs**

LEGEND

Cadastre

Lot Boundaries

SOURCES

Image source: Nearmap image
Image dates: 28 December 2023
Cadastral: NSW Government Spatial Service

PROJECT
EROSION AND SEDIMENT CONTROL PLAN ELSYIAN DEVELOPMENT

CLIENT
GREENLAND DEVELOPMENT PTY LTD

DRAWING
SITE LOCATION

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:12 500@A3	31/07/2024	AJS	GLH	12286	001	-

GILBERT SUTHERLAND

ORIENTATION

SCALE 1:10 000

100 200 300 400 500 metres

ROBINA

PO Box 4115 Robina QLD4230 07 5578 9944

Email robina@access.gs **www.access.gs**

LEGEND

Site Boundary

SOURCES

Image: Nearmap, image dated 22/01/2024

PROJECT	CLIENT	DRAWING
EROSION AND SEDIMENT CONTROL PLAN, ELYSIAN DEVELOPMENT	GREENLAND DEVELOPMENT PTY LTD	AERIAL PHOTOGRAPH

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:10 000@A3	18/10/2024	SWP	GLH	12286	002	-

GILBERT SUTHERLAND

ORIENTATION

SCALE

50 100 150 200 250
metres

ROBINA
PO Box 4115 Robina QLD4230
Email robina@access.gs
07 5578 9944
www.access.gs

LEGEND

Site Boundary

Soil Landscapes

- 9541bu
- 9541ca
- 9541caa
- 9541cb
- 9541cr
- 9541og
- 9541xx

SOURCES

Image: Nearmap, image dated 22/01/2024

Soil Landscapes: Sharing and Enabling Environmental Data, NSW Government

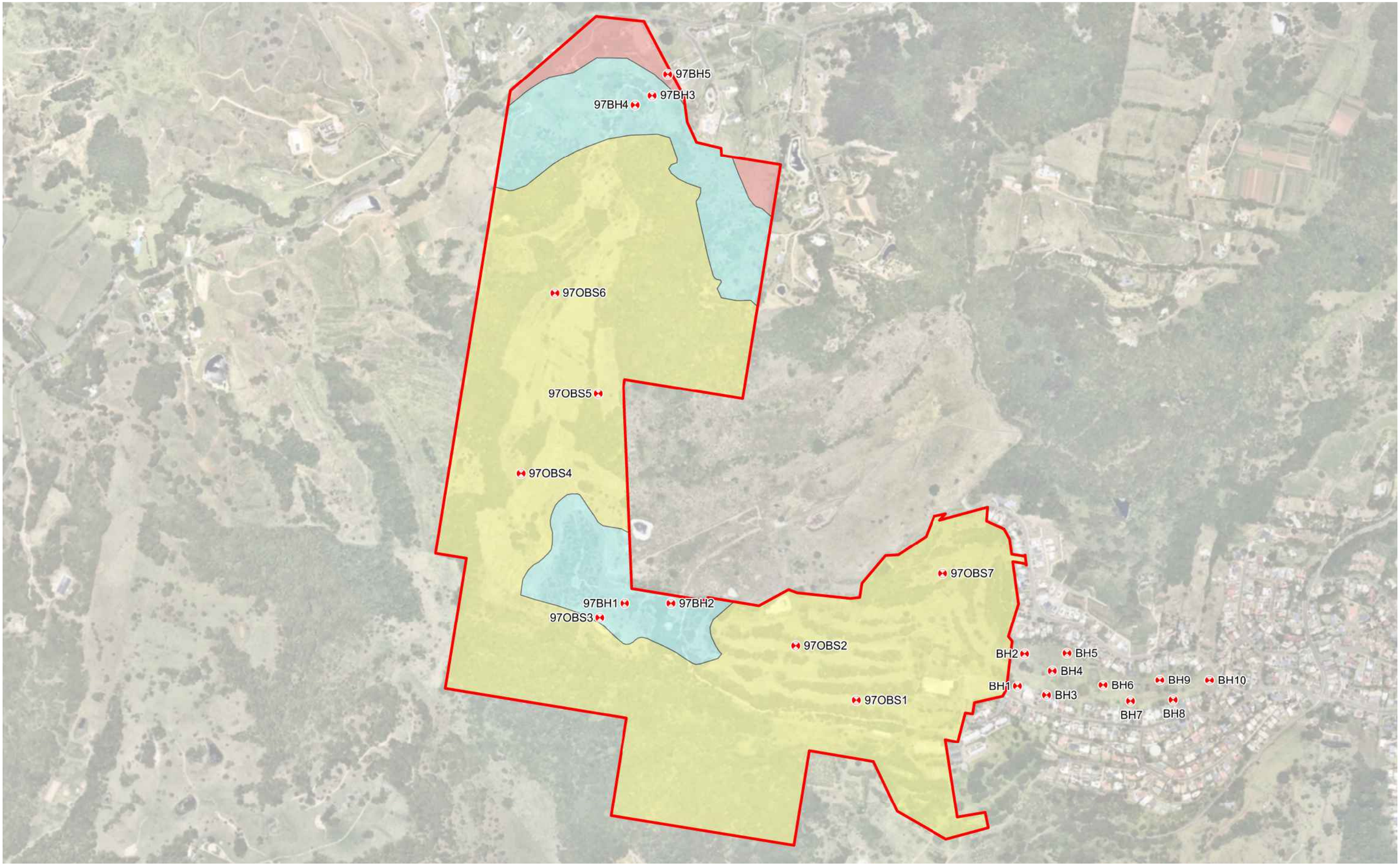
PROJECT
EROSION AND SEDIMENT CONTROL PLAN, ELYSIAN DEVELOPMENT

CLIENT
GREENLAND DEVELOPMENT PTY LTD

DRAWING
SOIL LANDSCAPES

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:10 000@A3	17/10/2024	SWP	GLH	12286	003	-

GILBERT SUTHERLAND



Ù
ORIENTATION

SCALE

50 100 150 200 250
metres

ROBINA
PO Box 4115 Robina QLD4230 07 5578 9944
Email robina@access.gs **www.access.gs**

LEGEND

Site Boundary

Borehole Locations

Soil Type

Dermosols

Ferrosols

Kurosols/Dermosols

SOURCES

Image: Nearmap, image dated 22/01/2024

PROJECT
EROSION AND SEDIMENT CONTROL PLAN, ELYSIAN DEVELOPMENT

CLIENT
GREENLAND DEVELOPMENT PTY LTD

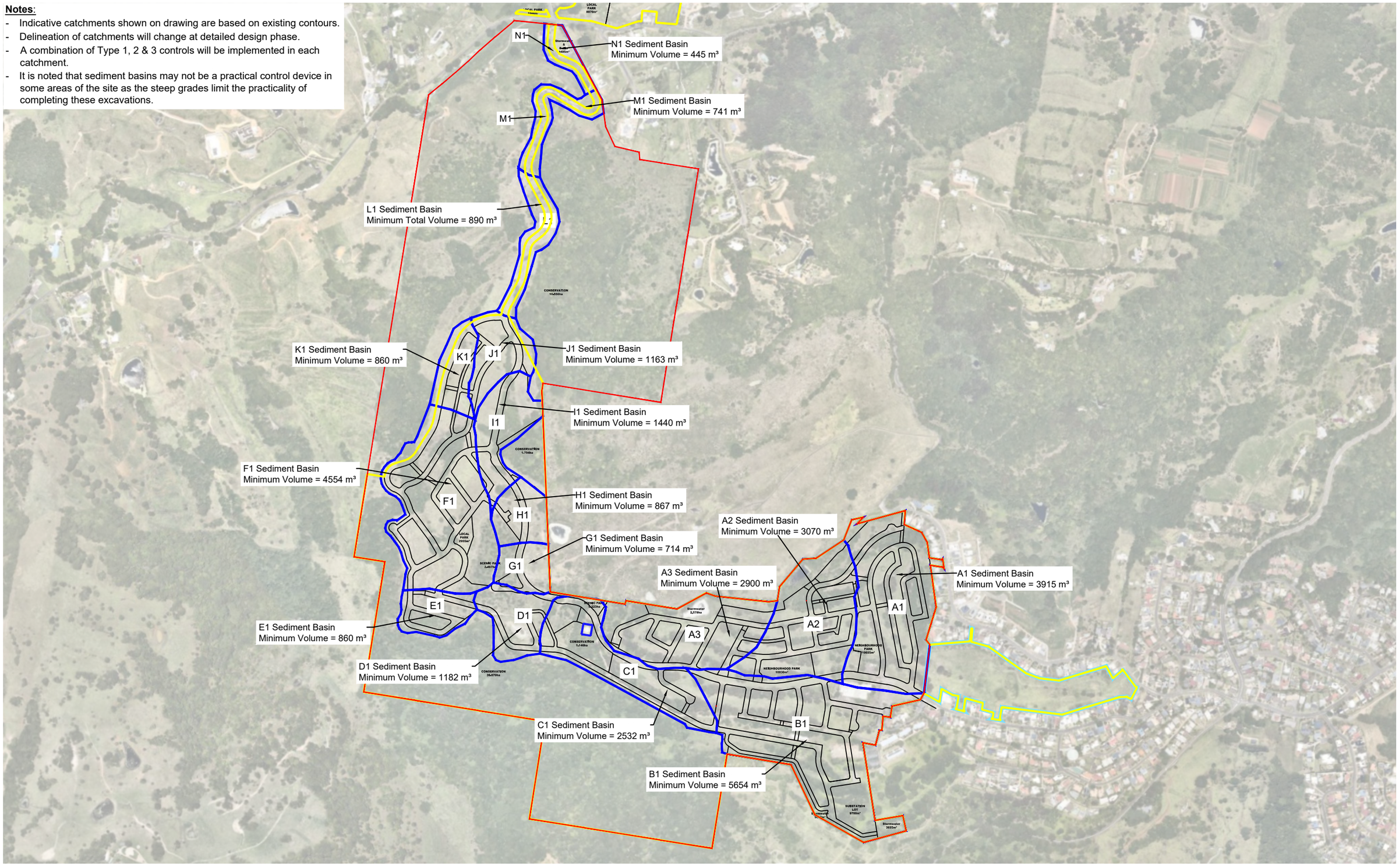
DRAWING
BOREHOLE LOCATIONS & SOILS MAP

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:10 000@A3	17/10/2024	SWP	GLH	12286	004	-

GILBERT SUTHERLAND

Notes:

- Indicative catchments shown on drawing are based on existing contours.
- Delineation of catchments will change at detailed design phase.
- A combination of Type 1, 2 & 3 controls will be implemented in each catchment.
- It is noted that sediment basins may not be a practical control device in some areas of the site as the steep grades limit the practicality of completing these excavations.



ORIENTATION

SCALE 1:10 000

100 200 300 400 500 metres

ROBINA

PO Box 4115 Robina QLD4230 07 5578 9944
Email robina@access.gs **www.access.gs**

LEGEND

- Site Boundary
- Existing Catchment Boundary
- Modification Application Boundary
- Lot 32 DP1085109

SOURCES

Lot Layout: RPS Concept Plan "12122-50" revision D, dated 1/11/2024

PROJECT
EROSION AND SEDIMENT CONTROL PLAN, ELYSIAN DEVELOPMENT

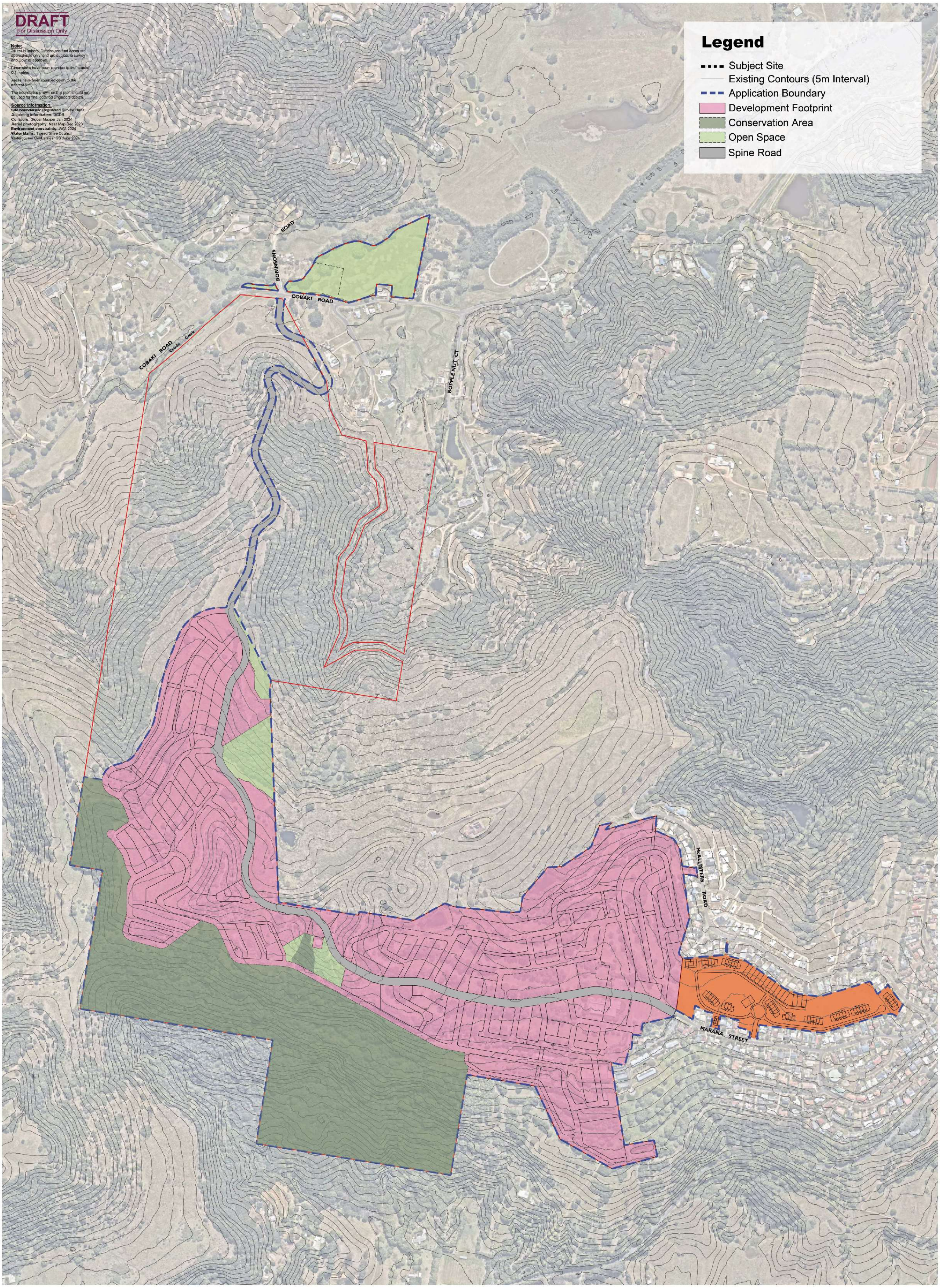
CLIENT
GREENLAND DEVELOPMENT PTY LTD

DRAWING
INDICATIVE SEDIMENT BASIN VOLUMES

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:10 000@A3	15/11/2024	SWP	ELH	12286	005	-

GILBERT SUTHERLAND

8 Appendix 2 – Reference drawings



PLAN REF: 12122 – 050
Rev No: D
DATE: 1 November 2024
CLIENT: GREENLAND
DRAWN BY: CC/SE
CHECKED BY: CC
0 30 60 90 120 150 1 : 3,000 @ A0

ELYSIAN
BIOCERTIFICATION PLAN

URBAN DESIGN
Level 8
31 Duncan Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

rps A TETRA TECH COMPANY

9 Appendix 3 – Borelogs

Borehole: BH1

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878856

Easting: 546596

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.65

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark reddish brown , moderate subangular blocky, trace of fine grained sand, abundant fine to medium sized roots, moist.		5YR3/4					4/7M					
.1																.1
.2																.2
.3				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, occasional fine roots, moist.		2.5YR5/4					4/7M					.3
.4																.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH2

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878957

Easting: 546618

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.65

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark reddish brown , moderate subangular blocky, trace of fine grained sand, abundant fine to medium sized roots, moist.		5YR3/4					4/7M					
.1																.1
.2																.2
.3																.3
.4				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, occasional fine roots, moist.		2.5YR5/4					4/7M					.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH3

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878844

Easting: 546682

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.65

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark reddish brown , moderate subangular blocky, trace of fine grained sand, abundant fine to medium sized roots, moist.		5YR3/4					4/7M					
.1																.1
.2				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, occasional fine roots, moist.		2.5YR5/4					4/7M					.2
.3																.3
.4																.4
.5				GRAVELY MEDIUM CLAY, Brown , moderate subangular blocky, trace of fine to medium grained sand, fine to medium sized angular gravel, moist.		7.5YR4/6										.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH4

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878904

Easting: 546699

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.5

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark reddish brown , moderate subangular blocky, trace of fine grained sand, abundant fine to medium sized roots, moist.		5YR3/4					4/7M					
.1																.1
.2																.2
.3				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, occasional fine roots, moist.		2.5YR5/4										.3
.4											4/7M					.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH5

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878933

Easting: 546766

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.65

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark brown , fine to medium grained sand, occasional fine sized angular gravel throughout, abundant fine to medium sized roots, moist.		7.5YR3/4					4/7M					
.1																.1
.2																.2
.3																.3
.4				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, occasional fine to coarse angular gravel, occasional fine roots, moist.		2.5YR5/4					4/7M					.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH6

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878880

Easting: 546842

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.6

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LOAMY SAND, Brown , fine to medium grained sand, abundant fine to medium sized roots, occasional organics, moist.		7.5YR5/2					4/7M					
.1																.1
.2																.2
.3				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, occasional fine roots, moist.		2.5YR5/4					4/7M					.3
.4																.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH7

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878808

Easting: 546909

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.65

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark reddish brown , moderate subangular blocky, trace of fine grained sand, abundant fine to medium sized roots, moist.		5YR3/4					8M					
.1																.1
.2																.2
.3				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, trace of fine sized angular gravel, occasional fine roots, moist.		2.5YR5/4					4/7M					.3
.4																.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH8

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878813

Easting: 547014

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.5

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark reddish brown , moderate subangular blocky, trace of fine grained sand, abundant fine to medium sized roots, moist.		5YR3/4					8M					
.1																.1
.2																.2
.3				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, trace of fine sized angular gravel, occasional fine roots, moist.		2.5YR5/4										.3
.4											4/7M					.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH9

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: _____

Easting: _____

RL(m): _____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.65

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark reddish brown , moderate subangular blocky, trace of fine grained sand, abundant fine to medium sized roots, moist.		5YR3/4					8M					
.1																.1
.2																.2
.3				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, occasional medium to coarse sized angular gravel, abundant fine to medium sized roots, moist.		2.5YR5/4					4/7M					.3
.4																.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: BH10

Project: GJ0425

Client: TERRANORA GROUP MGT

Northing: 6878871

Easting: 547134

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.65

Logged by: AJS

Drilled by: G&S

Start date: 23.06.05

Completion date: 23.06.05

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
				LIGHT MEDIUM CLAY, Dark reddish brown , moderate subangular blocky, trace of fine grained sand, abundant fine to medium sized roots, moist.		5YR3/4					8M					
.1																.1
.2																.2
.3				MEDIUM CLAY, Reddish Brown , moderate subangular blocky, trace of fine grained sand, trace of fine sized angular gravel, occasional fine roots, moist.		2.5YR5/4					4/7M					.3
.4																.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: 97BH1

Project: GJ9737-1

Client: Terranora Group Mgt

Northing: _____

Easting: _____

RL(m): _____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.6

Logged by:

Drilled by:

Start date: 25/11/1997

Completion date: 25/11/1997

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
.1				CLAY LOAM, Brownish black , Weak to moderate (2-5mm) polyhedral		10YR3/2										.1
.2				MEDIUM CLAY, Greyish yellow brown , Weak to moderate (2-5mm) polyhedral		10YR4/2							4.49			.2
.3																.3
.4																.4
.5				MEDIUM TO HARD CLAY, Dark reddish brown, Dull yellowish brown, Mottling, weak to moderate (2-5mm) polyhedral		2.5YR3/6, 10YR4/3			10YR4/3							.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: 97BH2

Project: GJ9737-1

Client: Terranora Group Mgt

Northing: _____

Easting: _____

RL(m): _____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.7

Logged by:

Drilled by:

Start date: 25/11/1997

Completion date: 25/11/1997

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description: Soil Description (as per McDonald et.al1990)	Soil Description: Aust. Soil Class.	Soil Description: Revised Standard Colour	Soil Description: Depositional Environment	Soil Description: Accessories	Soil Description: Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
.1				CLAY LOAM, Brown , Fine sandy, strong angular blocky, weathered rock near surface (pieces)		7.5YR4/3										.1
.2																.2
.3																.3
.4				LIGHT CLAY, Dull yellowish brown , Strong polyhedral		10YR4/3							4.51			.4
.5																.5
.6				MEDIUM CLAY, Reddish brown , Strong polyhedral, basalt at depth visible		5YR4/4										.6
.7																.7
.8																.8
.9																.9

Borehole: 97BH3

Project: GJ9737-1

Client: Terranora Group Mgt

Northing: _____

Easting: _____

RL(m): _____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.6

Logged by:

Drilled by:

Start date: 25/11/1997

Completion date: 25/11/1997

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description (as per McDonald et.al1990)	Aust. Soil Class.	Revised Standard Colour	Depositional Environment	Accessories	Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
.1				CLAY LOAM, Dull yellowish brown , Strong angular blocky		10YR4/3										.1
.2				LIGHT CLAY, Bright brown , Moderate (2-5mm) polyhedral		7.5YR5/6							4.67			.2
.3																.3
.4				MEDIUM CLAY, Reddish brown , Moderate (2-5mm) polyhedral		5YR4/6										.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: 97BH4

Project: GJ9737-1

Client: Terranora Group Mgt

Northing: _____

Easting: _____

RL(m): _____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.6

Logged by:

Drilled by:

Start date: 25/11/1997

Completion date: 25/11/1997

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description: Soil Description (as per McDonald et.al1990)	Soil Description: Aust. Soil Class.	Soil Description: Revised Standard Colour	Soil Description: Depositional Environment	Soil Description: Accessories	Soil Description: Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
.1				CLAY LOAM, Dull yellowish brown , Strong angular blocky (2-10mm)		10YR4/3										.1
.2				LIGHT CLAY, Bright brown , Moderate (2-5mm) polyhedral		7.5YR5/6							4.85			.2
.3																.3
.4				LIGHT MEDIUM CLAY, Yellowish Red , Moderate (2-5mm) polyhedral		5YR5/8										.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

Borehole: 97BH5

Project: GJ9737-1

Client: Terranora Group Mgt

Northing: _____

Easting: _____

RL(m): ____

GILBERT+SUTHERLAND
agriculture - water - environment

Depth (m): 0.6

Logged by:

Drilled by:

Start date: 25/11/1997

Completion date: 25/11/1997

Depth NSL(m)	Drilling: Depth (RL) m	Drilling: Method	Drilling: Graphic log	Soil Description: Soil Description (as per McDonald et.al1990)	Soil Description: Aust. Soil Class.	Soil Description: Revised Standard Colour	Soil Description: Depositional Environment	Soil Description: Accessories	Soil Description: Secondary Colour	Assays: Sample ID	Assays: Emerson class	Assays: pHfox	Assays: pH(Field)	Assays: Crs(%S)	Assays: TAA(molH/t)	Depth NSL(m)
.1				CLAY LOAM, Brown , Strong angular blocky (2-5mm)		10YR4/4										.1
.2																.2
.3																.3
.4				CLAY LOAM, Bright brown , Moderate to strong angular blocky (2-5mm)		7.5YR5/6							5.32			.4
.5																.5
.6																.6
.7																.7
.8																.8
.9																.9

10 Appendix 4 – Indicative sediment basin sizing

Table A4.1 – Minimum Type D sediment basin requirements

Catchment No.	Disturbed area (ha)	Minimum settling volume ($m^{3)}$	Minimum sediment storage volume (m^3)	Minimum total volume (m^3)	Minimum depth (m)
A1	10.47	2610	1305	3915	1.2
A2	8.21	2047	1023	3070	1.2
A3	7.75	1932	966	2898	1.2
B1	15.12	3769	1885	5654	1.2
C1	6.77	1688	844	2532	1.2
D1	3.16	788	394	1182	1.2
E1	2.30	573	287	860	1.2
F1	12.18	3036	1518	4554	1.2
G1	1.91	476	238	714	1.2
H1	2.32	578	289	867	1.2
I1	3.85	960	480	1440	1.2
J1	3.11	775	388	1163	1.2
K1	2.30	573	287	860	1.2
L1	2.38	593	297	890	1.2
M1	1.98	493.6	247	741	1.2
N1	1.19	296.6	148	445	1.2