ORDINARY COUNCIL MEETING

ATTACHMENTS BOOKLET

Part 3 - Item 9.3 - Attachments 20-26

Under Separate Cover

Tuesday, 6 December 2022

Table of Contents

9.3 Planning Proposal - 160 Burwood Road, Concord (the Bushells site)
Attachment 20 Affordable Housing Contribution Scheme 822
Attachment 21 Economic Impact Assessment... 860
Attachment 22 Retail Demand Assessment.. 900
Attachment 23 Aboriginal Due Diligence Assessment 930
Attachment 24 Contamination Assessment 956
Attachment 25 Additional Contamination Assessment... 1086
Attachment 26 Preliminary Geotechnical Investigation 1130

STRATEGIC
PLANNING POLICY

CITY OF CANADA BAY
AFFORDABLE HOUSING CONTRIBUTION SCHEME

Date of adoption:
18/08/2020

Dates revised:
16/06/2021, 01/03/2022

Effective date:
TBC

Version	Date	Author	Amendment
2.0	Revised 15/6/21 Effective 31/10/21	T.Kao	Rhodes West Contribution Area added to AHCS References to annual indexation are corrected to quarterly indexation
3.0X	Revised 01/03/2022 Effective TBC	T.Kao	1-7 Ramsay St and 5&7 Harrabrook Ave, Five Dock Contribution Area added to AHCS
4.0	Revised 09/11/2022 Effective TBC	H Wilkins	160 Burwood Road, Concord Contribution Area added to AHCS

TABLE OF CONTENTS

SECTION 1: STRATEGIC CONTEXT AND BACKGROUND *3*

- 1.1 Introduction 1
- 1.2 Context 1
- 1.3 Objectives of the AHCS 2
- 1.4 Where does the AHCS apply? 2
- 1.5 What type of development does the AHCS apply to? 6
- 1.6 Overview- Affordable Housing Need in City of Canada Bay 6
- 1.7 Legislative basis for Affordable Housing Contributions 9
- 1.8 Relationship to other affordable housing provisions in the LGA 10
- 1.9 Affordable housing principles 11
- 1.10 Definitions 12

SECTION 2: AFFORDABLE HOUSING CONTRIBUTIONS *15*

- **2.1** Contribution rates **15**
- **2.2** Dedication of dwellings **16**
- **2.3** Equivalent monetary contribution **20**
- **2.4** Dedication of Land **22**
- **2.5** Development that is exempt from the affordable housing contribution scheme **24**
- **2.6** Conditions of consent for affordable housing **24**

SECTION 3: ADMINISTRATION AND IMPLEMENTATION *25*

- **3.1** How to make a contribution **25**
- **3.2** Indexing of payments **26**
- **3.3** Processes for the distribution and management of funds **26**
- **3.4** Registered community housing providers and delivery program **26**
- **3.5** Monitoring and review of scheme **27**

APPENDICES:

1. Appendix A- Local Housing Needs Assessment (Canada Bay Local Housing Strategy- SGS Economics and Planning 2019)
2. Appendix B- Affordable Housing Viability Assessment
3. Appendix C- References

SECTION 1: STRATEGIC CONTEXT AND BACKGROUND

1.1 Introduction

The City of Canada Bay Affordable Housing Contributions Scheme (the AHCS), sets out how, where, and at what rate development contributions are collected by the Council for affordable housing.

The AHCS has been prepared in accordance with the requirements of Section 7.32(1)(c) of the Environmental Planning and Assessment Act and State Environmental Planning Policy 70 - Affordable Housing (Revised Schemes) (SEPP 70).

It is consistent with the Eastern City District Plan which identifies opportunities to support affordable rental housing, particularly for key workers and skilled workers in targeted employment areas.

1.2 Context

In Sydney over the last 20 years, a growing population combined with a decrease in average household size has led to an increase in the demand for housing. This demand has exceeded the supply of new dwellings and has contributed to increased housing costs, which affects the ability of very low to moderate income households to live in large parts of the Eastern City District, including desirable locations such as the City of Canada Bay.

Within Canada Bay, the redevelopment of land at Rhodes East and in the Parramatta Road Corridor is likely to place further pressure on housing affordability. Unless there is intervention to support the provision of designated affordable housing, urban renewal is likely to push prices and rents that are already beyond the capacity of many households even further out of reach.

Council is committed to enabling affordable housing in the City of Canada Bay to maintain a diverse, vibrant and healthy community and to alleviate housing stress experienced by some individuals and families in the private rental housing market. This commitment is set out in the Canada Bay Community Strategic Plan - *Your Future 2030* which identifies housing affordability as a challenge, and recognises the need to supply housing for purchase and rental across a range of income levels to ensure a broad cross-section of the community can enjoy living and working in the City. This approach is reinforced in the City of Canada Bay Local Strategic Planning Statement (the LSPS) which sets out a land-use vision that includes housing affordability and includes actions requiring Council to address affordable housing.

The City of Canada Bay Housing Strategy (the Housing Strategy, provided at Appendix A) supports the LSPS, providing an evidence base and the following vision for Affordable Housing in Canada Bay:

> *Affordability of housing will be addressed through the requirement for major redevelopment sites to provide affordable housing that can be managed by community housing providers. This will allow key workers and households on low-moderate incomes to live within the City of Canada Bay, and retain social and economic diversity.* (SGS 2019: p 12).

This Affordable Housing Contribution Scheme is a key step towards meeting that vision.

1.3 Objectives of the AHCS

The objectives of the City of Canada Bay AHCS are to:

- recognise the provision of affordable rental housing as critical infrastructure to support sustainable growth
- contribute to meeting the needs of very low to moderate income households for affordable housing in the City of Canada Bay
- provide certainty around the requirements for affordable housing in the City of Canada Bay, including the rate for contributions and how contributions will be collected
- ensure that contribution rates for affordable housing are viable and are evidence- based.

1.4 Where does the AHCS apply?

The AHCS applies to the following land within the City of Canada Bay Local Government Area:

1) Rhodes West and Rhodes East as shown in Figure 1.1, below; and
2) The Parramatta Road Corridor Urban Transformation Strategy Precinct Areas of Burwood, Homebush and Kings Bay as shown in Figure 1.2, below; and
3) 160 Burwood Rd, Concord (Bushell 's site) at Figure 1.3, below; and
4) 1-7 Ramsay Road and 5 & 7 Harrabrook Avenue, Five Dock at Figure 1.4 below,
5) Other areas within the City of Canada Bay where a Planning Proposal is approved for residential or mixed-use development and an uplift of land value is created, and where Council resolves to include the area in this AHCS scheme and the Canada Bay LEP.

These lands to which the AHCS apply are collectively referred to as "the affordable housing contribution areas".

Additional land may be added to the AHCS by amendment of this document via Council resolution and amendment of the Canada Bay LEP.

Figure 1.1a: Rhodes East Affordable Housing Contribution Area

Figure 1.1b: Rhodes West Affordable Housing Contribution Area

Figure 1.2a: Homebush Affordable Housing Contribution Area

Figure 1.2b: Burwood Affordable Housing Contribution Area

Figure 1.2c: Kings Bay Affordable Housing Contribution Area

Figure 1.3: 160 Burwood Road, Concord Affordable Housing Contribution Area

Figure 1.4: 1- 7 Ramsay Street and 5 & 7 Harrabrook Avenue, Five Dock Affordable Housing Contribution Area

1.5 What type of development does the AHCS apply to?

The AHCS applies to all new development in the areas defined by the maps in section 1.2 of this AHCS, except for:

- Development for non-residential floorspace (unless identified as adaptable floor space)
- Exempt development
- A dwelling house that results in the creation of less than 200sqm of residential floor space
- Refurbishment or repair of a building that results in additional residential floorspace less than 100 sqm
- Development for the purposes of affordable housing or social housing
- Development of community facilities, public roads or public utility undertakings.

1.6 Overview- Affordable Housing Need in City of Canada Bay

Evidence

Council has assembled a comprehensive evidence base that considers both the need for and viability of requiring affordable housing provision as part of development in the LGA. This has supported the development of the AHCS and is referenced in this section and throughout the document, with details provided in the appendices. The evidence base includes LGA-wide information such as its Housing Strategy, and locality-based affordable housing reports for the Rhodes Planned Precinct, Parramatta Road Corridor precincts and the former Bushell's site at 160 Burwood Road, Concord.

The evidence base includes the following documents:

- Council's Affordable Housing Policy (2007, revised August 2017)
- City of Canada Bay Housing Strategy (SGS Economics and Planning) 2019
- Draft Affordable Housing Program Rhodes East (Hill PDA) 2017
- Affordable Rental Housing -Evidence report Rhodes East (Hill PDA) 2017
- Draft Affordable Housing Program- Parramatta Road Corridor (AEC Consulting 2019)
- Affordable Housing Program- Parramatta Road Corridor Background Analysis (AEC Consulting 2018)
- 160 Burwood Road Concord, Affordable Housing Feasibility Analysis (AEC Consulting 2019)
- Feasibility analysis undertaken by the Department of Planning, Industry and Environment for Rhodes Gateway West (Jones Lang LaSalle 2020)
- 1 Ramsay Road, Five Dock – Affordable Housing Feasibility Analysis (Atlas Urban Economics 2021)

Overview

As for many Councils within the Greater Sydney Region, the decline in the affordability of housing is a key issue for the City of Canada Bay. Over the last 20 years there has been an ongoing decline in the proportion of housing stock available for very low to moderate income households in particular. The desirable location and proximity of the LGA, together with the upward pressure on property prices from urban renewal and stagnation of wages is expected to cause further declines in affordability over future decades. This will lead to increased demand for Affordable and Social Housing. [1,2]

---

[1] SGS Economics and Planning for City of Canada Bay Council (2019) Canada Bay Housing Strategy.

[3] AEC for City of Canada Bay Council (2019) Affordable Housing Program Parramatta Road Corridor.

The lack of affordable rental housing will have the effect of displacement within the City of Canada Bay, with very low-moderate income earners at risk of being forced away from the area. This would lead to a less diverse community, the migration of young people to other areas and a reduced labour force of key workers available to support the local economy. [3]

One of the key findings of The City of Canada Bay's Housing Strategy is that housing in the LGA is becoming less affordable- particularly for young families moving into larger dwellings with more than two bedrooms.[4]

Affordable and Social Housing Demand[5]

The Housing Strategy describes households who are in need of affordable housing as those who, due to financial stress (and potentially other reasons), are either:

- Unable to access market housing (including homeless persons)
- Have low household incomes and spend a high proportion of this income on rent (i.e. are experiencing rental stress)[6]

Research undertaken by SGS Economics and Planning for the Housing Strategy found that at the time of the last Census, 42% of households renting in the City of Canada Bay LGA experienced rental stress (paying more than 30% of household income on rent). Of the 3,780 households currently experiencing rental stress, 2,224 are experiencing severe rental stress (paying more than 50% of household income on rent). This has a significant impact on lower income households, including key workers, sole parents, older persons and students.

This level of rental stress translated to a demand for 5,058 social and affordable housing dwellings within Canada Bay, illustrated in Figure 1.4 below: The current 1,016 Canada Bay households living in social housing also contributes to this demand.

---

[3] Affordable Housing Discussion Paper and Action Plan- Warringah Council (2015) in Hill PDA (2017 Affordable Housing Program Rhodes East)

[4] SGS Economics and Planning for City of Canada Bay Council (2019) Canada Bay Housing Strategy.

[5] Information in this section from SGS Economics and Planning for City of Canada Bay Council (2019) Canada Bay Housing Strategy.

[6] This definition excludes those who are homeowners and are experiencing mortgage stress. This cohort is typically excluded, as these households have the option of liquidating their asset and entering the rental market. (source: SGS Economics and Planning 2019).

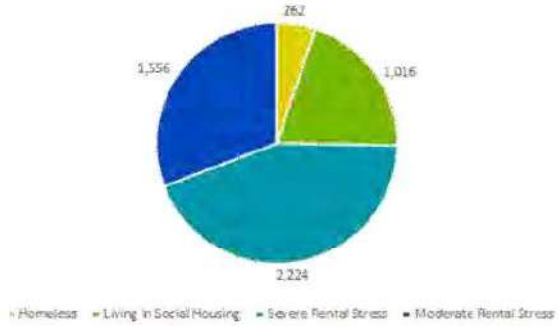


Figure 1.4: Current Demand (by number of households) for Social and Affordable Housing

Source: ABS Census 2016, ABS Homelessness Estimate (Cat. 2049.0), SGS Economics & Planning 2018

Over the 20-year period spanning from 2016 to 2036, the City of Canada Bay is expected to accommodate a high level of population growth, with the population predicted to increase from approximately 88,000 in 2016 to 120,000 in 2036.

Demand for social and affordable housing is expected to grow by approximately 770 dwellings to 2026 and up to 1,997 additional dwellings between 2016 and 2036. When added to current demand, this results in a total demand of 7,056 dwellings (i.e. 14% of all dwellings in Canada Bay). This represents an average annual growth rate of 1.7%, compared to an annual growth of 1.5% across NSW.[7]

In addition to population growth pressures, the redevelopment of land in urban renewal precincts such as Rhodes Planned Precinct and the Parramatta Road Corridor is likely to place upward pressure on property values. Unless there is intervention to support the provision of designated affordable housing, urban renewal is likely to push already high purchase prices and rents further out of reach of very low to moderate income households.

Current supply of affordable housing[8]

In 2016, Canada Bay had a stock of 1,187 social and affordable housing dwellings. Of these, the majority (816) were public housing dwellings, 331 were community housing dwellings and 40 were National Rental Affordability Scheme (NRAS) dwellings (SGS Economics and Planning). It is noted that NRAS is currently being phased out by the Australian Government.

When considering this supply against current demand, SGS found that in 2016, there was consequently a shortfall of 3,871 affordable and social dwellings in the Canada Bay LGA.

---

[7] Ibid

[8] Information sourced from [9]SGS Economics and Planning for City of Canada Bay Council (2019) Canada Bay Housing Strategy.

1.7 Legislative basis for Affordable Housing Contributions

Section 7.32 of the Environmental Planning and Assessment Act (EP& A Act) allows Council to levy contributions for affordable housing if a State Environmental Planning Policy (SEPP) identifies a need for affordable housing in the LGA.

In April 2018, State Environmental Planning Policy No 70 – Affordable Housing (Revised Schemes) (SEPP 70) was amended to apply to the City of Canada Bay. The SEPP provides a mechanism for Councils to develop schemes and levy developer contributions for affordable housing via conditions of consent. The SEPP now applies to all Councils in the Greater Sydney Region.

Under Section 7.32(3)(b) of the EP&A Act, any condition imposed on a development consent must be authorised by a Local Environmental Plan (LEP) and be in accordance with an affordable housing contribution scheme for dedications or contributions set out in, or adopted by, the LEP.

Clause 6.12 of the City of Canada Bay LEP 2013 authorises this AHCS, as follows:

Part 6 Local Provisions

6.12 Affordable housing

(1) This clause applies to development on land in an affordable housing contribution area that involves—

(a) the erection of a new building with a gross floor area of more than 200 square metres, or
(b) alterations to an existing building that will result in the creation of more than 200 square metres of gross floor area that is intended to be used for residential purposes, or
(c) the demolition of existing floor area and the subsequent creation, whether for the same or a different purpose, of more than 100 square metres of gross floor area.

(2) The consent authority may, when granting development consent to development to which this clause applies, impose a condition requiring a contribution equivalent to the applicable ***affordable housing levy contribution*** for the development specified in subclauses (2A)–(6A).

(2A) The affordable housing levy contribution for development in Area 4 is 3.5% of the relevant floor area that exceeds the floor space achieved by applying a floor space ratio of 1.76:1.

(3) The affordable housing levy contribution for development in the following affordable housing contribution areas is 4% of the relevant floor area—

(a) the Burwood affordable housing contribution area,
(b) the Homebush affordable housing contribution area, except for 3 King Street, Concord West and 176–184 George Street, Concord West,
(c) the Kings Bay affordable housing contribution area.

(4) The affordable housing levy contribution for development on land at 3 King Street, within the Homebush affordable housing contribution area, is 5% of the relevant floor area that exceeds the floor space achieved by applying a floor space ratio of 0.5:1.

(5) The affordable housing levy contribution for development on land at 176–184 George Street, Concord West, within the Homebush affordable housing contribution area, is 5% of the relevant floor area that exceeds the floor space achieved by applying a floor space ratio of 1.0:1.

(6) The affordable housing levy contribution for development in the following affordable housing contribution areas is 5% of the relevant floor area—

- ~~(a) the 160 Burwood Road Concord affordable housing contribution area,~~
- (~~b~~a) ~~-~~the Rhodes East affordable housing contribution area,
- (b~~c~~) the 1 – 7 Ramsay Road and 5 & 7 Harrabrook Avenue, Five Dock.

(6A) The affordable housing levy contribution for development on land in the Rhodes West affordable housing contribution area, except for Area 4, is 5% of the relevant floor area that exceeds the floor space achieved by applying the maximum floor space ratio that was shown for the land on the Floor Space Ratio Map immediately before the commencement of this subclause.

(6B) The affordable housing levy contribution for development in the 160 Burwood Road Concord affordable housing contribution area is 7% of the relevant floor area.

(7) A condition imposed under this clause must provide for the affordable housing levy contribution to be satisfied—

- (a) by dedication in favour of the Council of land comprising—
- (i) 1 or more dwellings, each having a gross floor area of not less than 50 square metres, with any remainder paid as a monetary contribution to the Council, or
- (ii) other land approved by the Council in accordance with the Affordable Housing Contributions Scheme, with any remainder paid as a monetary contribution to the Council, or
- (b) if the person chooses, by monetary contribution paid to the Council.

(8) The rate at which a dedication of land or monetary contribution is taken to be equivalent to the relevant floor area for the purposes of the affordable housing levy contribution is to be calculated in accordance with the Affordable Housing Contributions Scheme.

(9) To avoid doubt—

- (a) it does not matter whether the floor area, to which a condition under this clause relates, was in existence before, or is created after, the commencement of this clause, or whether the floor area concerned replaces an existing area, and
- (b) the demolition of a building, or a change in the use of land, does not give rise to a claim for a refund of an affordable housing contribution.

(10) In this clause—

affordable housing contribution area means the following areas shown on the Affordable Housing Contribution Scheme Map—

- (a) Burwood affordable housing contribution area,
- (b) 160 Burwood Road Concord affordable housing contribution area,
- (c) Homebush affordable housing contribution area,
- (d) Kings Bay affordable housing contribution area,
- (e) Rhodes East affordable housing contribution area,
- (f) Rhodes West affordable housing contribution area,
- (g) 1 - 7 Ramsay Street and 5 & 7 Harrabrook Avenue affordable housing contribution area.

Affordable Housing Contributions Scheme means the Affordable Housing Contributions Scheme adopted by the Council on 18 August 2020.

Area 4 means the land identified as "Area 4" on the Additional Local Provisions Map.

relevant floor area of a building means the gross floor area of the building that is to be used for residential purposes excluding the floor area that is—

(a) to be used to provide affordable housing or public housing, or
(b) to be used for community facilities, schools, public roads or public utility undertakings, or
(c) on land in Zone IN1 General Industrial.

1.8 Relationship to other affordable housing provisions in the LGA

City of Canada Bay Local Environmental Plan 2013

The Affordable Housing Contributions Scheme is affected by the inclusionary zoning provisions in the City of Canada Bay Local Environmental Plan 2013 which are authorised under the Environmental Planning and Assessment Act 1979 and State Environmental Planning Policy No. 70 Affordable Housing (Revised Schemes).

Under these provisions all residential development in the nominated locations (unless excluded) is required to provide affordable housing contributions. This can be achieved by dedicating affordable housing dwellings on-site or by a monetary contribution or by land dedication of suitable land to Council.

City of Canada Bay Local Strategic Planning Statement

The City of Canada Bay Local Strategic Planning Statement sets out the following affordable housing provisions:

- Action 2.1 includes Council's intention for 5% of new housing to be provided as affordable housing in the Rhodes Peninsula.
- Action 5.1 states that an Affordable Housing Contributions Scheme will be prepared for the Parramatta Road Corridor.
- Action 5.5 requires a minimum of 5% of the Gross Floor Area of new development to be dedicated as affordable housing for: Planned Precincts; Parramatta Road Corridor precincts; and where there is an increase in density arising from a planning proposal. It also states that 'an affordable housing contribution plan is required before the rezoning of above precincts/sites.

The targets outlined in the Local Strategic Planning Statement are subject to detailed viability testing. Viability testing undertaken to inform the Affordable Housing Contributions Scheme has shown that it is not viable to require the 5% target contribution within the Parramatta Road Corridor, therefore a 4% contribution requirement will be applied, to be reviewed and amended in future, if conditions change and the 5% target is found to be viable.

Voluntary Planning Agreements

Council has a Planning Agreements Policy which sets out its policy, principles and procedures relating to planning agreements under section 7.4 of the Environmental Planning and Assessment Act 1979.

The minimum requirements for affordable housing as set out in this AHCS will apply to applicable development regardless whether a Voluntary Planning Agreement is negotiated with Council. In some instances, contributions additional to Affordable Housing will be negotiated and required in a Voluntary Planning Agreement.

Where Council is negotiating the terms of a proposed planning agreement that includes provision for affordable housing in connection with a development application or proposed development application, it will follow the requirements set out in Environmental Planning and Assessment (Planning Agreements) Ministerial Direction 2019.

City of Canada Bay Affordable Housing Policy

The City of Canada Bay Affordable Housing Policy provides a set of principles and clarifies the intent of Council's involvement in affordable housing. The principles are:

- Council supports the production of affordable housing stock; whether through inclusionary zoning, voluntary planning agreements or working with developers to encourage appropriately designed affordable housing
- Council aims to provide increased flexibility for a diverse range of housing types and sizes for varying stages of life. Council may achieve this by updating the LEP and DCP following detailed community engagement and analysis in order to understand needs
- Council undertakes the role of advocacy, and where possible, undertake mitigation to reduce further loss to affordable housing stock

It also provides management guidelines for the ongoing operation of affordable housing units owned by Council.

1.9 Affordable housing principles

In addition to those principles provided in the City of Canada Bay Affordable Housing Policy, the AHCS will be managed in accordance with the following principles set out in SEPP 70:

1. Where any of the circumstances described in section 7.32 (1) (a), (b), (c) or (d) of the Act occur, and a State Environmental Planning Policy or Local Environmental Plan authorises an affordable housing condition to be imposed, such a condition should be imposed so that mixed and balanced communities are created.

2. Affordable housing is to be created and managed so that a socially diverse residential population representative of all income groups is developed and maintained in a locality.
3. Affordable housing is to be made available to very low, low or moderate income households, or any combination of these.
4. Affordable housing is to be rented to appropriately qualified tenants and at an appropriate rate of gross household income.
5. Land provided for affordable housing is to be used for the purpose of the provision of affordable housing.
6. Buildings provided for affordable housing are to be managed so as to maintain their continued use for affordable housing.
7. Rental from affordable housing, after deduction of normal landlord's expenses (including management and maintenance costs and all rates and taxes payable in connection with the dwellings), is generally to be used for the purpose of improving or replacing affordable housing or for providing additional affordable housing.
8. Affordable housing is to consist of dwellings constructed to a standard that, in the opinion of the consent authority, is consistent with other dwellings in the vicinity.

1.10 Definitions

Affordable Housing	As defined by Environmental Planning and Assessment Act 1979: means housing for very low-income households, low income households or moderate-income households, being such households as are prescribed by the regulations or as are provided for in an environmental planning instrument.
Affordable Rental Housing	Is affordable rental housing that is owned by the City of Canada Bay that is managed by a registered Community Housing Provider and rented to very low, low and moderate income households.
Contribution rate	The contribution rate that is used in the calculation of the monetary contribution for a relevant development and is adjusted quarterly to take into account indexation.
Dwelling in-kind	Dedication to the City of Canada Bay of affordable housing on-site
Gross Floor Area (GFA)	As defined by Canada Bay Local Environmental Plan 2013: The sum of the floor area of each floor of a building measured from the internal face of external walls, or from the internal face of walls separating the building from any other building, measured at a height of 1.4 metres above the floor, and includes: a) the area of a mezzanine, and b) habitable rooms in a basement or an attic, and c) any shop, auditorium, cinema, and the like, in a basement or attic, but excludes: d) any area for common vertical circulation, such as lifts and stairs, and

	e) any basement: f) storage, and g) vehicular access, loading areas, garbage and services, and h) plant rooms, lift towers and other areas used exclusively for mechanical services or ducting, and i) car parking to meet any requirements of the consent authority (including access to that car parking), and j) any space used for the loading or unloading of goods (including access to it), and k) terraces and balconies with outer walls less than 1.4 metres high, and l) voids above a floor at the level of a storey or storey above.
Housing affordability	Refers to the relationship between expenditure on housing cost (whether a mortgage payment or a rental payment) and household incomes. A common benchmark measure is no more than 30% of gross household income is spent on housing costs.
Inclusionary zoning	A planning intervention by government that mandates a certain proportion of development is required (or included) as affordable housing dwellings as a condition of planning consent. This mandatory requirement is specified as a certain proportion of affordable housing to be 'included' within the development.
In-lieu contribution	Contribution rates for monetary contributions in lieu of affordable housing units. The Contribution Rate is expressed as dollar amount of affordable housing required. A contribution in-lieu of (instead of) cash could be made in-kind, whether as a contribution of land or contribution of completed dwellings.
Land in-kind	Dedication to the City of Canada Bay of land for affordable housing
Vert low, low & moderate income households	As defined in State Environmental Planning Policy 70 Affordable Housing (Revised Schemes), very low to moderate income households are those households whose gross incomes fall within the following ranges of percentages of the median household income for the time being for the Sydney Statistical Division according to the Australian Bureau of Statistics: • Very low-income household < 50% • Low income household 50% -80% • Moderate income household 80% to 120%
Registered Community Housing Provider	Community housing providers who are registered under the National Regulatory System of Community Housing. In NSW a community housing provide must be registered by the Registrar of Community Housing to receive assistance from the Department of Family and Community Services or the NSW Land and Housing Corporation.
Net Saleable Area (NSA)	A term used for residential property which refers to the internal floor area including internal walls, mezzanines, bathrooms and hallways but

	excludes common spaces and uncovered areas such as balconies, patios and verandahs.

SECTION 2: AFFORDABLE HOUSING CONTRIBUTIONS

2.1 Contribution rates

Affordable housing contributions are in addition to other contributions including local infrastructure contributions (s7.11 or s7.12) and special infrastructure contributions (Subdivision 4 of the Act).

All development in the Affordable Housing Contribution Areas must contribute to affordable housing, required through a condition of development consent. Contributions must meet the following requirements:

- A contribution is to be calculated in accordance with the requirements of this section. There are no savings or credits for floor space that may exist on the site, even if the building is being adapted or reused.
- If the contribution is less than 50 sqm then it must be made as a monetary contribution.
- A contribution in some instances may comprise a combination of in-kind dedication and monetary contribution.
- Adaptable floor area (from existing commercial/industrial to residential) is calculated in the total residential gross floor area for the purpose of calculating an affordable housing contribution.
- In all instances Council will require evidence that that the condition of consent has been satisfied prior to the granting of a Construction Certificate.

The rates of affordable housing contributions required under the AHCS are as follows:

Rhodes East and Rhodes West Affordable Housing Contribution Areas

Rhodes East Affordable Housing Contribution Area: 5% of the total gross floor area that is to be used for residential uses.

Rhodes West Affordable Housing Contribution Area: 5% of the additional gross floor area that is to be used for residential uses (except for 4 Mary Street and 1-9 Marquet Street in Rhodes where 3.5% of the additional gross floor area applies) [9]

---

[9] With regard to the Rhodes West Affordable Housing Contribution Area (Rhodes Gateway West) additional gross floor area is taken to mean any additional floor area that is granted development approval in addition to what is permissible under the Canada Bay LEP as at October 2020, with the exception of 4 Mary Street and 1-9 Marquet Street where additional gross floor area is taken to mean any additional floor area that is granted development approval in addition to what is permissible under the Canada Bay LEP as at October 2020.

Parramatta Road Corridor Affordable Housing Contribution Areas:

- **Kings Bay Affordable Housing Contribution Area -** 4% of the total gross floor area that is to be used for residential uses.
- **Burwood Affordable Housing Contribution Area -** 4% of the total gross floor area that is to be used for residential uses.
- **Homebush Affordable Housing Contribution Area -** 4% of total gross floor area (except for 3 King St and 176 George Street in Concord West where 5% of additional gross floor area applies)[10]

160 Burwood Road, Concord Affordable Housing Contribution Area:

160 Burwood Road, Concord: 7~~5~~% of the total gross floor area that is to be used for residential uses.

A detailed justification for the above rates and description of the viability testing for each of the locations can be found in Appendix B.

There are three methods by which a contribution requirement may be satisfied:

- Dedication of completed dwellings (refer section 2.2);
- Making an equivalent monetary contribution (refer section 2.3); or
- Contribution of land for affordable housing (refer section 2.4).

When submitting a DA, the documentation should confirm which method of contribution is proposed.

1-7 Ramsay Street and 5 & 7 Harrabrook Avenue Affordable Housing Contribution Area:

1 – 7 Ramsay Street and 5 & 7 Harrabrook Avenue, Five Dock: 5% of the total gross floor area that is to be used for residential uses.

A detailed justification for the above rates and description of the viability testing for each of the locations can be found in Appendix B.

There are three methods by which a contribution requirement may be satisfied:

- Dedication of completed dwellings (refer section 2.2);
- Making an equivalent monetary contribution (refer section 2.3); or
- Contribution of land for affordable housing (refer section 2.4).

When submitting a DA, the documentation should confirm which method of contribution is proposed.

2.2 Dedication of dwellings

The affordable housing contribution requirement may be satisfied through the dedication of completed dwellings free of cost, and to the satisfaction of Council. The completed dwellings must be purposed as affordable rental dwellings and meet the following requirements:

- Align with the affordable housing principles in Section 1. 7.
- The location, size and quality of the affordable housing dwellings are to be to the satisfaction of Council and its nominated Community Housing Provider (CHP) and generally consistent with the standard of new housing in the LGA. They should not be distinguishable from market housing within the LGA. If not to its satisfaction, Council may require the contribution to be satisfied by way of an equivalent monetary contribution.
- Completed dwellings (and land) are dedicated to Council in perpetuity and free of cost. Council

or its Community Housing Provider will be responsible for rental arrangements.

- Total gross floor area (GFA) exceeds 50sqm. If the GFA is less than 50sqm, a monetary contribution will instead be payable (as described in section 2.3 of the Scheme).
- The internal living space (net saleable area, NSA) of the competed dwellings is to be a similar efficiency ratio to the overall residential dwellings.
- The dwellings shall meet the minimum sustainability and energy-efficiency requirements set out in the City of Canada Bay LEP and DCP.
- Where only part of a contribution is satisfied through dedication of completed dwellings, any remaining requirement is to be paid as a monetary contribution.

---

[10] The affordable housing contributions rates in the Homebush Scheme Area are different for the sites at 3 King St and 176 George St, West Concord, as these are subject to negotiated Voluntary Planning Agreements where an agreement was made that 5% of additional gross floor area would be required as affordable housing contributions.

CALCULATING DWELLING CONTRIBUTION FOR 5% RATE (APPLIES TO RHODES EAST~~, 160 BURWOOD RD CONCORD,~~ AND 1-7 RAMSAY STREET and 5 & 7 HARRABROOK AVE FIVE DOCK AFFORDABLE HOUSING CONTRIBUTION AREAS)

Calculating the Contribution - *Residential development*

Calculation: **Gross floor area x 5% = required affordable housing square metre provision.**

Example: A development application for a new residential development comprising 8,000 square metres of GFA.

= 8,000sqm x 5%

= 400sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Mixed-use development*

Calculation: **Total GFA - non-residential GFA = residential GFA**

Residential GFA x 5% = required affordable housing square metre provision

Example: A development application for a new 8,000sqm mixed use development comprising 7,000sqm of residential GFA and 1,000sqm of non-residential GFA.

= 8,000sqm - 1,000sqm = 7,000sqm Residential GFA

= 7,000sqm x 5%

= 350sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Adaptable Use*

A change of use of an existing non-residential use to a residential use would attract an affordable housing contribution.

Affordable Housing contribution provision:

= contribution rate x converted residential gross floor area

= CR x RGFA

Example: A development application for a conversion of a of an existing 2,000 SQM commercial/industrial space to residential GFA.

2,000sqm of converted GFA

= 2,000sqm x 5%

= 100 sqm affordable housing GFA required to be dedicated

CALCULATING DWELLING CONTRIBUTION FOR 75% RATE (APPLIES TO 160 BURWOOD ROAD CONCORD AFFORDABLE HOUSING CONTRIBUTION AREA)

Calculating the Contribution - *Residential development*

Calculation: **Gross floor area x 7% = required affordable housing square metre provision.**

Example: A development application for a new residential development comprising 8,000 square metres of GFA.

= 8,000sqm x 7%

= 560sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Mixed-use development*

Calculation: **Total GFA - non-residential GFA = residential GFA**

Residential GFA x 7% = required affordable housing square metre provision

Example: A development application for a new 8,000sqm mixed use development comprising 7,000sqm of residential GFA and 1,000sqm of non-residential GFA.

= 8,000sqm - 1,000sqm = 7,000sqm Residential GFA

= 7,000sqm x 7%

= 490sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Adaptable Use*

A change of use of an existing non-residential use to a residential use would attract an affordable housing contribution.

Affordable Housing contribution provision:

= contribution rate x converted residential gross floor area

= CR x RGFA

Example: A development application for a conversion of a of an existing 2,000 SQM commercial/industrial space to residential GFA.

2,000sqm of converted GFA

= 2,000sqm x 7%

= 140 sqm affordable housing GFA required to be dedicated

CALCULATING DWELLING CONTRIBUTION FOR 4% RATE (APPLIES TO HOMEBUSH*, BURWOOD-AND KINGS BAY AFFORDABLE HOUSING CONTRIBUTION AREAS)

**Excluding 3 King St and 176 George Street in Concord West.*

Calculating the Contribution - *Residential development*

Calculation: **Gross floor area x 4% = required affordable housing square metre provision.**

Example: A development application for a new residential development comprising 8,000 square metres of GFA.

= 8,000sqm x 4%

= 320 sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Mixed-use development*

Calculation: Subtract the non-residential gross floor area from the total building gross floor area to determine the residential gross floor area

Therefore: **Total GFA - non-residential GFA = residential GFA**

Residential GFA x 4% = required affordable housing square metre provision

Example: A development application for a new 8,000sqm mixed use development comprising 7,000sqm of residential GFA and 1,000sqm of non-residential GFA.

= 8,000sqm - 1,000sqm = 7,000sqm Residential GFA

=7,000sqm x 4%

= 280 sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Adaptable Use*

A change of use of an existing non-residential use to a residential use would attract an affordable housing contribution.

Monetary contribution provision:

= contribution rate x converted residential gross floor area

= CR x RGFA

Example: A development application for a conversion of a of an existing 2,000 SQM commercial/industrial space to residential GFA.

2,000sqm of converted GFA

= 2,000sqm x 4%

= 80sqm affordable housing GFA required to be dedicated

Note: If the dedication of dwellings is in deficit of more than 1 sqm, the remaining balance of the GFA is paid as a monetary contribution using the methodology detailed in section 2.3.

If the dedication of dwellings exceeds the gross floor area required, the amount is not recoverable by the developer. Each affordable housing dwelling is required to have a gross floor area of 50sqm or greater.

Where dedication of dwellings exceeds the GFA requirement, there is no offset available against other contributions.

CALCULATING DWELLING CONTRIBUTION FOR 5% of Additional Gross Floor Area (APPLIES TO RHODES WEST* & 3 KING ST AND 176 GEORGE STREET CONCORD WEST AFFORDABLE HOUSING CONTRIBUTION AREAS)

**Excluding 4 Mary Street and 1-9 Marquet Street, Rhodes*

Calculating the Contribution - *Residential development*

Calculation:

Additional gross floor area# x 5% = required affordable housing square metre provision.

#Additional gross floor area = Subtract the total gross floor area permissible under the *Canada Bay Local Environmental Plan* prior to the amended development controls, from the proposed gross floor area.

Example: A development application for a new residential development comprising 8,000 square metres of additional GFA.

= 8,000sqm additional GFA x 5%
= 400sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Mixed-use development*

Calculation: **Total additional GFA – total additional non-residential GFA = Total additional residential GFA**

Total additional residential GFA x 5% = required affordable housing square metre provision

Example: A development application for a new residential development with an additional 8,000sqm mixed use development comprising 7,000sqm of additional residential GFA and 1,000sqm of additional non-residential GFA.

= 8,000sqm - 1,000sqm = 7,000sqm additional residential GFA

= 7,000sqm x 5%

= 350sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Adaptable Use*

A change of use of an existing non-residential use to a residential use would attract an affordable housing contribution.

Affordable Housing contribution provision:

= contribution rate x converted residential gross floor area

= CR x RGFA

Example: A development application for a conversion of a of an existing 2,000 SQM commercial/industrial space to residential GFA.

2,000sqm of converted GFA

= 2,000sqm x 5%

= 100 sqm affordable housing GFA required to be dedicated

CALCULATING DWELLING CONTRIBUTION FOR 3.5% of Additional Gross Floor Area (APPLIES TO 4 MARY STREET & 1-9 MARQUET STREET RHODES AFFORDABLE HOUSING CONTRIBUTION AREAS)

Calculating the Contribution -*Residential development*

Calculation:

Additional gross floor area# x 3.5% = required affordable housing square metre provision.

#**Additional gross floor area** = Subtract the total gross floor area permissible under the *Canada Bay Local Environmental Plan* prior to the amended development controls, from the proposed gross floor area.

Example: A development application for a new residential development comprising 8,000 square metres of additional GFA.

= 8,000sqm additional GFA x 3.5%

= 280sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Mixed-use development*

Calculation: **Total additional GFA – total additional non-residential GFA = Total additional residential GFA**

Total additional residential GFA x 3.5% = required affordable housing square metre provision

Example: A development application for a new residential development with an additional 8,000sqm mixed use development comprising 7,000sqm of additional residential GFA and 1,000sqm of additional non-residential GFA.

= 8,000sqm - 1,000sqm = 7,000sqm additional residential GFA

= 7,000sqm x 3.5%

= 245sqm affordable housing GFA required to be dedicated

Calculating the Contribution -*Adaptable Use*

A change of use of an existing non-residential use to a residential use would attract an affordable housing contribution.

Affordable Housing contribution provision:

= contribution rate x converted residential gross floor area

= CR x RGFA

Example: A development application for a conversion of a of an existing 2,000 SQM commercial/industrial space to residential GFA.

2,000sqm of converted GFA

= 2,000sqm x 3.5%

= 70 sqm affordable housing GFA required to be dedicated

2.3 Equivalent monetary contribution

Where a monetary contribution is to be made in lieu of the on-site dedication of completed dwellings, an equivalent monetary contribution will be made and indexed quarterly and the contribution rate will be reviewed periodically. The monetary contribution and sample calculations are outlined below.

The contribution rate^ (CR) to be used for each affordable housing contribution area is:

Affordable housing contribution area	**Contribution rate^ (% RATE)**	**Contribution rate /sqm GFA (CR)**
Rhodes East	5%	$488.75
Rhodes West	5.0% additional	$488.75
4 Mary Street and 1-9 Marquet Street in Rhodes	3.5% additional	$488.75
Homebush, Burwood, Kings Bay precincts	4%	$430.70
3 King St and 176 George Street in Concord West	5% additional	$538.35
160 Burwood Road, Concord	7~~5~~%	$~~578~~795.00
1 – 7 Ramsay Street and 5 & 7 Harrabrook Avenue Five Dock	5%	$606.00

^ The monetary contribution rate is reviewed and indexed quarterly as per Section 3.2 of this Scheme, with reference to median prices for the City of Canada Bay shown in the current NSW Family and Community Services Sales and Rent Reports. The current contributions rates are provided within the *AHCS Summary Table* on Council's website at https://www.canadabay.nsw.gov.au/development/plans-policies-and-controls/development-contribution-plans.

CALCULATING DWELLING CONTRIBUTION – APPLIES TO ALL AFFORDABLE HOUSING CONTRIBUTION AREAS

Calculating the Contribution - *Residential development*

Calculation: **Gross Floor Area x Contribution rate^ = required affordable housing square metre provision (CR).**

(For 3 King St and 176 George Street in Concord West, Additional Gross Floor Area# x 5% = required affordable housing square metre provision; and for 4 Mary Street and 1-9 Marquet Street in Rhodes, Additional Gross floor x 3.5% = required affordable housing square metre provision.)

= Contribution rate^ multiplied by gross floor area

= CR x GFA

#**Additional gross floor area** = Subtract the total gross floor area permissible under the *Canada Bay Local Environmental Plan* prior to the amended development controls, from the proposed gross floor area.

Example: A development application for a new residential development comprising 8,000 square metres of GFA.

= CR x GFA
= $538.35 x 8,000sqm

Total payable contribution = $4,306,800.00

Calculating the Contribution - *Mixed-use development*

Calculation: Subtract the non-residential gross floor area from the total building gross floor area to determine the residential gross floor area

Therefore: **Total GFA - non-residential GFA = residential GFA**

Monetary contribution provision:

= contribution rate^ x residential gross floor area

= CR x RGFA

Example: A development application in Rhodes East for a new 8,000sqm mixed use development comprising 7,000sqm of residential GFA and 1,000sqm of non-residential GFA.

= 8,000sqm - 1,000sqm = 7,000sqm Residential GFA

= 7,000sqm x CR ($488.75 for Rhodes East)

Total payable contribution = $3,421,250.00

Calculating the Contribution -*Adaptable Use*

A change of use of an existing non-residential use to a residential use would attract an affordable housing contribution.

Monetary contribution provision:

= contribution rate^ x converted residential gross floor area

= CR x RGFA

Example: A development application in Rhodes East for a conversion of an existing commercial/industrial space to residential GFA.

1,000sqm of converted GFA

= 1,000sqm x $488.75

Total payable contribution = $488,750.00

^The monetary contribution rates are reviewed and indexed on a quarterly basis as per Section 3.2 of this Scheme. The current Contributions rates are provided on Council's website within the *AHCS Summary Table*.

2.4 Dedication of Land

The acceptability of land for dedication (as an alternative to dedication of dwellings or monetary contribution) is subject to Council's discretion and approval, in consultation with the community housing sector and Council's partner CHP. The following requirements are identified to guide the assessment of suitability.

- Minimum area of 800sqm
- Within 5-min walking catchment (400m) of bus station or 10-min walking catchment (800m) of train station
- Not be subject to environmental constraints, in particular:
  - Be of residential building quality, not contaminated or require remediation
  - Be of good quality building land, not subject to flooding or flood constraints
- Have access, locational and site characteristics comparable to the proposed residential development.

The value of the dedicated land (assuming the associated floorspace potential is not transferred/ realised elsewhere on the site) should be equivalent to the monetary contribution calculated under the AHCS.

If the floorspace potential of the dedicated land is able to be transferred and developed elsewhere on the site, the land should be dedicated to Council at nominal cost ($200/sqm to cover cost of legal and administrative matters) and a monetary contribution will still be required for affordable housing.

If the floorspace potential of the dedicated land is not transferred and developed elsewhere on the site, the expertise of a valuer/ land economist is required. In this circumstance, the following steps are relevant for the dedication of land as a contribution.

- Assess if the land to be dedicated meets with the identified requirements
- If land is suitable for dedication, identify the proposed land in a subdivision plan to be approved by Council
- Calculate the equivalent monetary contribution payable
- Obtain independent valuation of land to be dedicated
- If the assessed land value is less than the equivalent monetary contribution payable, subject to acceptability by Council, pay the difference in monetary contribution.

If the assessed land value exceeds the equivalent monetary contribution, no offset or refund is applicable.

A development application must include the following information:

- The quantum and location of land to be dedicated and any residual amount for which a monetary contribution is required
- Identify on the subdivision plans the land proposed for dedication
- Demonstrate the value of the land to be dedicated against the equivalent monetary contribution
- Demonstrate the appropriateness of the land proposed for dedication with reference to the principles of the AHCS.

CALCULATING LAND DEDICATION CONTRIBUTION (Equivalent Monetary Contribution Payable)

Contribution rates: In 2019, Contribution rate/sqm GFA (CR) was equivalent to % contribution:

Affordable Housing Contribution Area	Contribution rate^ /sqm GFA (CR) in 2019
Rhodes East	$488.75
Rhodes West	$488.75
4 Mary Street and 1-9 Marquet Street in Rhodes	$488.75
Homebush, Burwood, Kings Bay precincts	$430.70
3 King St and 176 George Street in Concord West	$538.35
160 Burwood Road, Concord	$578.00
1 – 7 Ramsay Street and 5 & 7 Harrabrook Avenue Five Dock	$606.00

^Contribution rates are indexed quarterly as per Section 3.2 of this Scheme. To view the current contribution rate, refer to Council's *AHCS Summary Table* at https://www.canadabay.nsw.gov.au/development/plans-policies-and-controls/development-contribution-plans

Calculating the Contribution - *Residential development*

Example: A development in the Kings Bay Precinct proposes new residential floorspace of 4,000sqm GFA. The affordable housing contribution rate of 4% is applied to the residential GFA as follows:

4,000sqm GFA x 4% = 160sqm GFA to be completed and dedicated as affordable housing

An equivalent monetary contribution of $1,722,800 (4,000sqm x $430.70) is required.

If contribution through land dedication is proposed, consideration should be given to whether the floorspace potential associated with the dedicated land can be transferred and developed elsewhere on the site, or if the floorspace potential is foregone with the land that is dedicated.

These two scenarios are illustrated below:

- Scenario 1 - floorspace potential cannot be transferred/ developed elsewhere
    - If the land proposed for dedication is valued at $2,000,000, its value exceeds the equivalent monetary contribution of $1,722,720 required. If accepted for dedication, no offset or refund is applicable.
    - If the land proposed for dedication is valued at $1,500,000, its value is less than the equivalent monetary contribution of $1,722,720 required. A monetary contribution of $222,720 is required.
- Scenario 2 - floorspace potential can be transferred and developed elsewhere on the site
    - In this example, the land should be transferred to Council at nominal cost ($200/sqm) and a monetary contribution ($1,722,720) made.
    - If the land proposed for dedication measured 800sqm, a monetary contribution of $1,562,720 would be required, calculated below:

= $1,722,720 - $160,000 (800sqm x $200/sqm)
= $1,562,720

2.5 Development that is exempt from the affordable housing contribution scheme

The following development is exempt from the AHCS:

a) Development for non-residential floorspace (unless identified as adaptable floor space)
b) Exempt development
c) A dwelling house that results in the creation of less than 200sqm of residential floor space;
d) Refurbishment or repair of a building that results in additional residential floorspace less than 100 sqm
e) Development for the purposes of affordable housing or social housing
f) Development of community facilities, public roads or public utility undertakings.

The justification for granting exemptions to these development categories is:

- In the case of a) and f), above, the development of non-residential floorspace and community facilities, public roads or public utility undertakings are excluded from affordable housing levies. This is because they are considered to have community value due to their ability to accommodate jobs (commercial or community development) and/ or community services (community facilities).

- In the case of b), c), and d), the works are considered to be of a minor nature and imposition of an affordable housing levy is considered an unfair burden in such minor circumstances.

- In the case of e), development for the purposes of affordable or social housing will already contribute substantially to the aims of the AHCS.

2.6 Conditions of consent for affordable housing

Council will levy developer contributions for affordable housing via conditions of consent.

The condition of consent must include the following information:

a) The total residential gross floor area of the development that was used to calculate the contribution or the monetary contribution required.
b) the different floor areas that can contribute to the total contribution amount (this only applies in instances where rates differ between development types or between commercial and residential floor space)
c) the relevant contribution rates
d) the indexation period at time of determination (for any monetary contributions).
e) a requirement to demonstrate that the title of any dwellings will be transferred to a community housing provider or council prior to the granting a Construction Certificate.
f) a requirement to make any monetary payment at a specified time or stage in the development application process
g) a requirement that any dwellings that will be dedicated are shown on approved plans in the same development application and referenced in the affordable housing condition.
h) The dedicated affordable housing is to be constructed to a standard which in the opinion of Council is consistent with other dwellings in the development.
i) If a staged development, affordable housing must be provided at each stage.

SECTION 3: ADMINISTRATION AND IMPLEMENTATION

3.1 How to make a contribution

All development to which this AHCS applies (other than development excluded by Canada Bay LEP 2013) is required to provide affordable housing. This requirement will be by way of a condition of development consent.

There are three different ways to make the required affordable housing contribution. The first is the dedication of affordable housing dwellings to Council. Secondly where it is not possible or practical for affordable housing to be dedicated an equivalent monetary contribution can be made. The third and least preferred is the dedication of land and is expected to apply in exceptional situations.

A contribution requirement forms part of a development consent. Council will require evidence that the affordable housing contribution requirement is satisfied prior to granting of any construction certificate or complying development certificate. Where no construction certificate is required, evidence that the affordable housing contribution requirement is satisfied will be required by Council before commencement of use/occupation.

The Scheme also includes a methodology for the dedication of land, however it is expected that this approach would only occur in exceptional circumstances.

Dedicating affordable housing dwellings

Where affordable housing is proposed to be dedicated on site, the applicant must transfer the titles of the dwellings to Council. An agreement to transfer the titles must be made and evidence provided to Council prior to the granting of a Construction Certificate.

Council must be satisfied that the nominated dwellings achieve the affordable housing principles and design details as set out in this Scheme. Where appropriate Council will seek comment from the Community Housing Provider to ensure this.

Council and the Community Housing Provider (as appropriate) will also consider the suitability of the proposed dedication and quantum of dwellings from an operational perspective, that is, the cost implications of management and maintenance.

The affordable housing contribution will be satisfied when the title is transferred to Council prior to issue of an Occupancy Certificate.

Paying a monetary contribution

Where an applicant is to make a monetary contribution towards affordable housing the amount of the contribution will be specified in the condition of development consent. The contribution must be paid to Council prior to the issue of any Construction Certificate.

If the applicant is unable to pay the monetary contribution at Construction Certificate stage, evidence must be provided to Council to this effect and arrangements made for Council to secure payment such as a Bank Guarantee or equivalent at a later stage in the development period.

Dedicating land

Where land is proposed to be dedicated as a contribution, Council will ensure the proposed land satisfies Council's requirements and refer the application to a preferred CHP for comment.

Council will undertake an assessment of the appropriateness of land proposed for dedication with reference to the affordable housing principles and comment received from the preferred CHP.

3.2 Indexing of payments

Contribution rates will be adjusted quarterly within one week of the first of March, June, September and December, to ensure that the contributions reflect the costs associated with the provision of affordable housing over time. Rates will be adjusted with reference to movement in the median price for strata dwellings in the City of Canada Bay LGA. All monetary contributions must be indexed at the time of payment to ensure funds received will cover the full costs of delivering the required affordable housing contributions.

The median strata price is published quarterly in the NSW Government Rent and Sales Report, Table: Sales Price - Greater Metropolitan Region - Strata.

The formula for the adjustment is:

Next Quarter's Contribution Rate = Current Contribution Rate x (MDP2/MDP1)

Where:

MDP1 is the median strata dwelling price for the PREVIOUS quarter

MDP2 is the median strata dwelling price for the CURRENT quarter

The City of Canada Bay's website will display the current rates within the *AHCS Summary Table.*

3.3 Processes for the distribution and management of funds

Contributions will be pooled and managed by Canada Bay Council or its nominated Community Housing Provider until there is sufficient funding available to issue a tender or request for expressions of interest. Any financial return resulting from the management of funds in waiting is to be used for the purpose of developing affordable housing in accordance with this Scheme.

Rental income received from affordable housing stock will be managed in accordance with the terms outlined in Council's Affordable Housing policy. This will ensure returns are re-invested in affordable housing stock in the form of property maintenance and renewal and replacement.

3.4 Registered community housing providers and delivery program

Affordable Housing properties acquired or achieved under this AHCS or by any other means, are to be transferred in property title to the City of Canada Bay Council. Alternatively, the City of Canada Bay Council may nominate a Community Housing Provider, to which the property title is transferred.

Council will outsource the management of the affordable housing contributions and dwellings to a Housing Manager with demonstrated experience and expertise in the management of affordable housing. Selection of the Housing Manager to manage the dwellings will be conducted in accordance with Council's Procurement Policy. Council will enter into a management agreement for the affordable rental housing dwellings with the successful Housing Manager following the selection process.

A Council inter-departmental Affordable Housing Steering Committee will be involved in the ongoing management of the Affordable Housing program and preparation of a management agreement that clearly delineate the responsibilities of both Council and the Community Housing Provider. Council will also provide a delivery program that outlines how funds raised or dwelling provided under the scheme will be used and requirements for reporting and transparency.

3.5 Monitoring and review of scheme

The AHCS will be reviewed by the Affordable Housing Steering Committee on an annual basis. Key considerations will include:

- A review of evidence relating to the Affordable Housing Contribution Scheme where monitoring identifies issues or considerable change in market conditions.
- number of delivered affordable housing dwellings
- total amount of funds in waiting
- allocation of funding within that year
- Size, type, quality and locational appropriateness of dwellings
- Maintenance and management issues
- Retention and use of affordable housing revenue by Council
- Social capital objectives – community building and connectedness
- Access to and use of support services by tenants
- Performance of the Housing Manager in accordance with the Management Agreement
- Internal management issues for Council
- an affordable housing covenant is registered on the title of the land;
- affordable rental dwellings are rented to very low, low and moderate income households at a per cent of gross household income or at a discount-to-market rent;
- all rent received after deduction of management and maintenance costs will be used only for the purpose of improving, replacing, maintaining or providing additional affordable rental housing; and
- affordable rental dwellings are designed and constructed to a standard which, in the opinion of Council, is generally consistent with other dwellings in the LGA, that is they are not differentiated as affordable housing compared with the design of other housing.

Affordable Housing Covenants

The affordable housing covenant ensures the benefits of affordable housing are secured in accordance with this Program in the long term.

The affordable housing covenant will be required to be registered, before the date of the issue of the occupation certificate, against the title of the property, in accordance with section 88E of the Conveyancing Act 1919. The covenant will:

- require affordable rental housing to be retained as affordable rental housing in perpetuity;
- require affordable rental housing to be managed in accordance with the Affordable Rental Housing Principles;
- allow at the sole discretion of Council for the removal of the covenant to facilitate the sale of affordable rental housing where Council is satisfied equivalent or better replacement stock is to be provided within the LGA; and
- allow for the lifting of the covenant at the sole discretion of Council in the circumstance that the eligible community housing provider becomes insolvent and another eligible community housing provider, or the Council, is unable or unwilling to take over the interest in the asset.

HillPDA
CONSULTING

CONCORD FRESHFOOD PROJECT
Economic Impact Assessment

Prepared for Colliers

February 2019

Contents

Executive Summary **5**
- The Planning Proposal 5
- Government Strategies and Targets 5
- Industry Market Overview 5
- Residential Justification 5
- Economic Impacts 6
- Public Benefits 7
- Summary 7

1.0 Introduction **10**
- 1.1 The Subject Site 10
- 1.2 Area Overview 11
- 1.3 The Study Purpose 11
- 1.4 Planning Proposal 11
- 1.5 Study Structure 12

2.0 Contextual review **14**
- 2.1 State Government Plans and Policies 14
  - 2.1.1 Greater Sydney Region Plan 14
  - 2.1.2 Eastern District Plan 14
  - 2.1.3 NSW Draft Centres Policy (2009) 14
  - 2.1.4 Draft State Significant Planning Policy (Competition) (2010) 15
  - 2.1.5 Ministerial Section 117 Direction 1.1 (2009) 15
  - 2.1.6 State Environmental Planning Policy (Affordable Rental Housing) 2009 16
- 2.2 Local Policies and Guidance 17
  - 2.2.1 Canada Bay Local Environmental Plan (LEP) 2013 17
  - 2.2.2 The City of Canada Bay Local Planning Strategy 2009-2031 17

3.0 Industry market overview **20**
- 3.1 Industrial Sector Trends 20
- 3.2 Subject Site Assessment 20
  - 3.2.1 Zoning 20
  - 3.2.2 Developable area 21
  - 3.2.3 Connectivity 21
  - 3.2.4 Topography and Soil Conditions 21
  - 3.2.5 Environment 21
- 3.3 Central Subregion Industrial Lands Demand 21
- 3.4 Conclusion 22

4.0 Residential justification **24**
- 4.1 Local Market Overview 24
- 4.2 Population Projections 24
- 4.3 Private Occupied Dwellings 25
- 4.4 Affordable Housing 25
  - 4.4.1 Rental Market 25
  - 4.4.2 Housing Market 25
- 4.5 Improving Housing Choice 26
- 4.6 Drivers of Demand 27

4.7 Housing Market Change ... 28
4.8 Policy Perspective ... 29
4.9 Summary & Implications ... 30

5.0 Economic Impacts ... 32
5.1 Employment ... 32
5.2 Gross Value Added ... 33
5.3 Economic Impacts from Construction ... 34
5.4 Construction Employment ... 34
5.5 Other Economic Impacts ... 35
5.5.1 Expenditure from Residents ... 35
5.5.2 Expenditure from Workers ... 36
5.5.3 Investment Stimulus ... 36
5.6 Public Benefits ... 36
5.6.1 Bus Service ... 36
5.6.2 Ferry Service ... 37
5.6.3 Public Open Space ... 37
5.6.4 Affordable Housing ... 37
5.7 Summary and Implications ... 37

Tables

Table 1: Economic Impact of Planning Proposal ... 6
Table 2: Estimate of Value of Public Domain ... 7
Table 3: Consistency of Planning Proposal with Ministerial Direction 1.1 Business & Industrial Zones ... 16
Table 4: Population Projections 2011 to 2031 ... 24
Table 5: Rental Affordability Canada Bay (2006-2011) ... 25
Table 6: Concord median dwelling prices 2009-2018 ... 26
Table 7: Age and household type profile, Canada Bay LGA (2011-2031) ... 27
Table 8: Change in Occupied Private Dwellings, Canada Bay LGA 2006-2016 ... 29
Table 9: Planning proposal employment generation ... 32
Table 10: Potential salary contribution ... 33
Table 11: Gross value added from the various land uses on site ... 33
Table 12: Estimated economic multipliers ... 34
Table 13: Estimated Job Multipliers ... 35
Table 14: Estimate of Value of Public Domain ... 36
Table 15: Summary of the Economic Impacts of Planning Proposal ... 38

Figures

Figure 1: Aerial Image of Subject Site ... 10
Figure 2: Site Zoning ... 11

Quality Assurance

Report Contacts

Adrian Hack
Principal, Urban and Retail Economics
M. Land Econ. B.Town Planning (Hons). MPIA
Adrian.Hack@hillpda.com

Supervisor

Adrian Hack
Principal, Urban and Retail Economics
M. Land Econ. B.Town Planning (Hons). MPIA
Adrian.Hack@hillpda.com

Quality Control

This document is for discussion purposes only unless signed and dated by a Principal of HillPDA.

Reviewer

Signature		Dated	05/02/19

Report Details

Job Number	C19051
Version	Final
File Name	Concord Bushells Site Revised PP EIA 050219F
Date Printed	February 2019

EXECUTIVE SUMMARY

HillPDA was commissioned by Colliers to undertake this Economic Assessment (hereafter referred to as 'the Study') of a Planning Proposal for the rezoning of land at 160 Burwood Road, Concord (hence referred to as the Subject Site).

The Planning Proposal

The Planning Proposal would facilitate a mixed use development comprising medium to high density residential, retail, commercial and community uses.

For the purpose of this study it has been assumed that the proposed new zoning will provide:

- 475 apartments
- 48 (10%) for affordable housing
- up to 3,500sqm (GFA) retail space
- 15,700sqm of public open space.

Government Strategies and Targets

The State and Government strategies and policies give impetus to the need to create housing and employment opportunities. This is evident in the Eastern District Plan and the new Greater Sydney Region Plan. The Planning Proposal is in accordance with these strategies in providing significant additional housing – including affordable housing – and an increase in dwelling mixture choice in close proximity to transport and employment. The associated increase in population will also stimulate demand for businesses located in Concord Town Centre and this will have positive flow-on effects for economic activity and employment in the locality.

Industry Market Overview

The Inner West industrial market is characterised by low levels of demand and new lease activity. This has been a result of subdued investment resulting in a lack of new developments.

Low demand for traditional industrial uses has resulted in the development of alternative uses in industrial areas such as hardware retailing, showrooms and self-storage facilities rather than manufacturing and urban support services.

The Subject Site's peninsula location, poor road access for heavy vehicles and its proximity to sensitive residential areas are significant constraints on its suitability for industrial uses and its ability to maximise the available floorspace.

Given the Subject Site's foreshore location and the fact that it is surrounding by residential uses, it would be better suited for higher valued land uses – that is residential and other employment uses.

Residential Justification

Anticipated population growth and latent demand for new residential dwellings in the Canada Bay LGA has been driving a major transformation of the area with a notable increase in the level of medium density development, particularly around the foreshore. This trend is projected to continue, with demand expected to remain strong through the foreseeable future notwithstanding the recent 'downturn' in the market. The recent downturn is a short term adjustment to the 'heated' market during the 2014-17 period.

As there are limited opportunities to develop new housing in areas with high amenity and proximity to employment, increasingly industrial and mixed use sites are being redeveloped to maximise their potential to contribute to a range of government objectives.

From a policy perspective, the Planning Proposal would help to meet the demand for new dwellings and, by providing 10% of the apartments as affordable housing units, would also help address housing affordability within the Canada Bay LGA.

Economic Impacts

Currently the site is occupied by FreshFood Services Pty Ltd (The House of Robert Timms) for the manufacture of coffee and has 136 employees. However, the factory has come to the end of its useful life and an alternative, more suitable, site is currently being sought to establish a new facility.

Two scenarios for the site were investigated:

- Maintain the site under its existing use; or
- Redevelopment for medium to high density housing and mixed use development under the planning proposal.

Table 1 below summarises the economic impact of each scenario.

Table 1: Economic Impact of Planning Proposal

	Industrial Use	Planning Proposal
Total Jobs Generated	136	187
Total Salaries ($m) Generated	$8.4m	$7.1m
Industry Value Added (to GDP)	$14.4m	$9.8m
Construction Costs		$311m
Total Economic activity from construction		$1.0bn
Jobs Years in Construction		2,677

Source: HillPDA

The Planning Proposal would lead to a net increase in jobs (+51 jobs) but a lower total remunerations to workers (-$1.3m) and lower gross value added (-$4.6m) largely because it would replace jobs in manufacturing with jobs in the retail, hospitalities and service industries.

The Planning Proposal would generate $311m construction on site, additional economic activity of +$1.0bn and +2,677 job years directly and indirectly during the period of construction.

Maintaining the site for food & beverage manufacturing and expanding the operation to maximise the potential floorspace and employment onsite would bring some minor additional benefits in terms of industry value add and employment. However, the Site's location on the Parramatta River, surrounded by residential uses, with poor heavy vehicle access, and isolated from other industrial uses and major transport routes, are major constraints on its continued suitability and appeal as an industrial site.

Public Benefits

In addition to providing 475 dwelling units, the Planning Proposal will provide substantial public benefits in terms of open space, public transport services and affordable housing. These benefits are quantified below.

Table 2: Estimate of Value of Public Domain

Public Benefit	Sqm	Rate	TOTAL
AIR RIGHTS OVER PUBLIC SPACES*	7,400	$3,500 /sqm	25,900,000
D+C OF PUBLIC SPACES (say)	7,400	$500 /sqm	3,700,000
10% AFFORDABLE HOUSING UNITS**	5,207	$3,611 /sqm	18,802,000
BUS SERVICE***			840,000
FERRY SERVICE***			2,100,000
TOTAL VALUE OF PUBLIC BENEFITS			51,342,000

* Foreshore park and public plaza area only. It excludes the area of internal roads or laneways and the areas of private open spaces. The market value of development rights (at $3,500/sqm GFA) is the rate adopted by Burwood Council under its VPA policy evident by several development site sales in 2017-18.

** Assumes 10% of the total residential GFA and a benefit of 25% of the assumed sales rate per net saleable area of $14,444/sqm (or equivalent in monetary terms).

*** This is the capped level of underwriting by Freshfood for three years of service

Source: Freshfood and HillPDA

The total value of the public benefits components amount to $51.3m. This includes the proposed community bus loop operating hourly and connecting the site with both Burwood and Strathfield stations via Concord hospital. It is proposed that the developer will fund the operation of the bus route at an annual estimated cost of $280,000 (excludes fleet and depot costs) for a period of three years.

The above estimate also includes the cost of Freshfoods underwriting a ferry service (14 ferry trips to Barrangaroo every day, 7 days a week) at $700,000 over three years, commencing immediately following building completion of the first residential stage.

The development proposes significant visual and amenity improvements to the public domain by way of renewed urban form, increased connectivity including open spaces and a through site link, and associated landscaping works. These improvements would enhance the appeal of the site for a broad range of visitors increasing the scale of its trade area.

The public spaces, through site link (between the waterfront and Burwood Road) and the public transport services are public benefits being delivered by the planning proposal. These items will benefit a much wider community than just the residents on the subject site. If the site was already appropriately zoned for residential apartments then an application could be submitted for a residential only development with no provision of public spaces, no public access through the site and no underwriting of additional public transport services. For these reasons the above items should be treated as public benefits over and above normal development costs.

Summary

In addition to contributing to the supply of housing there would be considerable economic benefits associated with changing the composition of use of the Subject Site from predominantly industrial to predominantly residential:

- Complementing the character of the immediate region, which is predominately residential

- Increasing the proportion of residents living close to employment, retail facilities, amenities and public transport (which aligns with the Greater Sydney Region Plan)
- Supporting the viability of the main retail and commercial precincts
- Providing housing close to education and recreation facilities. This is an advantage to residential developments with residents seeking to escape from the urban environment and attracted by proximity to schools for their children
- Provision of open space. This new space would have a positive visual impact in the locality. There is also a range of social benefits that well located and equipped open space offers to the local community and society more broadly
- Financially supporting public transport initiatives including bus and ferry.

INTRODUCTION

1.0 INTRODUCTION

HillPDA was commissioned by Colliers to undertake this Economic Assessment (hereafter referred to as 'the Study') of a Planning Proposal for the rezoning of land (known as the Bushells Coffee Site). Hereafter it is referred to as the subject site.

1.1 The Subject Site

The Subject Site comprises 3.93ha of land and is located at 160 Burwood Road, Concord (see Aerial figure below).

The Subject Site consists of the following lots: Lot 2, DP230294, Lot 398, DP752023, Lot 399, DP752023, Lot 5, DP129325.

Figure 1: Aerial Image of Subject Site

Source: Six View Maps

The site area is currently zoned for General Industrial Use (IN1) – see Figure 2. The site has a legal frontage to the Parramatta River (Exile Bay). Access along the foreshore is currently available to the public however the remainder of the site is securely fenced. The site has an approximate 170m frontage to Burwood Road.

Figure 2: Site Zoning

Source: NSW Planning Portal

1.2 Area Overview

The Subject Site is around 1.5km from the Majors Bay Road shops, 2.5km from Burwood Station and 1km from Parramatta Road (A4). Sydney CBD is 12km from the site via Parramatta Road, which is a 45 minute journey by bus or 15 minutes by train from Burwood Station. The site is within an easy drive (7km) of Sydney Olympic Park and Rhodes Waterside Shopping Centre.

The site is also distinctly positioned close to education and recreation facilities such as the Concord Public School, Concord High School, Massey Park Public Golf Club, Barnwell Public Golf Club, Bayview Park, Jesse Stewart Reserve, Greenlees Park, Rothwell Park and the Cintra Park tennis courts.

1.3 The Study Purpose

It is understood that FreshFood Services Pty Ltd is seeking the rezoning of the Subject Site from its current zoning of IN1 General Industrial under the Canada Bay Local Environmental Plan (LEP) 2013, to a zoning that would allow a mixed use development.

The purpose of this Study is to provide an economic assessment of the Planning Proposal. As part of this assessment the Study explores the economic viability / impact of retaining the current zoning versus amending the zoning to allow for a mixed use development. Furthermore the Study considers the proposed rezoning of industrial lands against the directions set out in the Ministerial Section 117 Direction 1.1.

1.4 Planning Proposal

The Planning Proposal would facilitate a mixed use development comprising medium to high density residential, retail, commercial and community uses.

The planning proposal will provide:

- 475 residential dwellings
- 48 (10%) for affordable housing
- Up to 3,500sqm (GFA) retail / commercial space

- 15,700sqm of public open space

1.5 Study Structure

To meet the requirements of the project brief and fully consider the economic impacts associated with the proposed rezoning, the study is set out in the following manner:

- Chapter 2 undertakes an assessment of the planning and legislative background to the proposed rezoning and assesses the economic principle of the rezoning in context of the planning policies reviewed earlier
- Chapter 3 undertakes an industrial supply assessment to ascertain whether there is sufficient demand for industrial uses in the Canada Bay area
- Chapter 4 undertakes an assessment of the demographic profile for the Concord suburb residential market. It uses published data sources to provide an insight into the drivers of residential demand and supply in the Concord suburb locality
- Chapter 5 assesses the economic impacts of the planning proposal against the base case "do nothing" option and also quantifies where possible the public benefits of the Planning Proposal.

CONTEXTUAL REVIEW

2.0 CONTEXTUAL REVIEW

This Chapter undertakes an appraisal of the planning and legislative context for the proposed rezoning based on state, regional and local planning guidelines. It considers matters relating to the proposed rezoning and development from an economic perspective only.

2.1 State Government Plans and Policies

2.1.1 Greater Sydney Region Plan

The Greater Sydney Region Plan – *A Metropolis of Three Cities* (Region Plan) was finalised in March 2018 by the Greater Sydney Commission. The vision of the Region Plan is to create a metropolis of three cities, specifically the Western Parkland City, Central River City and the Eastern Harbour City. The study area is within the Eastern Harbour City with its aim to – *build on its recognised economic strength and address liveability and sustainability*. The Eastern Economic Corridor City is identified within the Eastern Harbour City to foster innovation and global competitiveness, supported by investments in transport and services, jobs growth and business activity.

A core intent of the Region Plan is to give people more housing choice and establish more jobs closer to where people live, to develop a more accessible and walkable city and creating conditions for a stronger economy.

2.1.2 Eastern District Plan

The East District Plan maps out the 20-year vision for the East District of Greater Sydney. Canada Bay LGA is the western end of the district. By 2036 it is projected that the District will have a population of 1.338million, representing an additional 325,050 persons over the 20 year period from 2016.

To house this growth an additional 624,000 dwellings are required representing an average annual rate of 36,250 dwellings. Specifically, the District Plan targets an additional 48,650 dwellings to be provided over the next five years.

Another key focus of the plan is housing diversity and affordability. The plan identifies a number of measures to improve affordability across the continuum. The key measure is to target 5-10% affordable housing for new developments. Also Planning Priority E5 is about providing housing supply, choice and affordability, with access to jobs, services and public transport.

The planning proposal contributes to these objectives by providing 475 new apartments on the Parramatta River combined with regular ferry services to the city and bus services to Burwood major centre.

2.1.3 NSW Draft Centres Policy (2009)

The NSW Department of Planning and Infrastructure (now named the Department of Planning and Environment) released the Draft Centres Policy in April 2009.

The Draft Centres Policy focuses around six key principles. The principles relate to:

- The need to reinforce the importance of centres and of clustering business activities
- The need to ensure the planning system is flexible, allows centres to grow and new centres to form

- The market is best placed to determine need. The planning system should accommodate this need whilst regulating its location and scale
- Councils should zone sufficient land to accommodate demand, including larger retail formats
- Centres should have a mix of retail types that encourage competition
- Centres should be well designed to encourage people to visit and stay longer.

The Draft Centres Policy indicates that the preferred location for new retail and commercial development is in centres, although it recognises that there may be exceptions to this approach.

An assessment of the impact of the proposed retail floorspace at the Subject Site showed that it would capture demand currently served by a number of centres. This diffusion of demand, together with solid population growth in these centres' trade areas, would preclude the site's retail offering from undermining the viability of neighbouring centres.

2.1.4 Draft State Significant Planning Policy (Competition) (2010)

Following a review undertaken by the DP&I and the Better Regulation Office concerning how economic growth and competition is affected by the planning system, a draft State Environmental Planning Policy (SEPP) was prepared and placed on public exhibition in July 2010.

The proposed state-wide planning policy removes artificial barriers to competition between retail businesses. The draft SEPP proposes:

- The commercial viability of a proposed development may not be taken into consideration by a consent authority, usually the local council, when determining development applications
- The likely impact of a proposed development on the commercial viability of other individual businesses may also not be considered unless the proposed development is likely to have an overall adverse impact on the extent and adequacy of local community services and facilities, taking into account those to be provided by the proposed development itself
- Any restrictions in local planning instruments on the number of a particular type of retail store in an area, or the distance between stores of the same type, will have no effect.

Further to the above, the retail offering proposed at the Subject Site will provide a different mix and design to that of existing retail in Concord. The Site will provide specialised retailing, as well as serving the localised walking catchment for convenience shopping, which together with the Site's public amenities will attract destination shopping.

2.1.5 Ministerial Section 117 Direction 1.1 (2009)

Section 117 Direction 1.1 relates to Business and Industrial zones. The objectives of the direction are as follows:

- Encourage employment growth in suitable locations
- Protect employment land in business and industrial zones
- Support the viability of identified strategic centres.

This Direction applies when a planning proposal would affect land within an existing or proposed business or industrial zone. As such this report will address the five key requirements of Direction 117, these being:

- Follow the objectives of the Direction
- Retention of existing business and industrial zones
- No net loss of potential floorspace for employment uses and related public services in business zones
- Not reduce the potential floorspace area for industrial uses in industrial zones
- Be in accordance with a Strategy approved by the Director General of the DP&I.

The following table assesses the consistency of mixed use development on the Subject Site, against the five key requirements of the Direction for strategies concerning employment lands.

Table 3: Consistency of Planning Proposal with Ministerial Direction 1.1 Business & Industrial Zones

Relevant Matters	Comment and Consistency
Objectives of the Direction	A mixed use development on the Subject Site would result in a net loss in land zoned for employment uses. Despite this the site proposed for rezoning has little opportunity for employment growth or intensification. It comprises only a small proportion of industrial land in the Central Subregion. The proposed development would generate additional demand for retail and business services which would help to support the viability of identified strategic centres (consistent with objective 1.C).
Retain existing business and industrial zones	The proposed rezoning would result in a loss in industrial zoned land. However the site is isolated from other industrial land, has poor access for heavy vehicles and is surrounded by residential uses, which impact on its ongoing suitability for industrial uses. From a future supply perspective, the Subject Site represented 13% of existing supply of employment lands (land zoned B5, B6, B7 or IN) in Canada Bay in 2015, but just 0.3% of the supply within the Central Subregion[1].
No net loss of potential floorspace for employment uses and related public services in business zones	The proposed rezoning is not within a business related zone. Thus it would not result in a potential net loss in floorspace related to employment uses and related public services in commercial centres. The development proposes to include 3,500sqm of retail and commercial floorspace. As such the development would actually result in a net increase in employment and community floorspace in a business zone (329 jobs).
Not reduce the potential floorspace area for industrial uses in industrial zones	The proposed rezoning would result in a potential loss in floorspace that could be utilised for industrial uses. However industrial uses are increasingly unnecessary in these locations resulting in significant under-capitalisation of land. The development of a mixed use development would create additional demand for local urban services.
In accordance with a Strategy approved by the Director General of DP&I	The proposed rezoning and subsequent mixed use development responds to and accords with the indicative targets for population, housing and employment growth set out in the Greater Sydney Region Plan and the Eastern District Plan.

2.1.6 State Environmental Planning Policy (Affordable Rental Housing) 2009

The ARH SEPP 2009 aims to facilitate affordable rental housing through incentivising private and public development by way of expanded permissibility, FSR bonuses and non-discretionary development standards. Additionally, the ARH SEPP 2009 seeks to retain and mitigate the loss of existing affordable housing stock, expand the development role of not for profit housing providers and locate affordable housing near local businesses for workers.

---

[1] NSW Department of Planning & Environment: Employment Lands Development Program, 2015 Report

The Planning Proposal would address this issue by providing 10% of the 475 apartments on site for affordable housing.

2.2 Local Policies and Guidance

2.2.1 Canada Bay Local Environmental Plan (LEP) 2013

As stated previously the Subject Site is currently zoned IN1 General Industrial. The objectives of the IN1 zone are described below.

- To provide a wide range of industrial and warehouse land uses
- To encourage employment opportunities
- To minimise any adverse effect of industry on other land uses
- To support and protect industrial land for industrial uses.

Residential development is prohibited within an IN1 zone, as are water recreation structures, child care facilities, registered clubs and community facilities. Neighbourhood shops are permitted with consent.

2.2.2 The City of Canada Bay Local Planning Strategy 2009-2031

The Local Planning Strategy (LPS) is the principal document for communicating the future land use planning of Canada Bay. The purpose of the LPS is to:

- Ensure that the Metropolitan Strategy for Sydney and the draft Inner West Subregional Strategy are considered at a local level
- Provide a framework for future land use planning of the City of Canada Bay to guide the preparation of a new city-wide LEP and DCP
- Ensure that future planning achieves principles of Ecologically Sustainable Development (ESD)
- Achieve quality urban design outcomes for public and private areas that provide the City of Canada Bay with high amenity
- Provide housing and employment in locations that is designed and located to meet the requirements of the existing and future population
- Support changing social needs of the City of Canada Bay community, including the ageing population and affordability
- Protect the heritage items and conservation areas of the City of Canada Bay
- Protect the natural environment, including prominent view corridors of the City of Canada Bay – its parks, bushland and foreshore areas
- Ensure that planning for land use and transport occurs in an integrated manner to reduce private car use.

Objective E5 of the planning strategy is to *retain industrial sites within the LGA*. The Subject Site is identified along with George Street, North Strathfield and Leeds Street, Rhodes.

Action E8 similarly relates to the same three industrial zonings. It states that the IN1 general industrial zoning is likely to be the most appropriate land use for these areas and that Council supports the retention of these areas for industrial purposes in the medium term. However, it also outlines a timeframe for further investigations of the most appropriate uses for the zones in the longer term, which in the case of the Subject Site is within 10 years – i.e. by 2020.

Action H6 considers opportunities for the provision of affordable housing on rezoned sites including the Subject Site, which it is stated is expected to be rezoned for other purposes than employment lands over the longer term.

The planning proposal would address these issues in the following manner:

- Provide both public and private areas within high amenity, including improved access to the foreshore
- Support the changing social needs of the community through the provision of a range of unit typologies and price points, including affordable housing
- Provide easy access to a range of retail and community uses, including child care facilities, thereby supporting both an ageing population and young families with children
- Retain the industrial heritage onsite through the adaptive uses of the Bushells building
- Protect the natural environment through remediating the site and enhancing the site's connectivity to the foreshore.

INDUSTRY MARKET OVERVIEW

3.0 INDUSTRY MARKET OVERVIEW

The following chapter undertakes an assessment of the current supply and demand for industrial lands and therefore the likely need for retention of industrial lands within the Canada Bay LGA.

3.1 Industrial Sector Trends

The demand for industrial floorspace continues to be influenced by the globalisation of trade and the increasing dominance of information technology by businesses. The global supply chain has evolved into an alignment of firms that design, develop, market and produce goods and services and deliver to the end user as required. The face of traditional manufacturing is therefore changing, becoming more efficient amid the use of new technologies and equipment. These savings in efficiency have resulted in corresponding savings in labour costs and the demand for floorspace.

As a consequence, the rate of development of industrial land and floorspace across NSW has generally been outpaced by the rate of employment growth. This trend however varies considerably between types of activity.

Manufacturing employment growth has generally either declined or remained stagnant, with a few exceptions. These exceptions include food manufacturing and beverage & tobacco manufacturing. The combination of a rising population and growing disposable incomes has underpinned growth in domestic demand for these goods. The perishable nature of significant proportion of production, together with the relative isolation of Australia from competitor markets, has helped cushion these sectors from international forces. Australia is also a major food and beverage exporter and growing demand from emerging Asian markets has bolstered demand for Australian production.

With declines in non-food manufacturing and a growth in imports, warehousing, transport, distribution and logistics businesses have thrived. These types of businesses together with larger manufacturing services have shifted their preferred locations from the inner city to the Outer-West and South-West of Greater Sydney. These locational decisions have been supported by improvements to the outer orbital ring roads and motorways (M5 and M7) and the proposed development of intermodal facilities such as the Moorebank Intermodal.

These locations benefit from the availability of larger sites required for modern logistics businesses that are not generally available in the Inner West Subregion.

3.2 Subject Site Assessment

The development of industrial related uses require a number of prerequisites / characteristics such as appropriate zoning, a large developable area, high connectivity, good topography and soil conditions and a conducive surrounding environment. Each of these prerequisites / characteristics will now be explored.

3.2.1 Zoning

The Subjects Site's current zoning of IN1 General Industrial allows for the development of industrial related uses.

3.2.2 Developable area

Industrial developments usually require a large developable area to allow for large floor plates, storage areas and vehicle turning and access points. The Subject Site comprises approximately 3.93ha of land which is ample for most industrial uses.

Currently the site only contains one access point on Burwood Road, 2km from the intersection with Parramatta Road. Although Burwood Road is a major arterial road between Parramatta Road and Croydon Park, it is only a local road between Parramatta Road and Exile Bay. The site is surrounded by residential uses and effectively freight movements are passing through local residential roads.

3.2.3 Connectivity

Industrial developments usually require good access to highways with two entry points. Rail and freight lines are also desirable. As stated before the site contains one access point for vehicles on Burwood Road and the site is accessed through a residential area. The site does not have ready access to any rail and freight transport nodes.

The isolation of the site from other industrial and business zones will also limit any agglomeration benefits for prospective firms.

3.2.4 Topography and Soil Conditions

Industrial developments usually require level ground with good soil conditions that allow drainage. The Subject Site topography reveals that the site is predominantly flat.

3.2.5 Environment

The surrounding environment is one of water courses, residential land and recreational spaces. Exile Bay, the neighbouring Bays and the Parramatta River are used by recreational fishermen, student rowers and the occasional swimmer. This would place stringent requirements on the type of industry that could locate there. Manufacturing and many engineering and service industries would be contentious because of the potential for increased amounts of run off and pollution.

Based on the above analysis, the Subject Site's peninsula location with poor access, and proximity to sensitive residential uses, is a significant constraint on its suitability for many industrial uses.

3.3 Central Subregion Industrial Lands Demand

The 2018 Employment Lands Development Monitor (ELDM)[2] identifies 30.3ha of employment lands within the Canada Bay LGA[3], of which the Subject Site accounts for 12.8%, Parramatta Road/Queens Road for 40.5%, Concord West for 25.0% and Leeds Street, Rhodes for 21.1%.

The Canada Bay LGA contains just 2.0% of the total zoned employment lands in the Eastern City District. While Strathfield LGA was identified as having 287ha of employment lands, the other Inner West LGAs (Canada Bay, Burwood and Inner West) totalled 307.3ha.

---

[2] Department of Planning and Environment: Employment Lands Development Monitor 2018

[3] Employment lands was defined as land zoned for industrial purposes and included IN1, IN2, IN3, B5, B6 and B7 land use zones

Colliers noted in their Industrial Research and Forecast Report, Second Half 2015, that "speculative purchases continued to occur in the inner west submarket and that properties in proximity to train stations, bounding the Parramatta River, or in areas with potential rezoning were in high demand"[4].

These sites are being purchased with a view to their future rezoning in accordance with government policy to promote greater housing density in locations with high amenity and good transport links.

3.4 Conclusion

With the exception of activity around Port Botany, the Eastern City District industrial market is characterised by low levels of demand and new lease activity. This has been a result of subdued investment resulting in a lack in new developments.

Outside of the Port, investment activity has been centred on non-traditional uses. Low employment generating industrial uses are increasingly unnecessary in close proximity to major centres as a result of a long term structural shift in economic activity.

Low demand for traditional industrial uses has resulted in the development of alternative uses within the industrial areas such as hardware retailing, showrooms and self-storage facilities rather than manufacturing.

The development of a mixed use development would create additional demand for local urban service trades and industries.

---

[4] Colliers International: Industrial Research and Forecasts Report, Second Half 2015, pg. 16

RESIDENTIAL JUSTIFICATION

4.0 RESIDENTIAL JUSTIFICATION

This Chapter undertakes an assessment of the demographic profile for the Concord suburb residential market and analyses trends and factors influencing the property market within Concord.

4.1 Local Market Overview

The suburb of Concord is located in the LGA of Canada Bay. Concord is an inner west suburb of Sydney, located 14km west of the Sydney CBD.

The 2016 Census recorded a resident population of 13,880 persons for the suburb of Concord. The suburb is characterised by low density housing – separate houses accounted for 71% of total dwellings in 2016, apartments just 16%. Of a total of 783 units, 69% were in one or two storey blocks and only 30% were located in a block with four or more storeys.

There were 70 unit sales (new and existing) in the Concord suburb from 1 July 2017 to 22 June 2018 according to RPData and 163 house sales. Median house price at $2.11m was much higher than the median unit price at $871,000. Over the five years to 2014-15 there were just 58 dwelling completions in Concord suburb or 1.4% of dwelling completions within the Canada Bay LGA (NSW Department of Planning and Environment).

The Canada Bay LGA itself has a high share of apartments, comprising 52% of all occupied dwellings in 2016. The Canada Bay LGA was formed in December 2000 following the merger of Drummoyne and Concord councils. The proportion of apartments to total dwellings in the two former councils in 2001 was 31%. Concord LGA was only 21%. In the intervening period dwelling growth has been predominantly centred in the north west of the Canada Bay LGA in Rhodes, Liberty Grove, Mortlake and Breakfast Point (taking advantage of their foreshore locations), and in the south west, near Strathfield and North Strathfield railway stations.

House and unit price growth within the suburb of Concord has largely kept pace with that of the broader Canada Bay LGA over the last five years.

4.2 Population Projections

Population projections sourced from the NSW Bureau of Transport Statistics (BTS) are shown in the table below for the Concord suburb and for the Canada Bay LGA.

Table 4: Population Projections 2011 to 2031

	2016	2021	2026	2031	2036	Growth 2016-36	
Concord	15,098	15,389	16,408	17,617	18,742	3,644	24%
Canada Bay LGA	75,098	78,248	81,726	85,239	89,688	14,590	19%

Source: NSW Transport Performance and Analytics (2018)

Over the 2016 to 2036 period, NSW Government forecasts a 24% increase in the population for Concord suburb and a 19% increase in the Canada Bay LGA population. It should be noted that the BTS population estimates are a little higher than ABS Census figures because – the latter is considered to be an undercount of the actual resident population.

4.3 Private Occupied Dwellings

Over the period of 2006 to 2016, the number of private occupied dwellings in the Canada Bay LGA increased by 7,958 dwellings (from 26,147 in 2006 to 34,105 in 2016). A comparison of the number of private occupied dwellings against population growth demonstrates that supply has not kept up with demand over this period. The average household size has crept up from 2.51 to 2.58.

In 2001 the average household size was 2.50. If we apply this rate today it suggests a need for 35,206 occupied dwellings – some 1,100 more than actual.

4.4 Affordable Housing

4.4.1 Rental Market

A shortage in the supply of houses has resulted in the escalation of house prices in Concord. In the Concord suburb over the five years to 2011 the median weekly rent increased from $300 to $426, a compound annual growth rate of 7.3%. The median weekly rent for the Canada Bay LGA over the same period grew at an annual compound rate of 7.5%, from $335 to $480.

Rental affordability deteriorated in Concord suburb between 2006 and 2011, with the rental share of income increasing from 22.2% in 2006 to 24.6% in 2011 (refer to Table 5).

Table 5: Rental Affordability Canada Bay (2006-2011)

	2006	2016
Annual Median Rent	17,420	29,380
Annual Median Household Income	75,556	107,106
Rent % of Income	23%	27%

Source: Census 2006-16 Time Series

With moderate population growth anticipated in Concord over the next decade, it will be essential to provide new residential stock to maintain affordability. As such the Planning Proposal will facilitate in alleviating some of the ongoing rental pressure being experienced in Concord.

4.4.2 Housing Market

Data relating to unit prices in Concord has been derived from Residex and is provided in Table 6 below. This indicates that the median price of a house and a unit increased sharply between 2012 and 2017.

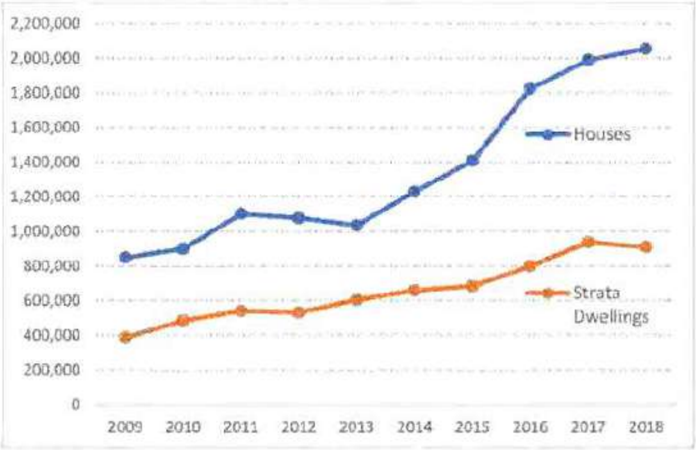


Table 6: Concord median dwelling prices 2009-2018

Source: RPData

Between 2013 and 2018 the median price of houses doubled compared to an increase of 50% for strata title dwellings. The extent of the price rise for dwellings in Concord is indicative of high demand for dwellings in this location and evidence of the increasing unaffordability of these dwelling types, particularly with respect to houses. Increasing the supply of apartments is imperative to alleviating the problem of affordability.

Despite the relatively high median annual household income of $107,106[5], it is evident that home ownership is challenging in the suburb of Concord.

In 2015-16 the NSW Government developed a new package aimed at improving housing affordability across the state.

For first home buyers, the package:

- Abolished stamp duty on all homes up to $650,000
- Gave stamp duty relief for homes up to $800,000
- Provided a $10,000 grant for builders of new homes up to $750,000 and purchasers of new homes up to $600,000
- Abolished insurance duty on lenders' mortgage insurance
- Ensured foreign investors pay higher duties and land taxes.

The Planning Proposal would provide 53 affordable housing dwellings – a mix of 1, 2 and 3 bedroom units – at a 25% discount to the prevailing market price. It is anticipated that some of these dwellings would fall within the price bands that would qualify for stamp duty relief from the NSW State Government, further improving their affordability to first home buyers.

4.5 Improving Housing Choice

One of the overarching priorities of the draft Central District Plan is to improve housing choice, diversity and affordability.

---

[5] Census 2016 median household income for Concord

Table 7: Age and household type profile, Canada Bay LGA (2011-2031)

	2016	2036	2016-36
Age cohort			
0-14	16%	15%	-1%
15-24	12%	12%	0%
25-34	20%	19%	-1%
35-49	21%	21%	-1%
50-64	16%	16%	0%
65+	14%	18%	3%
Household type			
Couple families with dependents	32%	30%	-2%
Couples without dependents	30%	31%	1%
Group households	6%	6%	0%
Lone person households	22%	23%	1%
One parent family	8%	8%	0%
Other families	3%	3%	0%

Source: Canada Bay LGA Forecast.ID

As demonstrated in the table above, the Canada Bay LGA is anticipated to experience an ageing population, with a greater proportion of retirees over the next two decades. Similarly, the proportion of couples without dependent children and lone person households is also expected to increase over this period.

Over the past few years, a number of developers including Mirvac and JQZ have included housing affordability measures, targeted at first home buyers. These initiatives have not formed part of any formal planning agreement. In Sydney Olympic Park, as part of a 690 apartment development, Mirvac priced 60 apartments at a lower level, exclusively to first home buyers. This resulting lower price-point enabled buyers to utilise the First Home Owners Grant. As part of this initiative, first time buyers were able to pay 5 per cent on exchange, half the usual deposit, and the remaining 5 per cent in two annual instalments. This secures the property while the first home buyer continues to save for the full 10 per cent deposit. A similar initiative was offered in 2017 by JQZ as part of the redevelopment of the former Darrell Lea site at Ramsgate[6].

4.6 Drivers of Demand

The development of land for residential use is driving more widespread renewal than for any other land use at present, representing the 'highest and best use' from a development standpoint. Sales of development sites reflect this sentiment, with sites offering residential development opportunities observed to be principally driving sales activity in the development market.

Late 2013 saw the start of a strong phase of activity in the Sydney market, evidenced by the significant price rises and the increase in development activity, buyer enquires and clearance rates. The high levels of demand reflected significant pent up demand for dwellings as residential property prices and investor interest over the 5 years prior to 2013 was flat and construction activity failed to keep up with long term demand.

---

[6] See: https://pavilions.mirvac.com/the-right-start-plus and https://marrickandco.mirvac.com/the-right-start-plus

In the past 12 months we have seen some "correction" in the heated market with a minor fall in the median price of apartments as well as falls in the number of properties sold and auction clearance rates.

The key drivers of NSW's residential property market have been:

- Low interest rates underpinning affordability
- Demand for an affordable housing product – leading to an increased proportion of apartment developments
- High cost of ownership leading to a higher propensity for households to rent
- Downsizing of empty nesters
- Increased demand for new housing around major transport nodes, especially existing railway stations, owing to lifestyle change
- Demographic trends leading to declining household sizes
- Strong population growth from international migration and natural increase
- Strong demand from international investors, particularly from Asia.

The minor downturn or correction in the market over the past year is partly due to the downturn in investor interest including overseas buyers and the tightening of finance. However this is a short term condition. Continued population growth in the Sydney region will continue to increase pressure on existing urban areas – especially those served by employment and transport nodes – to provide a greater level of infill housing.

Strong population growth and demand for residential sites with good transport links and amenities will continue to underpin high demand for new apartments in Sydney's inner west.

4.7 Housing Market Change

From 2001 the Canada Bay LGA housing market experienced a sizeable increase in the supply of new dwellings. The total number increased by 48% from 21,596 dwellings in 2001 to 32,102 dwellings by 2016[7]. From 2006 to 2016 the number of occupied dwellings in the LGA increased by 7,689 and 97% of the increase were in apartments. The table below shows the total number of dwellings and net increase by dwelling type and number of bedrooms from 2001 to 2011.

The majority of opportunities for residential growth within Concord suburb are through redevelopment of lower density residential lots and redundant or underutilised sites, such as the Subject Site.

The provision of higher density dwellings, especially apartments, aligns with broader lifestyle trends towards living close to amenities, transport nodes and employment. This is reflected in the Canada Bay LGA which has experienced a significant shift in its housing composition towards medium and high density dwellings.

---

[7] ABS 2016 Canada Bay LGA Time Series Profile

Table 8: Change in Occupied Private Dwellings, Canada Bay LGA 2006-2016

	2006	2011	2016	2006-26	2006-16 (%)
Separate house:					
None (includes bedsitters)	3	4	8	5	167%
One bedroom	33	35	23	-10	-30%
Two bedrooms	1,458	1,237	937	-521	-36%
Three bedrooms	5,160	4,954	4,562	-598	-12%
Four or more bedrooms	3,518	4,148	4,660	1,142	32%
Number of bedrooms not stated	123	92	108	-15	-12%
Total	10,297	10,469	10,295	-2	0%
Semi-detached, row or terrace house:					
None (includes bedsitters)	0	3	0	0	
One bedroom	15	20	26	11	73%
Two bedrooms	634	811	646	12	2%
Three bedrooms	1,033	1,327	1,226	193	19%
Four or more bedrooms	195	253	298	103	53%
Number of bedrooms not stated	14	18	28	14	100%
Total	1,890	2,429	2,221	331	18%
Flat, Unit or Apartment:					
None (includes bedsitters)	7	16	19	12	171%
One bedroom	200	434	1,098	898	449%
Two bedrooms	2,944	4,187	6,093	3,149	107%
Three bedrooms	1,760	2,258	2,712	952	54%
Four or more bedrooms	59	112	148	89	151%
Number of bedrooms not stated	58	51	112	54	93%
Total	5,023	7,059	10,182	5,159	103%
TOTAL	17,210	19,957	22,698	5,488	32%

Source: ABS – Time Series Profile for Canada Bay LGA (2006 - 2016)

4.8 Policy Perspective

The Eastern District Plan has set a housing target in Canada Bay of 2,150 new dwellings between 2016 and 2021.

The City of Canada Bay Local Planning Strategy aims to achieve that target through quality urban design outcomes designed and located to meet the requirements of the existing and future population, including the ageing population and affordability. Additionally, the Strategy targets protection of heritage items, conservation areas and the natural environment, including prominent view corridors covering parks, bushland and foreshore areas. The Strategy also looks to ensure that planning for land use and transport occurs in an integrated manner to reduce private car use.

The planning proposal would address these issues in the following manner:

- Provide both public and private areas within high amenity, including improved access to the foreshore
- Support the changing social needs of the community through the provision of a range of unit typologies and price points, including affordable housing
- Provide easy access to a range of retail and community uses, including child care facilities, thereby supporting both an ageing population and young families with children and reducing vehicle trips
- Retain the industrial heritage onsite through the adaptive uses of the Bushells building
- Protect the natural environment through site remediation and enhancing the site's connectivity to the foreshore.

4.9 Summary & Implications

Anticipated population growth and latent demand for new residential dwellings in the Canada Bay LGA has been driving a transformation of industrial and business areas with a notable increase in the level of mixed use developments incorporating residential uses over time. This trend is projected to continue, with demand in the Canada Bay LGA expected to remain strong through the next decade.

As there are limited opportunities to develop new housing in sites with high amenity and good transport links, increasingly old industrial and cottage sites are being redeveloped to maximise their potential to contribute to a range of government objectives.

From a policy perspective, the Planning Proposal would help to meet the shortfall of new dwellings in a highly sought after location within the inner west of Sydney.

In addition to contributing to the supply of housing, other benefits from the development include:

- Complementing the character of the immediate region, which is predominately residential
- Increasing the proportion of residents living close to employment, retail facilities, amenities and public transport (which aligns with the NSW State Plan 2021)
- Supporting the viability of the main retail and commercial precincts, including the Majors Bay Road shopping centre
- The Subject Site is also distinctly positioned close to education and recreation facilities such as the Concord Public School, Concord High School, Massey Park Public Golf Club, Barnwell Public Golf Club, Bayview Park, Jesse Stewart Reserve, Greenlees Park, Rothwell Park and the Cintra Park tennis courts. This is an advantage to residential developments with residents seeking to escape from the urban environment and attracted by proximity to schools for their children
- Provision of open space. This new space would have a positive visual impact in the locality. There is also however a range of social benefits that well located and equipped open space offers to the local community and society more broadly. Research has found that the provision of parks and open space areas promotes physical activity and the associated health benefits for all age groups[8]
- Providing development contributions which could be used to improve public space and infrastructure within the LGA.

---

[8] South Australian Active Living Coalition. Creating active communities. How can open and public spaces in urban and suburban environments support active living? A literature review. South Australia: 2010

ECONOMIC IMPACTS

5.0 ECONOMIC IMPACTS

The following Chapter assesses and where possible quantifies the likely economic impacts of retaining the Subject Site's current use and zoning in comparison to redevelopment of the Subject Site under the Planning Proposal.

5.1 Employment

The Subject Site is currently home to the Bushells coffee manufacturing facility and employs 136 persons (full-time and part-time) across a range of roles:

- Factory floor (skilled) – 14 persons
- Factory floor (unskilled) – 61 persons
- Office staff – 44 persons
- Management staff – 17 persons.

However, the factory has reached the end of its useful life and an alternative location is currently being sought for a new operation.

The City of Canada Bay Local Planning Strategy 2010-2031 (pg. 64, Table 4.3) includes an assessment of employment land capacity and the potential for existing employment land sites to accommodate future employment undertaken by SGS Economics and Planning Pty Ltd (SGS). Based on this analysis, the number of additional jobs that could be created on site if the existing FSR of 1:1 were maximised is estimated to be 37, based on creating an additional floorspace capacity of 2,953sqm.

As it is uncertain what industrial uses the Subject Site would be redeveloped for. It has been assumed that the existing operations are maintained and expanded to maximise the floorspace and employment potential as described in the City of Canada Bay Local Planning Strategy 2010-2031.

The Planning Proposal would support permanent employment post-construction through the operation of retail and community uses within the development.

The Table below provides an estimate of the number of jobs that would be supported on the Subject Site in accordance with the Planning Proposal.

Table 9: Planning proposal employment generation

Land Use	Employment Density	NSA (sqm)	No. of Workers
Shop front space	1 worker per 24sqm	3,272*	136
Work at home	1 per 10 dwellings *		51
Total			187

Source: IBIS World Reports
* Assumes 92% of GFA is leasable space
** Work at home: 7.6% of workers undertake majority of work at home (ABS Locations of Work 2008 Cat 6275.0) and there are 1.4 working residents per occupied dwelling in Canada Bay LGA (Census 2016) which calculates to approximately 1 job for every 10 dwellings. Assumes 4% of apartments remain vacant.

Based on Table 10, the Planning Proposal is forecast to provide 187 jobs on the Subject Site after full development. These are jobs in full, part-time and casual positions. On this basis the Planning Proposal would provide 51 more jobs than the current use of the site.

If the current land use continued the combined total of 136 workers' remunerations under the current zoning would be approximately $8.4 million assuming an annual average wage of $61,920 in 2014-15 – sourced from IBISWorld Market Research for 'Tea, Coffee and Other Food Manufacturing Australia'[9].

Total workers' remunerations under the Planning Proposal is a little lower than the base case (approximately $7.1 million) as shown in the Table below, but with the creation of an additional 51 jobs. This is because the change in nature of the work from largely full time manufacturing jobs to a combination of full and part time jobs in lower paid retail services.

Table 10: Potential salary contribution

Land Use	No. of Workers	Average Annual Wage	Total Wages ($m)
Retail	136	$29,000	$3.94
Work at Home	51	$62,000	$3.16
TOTAL	**187**	**$38,000**	**$7.11**

Source: ABS Average Weekly Earnings (Cat 6302) and IBIS World Reports.

5.2 Gross Value Added

Gross value added of an industry refers to the value of outputs less the costs of inputs. It also measures the contribution that the industry makes to the country's wealth or gross domestic product (GDP).

We estimate the GVA from the existing industrial uses on the site to be $14.4m every year based on $106,176 per worker[10].

We estimate the value add from the Planning Proposal to be in the order of $8.2m every year as shown in the below table.

Table 11: Gross value added from the various land uses on site

Land Use	No. Of Workers	IVA/ Worker	Gross Value Added ($m)
Retail	136	$42,800	$5.82
Work at Home	51	$77,500	$3.95
TOTAL	187	$52,264	$9.77

Source: * IBISWorld Industry Reports and HillPDA Estimate

Therefore the Planning Proposal would provide a lower annual gross value added or contribution to the economy than under its existing use despite the increase in number of workers. This is not surprising because the existing use is a manufacturing business and manufacturing generally has higher levels of value added than retail and personal services.

---

[9] Sources: IBIS World Reports and HillPDA

[10] Sources: IBIS World Reports

5.3 Economic Impacts from Construction

The following assesses the economic implications of rezoning the Subject Site to allow for a mixed use development. Given that the Planning Proposal is at a concept stage, a high level assessment of potential economic benefits has been undertaken.

The construction industry is a significant component of the economy accounting for 7.3% of Gross Domestic Product (GDP) and employing almost one million workers across Australia[11]. The industry has strong linkages with other sectors, so its impacts on the economy go further than the direct contribution of construction. Multipliers refer to the level of additional economic activity generated by a source industry.

There are two types of multipliers:

- Production induced: which is made up of:
  - first round effect: which is all outputs and employment required to produce the inputs for construction
  - an industrial support effect: which is the induced extra output and employment from all industries to support the production of the first round effect
- Consumption induced: which relates to the demand for additional goods and services due to increased spending by the wage and salary earners across all industries arising from employment.

Table 12: Estimated economic multipliers

	Direct Effects	Production induced effects		Consumption Induced Effects	Total
		First round effects	Industrial support effects		
Output ($/m)	1.000	0.620	0.647	0.945	3.309
Output ($million)	310.9	192.8	201.1	293.9	1,028.6

Source: ABS Australian National Accounts: Input-Output Tables 2014-15 (ABS Pub: 5209.0)

With an estimated cost of $311m construction would generate a further $394m of activity in production induced effects and $294m in consumption induced effects. Total economic activity generated by construction would be $1.03bn.

5.4 Construction Employment

HillPDA calculates that every million dollars of construction generates 2.16 full time positions over 12 months directly in construction on site[12]. Based on the estimated cost of $311m, 673 job years[13] would be directly generated.

---

[11] IBIS World Construction Industry Report 2015

[12] Source: Hill PDA and ABS Australian National Accounts: Input-Output Tables 2014-15 (ABS Pub: 5209.0)

[13] Note: One job year equals one full-time job for one full year

Table 13: Estimated Job Multipliers

	Direct Effects	Production induced effects		Consumption Induced Effects	Total
		First round effects	Industrial support effects		
Multipliers	1	0.737	0.818	1.422	3.978
Job Years per $million	2.165	1.596	1.772	3.079	8.612
Total Job Years Generated	673	496	551	957	2,677

Source: ABS Australian National Accounts: Input-Output Tables 2014-15 (ABS Pub: 5209.0)

From the ABS 2014-15 ANA Input-Output tables Hill PDA has calculated the multipliers for first round, industrial support and consumption induced effects of 0.74, 0.82 and 1.42 respectively for every job year in direct construction. Including the multiplier impacts the proposed development would therefore have potential to generate 2,677 job years during the period of construction.

Note that the multiplier effects are national, and not necessarily local. The ABS notes that "Care is needed in interpreting multiplier effects; their theoretical basis produces estimates which somewhat overstate the actual impacts in terms of output and employment. Nevertheless, the estimates illustrate the high flow-on effects of construction activity to the rest of the economy. Clearly, through its multipliers, construction activity has a high impact on the economy." Nevertheless, multipliers represent a significant additional economic benefits associated with this development to the economy.

5.5 Other Economic Impacts

5.5.1 Expenditure from Residents

The Planning Proposal would provide 532 new residential dwellings on site. Assuming 96% of the apartments are occupied and an average occupancy rate of 2.3 persons per apartment[14] we estimate 1,175 permanent residents on the Subject Site.

These residents would generate demand for local retail and commercial goods and services. With an assumed average retail spend of $14,550 per capita[15] the residents would spend around $17.1m every year on retail goods and services.

The retail centre will include speciality shops and restaurants as well as convenience shopping. HillPDA's retail assessment[16] demonstrates that the majority of expenditure generated by onsite residents would be would be captured by the larger centres such as Concord (Majors Bay Road), Burwood and other existing centres. The Subject Site's retail offering will however attract some of the convenience shopping demand previously captured by these neighbouring centres for residents within a walking catchment. It will provide some attraction as a 'retail/restaurant destination', reflecting its unique offering with the heritage building, waterfront access, through site link and the public amenity provided on site.

---

[14] Calculated from known occupancy rates by dwelling type by bedroom number in Canada Bay LGA (ABS Census 2016)

[15] Average expenditure in Concord suburb. Source: Pitney Bowes Anysite ($2017).

[16] HillPDA, Concord Site Retail Demand Assessment (March 2016)

5.5.2 Expenditure from Workers

A recent survey[17] found that Sydney CBD workers spend an average of $230 a week or $11,000 per annum on retail goods and services in the CBD localities. In smaller centres average spend is considerably lower due to the lack of retail offer. For the purpose of the assessment HillPDA has applied a more conservative weekly expenditure of $80 per week per employee which equates to an annual spend of around $3,700. With 91 non-resident workers on site this amounts to around $335,000 per annum.

5.5.3 Investment Stimulus

Where a significant property investment decision has been made it is generally viewed as a strong positive commitment for the local area. Such an investment can in turn stimulate and attract further investment. The direct investment in the Subject Site would support a wide range of economic multipliers as outlined above which would in turn support investment in associated industries. It would also raise the profile of Concord to potential investors.

The proposed development would create additional business opportunities in this locality associated with future residents and the commercial and retail uses on site. It would increase the profile of this area and in so doing increase the financial feasibility of mixed use development, potentially acting as a catalyst on surrounding sites.

5.6 Public Benefits

In addition to providing 475 dwelling units, the Planning Proposal will provide substantial public benefits in terms of open space, public transport services and affordable housing. The total value of the public benefits components amount to $51.3m as quantified in the table immediately below.

Table 14: Estimate of Value of Public Domain

Public Benefit	Sqm	Rate	TOTAL
AIR RIGHTS OVER PUBLIC OPEN SPACE*	7,400	$3,500 /sqm	25,900,000
D+C OF PUBLIC SPACES (say)	7,400	$500 /sqm	3,700,000
10% AFFORDABLE HOUSING UNITS**	5,207	$3,611 /sqm	18,802,000
BUS SERVICE***			840,000
FERRY SERVICE***			2,100,000
TOTAL VALUE OF PUBLIC BENEFITS			51,342,000

* The equivalent rate for the market value of development rights ($/sqm GFA) adopted by Burwood Council under its VPA policy evident by several development site sales in 2017-18

** Assumes 10% of the total residential GFA and a benefit of 25% of the assumed sales rate per net saleable area of $14,444/sqm (or equivalent in monetary terms).

*** This is the capped level of underwriting by Freshfood for three years of service

Source: Freshfood and HillPDA

5.6.1 Bus Service

A public benefit is the proposed community bus loop operating hourly and connecting the site with both Burwood and Strathfield stations via Concord hospital. It is proposed that the developer will fund the operation

---

[17] 2013 National Office Workers Survey, Urbis (2013)

of the bus route at an annual estimated cost of $280,000 (excludes fleet and depot costs) for a period of three years.

5.6.2 Ferry Service

The above estimate also includes the cost of Freshfoods underwriting a ferry service (14 ferry trips to Barrangaroo every day, 7 days a week) at $700,000 over three years, commencing immediately following building completion of the first residential stage.

5.6.3 Public Open Space

The development proposes significant visual and amenity improvements to the public domain by way of renewed urban form, increased connectivity including open spaces and a through site link, and associated landscaping works. These improvements would enhance the appeal of the site for a broad range of visitors increasing the scale of its trade area.

The public open space area in the above table measured at 7,400sqm relates only to the foreshore park and public plaza area. It excludes the area of internal roads or laneways and the areas of private open spaces.

The public spaces, through site link (between the waterfront and Burwood Road) and the public transport services are public benefits being delivered by the planning proposal. These items will benefit a much wider community than just the residents on the subject site. If the site was already appropriately zoned for residential apartments then an application could be submitted for a residential only development with no provision of public spaces, no public access through the site and no underwriting of additional public transport services. For these reasons the above items should be treated as public benefits over and above normal development costs.

5.6.4 Affordable Housing

For the purpose of the assessment it has been assumed that 10% of the apartments are sold at 75% of market value. The benefit to affordable housing is the 25% discount on average end sale value ($14,444 per square metre of internal saleable area).

There is flexibility around the implementation. Hence the contribution could be made by monetary payment or other method to the equivalent value.

5.7 Summary and Implications

The below table summarises the economic benefits of retaining the current uses in comparison to the development of the Subject Site in accordance with the Planning Proposal.

Table 15: Summary of the Economic Impacts of Planning Proposal

	Current Use	Planning Proposal
Total Jobs Generated	136	187
Total Salaries Generated ($m)	$8.4m	$7.1m
Gross Value Added ($m to GDP)	$14.4m	$9.8m
Construction Costs ($m)		$311m
Total Economic activity from construction*		$1.0bn
Jobs Years in Construction**		2,677

* Assumes expansion of activity to the site's feasible capacity (Canada Bay LPS)

** Direct and Indirect Job Years, where a Job Year refers to a single individual who is employed for one year

The Planning Proposal would provide more jobs onsite than the base case (retained for existing uses with potential expansion to maximise floorspace and employment capacity) and a higher level of industry value added than an expanded food and beverage manufacturing operation.

The Planning Proposal would create an additional 10 ongoing jobs. It would generate $1.0 billion in activity and create 2,677 job years during the construction phase of the development. The base case of continued industrial use would also create benefits during its expansion phase, but these are comparatively small compared to those under the Planning Proposal.

HillPDA

Disclaimer

1. This report is for the confidential use only of the party to whom it is addressed ("Client") for the specific purposes to which it refers and has been based on, and takes into account, the Client's specific instructions. It is not intended to be relied on by any third party who, subject to paragraph 3, must make their own enquiries in relation to the issues with which this report deals.
2. HillPDA makes no representations as to the appropriateness, accuracy or completeness of this report for the purpose of any party other than the Client ("Recipient"). HillPDA disclaims all liability to any Recipient for any loss, error or other consequence which may arise as a result of the Recipient acting, relying upon or using the whole or part of this report's contents.
3. This report must not be disclosed to any Recipient or reproduced in whole or in part, for any purpose not directly connected to the project for which HillPDA was engaged to prepare the report, without the prior written approval of HillPDA. In the event that a Recipient wishes to rely upon this report, the Recipient must inform HillPDA who may, in its sole discretion and on specified terms, provide its consent.
4. This report and its attached appendices are based on estimates, assumptions and information provided by the Client or sourced and referenced from external sources by HillPDA. While we endeavour to check these estimates, assumptions and information, no warranty is given in relation to their reliability, feasibility, accuracy or reasonableness. HillPDA presents these estimates and assumptions as a basis for the Client's interpretation and analysis. With respect to forecasts, HillPDA does not present them as results that will actually be achieved. HillPDA relies upon the interpretation of the Client to judge for itself the likelihood of whether these projections can be achieved or not.
5. Due care has been taken to prepare the attached financial models from available information at the time of writing, however no responsibility can be or is accepted for errors or inaccuracies that may have occurred either with the programming or the resultant financial projections and their assumptions.
6. This report does not constitute a valuation of any property or interest in property. In preparing this report HillPDA has relied upon information concerning the subject property and/or proposed development provided by the Client and HillPDA has not independently verified this information except where noted in this report.
7. In relation to any valuation which is undertaken for a Managed Investment Scheme (as defined by the Managed Investments Act 1998) or for any lender that is subject to the provisions of the Managed Investments Act, the following clause applies:

   This valuation is prepared on the assumption that the lender or addressee as referred to in this valuation report (and no other) may rely on the valuation for mortgage finance purposes and the lender has complied with its own lending guidelines as well as prudent finance industry lending practices, and has considered all prudent aspects of credit risk for any potential borrower, including the borrower's ability to service and repay any mortgage loan. Further, the valuation is prepared on the assumption that the lender is providing mortgage financing at a conservative and prudent loan to value ratio.
8. HillPDA makes no representations or warranties of any kind, about the accuracy, reliability, completeness, suitability or fitness in relation to maps generated by HillPDA or contained within this report.

Liability limited by a scheme approved under the Professional Standards Legislation

SYDNEY

Level 3, 234 George Street
Sydney NSW 2000
GPO Box 2748 Sydney NSW 2001
t: +61 2 9252 8777
f: +61 2 9252 6077
e: sydney@hillpda.com

MELBOURNE

Suite 114, 838 Collins Street
Docklands VIC 3008
t: +61 3 9629 1842
f: +61 3 9629 6315
e: melbourne@hillpda.com

WWW.HILLPDA.COM

HillPDA
CONSULTING

CONCORD FRESHFOOD PROJECT
Retail Demand Assessment

Prepared for Colliers

January 2019

Contents

Executive Summary 5

1.0 Introduction 7

- 1.1.1 The Subject Site 7
- 1.1.2 Area Overview 8
- 1.1.3 The Study Purpose 8
- 1.1.4 Planning Proposal 8

2.0 Demand for retail space 10

- 2.1 Expenditure from Residents in the Locality 10
  - 2.1.1 Socio-demographics of Residents 10
  - 2.1.2 Population Growth 14
  - 2.1.3 Expenditure from residents 15
- 2.2 Expenditure from Visitors 16
- 2.3 Expenditure from Workers 16
- 2.4 Total Potential Retail Sales and Demand for Retail Space 16
- 2.5 Examples of Neighbourhood Centres 17
- 2.6 Examples of Heritage Themed Centres 18
  - 2.6.1 Harold Park 18
  - 2.6.2 Danks Street 19
  - 2.6.3 The Grounds Alexandria 19
  - 2.6.4 Cammeray 20
  - 2.6.5 Bakehouse Quarter 20
  - 2.6.6 Case study implications 21
- 2.7 Implications for Subject Site 21
- 2.8 Suggested Retail Mix 21

3.0 Retail Impact assessment 24

- 3.1 Retail Centres in the Locality 24
  - 3.1.1 Burwood 24
  - 3.1.2 Five Dock 25
  - 3.1.3 Concord (Majors Bay Road) 25
  - 3.1.4 North Strathfield 25
  - 3.1.5 Neighbourhood Centres 25
- 3.2 Proposed Mix and Turnover 26
- 3.3 Redirection of Turnover from Existing Centres 26
- 3.4 Other Economic Benefits 28
- 3.5 Conclusion 28

Tables

Table 1: Forecast residents within the 800m walkable catchment 14
Table 2: Expenditure per capita ($2017) 15
Table 3: Forecast expenditure generated by Residents ($2017m) 15
Table 4: Demand for retail space on the Subject Site 17
Table 5: Estimated retail turnover in 2024 ($2017) 26
Table 6: Retail Impact Assessment 27

Figures

Figure 1-1: Aerial image of Subject Site 7
Figure 1-2: Site zoning 8
Figure 2-1: Likely walkable catchment 10
Figure 2-2: Population by Age Cohort 11
Figure 2-3: Income bands 12
Figure 2-4: Dwelling structure 12
Figure 2-5: Tenure type 13
Figure 2-6: Number of vehicles per dwelling 13
Figure 2-7: Household structure 14
Figure 3-1: Retail centres in the locality 25

Quality Assurance

Report Contacts

Adrian Hack
Principal, Urban and Retail Economics
M. Land Econ. B.Town Planning (Hons). MPIA
Adrian.Hack@hillpda.com

Quality Control

This document is for discussion purposes only unless signed and dated by a Principal of HillPDA.

Reviewer

Signature		Dated	22/01/19

Report Details

Job Number	C19051
Version	Final
File Name	Concord Site Retail Demand Assessment 220119F
Date Printed	January 2019

EXECUTIVE SUMMARY

The owner of the 3.93 hectare coffee factory at 160 Burwood Road, Concord will decommission the factory and is seeking to rezone the land to enable redevelopment for mixed uses.

This report summarises the findings of the retails needs and impact assessment of the proposal.

Within a walkable catchment of 800m there are around 3,300 residents and this is forecast to increase to around 4,000 by 2031. Redevelopment of the subject site will add a further 1,175 residents. Expenditure on retail goods and services generated by these residents will increase from $50m in 2017 to $84m in 2031 ($2017).

The provision of a local centre on the subject site of 3,500sqm GFA (assuming 2,800sqm leasable retail space and say 500 to 600sqm non-retail commercial GLA) is expected to achieve total retail sales of $18.7m by 2024. Around 75% of its trade is expected to come from residents in the immediate area. There is the opportunity to capture day trippers with the "theming" of retail space in the heritage building and facing the waterfront. Examples of retail spaces themed in heritage buildings include Harold Park, Danks Street Waterloo, The Grounds Alexandria, Stockland Cammeray and Bakehouse Quarter North Strathfield.

The strongest immediate impacts of the proposal are expected to be experienced by Concord Town Centre (Majors Bay Road) and on Cabarita and Bray Roads neighbourhood clusters. These centres are likely to experience around 7% loss in trade. This is considered to be a low to moderate impact. The impacts on all other centres are expected to be insignificant at less than 5% loss in trade.

Over time these impacts will diminish. Canada Bay west (Concord SLA) is forecast to achieve population growth of more than 1% every year over the next decade. The suburb of Concord is expected to be around 1.3% per annum – 26% over the next 18 years. As a result, by 2024, all existing centres in the locality are expected to trade at 7% or more above their 2017 levels with or without redevelopment under the planning proposal. Hence the viability of any existing centre will not be threatened.

Following full development there will be a sufficient population (around 5,000) within a walkable catchment to support a small village centre as proposed. This will have benefits of fewer car trips and reduced reliance on private motor vehicle trips.

Without the retail space the 5,000 people that live on site and within a walkable distance will have no retail facilities for top-up food and grocery shopping. Without the retail space the proposal itself will be a residential only development rather than a mixed use development. Apart from fewer jobs on site it would lack activation to both Burwood Road and the waterfront.

INTRODUCTION

1.0 INTRODUCTION

HillPDA was commissioned by Colliers on behalf of the site owners, FreshFood Pty Australia, to undertake a retail needs assessment (hereafter referred to as 'the Study') of a planning proposal for the rezoning of land known as the FreshFood site (also commonly known as the Bushells Coffee Site). Hereafter it is referred to as the subject site.

1.1.1 The Subject Site

The subject site has an area of 3.93ha and is located at 160 Burwood Road, Concord (see Aerial figure below). It consists of the following lots: Lot 2, DP230294, Lot 398, DP752023, Lot 399, DP752023, Lot 5, DP129325.

Figure 1-1: Aerial image of Subject Site

Source: SIX Maps

The site area is currently zoned IN1 General Industrial – see Figure 2. The site has a legal frontage to the Parramatta River (Exile Bay). Access along the foreshore is currently available to the public however the remainder of the site is securely fenced. The site has an approximate 170m frontage to Burwood Road on its southern boundary.

Figure 1-2: Site zoning

Source: NSW Planning Portal

1.1.2 Area Overview

The subject site is around 1.5km from the Majors Bay Road shops, 2.5km from Burwood Station and 1km from Parramatta Road (A4). Sydney CBD is 12km from the site via Parramatta Road, which is a 45 minute journey by bus or 15 minutes by train from Burwood Station. The site is within an easy drive (6km) of Sydney Olympic Park and Rhodes Waterside Shopping Centre. Cycling times to these venues is around 15 minutes.

The subject site is also distinctly positioned close to education and recreation facilities such as the Concord Public School, Concord High School, Massey Park Public Golf Club, Barnwell Public Golf Club, Bayview Park, Jesse Stewart Reserve, Greenlees Park, Rothwell Park and the Cintra Park tennis courts.

1.1.3 The Study Purpose

It is understood that FreshFood Services Pty Ltd is seeking the rezoning of the subject site from its current zoning of IN1 General Industrial under the Canada Bay Local Environmental Plan (LEP) 2013, to a zoning that would allow a mixed use development.

The purpose of this Study is to provide an assessment of the likely demand for retail services on the site including the amount of space and the type of offering or tenancy mix.

This study also considers the retail trading impacts on existing centres in the locality both at a point in time and over time having regard to growth in wider trade area.

1.1.4 Planning Proposal

The Planning Proposal would facilitate a mixed use development comprising medium to high density residential, retail, commercial and community uses.

The proposed development provides:

- 535 residential dwellings
- 53 (10%) for affordable housing
- Up to 3,500sqm of retail space
- 15,700sqm of public open space.

DEMAND FOR RETAIL SPACE

2.0 DEMAND FOR RETAIL SPACE

There are three sources of expenditure generating demand for retail space on the subject site being local residents, local workers and visitors or day trippers. Each one of these sources is examined below.

2.1 Expenditure from Residents in the Locality

There are around 3,300 residents within a walkable catchment (or immediate trade area) of the subject site defined as being within a distance of around 800m. This catchment extends to Tripod Street and Lindfield Avenue to the west, between Edith Avenue and Corby Avenue to the southwest and includes around 350 residents living just south of Lyons Road West between Cintra Park Netball courts and Barnwell Park Golf Course.

Figure 2-1: Likely walkable catchment

There are a further 550 residents that live just north of the walkable catchment on the Cabarita Peninsula between Exile Bay and France Bay. Whilst the walking distance is slightly more than 800m it is an attractive walk along the foreshore of Exile Bay pass the golf course and there is a lack of retail offer on the Cabarita Peninsula itself.

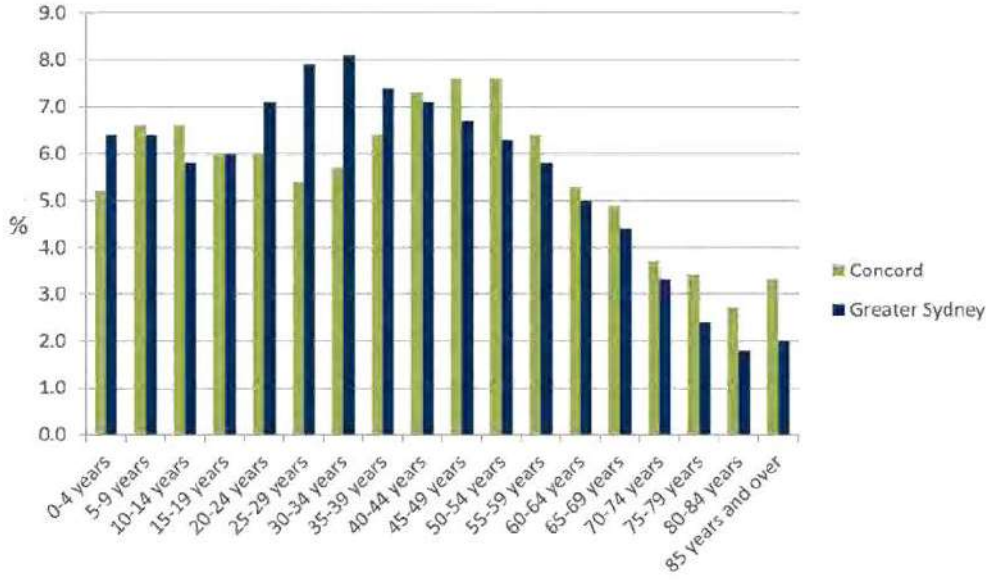
2.1.1 Socio-demographics of Residents

Below is a summary of the socio-demographic character of the area. Understanding the socio-demographics of a trade area (or potential trade area) is important as it affects the demand for retail and commercial services and the type of retail offer. Most importantly Household expenditure surveys have consistently shown a strong positive correlation between income and consumption levels and household consumption is directly related to the level of demand for retail space. The study area for this analysis is the State Suburb of Concord as defined by the Australian Bureau of Statistics in the Census of Population and Housing 2016.

Concord had an above average representation of people born in Australia at 62% of the population compared to Greater Sydney at 57%. The most common ancestries in Concord were Italian 17.7%, English 14.7%, Australian 14.0%, Chinese 9.5% and Irish 7.4%. This represents a marked difference from the most common ancestries in Greater Sydney, which were English 19.4%, Australian 18.1%, Chinese 7.8%, Irish 6.6% and Scottish 4.9%.

The chart below shows an overrepresentation of older persons living in the walkable catchment and an underrepresentation of young to middle aged adults. 17.9% of residents were over 65 years old with a median age of 41 in 2016 compared to 13.9% and 36 respectively Australia wide.

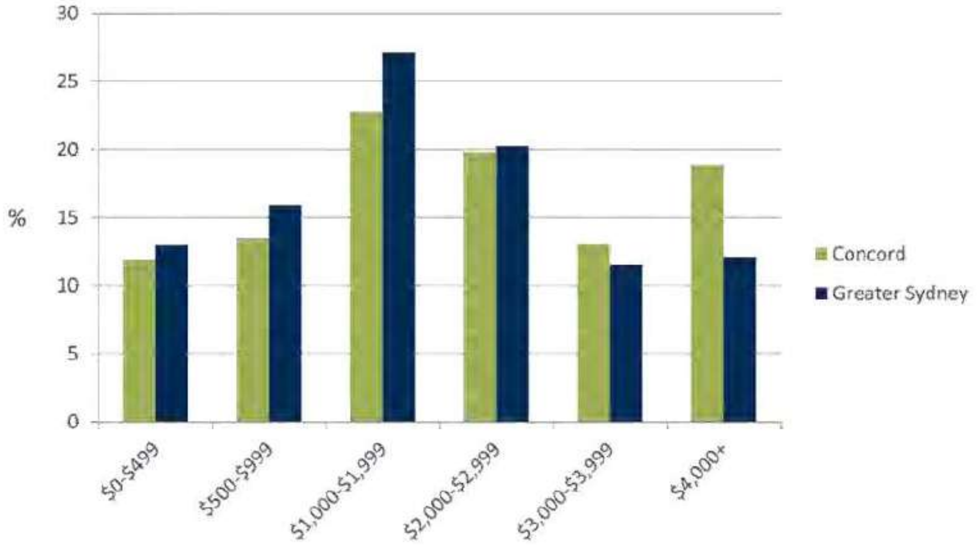
Figure 2-2: Population by Age Cohort



Source: ABSCensus 2016

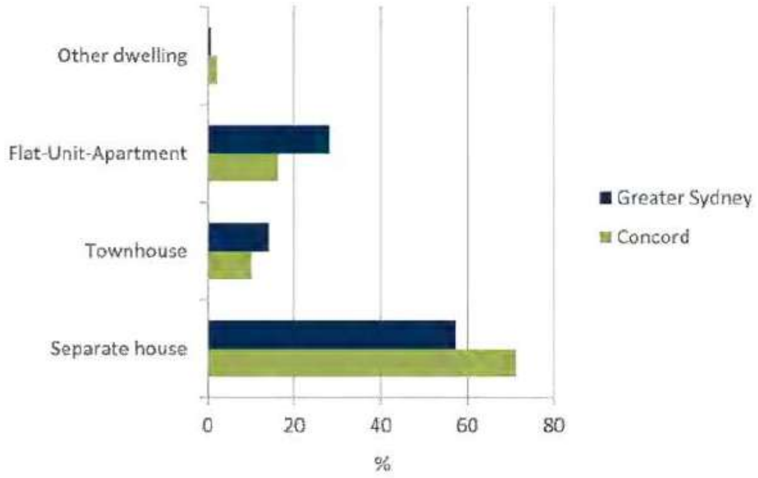
Most importantly, local residents in the walkable catchment have higher income levels compared to Greater Sydney. In 2016, median household income was $2,078 per week in Concord and $1,750 in Greater Sydney. 31.9% of households had an income level over $3,000 per week compared to 23.6% for Greater Sydney. Higher income levels results in more expenditure on retail goods and services. Income levels are shown in Figure 2-3 below.

Figure 2-3: Income bands



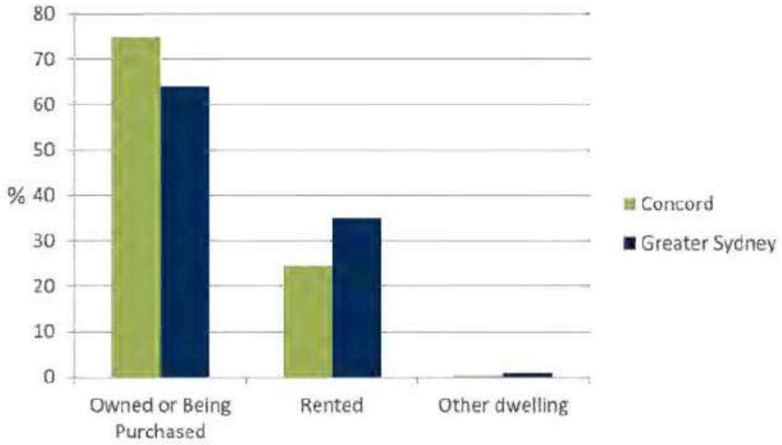
Concord featured a higher proportion of separate houses than Greater Sydney (71.2% and 57.2% respectively) and a lower proportion of Flat-unit-apartment type dwellings (16.4% and 28.2% respectively). The mix of dwelling structures in Concord and Greater Sydney is outlined in **Error! Not a valid bookmark self-reference.** below

Figure 2-4: Dwelling structure



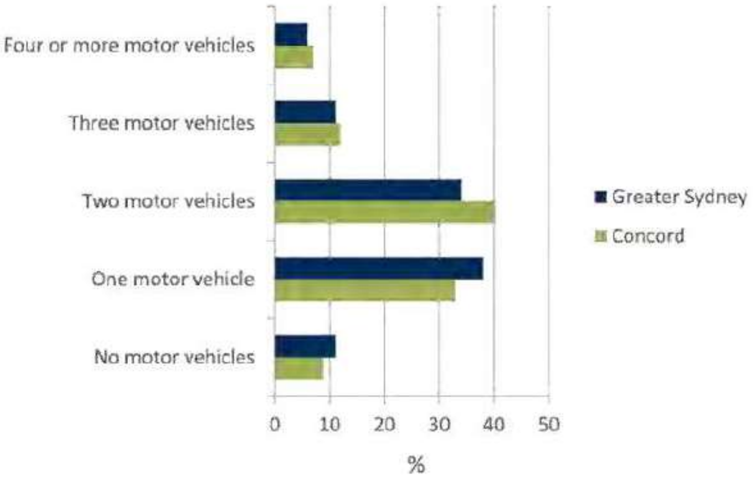
The census revealed that Concord had a higher level of homes owned or being purchased at 75% compared to 64.1% of homes in Greater Sydney. Tenure type is shown in Figure 2-5 below.

Figure 2-5: Tenure type



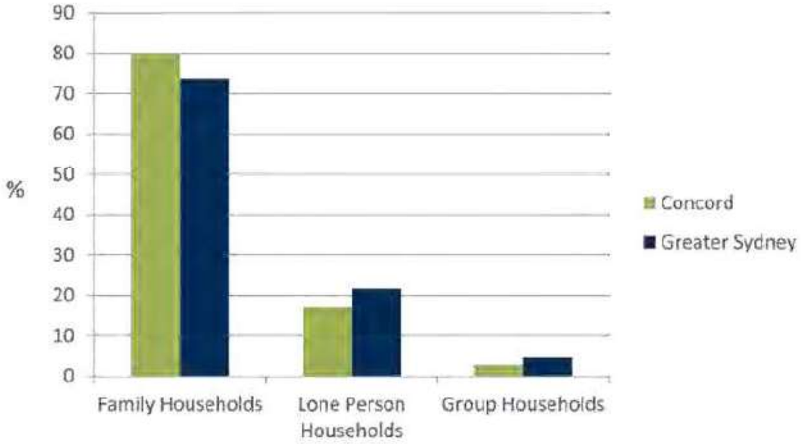
Concord featured higher levels of car ownership than that of Greater Sydney. The proportion of houses with two, three, four or more vehicles was higher in Concord and households with one vehicle or no vehicle at all was higher in Greater Sydney. The percentage breakdown of vehicles per dwelling is shown in Figure 2-6 below.

Figure 2-6: Number of vehicles per dwelling



Concord featured a higher proportion of family households than Greater Sydney at 80% and 73.7% respectively. In Concord, 17.1% of households were lone person households and 2.8% were group households. In Greater Sydney, 21.6% and 4.7% of households respectively were lone person and group households.

Figure 2-7: Household structure



In summary, the suburb of Concord has a high proportion of family households on high levels of income that own their own dwelling outright. These types of households have above average levels of demand for retail goods and services. In particular they demand high quality specialty food stores and quality restaurants.

2.1.2 Population Growth

Population in the walkable catchment in 2016 was approximately 3,350 based on ABS Census and PitneyBowes Anysite 2016. There are some variations in population forecast ranging from almost zero growth in the immediate area to 2.0% per annum as forecast by Pitney Bowes Anysite at SA1 level. At a suburb level Pitney Bowes Anysite is consistent with Forecast.ID to 2026. These forecasts do not take into consideration the subject planning proposal itself. For the purpose of the demand modelling we have adopted a rate of 1.0% per annum and added the population from the planning proposal.

Average household size in an occupied apartment in Canada Bay LGA is 2.2[1]. For total dwellings it is a little higher at 2.4. Although strata titled the average internal area of the apartments on the subject site will be around 100sqm – larger than average at around the size of a 3-bedroom unit. Hence we would expect a slightly higher average household size and we have assumed 2.3.

Based on an average occupancy of 2.3 persons per dwelling and assuming 96% occupancy we forecast the population on the subject site to reach residents. For the purpose of the forecast we have assumed that development will be 70% occupied by 2026. The forecast of population in the trade area is shown in the table below.

Table 1: Forecast residents within the 800m walkable catchment

	2016	2021	2026	2031
Forecast residents in Trade Area	3,350	3,520	3,700	3,890
Residents on the subject site			850	1,175
Total Residents in Trade Area	**3,350**	**3,520**	**4,550**	**5,065**

Source: Pitney Bowes Anysite 2017 and TPA 2018

---

[1] Average occupancy rate of apartments only in the Canada Bay LGA 2016 (ABS Census)

2.1.3 Expenditure from residents

Expenditure per capita generated by trade area residents is provided in the table below.

Table 2: Expenditure per capita ($2017)

YEAR	2016	2021	2026	2031
Supermarkets & grocery stores	4,432	4,612	4,800	4,995
Take-away liquor stores	424	442	459	478
Specialty food stores	521	542	564	587
Fast-food stores	817	850	884	920
Restaurants, hotels and clubs*	1,580	1,644	1,711	1,781
Department stores	1,037	1,079	1,123	1,169
Apparel stores	1,335	1,389	1,445	1,504
Bulky goods stores	2,106	2,191	2,280	2,373
Other personal & household goods	1,972	2,052	2,135	2,222
Selected personal services**	558	580	604	629
Total retailing	**14,781**	**15,382**	**16,007**	**16,658**

Source: Pitney Bowes Anysite 2016 and HillPDA
* Refers to drinking and dining areas only
** As per ANZSIC (includes hair and beauty, optical dispensing, clothing alterations and shoe repairs, key cutting, video hiring and photo processing)

The above forecast allows for 0.8% per annum real growth in retail spend per capita based on the long term trend since 1986[2].

The ABS Cat No. 8624.0 1998-99 provides a cross tabulation of expenditure by commodity type by retail sales by store type. HillPDA has recalibrated the cross tabulation data to account for retail trends since 1998-99 and to ensure that the results closely matches total retail sales by store type in the national accounts. Multiplying the results by forecast expenditure provides the following results.

Table 3: Forecast expenditure generated by Residents ($2017m)

YEAR	2016	2021	2026	2031
Supermarkets & grocery stores	14.8	16.2	21.8	25.3
Take-away liquor stores	1.4	1.6	2.1	2.4
Specialty food stores	1.7	1.9	2.6	3.0
Fast-food stores	2.7	3.0	4.0	4.7
Restaurants, hotels and clubs	5.3	5.8	7.8	9.0
Department stores	3.5	3.8	5.1	5.9
Apparel stores	4.5	4.9	6.6	7.6
Bulky goods stores	7.1	7.7	10.4	12.0
Other personal & household goods	6.6	7.2	9.7	11.3
Selected personal services	1.9	2.0	2.7	3.2
Total retailing	**49.5**	**54.1**	**72.8**	**84.4**

---

[2] HillPDA calculation from ABS Population, CPI and Retail Sales for Australia Total

The above table shows a significant level of growth (80%) in retail expenditure generated by local residents from $50m in 2017 to $84m in 2031. Of course any proposed retail space on the subject site cannot expect to capture total expenditure as a high proportion of it will be captured by larger higher order centres. Large full line supermarkets generally require a turnover of $30m or more. Given that the supermarket will be restricted to 1,000sqm in size its role will be different from the large full line supermarkets. It will be a metro style supermarket providing a "convenience" role. It will be a "small trolley and/or basket" supermarket for regular shopping rather than a large trolley supermarket for weekly or fortnightly shopping. A large proportion of trade is expected to come from local residents that walk to the store rather than take their car.

For a supermarket of around 600sqm to 1,000sqm we would expect that it would capture around 30% of the local area's expenditure in supermarkets and grocery stores. The subject site also has potential to capture a similar proportion of local resident expenditure in specialty foods, food services, liquor and personal services.

2.2 Expenditure from Visitors

In addition to residents within the walkable catchment we would expect some expenditure to be captured from residents outside the walkable catchment. As mentioned above there are a further 550 residents on the Cabarita peninsula immediately north of Exile Bay that occasionally would walk the 1km distance given the pleasant amenity between the golf course and the water edge. There is also further opportunity to capture expenditure from cyclists using the foreshore route. We would expect a further 20% increase on the above figures to account for expenditure from beyond the walkable catchment. Furthermore a restaurant or 2 or 3 restaurants that earn a good reputation, particularly when themed at the waterfront, can attract patrons from a much wider area – even beyond the LGA boundary.

2.3 Expenditure from Workers

Some expenditure can also be captured by workers on site. A recent survey found that Sydney CBD workers spend an average of $230 a week or $11,000 per annum on retail goods and services in the CBD localities[3]. In smaller centres average spend is considerably lower due to the lack of retail offer. For the purpose of the assessment HillPDA has applied a more conservative weekly expenditure of $80 per week per employee which equates to an annual spend of around $3,700. With 91 non-resident workers on site this amounts to an additional $335,000 per annum.

2.4 Total Potential Retail Sales and Demand for Retail Space

Total potential retail sales are derived from applying target capture rates to expenditure generated by trade area residents. Demand for retail space is calculated from dividing potential retail sales by industry benchmark retail turnover density (RTD) rates ($/sqm). This is shown in the table below.

---

[3] 2013 National Office Workers Survey, Urbis (2013)

Table 4: Demand for retail space on the Subject Site

Store Type	Capture from Trade Area Residents	RTD ($/sqm)*	2021	2026	2031
Supermarkets & grocery stores	30%	9,500	651	909	1017
Take-away liquor stores	30%	10,000	59	83	93
Specialty food stores	30%	7,250	100	140	157
Fast-food stores	25%	7,250	131	183	205
Restaurants, hotels and clubs	25%	5,000	367	513	574
Department stores	0%	3,500	0	0	0
Apparel stores	0%	6,000	0	0	0
Bulky goods stores	0%	3,500	0	0	0
Other personal & household	20%	5,000	366	483	548
Selected personal services	30%	4,000	194	272	304
Non-retail services ** (say 16% of the above)			355	497	556
TOTAL	19%	6,926	2,241	2,955	3,355

Source: Shopping Centre News, PCA, Urbis Retail Averages, HillPDA and various consultancy studies
* Assumes to increase at 0.4% per annum from 2016 in line with historic trends.
** Includes non-retail commercial occupiers of shop front spaces such as real estate agents, travel agents and financial institutions.
Totals assumes 20% of the turnover is derived from beyond the trade area and a further $335,000 per annum from non-resident workers on site.

The above table shows that residents within the walkable catchment, visitors and workers on site could support around 3,300sqm of leaseable shop front retail space.

2.5 Examples of Neighbourhood Centres

We tested the robustness of the above estimates by benchmarking it to other known neighbourhood centres (generally centres below 3,000sqm in size with no supermarket or a small format supermarket less than 1,000sqm). Examples include:

- Breakfast Point has a 2,500sqm centre anchored by a 1,400sqm Supa-IGA serving a population of around 4,500 to 5,000 people
- North Epping has a 1,500sqm shopping centre including a 250sqm supermarket serving a trade area of 4,400 people
- East Killara has a 1,200sqm shopping centre comprising 9 shops with 300sqm supermarket serving a population of 2,900
- North Turramurra has 2,500sqm of retail space anchored by a 500sqm supermarket for a trade area of 4,000 people
- West Pymble has 2,000sqm comprising 22 shops anchored by a 300sqm supermarket serving a trade area of 5,000 people.

The above examples are centres that are generally positioned in the centre of their respective trade areas and have well defined trade areas (suburbs) surrounded by arterial roads and bushland. These centres have all performed sustainably over the past couple of decades suggesting that a centre of say 3,000sqm for the subject site is an appropriate size.

Additional retail space could be provided on the subject site but this implies that it will draw other expenditure from outside the immediate area. This is achievable if the offer is such that it becomes a destination. Additional sources are explored in the following sections.

2.6 Examples of Heritage Themed Centres

The subject site provides a unique opportunity combining quasi-heritage industrial architecture with waterfront amenity. Below are some case studies of retail centres that offer some insights into what is achievable on the subject site. The case studies also allow the ingredients to successful village centres to be explored and lessons learned applied to the Subject Site.

2.6.1 Harold Park

Harold Park is a 5 stage development being undertaken by Mirvac on the former Harold Park Raceway, Glebe. The concept plan for Harold Park comprises approximately 1,250 residential dwellings to be a mixture of 1, 2 and 3 bed properties and terraces and a further 50 affordable housing dwellings[4]. A retail centre of 5,920sqm gross lettable area inclusive of a supermarket has just been completed in the former Rozelle Tram Sheds which are heritage listed.

The ultimate retail mix of the centre based on the development application comprises:

- 2,656sqm supermarket
- 500sqm gymnasium
- 2,720sqm of convenience focused retail
- A further 500sqm community facility.

The former Rozelle Tram Sheds comprise a split level facility with access to Jubilee Light Rail Station, a supermarket and community uses located on the upper level and market hall style retail with car parking located at the ground level. Similar to Precinct D, a retail centre in this location faces the challenge of activating a split level and laneway focused centre. By incorporating key anchors such as a supermarket, community facilities and gym in strategic locations the proposed layout seeks to pull footfall through the centre in a manner to benefit all businesses and promote commercial viability.

---

[4] Harold Park Tram Sheds Economic Impact Assessment, Hill PDA (2013)

2.6.2 Danks Street

Danks Street is a new centre which has emerged out of residential growth in the surrounding suburb of Waterloo and in particular the adjacent high density Meriton development. No trading data is publically available for this centre but anecdotally we understand that it is trading well.

Retail in the centre is focused on the Danks Street Shopping Plaza which provides 3,642sqm GLA floorspace anchored by Coles (2,642sqm) and 15 specialties (1,220sqm)[5]. A 1,475sqm ALDI foodstore recently opened near the Shopping Plaza and there is a further 2,100sqm of strip retail along Danks Street[6]. The strip retail has built a reputation through a mix of cafés and restaurants, art and furniture galleries as well as a place for artisan handcrafts. It was formerly anchored by Fratelli Fresh and Café Sopra and associated Vicino Casa di Fratelli (kitchenwares). Total retail floorspace in Danks Street is approximately 7,200sqm GLA.

Today Danks Street is an example of the success that retail targeted at the high end cafe/ restaurant market can have in activating a centre. The centre has a good provision of cafes and restaurants which serves a wide catchment area and lead to the centre developing a reputation for dining and eating out which attracted shoppers. There are also a number of organic and other specialty foods, art and craft, furniture and bulky goods stores.

2.6.3 The Grounds Alexandria

"The Grounds" on Huntley Street in Alexandria has a similar storey to Danks Street. It began as a freestanding restaurant but is now supporting other retail uses adjacent due to its popularity with a further broadening of retail uses[7].

Located in a former industrial precinct from the 1920s, The Grounds of Alexandria is a landmark coffee roastery, café and kitchen garden known for its abundance of fresh produce and hands-on experiences. Opened in April 2012 the site hosts a coffee research and testing facility, artisan bakery and luscious open garden of heirloom vegetables, fragrant herbs, fresh fruit and flowers, farm animals and children's play area.

There are plans for further expansion to include a cider room, meat shop, children's cinema and wood-chopping area.

---

[5] NSW/ ACT Shopping Centres Directory, Property Council of Australia (2012/13)
[6] Redfern-Waterloo Retail Needs Assessment, MacroPlanDimasi (2012)
[7] Employment Lands Study, SGS Economics and Planning (2013)

2.6.4 Cammeray

Stockland Cammeray is a purpose built shopping centre catering for the surrounding, affluent residential suburb. It opened for trading in November 2008 and provides 5,700sqm of commercial floorspace in the following components.

Retail Store Type	Floorspace (sqm GLA)[8]
Harris Farm Foodstore	712
11 Specialty stores	2,580
Medical centre	249
Childcare centre	1,550
Dentist	93
Office space	534
Total	5,718

Stockland Cammeray is anchored by a Harris Farm. The other 18 tenancies include 6 café, restaurant and takeaway food tenancies, butcher, patisserie, pharmacy, nail bar, hairdresser, dentist, medical practice and childcare centre.

The demographic of the main trade area served by this development has an average household income which is 40% above the Sydney Metropolitan average.

2.6.5 Bakehouse Quarter

The Bakehouse Quarter is a redevelopment project on the former Arnott's biscuit factory site located along George Street in North Strathfield some 3.5 kilometres from Precinct D. The theme of the project is mixed retail, entertainment and office uses integrated into the historic factory of the site and its buildings along with open space and cobblestoned lanes and streets.

Retail tenants include ALDI, minimart, food markets and specialty stores including pharmacy and newsagent and 14 personal service outlets including hairdressers and fitness centre in addition to about 17 restaurants / bars / cafes. The entertainment offer includes ten-pin bowling, dance studio, amusement centre and laser skirmish. The site also accommodates two childcare centres and an education college. Approximately 11 commercial tenants are located in the development including professional service firms and NRMA's head office and main call centre. The site includes serviced offices with shared facilities and services for small business tenants.

In terms of design, the layout follows the former industrial site's structure and can therefore be described as a campus style development. The area has ample at grade car parking and is adjacent to the junction of Parramatta Road and the M4 Motorway. North Strathfield Train Station is located at the northern edge of the precinct.

---

[8] NSW/ ACT Shopping Centre Directory 2013 Property Council of Australia

The Bakehouse Quarter demonstrates the positive impact that night-time activation has on the vitality and viability of the centre offering. The subject site should seek to ensure that activation is achieved throughout the day and in the evening through the retail mix to diversify usage.

2.6.6 Case study implications

The lessons learned from the case study examples comprise:

- Multiple anchors are desirable. These will serve to broaden the appeal of the centre, extend the trade area and operating hours / activity. Anchors could include a supermarket or convenience foodstore, dining precinct, upmarket food hall, club and/or community uses such as a medical centre or childcare centre
- The location of anchor tenants is important in terms of urban activation and ensuring the maximum commercial potential of centres is achieved
- In general terms the highest value commercial and retail uses are located on the locations with greatest footfall. Uses which rely less on passing trade, such as commercial offices, medical services, child care or specific localised uses, can be located away from footfall traffic
- Commercial office and community uses are a desirable component of the retail mix and offer
- The retail mix of centres should be tailored towards the demographic and ethnic character of the trade area which it serves and the needs of users – residents and workers.

2.7 Implications for Subject Site

The subject site enjoys two frontages:

- Burwood Road on the southern boundary of the site is the main feeder road on the peninsula
- Zoeller Street and Exile Bay provides the north facing water views.

The planning of retail space should capitalise on these assets. Convenience retail should address the southern boundary and entrance being the main entrance and the most convenient for residents in the walkable catchment.

Themed retail should utilise the heritage features on the site but could also capitalise on the waterfront amenity. Club and themed restaurants are good examples.

Given these attributes we believe that a local centre of around 3,500sqm could be supported providing a combination of 2,000sqm to 2,500sqm of convenience retail and commercial services for local residents and 1,000sqm to 1,500sqm of themed retail and services including restaurants and the like with heritage and waterfront themes. These roles won't necessarily be distinct and there is likely to be some blurring of the two roles.

2.8 Suggested Retail Mix

Based on the above the suggested retail mix is as follows:

- Approximately 800 to 1,000sqm supermarket (small format Coles or Woolworths, IGA, Harris Farm or similar)
- 200sqm to 400sqm of specialty food (liquor, bakery, butcher, confectionary, coffee, etc)
- Approximately 800sqm of restaurants and fast food/take-aways (at least half of this space would be themed by the water)

- Approximately 500 to 800sqm of non-food retailing and personal services (newsagency, arts, hair and beauty, chemist, etc)
- Approximately 500sqm of non-retail space (travel, finance, medical, massage, real estate services, etc).

Total shop front floor space would be in the order of 3,000 to 3,500sqm.

RETAIL IMPACT ASSESSMENT

3.0 RETAIL IMPACT ASSESSMENT

The previous Chapter in this Study established a need for the retail component of the proposed development. This Chapter assesses the economic impact of the proposed retail floorspace on existing and proposed retail centres in the locality.

In terms of assessing economic impacts, previous court judgements such as "Fabcot Pty Ltd v Hawkesbury City Council (97) LGERA" and "Cartier Holdings Pty Ltd v Newcastle City Council and Anor [2001] NSWLEC 170" have provided some guidance on relevant issues. The NSW Land & Environment Court has stated that Councils should not be concerned about competition between individual stores as this is a matter of fair trading. Council should however concern itself with impacts in the locality. In particular Council has raised the concern about possible impact on Concord Shopping Centre (Majors Bay Road).

Before delving straight into the impacts we need to appreciate the centres in the locality which is the subject of the next section.

3.1 Retail Centres in the Locality

3.1.1 Burwood

Burwood is the major centre in the Inner-west metropolitan Sydney. It is only 2.1km south of the subject site although the main street "Burwood Road" stretches almost a kilometre further south.

Westfields anchors the northern end 2.2km from the subject site. It is a 3 level shopping centre with a total shop front floor space of 57,000sqm. It comprises 218 shops and is anchored by David Jones, Kmart, Target, Coles and Woolworths. It achieved retail sales of $480m in 2016 which equated to $8,461/sqm making it the 10th highest performing centre amongst the 83 largest centres (over 45,000sqm with reported retail sales) in Australia[9].

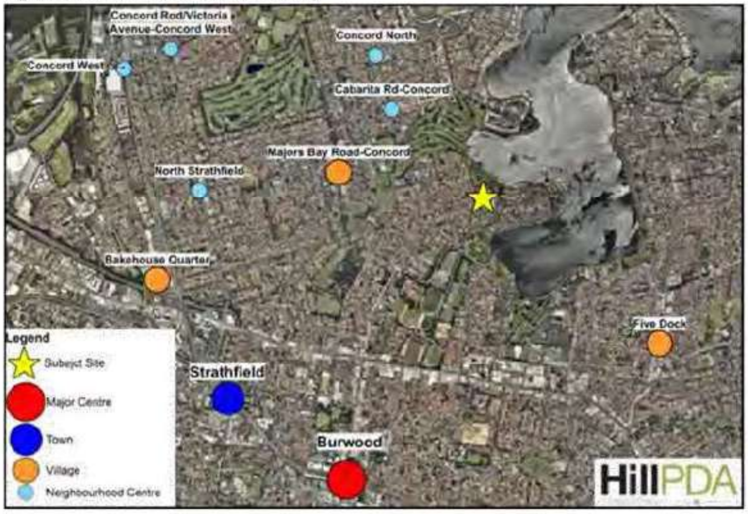
Just south of Burwood Station is the other indoor centre known as Burwood Plaza comprising 10,500sqm of shop front space with 48 stores including a Woolworths and Freshworld foodstore. Its current trading level is not known but in 2014 it achieved retail sales of $80m which was a strong level of performance[10].

Outside the centres are strip shops fronting both sides of Burwood Road and some side streets. Total shop front space in Burwood is around 100,000sqm.

---

[9] Shopping Centre News Big Guns 2017
[10] PCA Shopping Centres Directory 2015

Figure 3-1: Retail centres in the locality



Source: Pitney Bowes Anysite and HillPDA

3.1.2 Five Dock

Five Dock is a main street shopping centre 3.6km by road southeast of the subject site. It has around 17,000sqm of shop front space (around 14,500sqm occupied by retailers). The anchor tenant is a 3,300sqm Coles supermarket. Trading performance is unknown but would appear to be trading reasonably.

3.1.3 Concord (Majors Bay Road)

Concord is a "mainstreet" centre (1.5km west-north-west of the subject site) with shop front spaces on both sides of Majors Bay Road between Gallipoli Street and Brewer Street. The centre includes a full line Coles supermarket approximately 2,500sqm in size and 65 specialty shop front premises. Total shop front space is estimated to be 11,000sqm. Of the specialties a high proportion are restaurants (18). There are a further three take-away food stores, seventeen (24) other retailers, 14 non-retail commercial premises and six vacancies. 2 of the vacancies were being renovated or newly fitted out at the time of the survey.

Concord has a fairly wide trade area encompassing the Canada Bay LGA west of Five Dock. This area will benefit from population growth at an average rate of 2.25% per annum over the next decade.

3.1.4 North Strathfield

Along Concord Road in North Strathfield, 2.8km west of the subject site, is a small format Woolworths supermarket of around 1,200sqm. There are also 45 specialty shops fronting Concord Road between Homedale Avenue and Correys Avenue. 14 of the specialty shops are restaurants and take-aways, 9 are non-retail commercial services and 2 were vacant at the time of survey. Total shop front space is around 6,000sqm.

3.1.5 Neighbourhood Centres

Cabarita Road, 1.6km north of the subject site, is a neighbourhood centre comprising 9 shops, two of which are restaurants

Further to the north on the corner of Gale Street and Brays Road in is a small group of 10 shops including 4 restaurants / take-aways and a convenience store.

Another neighbourhood centre at North Strathfield Station comprises 15 small shops and no anchor tenant.

There is a small cluster of shops on Concord Road in Concord West between Nirranda Street and Myall Street comprising 18 shops.

Another neighbourhood centre at Concord West station comprises 16 small shops.

3.2 Proposed Mix and Turnover

For the purposes of this study HillPDA have assumed a centre of 3,557sqm (GFA) of which 2,700sqm would be occupied leasable retail space. For the purpose of the impact modelling we have assumed the following mix:

- 900sqm supermarket which could be a small format Woolworths or Coles, IGA, Harris Farm or something like the new Supamart IGA store in Harold Park
- 400sqm of specialty food (liquor, bakery, butcher, confectionary, etc)
- 700sqm of restaurants and take-aways (at least half of this space would be themed by the water)
- 800sqm of non-food retailing and personal services (newsagency, arts, hair and beauty, chemist, etc)
- Up to 700sqm of non-retail space (travel, finance, medical, massage, real estate services, etc).

We have further assumed that these businesses will trade at close to industry benchmark levels in metropolitan areas.

Finally we have assumed the centre will be fully operational by 2024.

The below table applies target turnover rates consistent with those used to calculate floorspace demand for the assumed floorspace mix on the subject site to derive expected turnover.

Table 5: Estimated retail turnover in 2024 ($2017)

Store Type	GLA (sqm	Retail Sales ($/sqm)*	Turnover ($m)
Supermarket	900	9,500	8.6
Specialty food & take-away	400	7,500	3.0
Restaurants	700	5,000	3.5
Other personal & household goods	800	4,500	3.6
Non-retail uses	500		
Total GLA	**3,200**	**7,723**	**18.7**

Source: Various including ABS Retail Survey 1998-99, Urbis Retail Averages, Shopping Centre News, HillPDA and various consultancy studies.

Based on our calculations the retail component of the proposed development would generate total retail sales in the order of $18.7m in 2024 (measured in 2017 dollars).

3.3 Redirection of Turnover from Existing Centres

The $18.7m of retail sales captured by the centre would be redirected from competing centres. Note that this turnover should be viewed in the context of growth in expenditure in the walkable catchment between 2016 and 2031 which is equivalent to some $35m of expenditure. The proposed centre is therefore justifiable based on growth alone and would not be reliant upon redirecting significant trade away from existing centres.

Notwithstanding this, in order to provide a robust assessment, HillPDA has prepared a bespoke gravity model to examine the extent of trade redirected from existing centres. The results of the bespoke gravity model are presented in the following table.

Note that the gravity model assumes that 20% of the turnover captured by the proposed development would be redirected from other destinations not listed in the gravity model. These include freestanding outlets in the wider Concord area as well as day trippers from beyond the locality.

Table 6: Retail Impact Assessment

	1	2	3	4	5	6	7	8	9
Retail Centre	Return travel time from Site (minutes)	Approx. Retail Floor Space	Estimated Turnover in 2017	Turnover in 2024 without Proposal	Turnover in 2024 with Proposal	Immediate Shift in Turnover in 2024	% Shift in Turnover in 2024	Shift in turnover from 2017 to 2024	% Shift in turnover from 2017 to 2024
Proposed Centre					18.7	18.7			
Concord	6.0	8,950	64.0	73.5	68.6	-4.9	-6.7%	4.6	7.2%
Cabarita & Brays Rds	6.0	1,800	9.6	11.0	10.2	-0.8	-7.1%	0.6	6.8%
North Strathfield	12.0	5,000	31.5	35.9	35.0	-1.0	-2.7%	3.5	11.0%
Burwood	15.0	89,000	680.0	791.9	785.9	-5.9	-0.8%	105.9	15.6%
Five Dock	14.0	14,500	108.0	120.7	118.4	-2.3	-1.9%	10.4	9.6%
Other Localities						-3.7			
TOTAL		119,250	893.1	1,033.1	1,036.8	0.0	0.4%	143.7	16.1%

1: Drivetime in minutes derived from Googlemaps.
2: Excludes Source: Various including Shopping Centre News, PCA Shopping Centres Directory, HillPDA Floorspace Surveys.
3: Various including Shopping Centre News, PCA Shopping Centres Directory, Shopping Centre Annual Reports, Urbis Retail Averages, Other Consultancy Reports and HillPDA Estimate.
4: Allows for population growth (variable for each centre) and real growth in retail spend per capita of 0.8% per annum in line with historic trend since 1986 (HillPDA Calculation from ABS Retail Sales, population estimates and CPI indexes).
5: The turnover of localities following the proposed development. The forecast turnover of the proposed development is distributed between localities based on distance and size.
6: Immediate shift in turnover. This is difference between the development and the do nothing options (i.e. Column 4 minus Column 5).
7: Immediate percentage shift is shift in turnover divided by the turnover in 2017 without the development proceeding.
8: This is the shift in turnover from 2017 to 2024 after the opening of the new development.
9: This is shift in turnover from 2017 to 2024 divided by the turnover in 2017.

There are no universal measures of significance of economic impact. There are references in various consultancy reports and statements in the NSW Land & Environment Court which suggest that a loss of trade below 5% is considered insignificant, 5% to 10% is low to moderate, 10% to 15% is moderate to high, and above 15% is a strong or significant impact. Generally impacts of up to 10% are considered to be within the normal competitive range, although this is dependent upon the trading performance of the centre in question and/ or the level of population growth in a trade area.

Columns 6 and 7 in the above table indicate the immediate or point in time trading impact of the proposed development. As would be expected, in proportional terms, Majors Bay Road and Cabarita in Concord would experience the strongest impacts – equivalent to 7% loss of trade. This is still considered to be a moderately low impact. All other centres would experience impacts of less than 5% which is considered insignificant.

Over time this impact will lessen across all the surrounding centres (refer to Columns 8 and 9). This is because these centres will capture an increasing amount of retail expenditure as a result of population and expenditure growth in their respective trade areas. Indeed, over the 2017 to 2024 period all centres will experience an increase in trading levels above 7% with or without the proposed development. On this basis, we consider that the trading impacts would be acceptable and would not threaten the role, function or commercial viability of any existing centre.

3.4 Other Economic Benefits

A significant benefit of the retail space is the improved convenience for residents that live in the immediate area. The existing 3,300 residents that live within 800m of the subject site and the 1,175 new residents all live beyond 800m of any other commercial centre.

The planning proposal will enable these residents to make more purchases regularly on foot rather than relying on using private motor vehicles. Whilst residents in the immediate area are expected to continue to shop at Burwood and Concord for major food and grocery shopping as well as comparative goods and leisure shopping, they are likely to make small but regular convenient purchases in the new centre.

By providing convenience retail services for a walkable catchment of more than 5,000 people we expect that there will be fewer car trips.

3.5 Conclusion

The proposed level and mix of retail uses on the site is supported for the following reasons:

- The residential area within 800m walking distance of the site currently houses 3,300 residents and will house more than 5,000 residents by the time the subject site is fully developed. This is sufficient population to support a neighbourhood centre
- Without the proposed retail space on the subject site these people will live more than walking distance from any other convenience retail offer
- With more than 2% per annum population growth in the Canada Bay - Concord SLA over the next decade the demand for retail space will continue to increase over and above the levels proposed on the subject site
- Due to population growth and increasing affluence all centres in the Canada Bay are expected to trade more than 13% above their current levels over the next 8 years with or without the planning proposal.

HillPDA

Disclaimer

1. This report is for the confidential use only of the party to whom it is addressed ("Client") for the specific purposes to which it refers and has been based on, and takes into account, the Client's specific instructions. It is not intended to be relied on by any third party who, subject to paragraph 3, must make their own enquiries in relation to the issues with which this report deals.
2. HillPDA makes no representations as to the appropriateness, accuracy or completeness of this report for the purpose of any party other than the Client ("Recipient"). HillPDA disclaims all liability to any Recipient for any loss, error or other consequence which may arise as a result of the Recipient acting, relying upon or using the whole or part of this report's contents.
3. This report must not be disclosed to any Recipient or reproduced in whole or in part, for any purpose not directly connected to the project for which HillPDA was engaged to prepare the report, without the prior written approval of HillPDA. In the event that a Recipient wishes to rely upon this report, the Recipient must inform HillPDA who may, in its sole discretion and on specified terms, provide its consent.
4. This report and its attached appendices are based on estimates, assumptions and information provided by the Client or sourced and referenced from external sources by HillPDA. While we endeavour to check these estimates, assumptions and information, no warranty is given in relation to their reliability, feasibility, accuracy or reasonableness. HillPDA presents these estimates and assumptions as a basis for the Client's interpretation and analysis. With respect to forecasts, HillPDA does not present them as results that will actually be achieved. HillPDA relies upon the interpretation of the Client to judge for itself the likelihood of whether these projections can be achieved or not.
5. Due care has been taken to prepare the attached financial models from available information at the time of writing, however no responsibility can be or is accepted for errors or inaccuracies that may have occurred either with the programming or the resultant financial projections and their assumptions.
6. This report does not constitute a valuation of any property or interest in property. In preparing this report HillPDA has relied upon information concerning the subject property and/or proposed development provided by the Client and HillPDA has not independently verified this information except where noted in this report.
7. In relation to any valuation which is undertaken for a Managed Investment Scheme (as defined by the Managed Investments Act 1998) or for any lender that is subject to the provisions of the Managed Investments Act, the following clause applies:

   This valuation is prepared on the assumption that the lender or addressee as referred to in this valuation report (and no other) may rely on the valuation for mortgage finance purposes and the lender has complied with its own lending guidelines as well as prudent finance industry lending practices, and has considered all prudent aspects of credit risk for any potential borrower, including the borrower's ability to service and repay any mortgage loan. Further, the valuation is prepared on the assumption that the lender is providing mortgage financing at a conservative and prudent loan to value ratio.
8. HillPDA makes no representations or warranties of any kind, about the accuracy, reliability, completeness, suitability or fitness in relation to maps generated by HillPDA or contained within this report.

Liability limited by a scheme approved under the Professional Standards Legislation

HillPDA
CONSULTING

SYDNEY

Level 3, 234 George Street
Sydney NSW 2000
GPO Box 2748 Sydney NSW 2001
t: +61 2 9252 8777
f: +61 2 9252 6077
e: sydney@hillpda.com

MELBOURNE

Suite 114, 838 Collins Street
Docklands VIC 3008
t: +61 3 9629 1842
f: +61 3 9629 6315
e: melbourne@hillpda.com

WWW.HILLPDA.COM

ABORIGINAL HERITAGE DUE DILIGENCE ASSESSMENT

Bushells Factory Redevelopment

160 Burwood Road

CONCORD

Job No. 2715
June 2017

Heritage 21
CULTURAL BUILT HERITAGE IN THE 21ST CENTURY

RAPPOPORT PTY LTD ©
CONSERVATION ARCHITECTS AND HERITAGE CONSULTANTS
Suite 48, 20-28 Maddox Street, Alexandria, NSW 2015
(02) 9519 2521
reception@Heritage 21.com.au

Heritage Impact Statements	Conservation Management Plans	On-site Conservation Architects
Photographic Archival Recordings	Interpretation Strategies	Expert Heritage Advice
Fabric Analyses	Heritage Approvals & Reports	Schedules of Conservation Work

TABLE OF CONTENTS

1.0 INTRODUCTION & STUDY AREA 4

1.1 BACKGROUND 4
1.2 REPORT OUTLINE AND TERMINOLOGY 4
1.3 STUDY AREA AND POTENTIAL IMPACTS 4
1.4 STUDY AREA CONTEXT AND AIMS 6
1.5 LEGISLATION SUMMARY 6
1.6 ABORIGINAL CONSULTATION 9
1.7 LIMITATIONS AND AUTHORSHIP 10
1.8 COPYRIGHT 10

2.0 ENVIRONMENTAL CONTEXT 11

2.1 LANDSCAPE AND GEOLOGY 11
2.2 SOILS 12
2.3 FLORA AND FAUNA 13
2.4 LAND USE HISTORY 15

3.0 ARCHAEOLOGICAL CONTEXT 17

4.0 SITE INSPECTION 20

4.1 AIMS AND METHODS 20
4.2 RESULTS 20
4.3 SUMMARY 20

5.0 DISCUSSION & RECOMMENDATIONS 22

5.1 DEVELOPMENT IMPACTS 22
5.2 DUE DILIGENCE 22
5.3 DISCUSSION & CONCLUSIONS 23
5.4 RECOMMENDATIONS 24

6.0 SOURCES 25

Cover page: Subject site at 160 Burwood Road, Concord as viewed from the Exile Bay foreshore. (Source: Heritage 21, 30.03.16)

Issue	Description	Date	Issued by
1	Draft report (D1) issued for comment.	07.06.17	KB
2	Report Issued (RI) for Planning Proposal	13.06.17	KB

1.0 INTRODUCTION & STUDY AREA

1.1 Background

Heritage 21 was appointed by NixAnderson, in August 2016, to provide Heritage and Archaeological Consultancy services in relation to the redevelopment of the former Bushells Factory located at 160 Burwood Road, Concord (study area). Heritage 21 commissioned Vanessa Hardy of Cultural Heritage Connections Pty Ltd to undertake a due diligence Aboriginal heritage assessment of the study area.

This *Aboriginal Heritage Due Diligence Assessment* ('report'), in conjunction with a *Statement of Heritage Impact* (June 2017), has been prepared by Heritage 21 on behalf of FreshFood Sydney Pty Ltd and NixAnderson to accompany a Planning Proposal seeking to rezone the site to facilitate future residential development.

1.2 Report Outline and Terminology

The following section (Section 2.0) of this report provides a summary of the environmental context of the study area. Section 3.0 examines the archaeological background and Section 4.0 presents the results of the site inspection. Section 5.0 provides a discussion and presents recommendations arising from the assessment.

The following definition is used throughout this report:

AHIMS:	Aboriginal Heritage Information Management System which is maintained by the NSW Office of Environment & Heritage
IMT:	A fine-grained siliceous stone known as either 'indurated mudstone' or 'silicified tuff'. While easily recognisable, this stone type is variable and various studies have been unable to conclude whether it sedimentary or igneous. Therefore, it has been suggested that a neutral term 'IMT' be used to describe the material. That term is used in this report.

1.3 Study Area and Potential Impacts

The study area site is located at 160 Burwood Road, Concord and has an area of approximately 3.9 hectares (see Figure 1 and Figure 2 below). It consists of the following lots:

- Lot 2, DP230294
- Lot 398, DP752023
- Lot 399, DP752023
- Lot 5, DP129325

The site includes a multi-storey brick and concrete c 1950s factory building with a prominent chimney stack as well as associated later buildings, roadways, carparks and landscaped areas. The site has a frontage to Burwood Road of approximately 170 metres and also fronts Exile Bay.

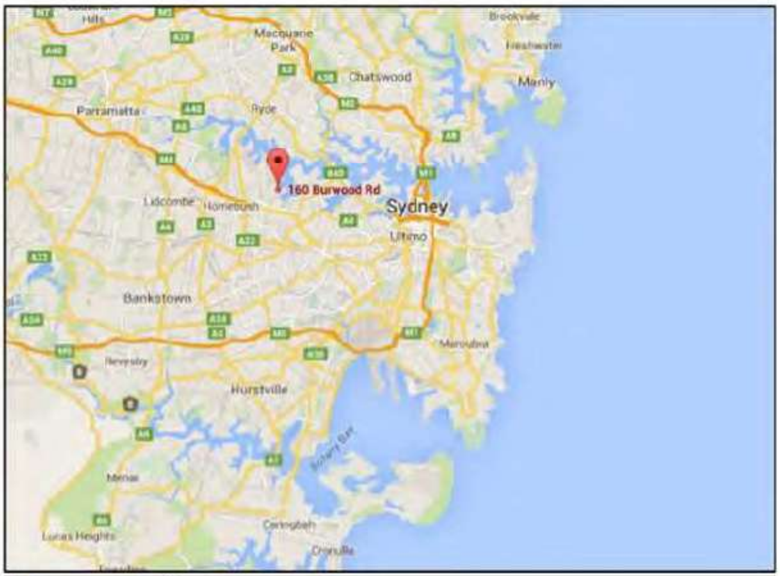


Figure 1. Map showing the location of the subject site indicated by the red arrow relative to Sydney's CBD.[1]

Figure 2. Current aerial photograph of the site (red outline).[2]

---

[1] Google, 'Google Maps', 2016, http://maps.google.com.au/ accessed 8 March 2016.

[2] NSW Land and Property Information, 'SIX Maps', n.d., http://maps.six.nsw.gov.au/ accessed 8 March 2016.

1.4 Study Area Context and Aims

No Aboriginal objects have been previously recorded within the study area boundaries.

The assessment has been designed to meet the requirements of the former Department of Environment, Climate Change and Water's (DECCW), now Office of Environment & Heritage (OEH), *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (hereafter 'Code of Practice').[3] A summary of the due diligence process is presented in Figure 3.

The major aims of a due diligence assessment includes the following:

- identify whether or not Aboriginal objects are, or are likely to be, present in the area;
- if objects are present or likely to be present, determine whether or not the proposed development activities are likely to harm Aboriginal objects; and
- determine whether further assessment or an Aboriginal Heritage Impact Permit (AHIP) is required.

In order to meet these objectives, the following tasks are required:

- undertake a search of the OEH AHIMS and a review of site cards for those sites within close proximity of the study area;
- check for landscape features which may indicate the presence of Aboriginal objects;
- undertake a desktop assessment using relevant background data to categorise the study area and form predictions about the likely presence of cultural sites;
- liaison with Metropolitan Local Aboriginal Land Council (MLALC);
- undertake a site inspection to check the desktop conclusions as well as to look for Aboriginal objects and any other relevant features that may not have been revealed during background review; and
- if necessary, consider strategies to avoid harming Aboriginal objects.

1.5 Legislation Summary

1.5.1 National Parks and Wildlife Act 1974 (amended 2010)

The *National Parks and Wildlife Act 1974* (NPW Act) protects Aboriginal objects and Aboriginal places in NSW. It has been amended by the National Parks and Wildlife Regulation 2009 (NPW Regulation). Under the NPW Act, the following are offences unless an exemption or defence is provided for under the Act:

- a person must not knowingly harm or desecrate an Aboriginal object (knowing offence)

---

[3] NSW Department of Environment, Climate Change and Water, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*, 2010.

- a person must not harm or desecrate an Aboriginal object or Aboriginal place (strict liability offence)

The maximum penalty for the knowing offence is $550,000 or $275,000 (depending on whether there are aggravating circumstances) and 1 or 2 years' goal for an individual. For a corporation the maximum penalty for the knowing offence is $1.1 million. The maximum penalty for the strict liability offence is $110,000 or $55,000 (depending whether there are aggravating circumstances) for an individual or $220,000 for a corporation.

Harm includes acts or omissions that "destroy, deface or damage" an Aboriginal object or Aboriginal Place, and in relation to an object, move the object from the land on which it has been situated. Harm does not include something that is trivial or negligible.

Section 91 of the Act also obliges any person who discovers an Aboriginal object to report it to the OEH for it to be entered on the AHIMS.

An Aboriginal object is defined as:

> *"...any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains."*

An Aboriginal object is legally protected irrespective of land tenure, the significance of the object and whether or not it has been recorded.

"Aboriginal Places" are places so declared under Section 84 of the Act.

Anyone who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution for the strict liability offence if they later harm an object. Due diligence can be exercised by complying with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*[4] (or industry-specific codes of practice) that has been adopted under the National Parks and Wildlife Regulation 2009. The code provides a process to enable a reasonable determination of whether or not Aboriginal objects will be harmed by an activity or whether further investigation or an Aboriginal Heritage Impact Permit (AHIP) are required.

There is also a range of defined exemptions and low impact activities defined in the Regulation for which due diligence is not required. These include undertaking specified farming, land management, maintenance, surveying or environmental rehabilitation works.

---

[4] NSW Department of Environment, Climate Change and Water, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*, 2010.

> *Clause 80B Defence of carrying out certain low impact activities: section 87 (4)*
>
> *(1) It is a defence to a prosecution for an offence under section 86 (2) of the Act, if the defendant establishes that the act or omission concerned:*
>
> *(a) was maintenance work of the following kind on land that has been disturbed: (i) maintenance of existing roads, fire and other trails and tracks,*

Under the amended Act a permit will no longer be required to *look for* Aboriginal objects providing the investigation is undertaken in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW.*[5] Archaeological test excavations that follow the code do not require an AHIP. If objects are present and harm cannot be avoided it is necessary to apply for an AHIP.

There are also requirements for consultation with Aboriginal people relating to AHIP applications. These are set out in the *Aboriginal cultural heritage consultation requirements for proponents 2010.*[6]

1.5.2 Environmental Planning and Assessment Act 1979

The *EP&A Act* requires that environmental impacts are considered in land use planning and decision-making. The definition of 'environmental impacts' includes impacts on the cultural heritage of the project area. The Act sets out specific statutory assessment processes including:

- Part 4: Development that requires consent under consideration of environmental planning instruments.
- Part 5: An assessment process for activities undertaken by public authorities and for developments that do not require development consent but an approval under another mechanism.

---

[5] NSW Department of Environment, Climate Change and Water, *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales: Part 6 National Parks and Wildlife Act*, 2010.

[6] NSW Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, 2010.

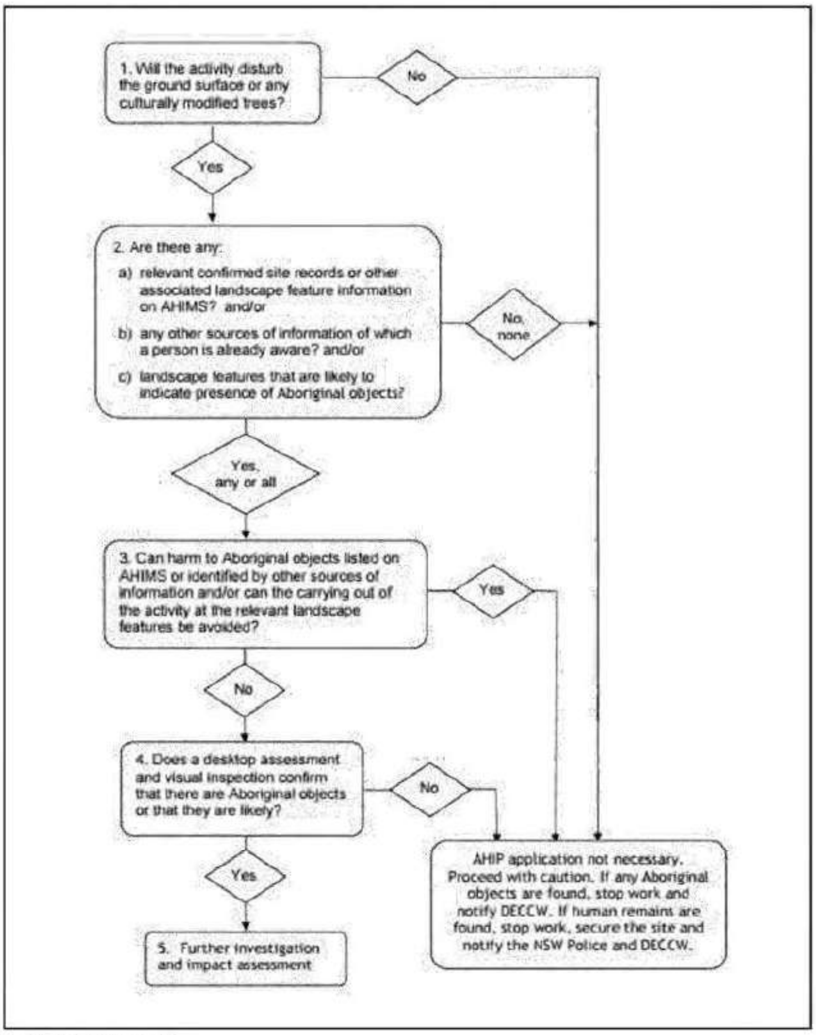


Figure 3. Due diligence process.[7]

1.6 Aboriginal Consultation

The Metropolitan Local Aboriginal Land Council (MLALC) was contacted prior to the site inspection and invited to participate in the due diligence assessment. Unfortunately, the sites officer Jay Daly was unexpectedly unable to attend site on the day the archaeologist attended. Further contact was made to present some information about the nature of the site.

---

[7] NSW Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, 2010.

Heritage 21 and Cultural Heritage Connections recognises that Aboriginal people are the determinants of the cultural significance of their heritage. This is also recognised by OEH who provide a guideline for minimum requirements for consultation with Aboriginal stakeholders.[8] These are only legally required where archaeological testing or an AHIP is required.

1.7 Limitations and Authorship

This assessment is limited to a consideration of the Aboriginal archaeological potential of the study area.

No assessment of the cultural value of the area has been made by Aboriginal stakeholders, therefore the assessment is limited to a consideration of the archaeological (scientific) value and the likely presence of Aboriginal objects.

No assessment of non-Aboriginal archaeological potential has been undertaken.

Analysis of the archaeological background, design of the methodology, field inspection and reporting for the assessment was undertaken by Vanessa Hardy (BA Hons), archaeologist and Director of Cultural Heritage Connections Pty Ltd.

1.8 Copyright

Heritage 21 and Cultural Heritage Connections hold copyright for this report. Any reference to or copying of the report or information contained in it must be referenced and acknowledged, stating the report's name, date in addition to Heritage 21 and Cultural Heritage Connection's authorship.

---

[8] NSW Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, 2010.

2.0 ENVIRONMENTAL CONTEXT

Analysis of the environmental context is essential for developing accurate models of cultural activity, site distribution patterns and the archaeological potential of any given area. Environmental characteristics influence the types of archaeological sites. An understanding of how the landscape looked and behaved in the past can help us to predict where Aboriginal people may have undertaken various activities and therefore the types of archaeological sites that may be found in the present. In addition, environmental processes influence the preservation of sites. Heavy erosion or acidic soils are likely to destroy or damage certain types of evidence, reducing the likelihood of locating evidence of past occupation.

The study area is located within the Sydney Basin. Its environmental setting is discussed below.

2.1 Landscape and Geology

The study area is within the Sydney Basin, which is underlain by Triassic sediments. The central portion of the Basin is the Cumberland Lowlands, an area of plains and gently undulating low hills on Wianamatta Group Shales. To the north and south as the Basin rises it is transversed by the drowned valleys of the Parramatta and Georges Rivers. The action of these rivers has exposed the underlying Hawkesbury Sandstone and produced the 'rugged to undulating' valleys of the Harbour Foreshores physiographic region.[9] The study area is within the Harbour Foreshores region fronting Exile Bay on the Parramatta River.

The due diligence Code of Practice provides a list of landscape features which can indicate an area has potential to contain Aboriginal occupation evidence. These are listed as areas on land that is *not disturbed* that are:

- within 200 metres of waters;
- located within a sand dune system;
- located on a ridge top, ridge line or headland;
- located within 200 metres below or above a cliff face; or
- within 20 metres of or in a cave, rock shelter, or a cave mouth.

The study area is within 200 metres of waters, namely Exile Bay. Burwood Road which the project area also fronts, runs along a natural ridge line.

The original landscape of the area would have been sloping down from the south (Burwood Road frontage) to the northern waterfront.

Stone suitable for tool manufacture occurs across the Cumberland Lowlands. Recorded artefacts have been made from silcrete, chert, IMT (see terminology provided in Section 1.2), quartz,

---

[9] G. A. Chapman and C. L. Murphy, *Soil Landscapes of Sydney 1:100 000*, Sydney, Soil Conservation Service of NSW, 1989.

quartzite and basalt. Many of these materials can be commonly found as cobbles or boulders eroding out of deposits near creek lines. The most commonly recorded material type in the Lowlands is silcrete. Two large outcrops of St Marys formation silcrete occur at Plumpton Ridge and at Marsden Park with smaller outcrops known at Riverstone and Erskine Park.[10] There are other numerous local sources for suitable stone including creek gravels.

2.2 Soils

The study area falls within the Gymea erosional soil landscape.[11] This soil type is common along the Harbour foreshores as well as the Parramatta and Georges Rivers. It is based on Hawkesbury Sandstone geology. The landscape of this soil type is typically undulating to rolling low hills. Slopes range from 10 to 25% with local relief of 20-80 metres. The sideslopes include varying width sandstone benches (10-100 metres) often forming broken scarps.[12]

Topsoil (A1 horizon) of the Gymea Landscape is a loose, coarse loamy sand to sandy loam, porous with an apedal single grained structure. Its colour can range from brownish-black where high levels of organic matter are present to a bleached dull yellow-orange. Its pH ranges from slightly to strongly acidic. Sandstone and ironstone inclusions are common. Where erosion has occurred underlying clayey sands and sandy clay subsoils can be exposed. Bedrock may also be exposed.

On crests up to 30 centimetres of A Horizon generally overlies bedrock or B Horizon soils. Sideslope soils are discontinuous and rock outcrop may be present. Up to 30 centimetres of A Horizon is commonly present on the inside and outside of benches.[13]

A geotechnical report indicates that the site *"comprises a sequence of topsoil/concrete/asphalt overlying, fill overlying, natural soils, overlying, bedrock"*.[14] Groundwater was found at 2.5 m in BH9.[15]

The fill was classified as silty/sandy clay with medium to high plasticity, generally well-compacted and included some sandstone floaters. Natural soils were predominantly medium to high plasticity silty clay and silty sand with some gravel. Bedrock was sandstone. The majority of the boreholes show that any residual topsoils likely to contain archaeological deposits are either not present or have been removed as part of the filling process. However four of the boreholes BH3, BH4, BH7 and BH8 all contained alluvial deposit.[16]

---

[10] Jo McDonald Cultural Heritage Management Pty Ltd, *Rouse Hill Infrastructure Project (Stage 3) Balmoral Road Release Area Indigenous & European Heritage Issues*, unpublished report to Rouse Hill Infrastructure Consortium (RHIC), 2002.

[11] G. A. Chapman et al, *Soil Landscapes Series Sheet 9130*, Sydney, Soil Conservation Service of NSW, 1989.

[12] G. A. Chapman and C. L. Murphy, *Soil Landscapes of Sydney 1:100 000*, Sydney, Soil Conservation Service of NSW, 1989.

[13] G. A. Chapman and C. L. Murphy, *Soil Landscapes of Sydney 1:100 000*, Sydney, Soil Conservation Service of NSW, 1989.

[14] Geotechnique Pty Ltd, *Proposed Redevelopment 160 Burwood Road: Concord Preliminary Geotechnical Investigation*, 2014.

[15] Geotechnique Pty Ltd, *Proposed Development Robert Timms Factory Site (Bushells) 160 Burwood Road: Concord Contamination Assessment of Soil*, 2014.

[16] Geotechnique Pty Ltd, *Concord Preliminary Geotechnical Investigation*, 2014.

In BH3 a fine to medium grained grey silty sand was located between 2.5 and 3 metres depth overlying weathered sandstone. In BH4 a fine to medium grained brown grey alluvial silty sand was recorded between 0.75 and 1 metre. In BH7 a fine to medium grained grey brown alluvial silty sand was found between 2.5-3 meters. In BH8 a fine to medium grained brown silty sand with some ironstone was recorded under 40 centimetres of fill to a depth of 1 metre.[17] The location of the boreholes is shown in Figure 4.

Figure 4. Location pf boreholes discussed in text.[18]

2.3 Flora and Fauna

The vegetation communities of the greater Sydney area have over 200 species with edible parts.[19] Many plants were exploited as a minor food resource, for example berries or plant nectars. Aboriginal firing of the landscape may have resulted in opening up of grasslands in the valleys and ridge tops, which, in turn, increased the habitat for large macropods.

The study area has been completely cleared since European settlement. In the past the area would have provided a wide variety of flora and fauna resources for the Aboriginal communities who lived there.

---

[17] Geotechnique Pty Ltd, *Concord Preliminary Geotechnical Investigation*, 2014.

[18] Geotechnique Pty Ltd, *Concord Preliminary Geotechnical Investigation*, 2014.

[19] V. Attenbrow, *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, Sydney, UNSW Press, 2002.

The study area would have been vegetated with eucalypt woodland on sandy soils on Hawkesbury sandstone.[20] Trees in this area included red bloodwood (*Eucalyptus gummifera*) and smooth-barked apple (*Angophora costata*). Sheltered slopes may also include black ash (*E. sieberi*), Sydney peppermint (*E. piperita*). Shrubs included Coast Banksia (*Banksia integrifolia*), Black she-oak (*Allocasuarina littoralis*) Cheese Tree (*Glochidion ferdinandi*) and *Melaleuca nodosa.*[21]

Wood was used to make canoe poles, weapons, woomeras, boomerangs and was used for firewood. Plant resins were used to fix parts of tools together. Bark was used for huts, carrying vessels, canoes, shields, fishing lines, bedding, blankets and torches, amongst other things.[22] Fibres were used to make ropes that could then be used in traps and nets for trapping animals, birds and fish. Local knowledge of medicine plants was also an important part of Aboriginal culture.

Animal resources were important to the Aboriginal people of the region, not only as a food source but because they could also be used for manufacturing. The use of animal skin clothing and animal bone tools has been well documented.

Most Australian land mammals are available all year around as they are not migratory; however, some may be easier to catch at certain times, for example possums are less active in the winter months. Possums are frequently referred to as part of the diet of Aboriginal people in inland Sydney areas. It was thought that a marked difference would be found between the inland and coastal diet of groups in the Sydney area, due to the coastal availability of fish and shellfish. However, many of the same animal species are found in bone remains excavated at archaeological sites. In general, macropods are common and would have formed an important part of the diet.[23] Water based plants and animals would also have been exploited in the local area. Other less permanent resources include migratory birds, such as the mutton bird, and seasonally available eggs of both birds and reptiles.

Overall, the resources available to inhabitants of the study area region could have provided a varied and generally reliable resource to sustain the many economic and social requirements of large Aboriginal groups.

---

[20] D. Benson and J. Howell, *Taken for Granted: The bushland of Sydney and its suburbs*, Kenthurst, Kangaroo Press Pty Ltd, 1990.
[21] Benson and Howell, *Taken for Granted* &. Chapman and Murphy, *Soil Landscapes of Sydney 1:100 000.*
[22] V. Attenbrow, *Sydney's Aboriginal Past*, 113.
[23] V. Attenbrow, *Sydney's Aboriginal Past*, 71.

2.4 Land Use History

As mentioned above, the subject land is currently occupied by a factory and associated buildings as well as landscaped areas, access roads and car parking. It appears that the current phase of construction was undertaken in the 1950s and continued into the 1980s. An aerial photo (see Figure 5) from c. 1943 shows the land occupied by a jetty and associated building pre dating the current site buildings. Prior to this the nearby land had been extensively filled and reshaped. Land reclamation was undertaken in Exile Bay. The adjacent area that is now golf course would have been largely wetlands. The area was then used for dumping rubbish and subsequently filled.[24] Figure 6 shows reclamation works in the 1930s. The study area would have been a sloping sandstone landscape adjacent to the mangrove and salt marsh. Further information relating to land tenure and the later phases of development of the area is presented in the *Statement of Heritage Impact* prepared by Heritage 21 (June 2017) and will not be repeated here.

Figure 5. Detail from 1943 aerial imagery of the subject site with the approximate boundaries indicated. [25]

---

[24] Benson and Howell, *Taken for Granted*, 56.
[25] NSW Land and Property Information, 'SIX Maps' accessed 8 March 2016.

Figure 6. Reclamation works at Exile Bay, c.1930.[26]

---

[26] City of Canada Bay Council, 'Canada Bay Image Library', accessed 16 March 2016, http://imagelibrary.canadabay.nsw.gov.au/Library/#1458173124818_0.

3.0 ARCHAEOLOGICAL CONTEXT

For the purposes of determining settlement and site location patterns, archaeologists examine regional and local trends in the distribution of known sites in relation to environment and topography. This information can be used to provide a picture of behaviour in the past as well as indicate how evidence of that past behaviour might be preserved in the archaeological record. The following provides a brief overview of known regional and local archaeological evidence.

Timing of the Aboriginal occupation of the Sydney region has been subject of some research. An early date (41,700 +3000/-2000 BP (years before present)) was taken from artefacts found in gravels of the Cranebrook Terrace on the Nepean River[27], however there is some disputes over the actual age of the deposits.

A site (RTA-G1) excavated by McDonald from the Parramatta Sand Sheet in the city centre of Parramatta has been dated to 30,735 +/- 407 BP.[28] This date is considered more reliable. A rock shelter site north of Penrith on the Nepean, known as Shaws Creek K2, is another Pleistocene dated site, dated to 14,700 +/- 250 BP.[29] More recently, a salvage excavation at Pitt Town on the banks of the Hawkesbury River has the lowest deposits containing artefacts dated to 15,000 BP.[30]

The evidence of site dates demonstrates that Aboriginal people have inhabited the region for many thousands of years. In light of this it is expected that a range of evidence of that past habitation may be present.

Many hundreds of artefact sites (also known as open campsites or artefact scatters) have been recorded within the Cumberland Lowlands. This is despite the fact that at least 50% of the Cumberland Plain has already been developed to such an extent that any archaeological evidence that may have once been present has been destroyed. Open artefact scatters can range from a few discarded stone pieces (resulting from a one-off use of an area) to large sites which may have been visited by a large number of people and/or been repeatedly used over many years. In these larger sites, distinct areas relating to specific activities can sometimes be located, such as knapping floors where individuals would have sat to manufacture stone tools. They can also include other habitation remains such as animal bone, shell or fireplaces (known as hearths). In areas where sandstone rock overhangs are present sites are commonly located within the overhangs and other sites such as middens, where shellfish are processed and discarded occur along waterways.

---

[27] E. Stockton and W. Holland, "Environments in the Blue Mountains", *Archaeology & Physical Anthropology in Oceania*, 9, 36-65.

[28] Jo McDonald Cultural Heritage Management Pty Ltd, *Archaeological Salvage Excavation of Site RTA-G1, 109-113 George Street, Parramatta, New South Wales*, Report to Landcom, 2005.

[29] V. Attenbrow, *Sydney's Aboriginal Past*, 18.

[30] A. N. Williams et al., " A Terminal Pleistocene Open Site on the Hawkesbury River, Pitt Town, New South Wales", *Australian Archaeology*, 74, 85-97.

A search of the OEH AHIMS database was undertaken on 16 March 2016 for an area at datum: GDA, Zone: 56, Eastings: 322670 - 328670, Northings 6249000 – 6255000. A total of 54 sites were recorded within this area.

The approximate locations of the registered sites are shown in Figure 7 below. The location information for sites recorded within the AHIMS is subject to variation in recording methods. Coordinates provided are often indicative rather than exact. As can be seen by some of the site being recorded in the water, the accuracy of locations cannot always be relied on. The author cannot vouch for the accuracy of the information provided by OEH or other agencies.

The subject land is <u>not</u> listed on the *Canada Bay Local Environmental Plan* (LEP), the NSW State Heritage Register, the National Heritage List, Commonwealth Heritage List of the Register of the National Trust of Australia (NSW). No Aboriginal archaeological sites or places of cultural heritage significance were recorded on these databases.

The two closest sites to the study area registered on AHIMS are both areas of shell concentration, likely to be midden sites. The fact that the recordings were submitted based on written information rather than a site visit suggests their locations are approximate. Of the 54 sites in the, the majority contain some shell material whether in open sites or rock shelter (closed site) contexts. In addition two open campsites (open artefact scatters) and one set of grinding grooves have been recorded. Art sites are also more common in areas of Hawkesbury Sandstone geology rather than the shale soils of the Cumberland Plain. Eight art sites are listed on AHIMS with five of these being in shelters (paintings) and three in open contexts (petroglyphs or rock engravings). A burial site has also been recorded at Abbotsford.

The reports held in AHIMS associated with the database search included reports from the *Port Jackson Archaeological Project*.[31] This project was undertaken in the early to mid-1990s partly because it was recognised that the archaeology of Port Jackson and surrounds was comparatively poorly documented.[32] This is, to a large extent still the case compared to the extensive amount of work that has been carried out on the broader Cumberland Plain. Relatively few excavations have been undertaken in the sandstone geology of Sydney Harbour and its associated rivers.

Attenbrow notes that the physical evidence of the activities of the Aboriginal inhabitants was noted by the early non-indigenous settlers. Governor Phillip commented on the observations of rock engravings by exploration parties with the First Fleet and also ordered that the burial mounds along Middle Harbour be investigated.[33]

---

[31] V. Attenbrow, *The Port Jackson Archaeological Project: Report on Stage 1*, Anthropology Division, Australian Museum, 1990.
[32] V. Attenbrow, *The Port Jackson Archaeological Project: Report on Stage 1*, Anthropology Division, Australian Museum, 1990.
[33] V. Attenbrow, *The Port Jackson Archaeological Project*, 1.

Predictive site modelling for the Parramatta River and surrounds has been limited due to the lack of detailed information. In general terms more sites have been recorded on sandstone geology than shale.[34]

In summary, there would have been relatively large Aboriginal populations utilising the study area and surrounds. The wetlands and mangroves would have provided diverse resources. The number of sites recorded on AHIMS is a fraction of what once would have been present on the river shores. The major factor influencing the potential for unrecorded sites to be located will be the level of disturbance in this highly urban region.

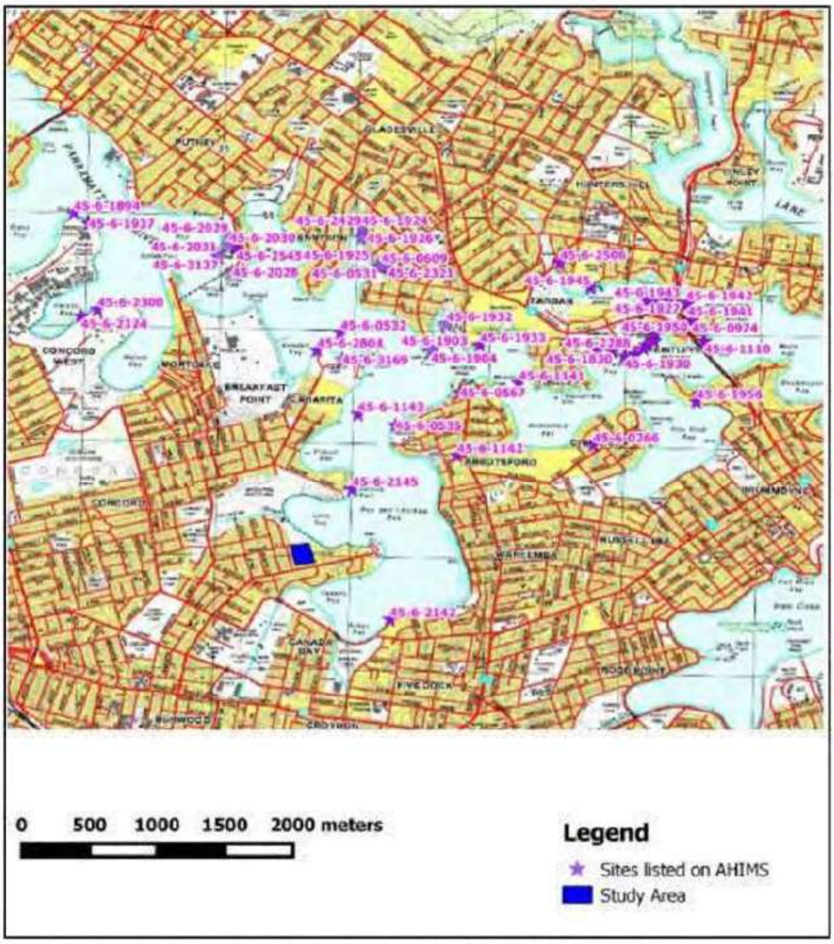


Figure 7. AHIMS site locations in relation to the study area (indicated in blue).[35]

---

[31] P. Irish, *Archaeological Research Directions: Report based on the findings of Stage 1 of the Aboriginal History Connections Program at the Sydney Olympic Parklands*, Sydney Olympic Park Authority, 2002, 21-22.

4.0 SITE INSPECTION

A site inspection was undertaken on Wednesday 30th March 2016. The archaeologist, Vanessa Hardy undertook the inspection. Kaylie Beasley, Heritage Consultant with Heritage 21 was also present. Conditions were fine and sunny. Unfortunately the MLALC sites officer did not attend. A telephone call to the MLALC office revealed the Sites Officer was away from work due to illness. As no prior notice was given of his inability to undertake the site inspection, it went ahead.

4.1 Aims and Methods

The aim of the site inspection was to determine whether any unrecorded Aboriginal objects or areas of sub-surface archaeological potential would be likely to occur in the study area and whether development of the subject land could have the potential to impact these sites or areas. The external parts of the study area were inspected on foot. No inspection was undertaken within standing buildings. In addition to the fenced area of the subject land the public foreshore access area was also inspected. Existing disturbances were noted.

4.2 Results

No Aboriginal objects were located during the site inspection. No trees with potential for Aboriginal scarring were located in the study area. No areas of sandstone or shelter overhangs were located within the study area. The entire area has been modified. As discussed in Section 2.0, the entire area has been subject to filling. Modifications to the filled surface include buildings and access roads as well as landscaped areas (see Figure 8).

4.3 Summary

No known sites are recorded within the study area boundaries. No Aboriginal objects were located during the site inspection. No trees with the potential for cultural scars were located within the study area. The site inspection revealed a disturbed (filled) landscape. No original natural ground surface was visible. The predictions for the likely presence of Aboriginal objects (discussed in Section 5.0) are therefore limited to sub-surface archaeological potential.

---

[35] AHIMS

Figure 8. The modified landscape of the study area. (Cultural Heritage Connections Pty Ltd/Heritage 21, 30.03.16)

Figure 9. Foreshore frontage of the study area. Note that the land is elevated and has been extensively filled. (Cultural Heritage Connections Pty Ltd/Heritage 21, 30.03.16).

5.0 DISCUSSION & RECOMMENDATIONS

This section provides a summary of the results of the assessment and a discussion of the due diligence requirements for the project. It also presents recommendations for ongoing management based on the assessment findings and the legislative context.

5.1 Development Impacts

No specific development plans have been considered as part of this assessment. It has been assumed that impacts could include the complete disturbance or removal of soils across the study area.

5.2 Due Diligence

Due diligence is defined in the Code of Practice as "*taking reasonable and practical steps to determine whether a person's actions will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm*".

The following discussion relates to the generic due diligence process shown in Figure 3 as applied to the study area.

Step 1 – Yes is disturbance likely

It was determined that future development works would disturb the ground surface and may have the potential to disturb culturally modified trees.

Step 2 – Yes there are sensitive landforms in the study area

The due diligence Code of Practice provides a list of landscape features which can indicate an area has potential to contain Aboriginal occupation evidence. These are listed as areas on land that is *not disturbed* that are:

- within 200 metres of waters;
- located within a sand dune system;
- located on a ridge top, ridge line or headland;
- located within 200 metres below or above a cliff face; or
- within 20 metres of or in a cave, rock shelter, or a cave mouth.

The study area is within 200 metres of waters. Although the land meets the definition of *disturbed* under the due diligence guidelines, the assessment presented in this report includes a consideration of the likelihood of development having an impact on subsurface Aboriginal objects beneath the level of known surface disturbance.

Step 3 – Can impacts to the landform be avoided? – unknown

If impacts can be restricted to existing fill it is unlikely that any additional impacts to any sub-surface Aboriginal objects will occur.

Step 4 – Are Aboriginal objects present or likely to be present – unknown

No objects are known to be present, however if the existing fill on the site were to be removed in the areas where original alluvial deposit might be present, there is some potential for currently unknown objects to be subject to impact.

5.3 Discussion & Conclusions

On the basis of the findings of the above archaeological assessment and the legislative framework for protecting and assessing Aboriginal archaeological sites in NSW, the following conclusions and recommendations are provided.

The Parramatta River and its surrounds would have been a resource rich area able to support Aboriginal occupation in the past. The presence of sites registered on AHIMS in the general vicinity demonstrates that sites can survive despite urban development. However the level of disturbance in any given area will influence the probability of archaeological material being preserved.

As there was no natural ground surface visibility due to the filling of the subject land, it was not possible to inspect the alluvial soils to ascertain their archaeological potential.

The entire study area has been filled, probably at some point in the 1920s-1930s. The geotechnical assessment prepared by Geotechnique Pty Ltd[36] shows that in much of the study area the introduced fill is overlaying B horizon soils or bedrock. These areas have low to negligible potential for containing Aboriginal objects.

Four of the boreholes (BH3, BH4, BH7 & BH8) removed during geophysical testing show that there is some alluvial deposit under the fill and overlaying the subsoils/bedrock. If disturbance to these areas is likely during development it would be prudent to undertake further consideration of the archaeological potential prior to any disturbance.

While the potential for Aboriginal objects to occur in the alluvial areas is still only considered low to moderate, further geomorphological input would enable increased certainly on this matter. Ideally a brief assessment by a geomorphologist with experience in assessing soil preservation in archaeological contexts would provide further information.

---

[36] Geotechnique Pty Ltd, *Concord Preliminary Geotechnical Investigation*, 2014.

5.4 Recommendations

1. In areas where there are existing buildings and the geotechnical information shows no remnant A Horizon soils there is no need for additional archaeological assessment. There is no impediment to development in these areas on archaeological grounds and it is recommended that development can 'proceed with caution' as outlined in the due diligence guidelines.

2. If ground disturbance is proposed to the depth of the described alluvial soils, consideration should be given to further assessment of these areas. In the first instance it is recommended that a geomorphologist with experience in assessing soil preservation in archaeological contexts be consulted.

3. A copy of this report should be provided to the MLALC for comment.

4. On-site employees or contractors involved in ground surface disturbance should be made aware of the statutory obligations that apply to the discovery of Aboriginal objects.

5. If Aboriginal objects are uncovered during ground surface works, all works must cease and OEH should be contacted to determine a course of action.

6. In the unlikely event that suspected human remains are found all work must cease, the site should be secured and the NSW Police and should be notified to advise on a course of action. If the remains are found to be archaeological, OEH and the LALC should be contacted to assist in determining appropriate management.

6.0 SOURCES

Attenbrow, V. *The Port Jackson Archaeological Project: Report on Stage 1*. Anthropology Division, Australian Museum, 1990.

Attenbrow, V. *Sydney's Aboriginal Past: investigating the archaeological and historical records*. Sydney, UNSW Press, 2002.

Benson, D. and J. Howell. *Taken for Granted: the bushland of Sydney and its suburbs*. Kenthurst, Kangaroo Press Pty. 1990.

Chapman, G. A. and C. L. Murphy. *Soil Landscapes of the Sydney 1:100 000 Sheet*. Sydney, Soil Conservation Service of NSW, 1989.

Chapman, G. A., C. L. Murphy, P. J. Tille, G. Atkinson and R. J. Morse. *Soil Landscape Series Sheet 9130*. Sydney, Soil Conservation Service of NSW, 1989.

Geotechnique Pty Ltd. *Proposed Development Robert Timms Factory Site (Bushells) 160 Burwood Road, Concord Contamination Assessment of Soil*. Letter Report, 2014.

-------- *Proposed Redevelopment 160 Burwood Road, Concord Preliminary Geotechnical Investigation*. Letter Report to Nix Anderson Pty Ltd, 2014.

IRISH, P. *Archaeological Research Directions: A report based on the findings of Stage 1 of the Aboriginal History & Connections Program at the Sydney Olympic Parklands*.Report to Sydney Olympic Park Authority.2002.

McDonald, Jo. (Cultural Heritage Management Pty Ltd). *Rouse Hill Infrastructure Project (Stage 3) Balmoral Road Release Area Indigneous & European Heritage Issues*. Unpublished report to Rouse Hill Infrastructure Consortium (RHIC), 2002.

-------- *Archaeological Salvage Excavation of Site RTA-G1, 109–113 George Street,Parramatta, New South Wales*. Report to Landcom, 2005.

NSW Department of Environment, Climate Change and Water (DECCW), *Aboriginal Cultural Heritage Consultation Requirements for Proponents*, 2010.

-------- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*. Part 6 National Parks and Wildlife Act 1974, 2010.

--------*Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. Department of Environment, Climate Change and Water NSW Guideline, 2010.

Stockton, E. and W. Holland. "Environments in the Blue Mountains." *Archaeology & Physical Anthropology in Oceania*, 1974, 9, 36-65.

Williams, A. N., P. Mitchell, R. V. S. Wright AND P. S. Toms. "A terminal Pleistocene Open Site on the Hawkesbury River, Pitt Town, New South Wales". Australian Archaeology 2012, 74, 85-97.

GEOTECHNIQUE®
PTY LTD
ABN 64 002 841 063

Member of
Australian Contaminated
Land Consultants Association Inc

Certified System
Quality
ISO 9001
SAI GLOBAL

Job No: 13188/2
Our Ref: 13188/2-AA
12 September 2014

Nix Anderson Pty Ltd
17 Chuter Street
McMahons Point NSW 2060

Attention: Mr R McGuinness

Dear Sir

re: **Proposed Development**
Robert Timms Factory Site (Bushell's)
160 Burwood Road, Concord
Contamination Assessment of Soil

This letter report presents the results of a contamination assessment of soils recovered from 10 geotechnical boreholes at 160 Burwood Road, Concord in the local government area of Canada Bay, hereafter referred to as the site.

It is understood that the site is proposed for an integrated Residential Community. This contamination assessment was to provide some indications on the contamination status of the sub-surface soil within the site for planning purposes.

The site is irregular in shape and covers an area of approximately 4 hectares (ha).

OBJECTIVE OF THE ASSESSMENT

The objective of the assessment was to ascertain whether the soils being assessed are likely to present a risk of harm to human health and the environment under the conditions for the proposed high density residential development.

SCOPE OF WORK

In order to achieve the objective, the following scope of work was conducted in accordance with our proposal dated 2 May 2014 (Reference Q6616);

- Recovery of soil samples from ten (10) boreholes locations in conjunction with a geotechnical investigation also undertaken by Geotechnique Pty Ltd (Geotechnique).
- Chemical analysis by National Association of Testing Authorities (NATA) accredited testing laboratories, in accordance with Chains of Custody (COC) prepared by Geotechnique.
- Implementation of industry standard quality assurance (QA) and quality control (QC) measures. QA/QC samples were also prepared and forwarded to the laboratories.
- Assessment of the laboratory analytical results against current applicable guidelines.
- Assessment of field and laboratory QA and QC.
- Assessment of the contamination status of the soils.

Lemko Place, Penrith NSW 2750 PO Box 880, Penrith NSW 2751
Telephone (02) 422 2700 Facsimile (02) 4722 2777
e-mail: info@geotech.com.au www.geotech.com.au

SITE CONDITION

During fieldwork from 7th to 14th August 2014, the site operated as a coffee factory. It consisted of a number of site features including:

- A multi storey factory building
- An administration building
- A gas storage area
- A guardhouse fronting Burwood Road

Open area of the site consisted of bitumen car parks, bitumen or concrete driveways and landscaped areas.

There were no obvious ash materials, asbestos sheets / pieces, odour, discolouration of the soils or petroleum hydrocarbon staining on the bare ground surface of the site that would indicate the potential for contamination.

The site generally slopes to the east.

The adjoining properties:

To the north:	Golf course, slopes similarly to the east.
To the east:	Residential land, slopes away from the site.
To the south:	Burwood Road, slopes similarly to the east.
To the west:	Residential land, slopes gently toward the site.

REVIEW OF AVAILABLE INFORMATION AND POTENTIAL FOR CONTAMINATION

SLR Consulting Australia Pty Ltd provided relevant information regarding their environmental investigation of the site (Appendix A). From 11 areas of environmental concern (AEC1 to AEC11), there was a potential for the site to be contaminated with Hydrocarbons, metals, pesticide, asbestos and PCBs. Borehole locations were appropriately located corresponding to the suggested AECs.

From interviewing the site supervisor, Ms Kayte Nguyen, Engineering Support Officer from Fresh Food Corporation Pty Ltd, the factory produced coffee from raw coffee bean. There were two main waste products from the process; coffee grounds and caustic solution. While coffee ground removal off site by contractor, the caustic solution which was used to clean the interior of the factory's machineries was neutralised with acid on site and discharge into the sewer system. Therefore, if the neutralization was not done appropriately or if there was spillage of either the caustic waste or the acid that was used to neutralized it, soil pH within the site could be altered.

Bushell's website provides an article about Bushell's history (Appendix B). According to the article, Bushell's purchased the site in 1956. Prior to that, the site was believed to have been occupied by a timber yard. Wood preservatives such as combination of copper, chromium and arsenic could have been used and potentially contaminated the soil.

Available aerial photographs (from 1970 to 2014) indicate that the factory appears in all aerial photos.

Geotechnical borehole logs of the 10 boreholes that were drilled indicated that fill was encountered at all boreholes up to depth of 5m. The fills could possibly have been imported from unknown sources for levelling and could have been contaminated with a wide range of contaminants.

FIELD SAMPLING AND LABORATORY TESTING

Field work for the contamination assessment of soils was carried out on 7th to 14th August 2014 in conjunction with a geotechnical investigation. Reference may be made to Report 13188/1 dated 10 September 2014 for details of the geotechnical investigation results.

Environmental Scientist and Engineer from Geotechnique were responsible for sampling and logging the sub-surface profile encountered at the ten borehole locations (BH1 to BH10). The boreholes were bored using a truck mounted drilling rig to depth of about 10m. The borehole locations are shown on the attached Drawing No 13188/1-AA1.

Reference should be made to the engineering logs (Report 13188/1) for detailed descriptions of the soil profile encountered during field work. Sub-surface materials encountered in the boreholes are summarised below. In particular, asphalt or concrete underlain by road base gravel were encountered BH1, BH6, BH7, BH8 and BH10.

Topsoil	The following 6 types of fill were encountered; Type 1: Silty Sand, fine grained, grey, with root fibres, was encountered to depths of 100 millimetres (mm) to 200mm below existing ground level (EGL) at BH2, BH3 and BH4, underlain by type 1 or type 4 fill. Type 2: Silty Clay, medium plasticity, grey, inclusion of sandstone fragments, was encountered to depths of 100 mm below EGL at BH5, underlain by type 3 fill.
Fill	The following 6 types of fill were encountered; Type 1: 200mm to 800mm thick silty Sand, fine grained, brown with clay and gravel, was encountered at BH1, BH3, BH4, BH7, BH8 and BH9. Type 2: 250mm to 1500mm thick silty Clay, medium to high plasticity, grey, trace of ironstone, was encountered at BH1, BH6, BH7, BH9 and BH10. Type 3: 300mm to 2300mm thick sandy Clay, low plasticity, dark brown trace of gravel, was encountered at BH1, BH2, BH3, BH5, BH7 and BH9. Type 4: 1350mm thick silty Sand, fine grained, grey, inclusion of gravel, was encountered at BH2. Type 5: 1200mm thick silty Clay, medium plasticity, grey, inclusion of gravel, was encountered at BH2 and BH7. Type 6: 1300mm thick sand Clay, high plasticity, dark grey, was encountered at BH3. Type 7: 200mm to 300mm thick Sandstone floater, was encountered at BH3 and BH4.
Residual Soil	The following 3 types of natural soil were encountered; Type 1: Silty SAND, fine grained, dark grey was, encountered at BH, BH3, BH4 and BH8. Type 2: Sandy CLAY, medium to high plasticity, brown and grey, was encountered at BH2, BH6 and BH7. Type 3: Silty CLAY, high plasticity, grey, was encountered at BH5, BH9 and BH10.
Bedrock	SANDSTONE, fine to medium grained, grey brown, extremely weathered, low strength.

Based on the contents of the fill materials and the natural soil profiles, it appears that Types 2, 3, 6 and 7 might have originated from construction of the factory; whilst Type 1, 4 and 5 fill materials could have been imported to the site for site levelling purposes.

The recovered soil samples did not have obvious asbestos sheets / pieces, odour, staining or discolouration that would indicate the potential for contamination.

Samples were recovered from the excavated material using a stainless steel trowel, which was decontaminated prior to use to prevent cross contamination.

The sampling procedures adopted were as follows;

- Bulk soil samples from boreholes were surfaced using a truck mounted drilling rig, with auger attachment, over the depth interval nominated by the Environmental Scientist/ Engineer. A representative soil sample was recovered directly from the auger, using a decontaminated stainless steel trowel.
- To minimise the potential loss of volatiles the soil sample was immediately transferred to a labelled, laboratory supplied, 250ml glass jar and sealed with an airtight, Teflon screw top lid. The fully filled jar was then placed in a chilled container.

Distilled water used for rinsing the trowel during sampling was collected at the completion of field work and placed in a glass bottle supplied by the laboratory. The rinsate water sample was labelled and placed in the chilled container.

In order to ensure the analytical performance of the primary laboratory, duplicate and split samples were prepared and kept in labelled laboratory supplied glass jars (acid-washed and solvent-rinsed) sealed with airtight screw Teflon top lids. The fully filled jars were placed in a chilled container.

At completion of field sampling the chilled containers were transported to our Penrith office. All the jars and bottles were then transferred to a refrigerator where the temperature is maintained below 4 °C.

The day after field work, the chilled containers with the trip spike sample were forwarded under COC conditions to the primary laboratory of SGS Environmental Services (SGS) and the secondary laboratory, Envirolab Services Pty Ltd (Envirolab), both NATA accredited.

On receipt of the samples the laboratories returned the Sample Receipt Advice verifying the integrity of all the samples received.

Within the holding times detailed in Schedule B(3) of The *National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM)* by the National Environment Protection Council (NEPC), the recovered soil samples were analysed, except for some pH analysis where holding time has been over by few days.

As mentioned, the soil profile encountered did not reveal any visual (staining, dying) or olfactory indicators of potential contaminants. Based on site observation, review of available information and the potential for contamination due to past and present site activities, the soil profile, the presence of fill, a suitable testing strategy is adopted below:

Environmental Concern	Borehole	Testing Strategy
In the vicinity of above ground tanks (ASTs), potential underground fuel tanks (USTs)	BH2, BH5, BH9 and BH10	Full range including metals, TPH, BTEX, PAH, OCP, PCB, total Phenols, total Cyanides, pH and Asbestos for top layer of fill or top soil, lower layer of fill and natural soil layer immediately below fill.
For screening in related to timber yard and possible pH issue	All boreholes	Metals, OCP, PAH and pH for all top layer top soil or fill and some lower fill layer.
Screening for imported fill	All boreholes	Full range for each fill type.

FIELD QUALITY ASSURANCE & QUALITY CONTROL (QA & QC)
The following QA / QC procedures were implemented for the sampling and analytical program.

Rinsate Sample
Five (5) rinsate water samples (R1 to R5) were recovered over the course of the field work in order to identify possible cross contamination between the sampling locations.

The rinsate water samples were analysed for Metals (arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn)). The test results for the rinsate water samples are summarised in Table A. Copies of the actual laboratory test results certificates are kept in the offices of Geotechnique and will be provided upon request.

As indicated in Table A, all other concentrations in the rinsate samples were less than LOR or much lower than the assessing criteria, which indicates that adequate decontamination had been carried out in the field.

Trip Spike Sample
Trip spike samples are obtained from the laboratory on a regular basis prior to conducting field sampling where volatile substances are suspected. The samples are retained in our Penrith office at less than 4 ° C for a period of not more than seven days. During field work trip spike samples are kept in a chilled container with soil samples recovered from the site. The trip spike samples are then forwarded to the laboratory together with the soil samples.

The trip spike is prepared by adding a known amount of pure petrol standard to a clean sand sample. The sample is mixed thoroughly to ensure a relatively homogenous distribution of the spike throughout the sample. When the sample is submitted for analysis the same procedure is adopted as for the soil samples being analysed.

The purpose of the trip spike is to detect any loss or potential loss of volatiles from the soil samples during field work or transportation.

Two (2) trip spike samples were tested for BTEX. The test results for the trip spike sample, reported as a percentage recovery of the applied spike concentration, are shown in the attached Table B.

The results indicate that it is unlikely that BTEX, if present within the soil samples recovered from the site, volatilised significantly during field work or transportation. Applying the losses experienced in the spike sample (worst case scenario) the actual concentrations of BTEX in each soil sample analysed might be at worst 0.121mg/kg (Benzene), 0.121mg/kg (Toluene), 0.119mg/kg (Ethyl benzene) and 0.357mg/kg (Xylenes). The concentrations in this case would still be considerably less than the relevant assessment criteria adopted (refer to Table F). Furthermore, all BTEX results were less than laboratory detection limits and there were no visible or olfactory indication of hydrocarbon contamination.

Based on the above it is considered that any loss of volatiles from the recovered samples that might have occurred would not affect the outcome / conclusions of this report.

Duplicate Sample
In order to ensure reliable analytical results from the laboratory, duplicate soil samples were prepared from original samples and submitted blind to the primary laboratory of SGS for analysis.

Duplicate samples were prepared on the basis of sample numbers recovered during the field work. The duplicate sample frequency was computed using the total number of samples analysed as part of this assessment. The duplicate frequency adopted (5% for metals, PAH, OCP and pH, 9% for TPH, BTEX, PCB, Phenols and Cyanides) complies with the NEPM, which recommends a duplicate frequency of at least 5%.

The duplicate samples test results are presented with the attached laboratory analytical reports and summarised in the attached Table C.

A comparison was made of the laboratory test results for the duplicate samples with the original samples and the Relative Percentage Differences (RPD) were computed to assess the difference between the original and duplicate. RPD within 30% are generally considered acceptable. However, this variation can be higher for organic analysis than for inorganics and for low concentrations of analytes.

As shown in Table C, the comparisons between the duplicate and corresponding original samples indicated generally acceptable RPD, with the exception of higher RPD of As due to inhomogeneity of the fill, Total PAH and Phenols due to low concentrations detected.

Based on the above, the variation is not considered to be critical and overall the duplicate sample comparisons indicate that the laboratory test data provided by SGS are of adequate accuracy and reliability for this assessment.

Split Sample
Split samples provide a check on the analytical performance of the primary laboratory. Split samples were submitted for analysis to the laboratory of Envirolab.

Split samples were prepared on the basis of sample numbers recovered during the field work. The split sample frequency was computed using the total number of samples analysed as part of this assessment. The split sample frequency adopted (5% for metals, PAH, OCP and pH, 9% for TPH, BTEX, PCB, Phenols and Cyanides) complies with the NEPM, which recommends a frequency of 5%.

The results are summarised in the attached Table D.

Based on Schedule B (3) of the NEPM the difference in the results between the split samples should in general be within 30% of the mean concentration determined by both laboratories, i.e., RPD should be within 30%. However, this variation can be higher for organic analysis than for inorganics and for low concentrations of analytes.

As shown in Table D the comparisons between the split and corresponding original samples indicated acceptable RPD, with the exception of higher RPD for Benzo (a) Pyrene (BaP) due to inhomogeneity of the fill, As, Hg, Zn, and Total PAH due to low concentrations detected. In particular, BaP concentration of the split sample was marginally higher than Ecological Screening Level for Urban residential.

Based on the above, it is concluded that the test results provided by the primary laboratory may be relied upon for this assessment.

LABORATORY QA & QC

Geotechnique uses only NATA accredited laboratories for chemical analyses. The laboratory must also incorporate quality laboratory management systems to ensure that trained analysts using validated methods and suitably calibrated equipment produce reliable results.

In addition to the quality control samples, the laboratory must also ensure that all analysts receive certification as to their competence in carrying out the analysis and participate in national and international proficiency studies. SGS and Envirolab are both accredited by NATA and operate Quality Systems designed to comply with ISO / IEC 17025.

The samples analysed for TPH (C6–C9) and BTEX were extracted by the purge and trap method recommended by the NSW EPA.

All reported laboratory limits of reporting (LOR) / practical quantitation limits (PQL) were less than the assessment criteria.

As part of the analytical run for the project the laboratories included laboratory blanks, duplicate samples, laboratory control samples, matrix spikes and surrogate spikes.

We have checked the QA / QC procedures and results adopted by the laboratories against the appropriate guidelines. The quality control sample numbers adopted by SGS and Envirolab are considered adequate for the analyses undertaken and generally conform to recommendations provided in the National Environment Protection Measure (NEPM) 1999 "Guideline on Laboratory Analysis of Potentially Contaminated Soils".

Overall, the quality control elements adopted by SGS and Envirolab indicate the analytical data to fall within acceptable levels of accuracy and precision for the analysis of soils. The analytical data provided is therefore considered to be reliable and useable for this assessment.

ASSESSMENT CRITERIA

Investigation levels and screening levels developed in the NEPM 2013 were used in this assessment, as follows;

- Risk-based Health Investigation Levels (HIL) for a broad range of metals and organic substances. The HIL are applicable for assessing human health risk via all relevant pathways of exposure. The HIL as listed in Table 1A (1) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" are provided for different land uses.

  The site is located within a parcel of industrial land, which will be developed into high density residential community. As such, with regard to human health, analytical results will be assessed against risk based HIL for *residential with minimal opportunities for soil access; including dwellings with fully and permanently paved yard space such as high-rise buildings and apartments* (HIL B).

- Health Screening Levels (HSL) for selected petroleum compounds, fractions and Naphthalene are applicable for assessing human health risk via inhalation and direct contact pathways. The HSL depend on specific soil physicochemical properties, land use scenarios and the characteristics of building structures. The HSL listed in Table 1A(3) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" apply to different soil types and depths below surface to >4 m.

  For this assessment, the analytical result was assessed against the available HSL for *with minimal opportunities for soil access; including dwellings with fully and permanently paved yard space such as high-rise buildings and apartments* (HSL B) for clay to depth of 0m to <1m and for sand to depth of 0m to <1m.

- Ecological Screening Levels (ESL) for selected petroleum hydrocarbon compounds, TPH fractions and Benzo(a)Pyrene are applicable for assessing the risk to terrestrial ecosystems. ESL listed in Table 1B(6) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" broadly apply to coarse and fine-grained soils and various land uses and are generally applicable to the top 2m of soil.

  The analytical results were assessed against the available ESL for *urban residential* for coarse and fine-grained soils.

- Ecological Investigation Levels (EIL), a specific type of Soil Quality Guidelines (SQG) for selected metals are applicable for assessing the risk to terrestrial ecosystems. EIL listed in Table 1B(1-5) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2m of soil. The EIL are calculated using 30% effect concentration (EC30) or lowest observed effect concentrations (LOEC) toxicity data. For arsenic and lead generic EIL for *urban residential* land use for aged contamination are adopted. For other metals, where available, EIL are calculated directly by using EIL calculator developed by CSIRO for NEPC.

  For this assessment the analytical results were assessed against the available SQG / EIL for *urban residential* land use for aged contamination in soil for low traffic volume.

- With regard to protection of the environment and impact on plant growth the available Provisional Phytotoxicity Based Investigation Levels (PIL) published in the *Guidelines for the NSW Site Auditor Scheme* (NSW EPA / DEC, 2006) and EIL published in the NEPM 1999 for cadmium and mercury are used.

For discrete soil samples, the individual concentrations of analytes, except Cd and Hg, were assessed against the HIL B / HSL B / ESL / EIL. The individual concentrations of Cd and Hg were assessed against the PIL and HIL B.

The soil will be deemed contaminated or containing contamination "hot spots" if the above criteria are unfulfilled. Further investigation, remediation and/or management will be recommended if the area of concern is found to be contaminated or contain contamination "hot spots".

LABORATORY TEST RESULTS, ASSESSMENT & DISCUSSION

Copies of the actual laboratory test results certificates from SGS are kept in the offices of Geotechnique and will be provided upon request. The test results are also presented in Tables E1, E2 and F to I together with the assessment criteria adopted. A discussion of the test data is presented in the following sub-sections.

Metals
The Metals test results for discrete selected soil samples are presented in Tables E1 and E2 and as shown, all concentrations of Metals were below the available relevant EIL, HIL B, except for elevated concentration of As from sample BH5 (0.1-0.4) which is marginally exceed HIL B. All Cd and Hg concentrations were also below the relevant PIL.

pH
The pH test results for discrete selected soil samples are presented in Tables E1 and E2 and as shown, soil pHs are ranging from extremely acidic (4) to strongly alkaline (9), however, majority of the pHs are within normal range of 6 to 8.

TPH and BTEX
The TPH and BTEX test results for the discrete selected soil samples are presented in Table F. As shown in Table F the concentrations of F1 (TPH C6-C10 less BTEX), F2 (TPH >C10-C16 less Naphthalene), F3 (TPH >C16-C34), F4 (TPH >C34-C40) and BTEX were below the relevant HSL B and / or ESL adopted. Moreover, all the test results were below the LOR.

PAH
The PAH test results for the selected discrete soil samples are presented in Table G and as shown, all BaP, BaP TEQ, Naphthalene and Total PAH were below the relevant HIL B or ESL or HSL B or EIL adopted, except for elevated BaP concentrations from samples BH2 (4.5-4.8) and split sample S1 (original sample BH9 (2.0-2.3)) which are higher than ESL but much lower than HIL B.

OCP
The OCP test results for selected discrete soil samples are presented in Table H and as indicated OCP were well below the relevant HIL B and all OCP were less than the laboratory LOR. The concentrations of DDT were also below the EIL.

PCB
The PCB test results for the selected discrete soil samples are presented in Table H and as shown the PCB concentrations were below the relevant HIL B adopted and less than the laboratory LOR.

Phenols
The Phenols test results for the selected discrete soil samples are presented in Table H and as shown the Phenols concentrations were well below the relevant HIL B adopted and less than the laboratory LOR.

Cyanides
The Cyanides test results for the selected discrete soil samples are presented in Table H and as shown the Cyanides concentrations were well below the relevant HIL B adopted and some less than the laboratory LOR.

Asbestos
The asbestos results for the selected discrete soil samples are presented in Table I and as shown no asbestos was detected in any of the samples.

CONCLUSION AND RECOMMENDATIONS
Based on this assessment it is considered that soils collected geotechnical borehole within the site are generally unlikely to pose a risk of harm to human health and the environment and are environmentally suitable to retain on site for the proposed development subjected to:

- Elevated As concentration found in sample BH5 (0.1-0.4), which is marginally higher than relevant HIL B, deems the soil within the vicinity of this sample to be contaminated or containing contamination "hot spots". Further investigation, remediation and/or management are required to make the contaminated soil suitable for the proposed development.

- Elevated BaP concentrations from samples BH2 (4.5-4.8) and split sample S1 (original sample BH9 (2.0-2.3)) do not pose a risk of harm to human health and the environment due to the fact that these concentrations appear deeper than 2.0m which are unlikely to significantly upset any terrestrial ecosystem. However, if the soils were to be excavated and used as topsoil, then they may have an impact on the immediate ecosystems where they landed. A horticulturist may be consulted to determine the suitability of the soils before being use as topsoil.

- Soil pHs were detected ranging from extremely acidic (4) to strongly alkaline (9). Extremely acidic condition could have an impact on footing of future structures; therefore appropriate consideration should be taken into account during the designing process.

If suspect materials (identified by unusual staining, odour, discolouration or inclusions such as building rubble, asbestos sheets / pieces, ash material, etc) are encountered during the construction stage, we recommend that this office is contacted for assessment and necessary action.

LIMITATIONS

Within the stated scope of work the services performed by Geotechnique in preparation of this report were conducted in a manner consistent with the level of quality and skill generally exercised by members of the profession and consulting practice.

This report has been prepared for Nix Anderson Pty Ltd for the purpose stated within. Any reliance on this report by other parties shall be at such parties' sole risk as the report might not contain sufficient information for other purposes.

This report shall only be presented in full and may not be used to support any other objective than those set out in the report, except where written approval is provided by Geotechnique.

The information in this report is considered accurate at completion of field sampling (14 August 2014) and in accordance with current site conditions. Any variations to the site form or use beyond this date might nullify the conclusions stated.

No contamination assessment can eliminate all risk; even a rigorous professional assessment might not detect all contamination within the investigated locations.

Reference should be made to the attached "Environmental Notes" for details of the limitations of this assessment.

If you have any questions, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

pp

AN NGUYEN
Environmental Scientist

Attached Drawing No 13188/1-AA1 Borehole Locations
Lab Summary Tables A to I
13188/1-AA Borehole Logs Nos 1 to 10
Appendix A Areas of Environmental Concern from SLR Consulting Australia Pty Ltd
Appendix B Bushell's History
Appendix C Envirolab Services Certificates of Analysis and SGS Environmental Services Analytical Report
Appendix D Environmental Notes

Imagery ©2014 NearMap.com

GEOTECHNIQUE® PTY LTD

PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700
Fax: 02 4722 2777
e-mail:info@geotech.com.au
www.geotech.com.au

NOTES

1. Site features are indicative and are not to scale.
2. This drawing has been produced using a base plan provided by others to which additional information e.g test pits, borehole locations or notes have been added. Some or all of the plan may not be relevant at the time of producing this drawing

Nix Management Pty Ltd
Proposed Development
Robert Timms Factory Site (Bushell's)
160 Burwood Road, Concord

Borehole Locations

Drawing No: 13188/1-AA1
Job No: 13188/1
Drawn By: MH
Date: 20 August 2014
Checked By: ER

File No: 13188-1
Layers: 0, AA1

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 1
Date : 07/08/2014
Logged/Checked by: AN/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.5
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger						0			Asphaltic concrete	M			Well compacted
									Road base Sandy GRAVEL, fine to medium grained, grey	M			
									FILL; Sandstone Gravel, medium to coarse grained, red grey, with sand	M			
		DS			N=R 6,15,7/50 Ref	0.5			FILL; Silty Sand, fine grained, brown, with clay and gravel				
		DS			N=8 4,4,4	1 1.5			FILL; Silty Clay, medium to high plasticity, grey, trace of ironstone	M<PL			
	▼	DS				2 2.5 3			FILL; Sandy Clay, low plasticity, dark brown, trace of gravel	M<PL			
		DS			N=R 3,25/150			SM	Silty SAND, fine grained, dark grey	W	MD		Bedrock
						3.5 4 4.5			Commenced Coring at 3.3m				

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 2
Date : 11/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted **slope :** **deg.** **R.L. surface :** ≃5.4
hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		DS				0			TOPSOIL; Silty Sand, fine grained, grey, with inclusion of root fibre				
									FILL; Silty Sand, fine grained, grey, with inclusion of gravel				Well compacted
		DS			N=4 4,2,2	0.5							
						1							
		DS			N=11 5,6,5	1.5			FILL: Gravelly Sandy Clay, low plasticity, brown				Well compacted
						2							
						2.5							
		DS			N=4 2,2,2	3							
						3.5							
									FILL; Silty Clay, medium plasticity, dark grey, with inclusion of timber				Well compacted
						4							
		DS			N=3 2,1,2	4.5							

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 2
Date : 11/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted **slope :** **deg.** **R.L. surface :** ≃5.4
hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger						5		CH	Sandy CLAY, high plasticity, brown and grey	M>PL	St-H		Residual
		DS											
						5.5							
						6							
					N=11 4,5,6								
						6.5							
						7							
						7.5							
						8							
						8.5							
						9							
						9.5							
									SANDSTONE; extremely weathered, extremely low strength, brown and grey				Bedrock

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 2
Date : 11/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.4
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	Dry					10	▨						
						10.5			Borehole 2 terminated at 10.5m				
						11							
						11.5							
						12							
						12.5							
						13							
						13.5							
						14							
						14.5							

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client :	Nix Anderson Pty Ltd	**Job No. :**	13188/1
Project :	Proposed Development	**Borehole No. :**	3
Location :	160 Burwood Road, Concord	**Date :**	12/08/2014
		Logged/Checked by:	LY/MT

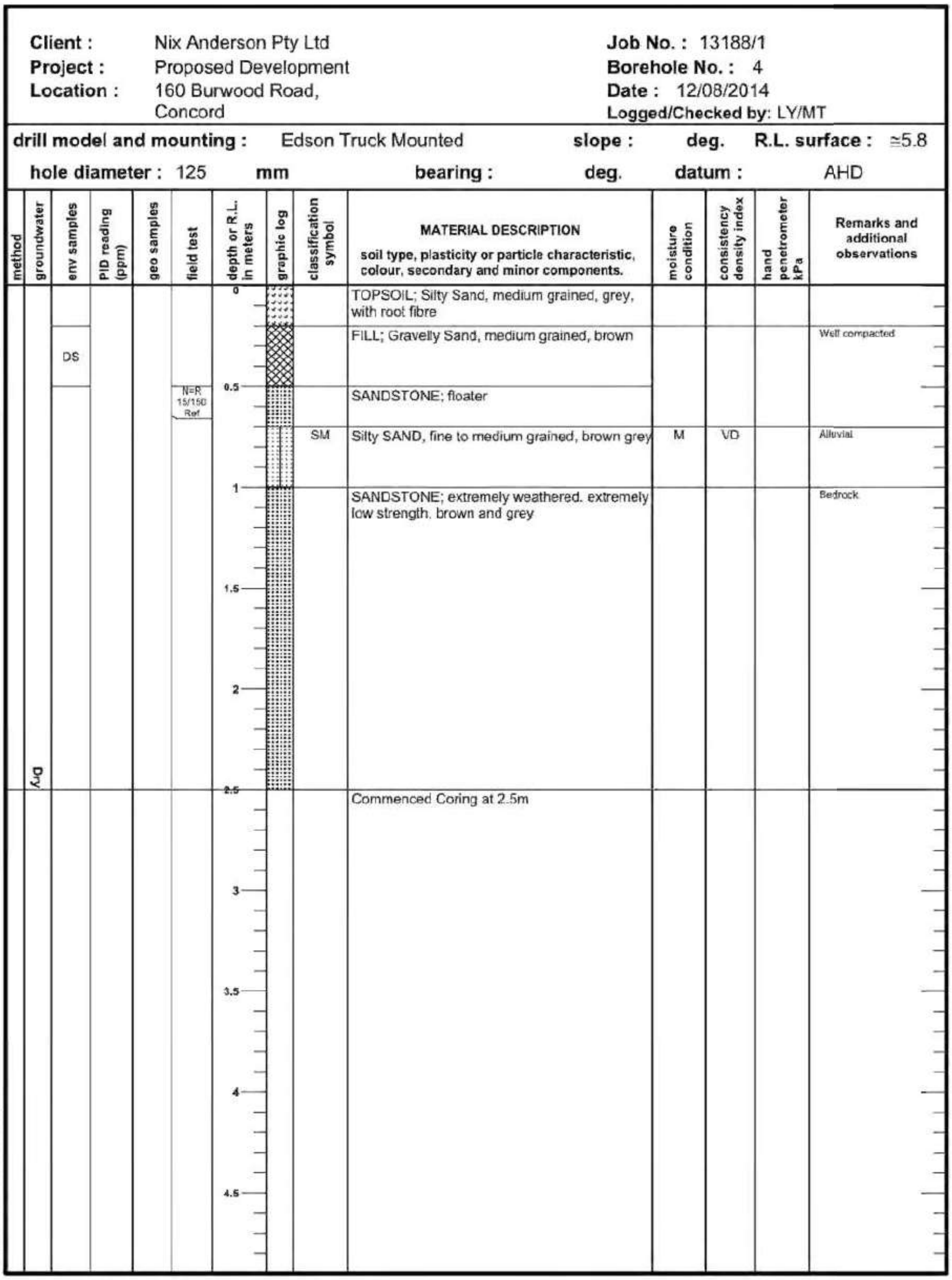
drill model and mounting :	Edson Truck Mounted	**slope :**	deg.	**R.L. surface :**	≃5.4
hole diameter :	125 mm	**bearing :**	deg.	**datum :**	AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger	Dry					0			TOPSOIL; Silty Sand, fine grained, grey, with root fibre				
		DS							FILL; Clayey Sand, medium grained, brown, with gravel				Well compacted
					N=R 11/50 Ref	0.5			Sandstone floater				
		DS				1			FILL; Sandy Clay, medium plasticity, brown				Well compacted
		DS			N=5 2,2,3	1.5 2			FILL; Sandy Clay, high plasticity, dark grey				Well compacted
						2.5		SM	Silty SAND, fine to medium grained, grey	M	L-VD		Alluvial
					N=R 10,10/50	3 3.5 4			SANDSTONE; extremely weathered, grey				Bedrock
						4.5			Coring commenced at 4.1m				

form no. 002 version 04 - 05/11

GEOTECHNIQUE PTY LTD

engineering log - borehole



Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 4
Date : 12/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.8
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0			TOPSOIL; Silty Sand, medium grained, grey, with root fibre				
		DS							FILL; Gravelly Sand, medium grained, brown				Well compacted
					N=R 15/150 Ref	0.5			SANDSTONE; floater				
								SM	Silty SAND, fine to medium grained, brown grey	M	VD		Alluvial
						1			SANDSTONE; extremely weathered. extremely low strength. brown and grey				Bedrock
						1.5							
						2							
	Dry												
						2.5			Commenced Coring at 2.5m				
						3							
						3.5							
						4							
						4.5							

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 5
Date : 13/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≃6.7
hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger	Dry					0			TOPSOIL; Silty Clay, medium plasticity, grey, with root fibre				
		DS							FILL; Sandy Gravelly Clay, medium plasticity, grey, with inclusion of sandstone fragments				Well compacted
					N=4 4,2,2	0.5 1		CH	Silty CLAY, high plasticity, grey	M>PL	S		Residual
						1.5			SANDSTONE; extremely weathered, extremely low strength, brown				Bedrock
						2 2.5 3 3.5 4 4.5			Commenced Coring at 1.6m				

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client :	Nix Anderson Pty Ltd	**Job No. :**	13188/1
Project :	Proposed Development	**Borehole No. :**	6
Location :	160 Burwood Road, Concord	**Date :**	13/08/2014
		Logged/Checked by:	LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≃6.3

hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0			CONCRETE				
									ROADBASE, gravel				
		DS							FILL; Gravelly Clay, medium plasticity, grey				Well compacted
		DS			N=R 7,20/100, Ref	0.5		CI	Sandy CLAY, medium plasticity, brown, with inclusion of ironstone	M>PL	H		Residual
	Dry					1			SANDSTONE; extremely weathered, extremely low strength, brown, with some ironstone				Bedrock
									Commenced Coring at 1.2m				
						1.5							
						2							
						2.5							
						3							
						3.5							
						4							
						4.5							

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client :	Nix Anderson Pty Ltd	**Job No. :**	13188/1
Project :	Proposed Development	**Borehole No. :**	7
Location :	160 Burwood Road, Concord	**Date :**	11/08/2014
		Logged/Checked by:	LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≃5.6

hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	**MATERIAL DESCRIPTION** soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger						0			ASPHALTIC CONCRETE				
									ROADBASE; sandy gravel, fine to medium grained, grey				Well compacted
									FILL; Silty Sand, fine grained, brown, with inclusion of gravel				
		DS			N=14 9,10,4	0.5							
						1			FILL; Sandy Clay, high plasticity, dark grey				Well compacted
		DS			N=5 5,3,2	1.5			FILL; Sandy Clay, medium plasticity, brown, with inclusion of gravel				Well compacted
						2							
		DS							FILL; Silty Clay, high plasticity, grey				Well compacted
						2.5		SM	Silty SAND, fine to medium grained, grey brown	M	D-VD		Alluvial
					N=R 2,2,10/ 100	3			SANDSTONE; fine to medium grained, grey brown				Bedrock
	Dry					3.5							
									Commenced Coring at 3.8m				
						4							
						4.5							

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 8
Date : 14/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.7
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0	■		Concrete Pavement 200mm				
		DS					▩		FILL; Silty Sand, fine to medium grained, brown, with some gravel				
					N=19 5,10,9	0.5	░	SM	Silty SAND, fine to medium grained, brown, with some ironstone	M	MD		
	Dry					1	▦	SM	SANDSTONE; fine to medium grained, brown, extremely weathered				Bedrock
						1.5			Commenced Coring at 1.4m				
						2							
						2.5							
						3							
						3.5							
						4							
						4.5							

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client :	Nix Anderson Pty Ltd	**Job No. :**	13188/1
Project :	Proposed Development	**Borehole No. :**	9
Location :	160 Burwood Road, Concord	**Date :**	14/08/2014
		Logged/Checked by:	LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≃7.16

hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0	■		Bitumen Pavement				
		DS					▩		FILL; Silty Gravelly Clay, medium plasticity, grey, with some gravel	M<PL			
					N=13 5,3,10	0.5	▩		FILL; Silty Gravelly Clay, medium to high plasticity, grey brown to dark brown, with gravel	M<PL			
		DS				1	▩		FILL; Silty Gravelly Clay, medium to high plasticity, grey brown to dark brown with ironstone	M<PL			
					N=5 2,2,3	1.5	▩						
		DS				2	▩		FILL; Silty Clay, medium to high plasticity, dark brown	M<PL	F		
						2.5	▨	CI-CH	Silty CLAY, medium to high plasticity, orange to grey, with some ironstone	M>PL	St		Residual
					N=8 2,3,5	3	▨						
						3.5	▨						
							⣿		SANDSTONE; fine to medium grained, grey red				Bedrock
	Dry					4	⣿						
						4.5			Commenced Coring at 4.5m				

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 10
Date : 14/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≃5.9
hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger	Dry					0	■		Concrete				
									Road base/gravel				
		DS					▩		FILL; Gravelly Clay, medium plasticity, grey with inclusion of sand				Well compacted
		DS			N=16 7,7,8	0.5	▨	CH	Shaley CLAY, high plasticity, grey and red brown	M>PL	VSt-H		Residual
						1							
					N=R 30/150, Ref	1.5	░		SANDSTONE; extremely weathered, extremely low strength, brown with ironstone bands				Bedrock
						2							
						2.5			Commenced coring at 2.4m				
						3							
						3.5							
						4							
						4.5							

form no. 002 version 04 - 05/11

EXPLANATORY NOTES

Introduction

These notes have been provided to simplify the geotechnical report with regard to investigation procedures, classification methods and certain matters relating to the Discussion and Comments section. Not all notes are necessarily relevant to all reports.

Geotechnical reports are based on information gained from finite sub-surface probing, excavation, boring, sampling or other means of investigation, supplemented by experience and knowledge of local geology. For this reason they must be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on AS1726 - 1993 "Geotechnical Site Investigations". In general, descriptions cover the following properties; strength or density, colour, structure, soil or rock type, and inclusions. Identification and classification of soil and rock involves, to a large extent, judgement within the acceptable level commonly adopted by current geotechnical practices.

Soil types are described according to the predominating particle size, qualified by the grading or other particles present (e.g. sandy clay) on the following basis:

Soil Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2.00mm
Gravel	2.00mm to 60.00mm

Cohesive soils are classified on the basis of strength, either by laboratory testing or engineering examination. The strength terms are defined as follows:

Classification	Undrained Shear Strength kPa
Very Soft	Less than 12
Soft	12 – 25
Firm	25 – 50
Stiff	50 – 100
Very Stiff	100 – 200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT), as below:

Relative Density	SPT 'N' Value (blows/300mm)	CPT Cone Value (q_c-MPQ)
Very Loose	Less than 5	Less than 2
Loose	5 – 10	2 – 5
Medium Dense	10 – 30	5 – 15
Dense	30 – 50	15 – 25
Very Dense	>50	>25

Rock types are classified by their geological names, together with descriptive terms on degrees of weathering, strength, defects and other minor components. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, type, moisture content, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin walled sample tube (normally known as U_{50}) into the soil and withdrawing a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils. Details of the type and method of sampling are given in the report.

Field Investigation Methods

The following is a brief summary of investigation methods currently carried out by this Company and comments on their use and application.

Hand Auger Drilling

The borehole is advanced by manually operated equipment. The diameter of the borehole ranges from 50mm to 100mm. Penetration depth of hand augered boreholes may be limited by premature refusal on a variety of materials, such as hard clay, gravels or ironstone.

Test Pits

These are excavated with a tractor-mounted backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3.0m for a backhoe and up to 6.0m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Care must be taken if construction is to be carried out near, or within the test pit locations, to either adequately recompact the backfill during construction, or to design the structure to accommodate the poorly compacted backfill.

Large Diameter Auger (e.g. Pengo)

The hole is advanced by a rotating plate or short spiral auger, generally 300mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5m) and are disturbed, but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers and is usually supplemented by occasional undisturbed tube sampling.

Continuous Spiral Flight Augers

The hole is advanced by using 90mm-115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be highly mixed with soil of other stratum.

Information from the drilling (as distinct from specific sampling by SPT or undisturbed samples) is of relatively lower reliability due to remoulding, mixing or softening of samples by groundwater, resulting in uncertainties of the original sample depth.

The spiral augers are usually advanced by using a V-bit through the soil profile to refusal, followed by Tungsten Carbide (TC) bit, to penetrate into bedrock. The quality and continuity of the bedrock may be assessed by examination of recovered rock fragments and through observation of the drilling penetration resistance.

Non-core Rotary Drilling (Wash Boring)

The hole is advanced by a rotary bit, with water being pumped down the drill rod and returned up the annulus carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the feel and rate of penetration.

Rotary Mud Stabilised Drilling

This is similar to rotary drilling, but uses drilling mud as a circulating fluid, which may consist of a range of products from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (e.g. SPT and U_{50}) samples).

Continuous Core Drilling
A continuous core sample is obtained using a diamond tipped core barrel. Providing full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush.

Portable Proline Drilling
This is manually operated equipment and is only used in sites which require bedrock core sampling and there is restricted site access to truck mounted drill rigs. The boreholes are usually advanced initially using a tricone roller bit and water circulation to penetrate the upper soil profile. In some instances, a hand auger may be used to penetrate the soil profile. Subsequent drilling into bedrock involves the use of NMLC triple tube equipment, using water as a lubricant.

Standard Penetration Tests
Standard penetration tests are used mainly in non-cohesive soils, but occasionally also in cohesive soils, as a means of determining density or strength and of obtaining a relatively undisturbed sample. The test procedure is described in AS1289 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube under the impact of a 63kg hammer with a free fall of 769mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In a case where full penetration is obtained with successive blow counts for each 150mm of, say 4, 6 and 7 blows as;

  N = 13
  4,6,7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm as;

  15, 30/40mm

The results of the tests can be related empirically to the engineering properties of the soil. Occasionally the test method is used to obtain samples in 50mm diameter thin walled sample tubes in clays. In these circumstances, the test results are shown on the bore logs in brackets.

Cone Penetrometer Testing and Interpretation
Cone penetrometer testing (sometimes referred to as Dutch Cone-CPT) described in this report, has been carried out using an electrical friction cone penetrometer and the test is described in AS1289 6.5.1.

In the test, a 35mm diameter rod with cone tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig, which is fitted with a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output on continuous chart recorders. The plotted results given in this report have been traced from the original records. The information provided on the charts comprises:

- Cone resistance - the actual end bearing force divided by the cross sectional area of the cone, expressed in MPa *
- Sleeve friction - the frictional force on the sleeve divided by the surface area, expressed in kPa

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and very soft clays, rising to 4% to 10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:

$$q_c \text{ (MPa)} = (0.4 \text{ to } 0.6)\ N \text{ (blows per 300mm)}$$

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:

$$q_c=(12 \text{ to } 18)C_u$$

Interpretation of CPT values can also be made to allow estimate of modulus or compressibility values, to allow calculation of foundation settlements. Inferred stratification, as shown on the attached report, is assessed from the cone and friction traces, from experience and information from nearby boreholes etc.

This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties and where precise information or soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometer (DCP)
Portable Dynamic Cone Penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows per successive 100mm increment of penetration.

There are two similar tests, Cone Penetrometer (commonly known as Scala Penetrometer) AS1289 6.3.2 and the Perth Sand Penetrometer AS1289 6.3.3. Scala Penetrometer is commonly adopted by this company and consists of a 16mm rod with a 20mm diameter cone end, driven with a 9kg hammer, dropping 510mm (AS1289 Test P3.2).

Laboratory Testing
Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedures are given on the individual report forms.

Engineering Logs
The engineering logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, however, this is not always practicable or possible to justify economically. As it is, the boreholes represent only a small sample of the total sub-surface profile. Interpretation of the information and its application to design and construction should take into account the spacing of boreholes, frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Groundwater
Where groundwater levels are measured in boreholes, there are several potential problems:

- in low permeability soils groundwater, although present, may enter the hole slowly or perhaps not at all during the investigation period
- a localised perched water table may lead to an erroneous indication of the true water table
- water table levels will vary from time to time due to the seasons or recent weather changes. They may not be the same at the time of construction as indicated in the report
- the use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole if water observations are to be made

More reliable measurements can be achieved by installing standpipes that are read at intervals over several days, or weeks for low permeability soils. Piezometers sealed in a particular stratum may be advisable in low permeability soils, or where there may be interference from a perched water table or surface water.

Engineering Reports
Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, perhaps a three-storey building, the information and interpretation may not be relevant if the design proposal is changed, say to a twenty-storey building. If this occurs, the Company will be pleased to review the report and sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of sub-surface conditions, discussions of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on bore spacing and sampling frequency.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of contractors responding to commercial pressures.

If these occur, the Company will be pleased to assist with investigation or advice to resolve the matter.

Site Anomalies
In the event that conditions encountered on-site during construction appear to vary from those that were expected from the information contained in the report, the Company requests immediate notification. Most problems are much more easily resolved when conditions are exposed rather than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes
Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institute of Engineers Australia. Where information obtained from this investigation is provided for tendering purposes; it is recommended that all information, including the written report and discussion, be made available.

In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or make additional copies of the report available for contract purposes, at a nominal charge.

Site Inspection
The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that the conditions exposed are as expected, to full time engineering presence on site.

Review of Design
Where major civil or structural developments are proposed, or where only a limited investigation has been completed, or where the geotechnical conditions are complex, it is prudent to have the design reviewed by a Senior Geotechnical Engineer.

TABLE A
RINSATE SAMPLES
(Ref No: 13188/2-AA)

ANALYTES	Rinsate R1 7/08/2014	Rinsate R2 11/08/2014	Rinsate R3 12/08/2014	Rinsate R4 13/08/2014	Rinsate R5 14/08/2014
METALS	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Arsenic	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	<0.02	<0.02	<0.02	<0.02	<0.02
Mercury	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE B
TRIP SPIKE SAMPLES
(Ref No: 13188/2-AA)

ANALYTES	Trip Spike TS1	Trip Spike TS2
BTEX		
Benzene	85%	79%
Toluene	79%	91%
Ethyl Benzene	81%	95%
Xylenes	81%	97%

Note : results are reported as percentage recovery of known spike concentrations

Nix Anderson Pty Ltd
AN.sf/11.09.2014

TABLE C
DUPLICATE SAMPLE
(Ref No: 13188/2-AA)

ANALYTES	BH5 0.1-0.4 m mg/kg	Duplicate D2 mg/kg	RELATIVE PERCENTAGE DIFFERENCES (RPD) %
METALS			
Arsenic	520	260	67
Cadmium	0.6	0.7	15
Chromium	37	36	3
Copper	41	43	5
Lead	120	110	9
Mercury	0.06	0.08	29
Nickel	10	9.5	5
Zinc	150	150	0
TOTAL PETROLEUM HYDROCARBONS (TPH)			
F1 (C6-C10 less BTEX)	<25	<25	-
F2 (>C10-C16)	<25	<25	-
F3 (>C16-C34)	<90	<90	-
F4 (>C34-C40)	<120	<120	-
BTEX			
Benzene	<0.1	<0.1	-
Toluene	<0.1	<0.1	-
Ethyl Benzene	<0.1	<0.1	-
Xylenes	<0.3	<0.3	-
POLYCYCLIC AROMATIC HYDROCARBONS			
Benzo(a)Pyrene TEQ	0.3	<0.3	-
Total PAH	2.4	1.5	46
Naphthalene	<0.1	<0.1	
Benzo(a)Pyrene	0.2	<0.1	-
ORGANOCHLORINE PESTICIDES (OCP)			
Hexachlorobenzene (HCB)	<0.1	<0.1	-
Heptachlor	<0.1	<0.1	-
Aldrin+Dieldrin	<0.15	<0.15	-
Endrin	<0.2	<0.2	-
Methoxychlor	<0.1	<0.1	-
Mirex	<0.1	<0.1	-
Endosulfan (alpha, beta & sulphate)	<0.5	<0.5	-
DDD+DDE+DDT	<0.6	<0.6	-
Chlordane (alpha & gamma)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<1	<1	-
CYANIDES & PHENOLS			
Cyanides	0.2	0.2	0
Phenols	0.3	0.1	100

Nix Anderson Pty Ltd
AN.sf/11.09.2014

GEOTECHNIQUE
PTY LTD

TABLE D
SPLIT SAMPLE
(Ref No: 13188/2-AA)

ANALYTES	BH9 2.0-2.3 m mg/kg (SGS)	Split Sample S1 mg/kg (ENVIROLAB)	RELATIVE PERCENTAGE DIFFERENCES (RPD) %
METALS			
Arsenic	12	20	50
Cadmium	0.4	<0.4	-
Chromium	20	25	22
Copper	20	32	46
Lead	42	50	17
Mercury	0.16	0.3	61
Nickel	2.3	3	26
Zinc	67	100	40
TOTAL PETROLEUM HYDROCARBONS (TPH)			
F1 (C6-C10 less BTEX)	<25	<25	-
F2 (>C10-C16)	<25	<50	-
F3 (>C16-C34)	<90	<50	-
F4 (>C34-C40)	<120	<100	-
BTEX			
Benzene	<0.1	<0.2	-
Toluene	<0.1	<0.5	-
Ethyl Benzene	<0.1	<1	-
Xylenes	<0.3	<3	-
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)			
Benzo(a)Pyrene TEQ	0.8	1	22
Total PAH	4.8	10.63	76
Naphthalene	<0.1	<0.1	-
Benzo(a)Pyrene	0.5	0.93	60
ORGANOCHLORINE PESTICIDES (OCP)			
Hexachlorobenzene (HCB)	<0.1	<0.1	-
Heptachlor	<0.1	<0.1	-
Aldrin+Dieldrin	<0.15	<0.2	-
Endrin	<0.2	<0.1	-
Methoxychlor	<0.1	<0.1	-
Mirex	<0.1	-	-
Endosulfan (alpha (I), beta (II) & sulphate)	<0.5	<0.3	-
DDD+DDE+DDT	<0.6	<0.3	-
Chlordane (alpha & gamma)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<1	<0.7	-
CYANIDES & PHENOLS			
Cyanides	0.1	<0.5	-
Phenols	0.4	<5	-

Nix Anderson Pty Ltd
AN.sf/11.09.2014

GEOTECHNIQUE
PTY LTD

TABLE E1
METALS, CATION EXCHANGE CAPACITY (CEC), pH & TOTAL ORGANIC CARBON (TOC) TEST RESULTS
DISCRETE SAMPLE(S)
(Ref No: 13188/2-AA)

		METALS (mg/kg)										
Sample Location	Depth (m)	ARSENIC	CADMIUM	CHROMIUM (Total)	COPPER	LEAD	MERCURY	NICKEL	ZINC	CEC (cmol/kg)	pH	TOC (%)
BH1	1.5-1.8	7	0.4	16	6.7	18	0.02	1.5	7.7	7	4	0
BH1	3.15-3.25	9	<0.3	14	4.1	18	0.02	3.1	11	8	6	2
BH2	0-0.15	<3	<0.3	9.1	17	28	0.02	5.3	54	10	5.3	4
BH2	0.5-0.8	4	0.3	12	15	20	0.01	4.5	38	10	6	2
BH2	4.5-4.8	30	0.8	52	**130**	120	0.4	8.3	**260**	25	8	3
BH2	5.1-5.25	10	0.3	18	8.5	22	0.02	1.9	19	13	8	0
BH3	0-0.1	<3	<0.3	8.4	8	13	0.01	5.5	26	7	6	2
BH3	1.5-1.8	7	<0.3	12	9	35	0.04	2.6	54	12	7	2
BH4	0-0.15	12	0.4	18	16	38	0.04	4.9	62	18	8	2
BH5	0.1-0.4	**520**	0.6	37	41	120	0.06	10	150	11	6	1
BH5	0.6-0.7	62	0.4	28	12	43	0.06	2.1	31	7	6	1
BH6	0.6-0.7	7	0.6	27	14	14	0.01	15	17	6	5	0
BH7	0.15-0.45	<3	<0.3	11	8.6	9	0.01	8.6	20	9	9	0
BH7	1.4-1.7	4	<0.3	11	9.3	13	0.01	5.9	17	8	6	0
BH8	0.2-0.4	4	0.5	97	15	10	0.02	50	35	-	8	-
BH9	0.2-0.5	6	0.4	23	18	23	0.02	15	43	34	8	0
BH9	2.0-2.3	12	0.4	20	20	42	0.16	2.3	67	15	7	1
BH9	2.55-2.65	5	0.3	9.3	12	24	0.05	0.7	13	6	5	0
BH10	0.23-0.5	6	0.4	16	22	15	0.01	19	16	15	7	0
BH10	0.55-0.65	4	<0.3	7.2	23	13	<0.01	19	15	6	5	0
Limits of Reporting (LOR)		1	0.3	0.5	0.5	1	0.05	0.5	2	0.02	-	0.05
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)												
Health-based Investigation Levels (HIL)[a] B - Residential B		500	150	500[c]	30000	1200	30[d]	1200	60000			
Ecological Investigation Levels (EIL)[b] - Urban residential		100[e]	-	400[f]	55	1100[g]	-	55	160			
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)												
Provisional Phytotoxity-Based Investigation Levels (PIL)			3				1					

Notes:
- a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
- b: EIL of aged copper, nickel & zinc were derived from calculation spreadsheet developed by CSIRO for NEPC; old NSW suburb with low traffic volume; the lowest CEC=6 cmolc/kg; pH=4 and TOC=1 % were selected for derivation of EIL.
- c: Chromium (VI)
- d: Methyl Mercury
- e: Generic EIL for aged arsenic
- f: Chromium (III), clay content was assumed =10%, a conservative assur
- g: Generic EIL for aged lead

Nix Anderson Pty Ltd
AN.sf/11.09.2014

TABLE E2
METALS, CATION EXCHANGE CAPACITY (CEC), pH & TOTAL ORGANIC CARBON (TOC) TEST RESULTS
DISCRETE SAMPLE
(Ref No: 13188/2-AA)

		METALS (mg/kg)										
Sample Location	Depth (m)	ARSENIC	CADMIUM	CHROMIUM (Total)	COPPER	LEAD	MERCURY	NICKEL	ZINC	CEC (cmol/kg)	pH	TOC (%)
BH2	4.5-4.8	30	0.8	52	130	120	0.4	8.3	260	25	8	3
Limits of Reporting (LOR)		1	0.3	0.5	0.5	1	0.05	0.5	2	0.02	-	0.05
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)												
Health-based Investigation Levels (HIL)[a]B - Residential B		500	150	500[c]	30000	1200	30[d]	1200	60000			
Ecological Investigation Levels (EIL)[b] - Urban residential		100[e]	-	400[f]	240	1100[g]	-	390	1100			
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)												
Provisional Phytotoxity-Based Investigation Levels (PIL)			3				1					

Notes:

a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

b: EIL of aged copper, nickel & zinc were derived from calculation spreadsheet developed by CSIRO for NEPC; old NSW suburb with low traffic volume; the lowest CEC=25 cmolc/kg; pH=8 and TOC=3 % were selected for derivation of EIL.

c: Chromium (VI)

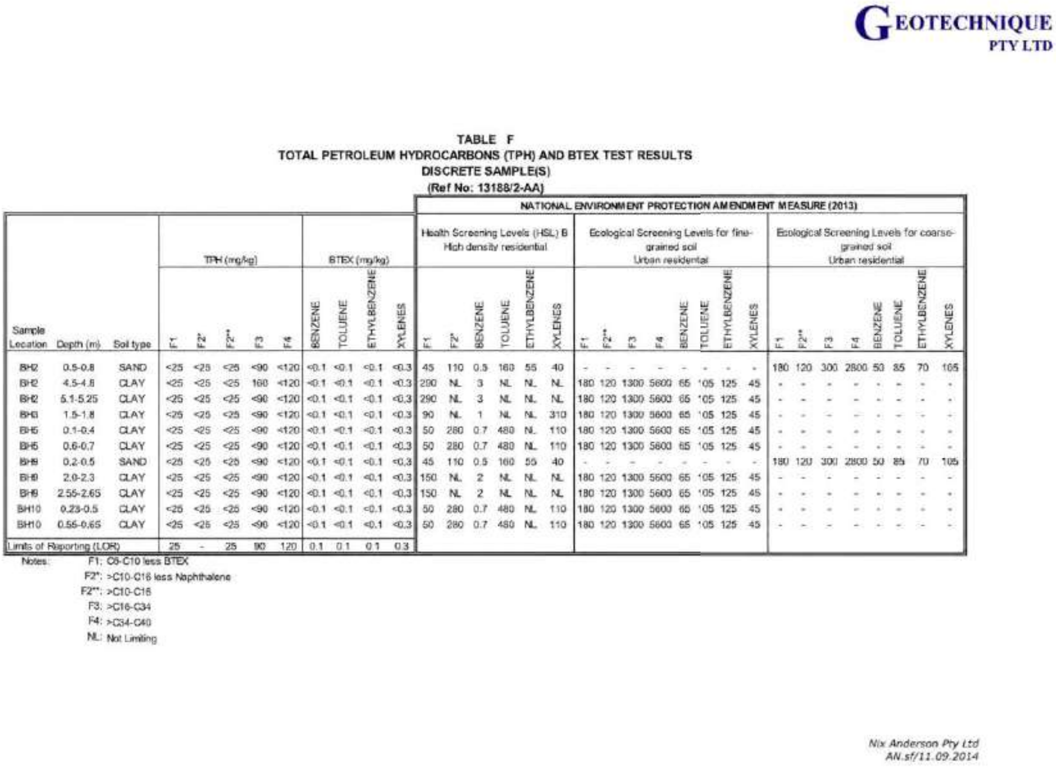
d: Methyl Mercury

e: Generic EIL for aged arsenic

f: Chromium (III), clay content was assumed =10%, a conservative assumption

g: Generic EIL for aged lead

Nix Anderson Pty Ltd
AN.sf/11.09.2014



GEOTECHNIQUE PTY LTD

TABLE F
TOTAL PETROLEUM HYDROCARBONS (TPH) AND BTEX TEST RESULTS
DISCRETE SAMPLE(S)
(Ref No: 13188/2-AA)

												NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)																					
			TPH (mg/kg)					BTEX (mg/kg)				Health Screening Levels (HSL) B High density residential						Ecological Screening Levels for fine-grained soil Urban residential								Ecological Screening Levels for coarse-grained soil Urban residential							
Sample Location	Depth (m)	Soil type	F1	F2*	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2*	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES
BH2	0.5-0.8	SAND	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH2	4.5-4.8	CLAY	<25	<25	<25	160	<120	<0.1	<0.1	<0.1	<0.3	290	NL	3	NL	NL	NL	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
BH2	5.1-5.25	CLAY	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	290	NL	3	NL	NL	NL	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
BH3	1.5-1.8	CLAY	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	90	NL	1	NL	NL	310	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
BH5	0.1-0.4	CLAY	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
BH5	0.6-0.7	CLAY	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
BH9	0.2-0.5	SAND	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH9	2.0-2.3	CLAY	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	150	NL	2	NL	NL	NL	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
BH9	2.55-2.65	CLAY	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	150	NL	2	NL	NL	NL	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
BH10	0.23-0.5	CLAY	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
BH10	0.55-0.65	CLAY	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
Limits of Reporting (LOR)			25	-	25	90	120	0.1	0.1	0.1	0.3																						

Notes:
F1: C6-C10 less BTEX
F2*: >C10-C16 less Naphthalene
F2**: >C10-C16
F3: >C16-C34
F4: >C34-C40
NL: Not Limiting

Nix Anderson Pty Ltd
AN.sf/11.09.2014

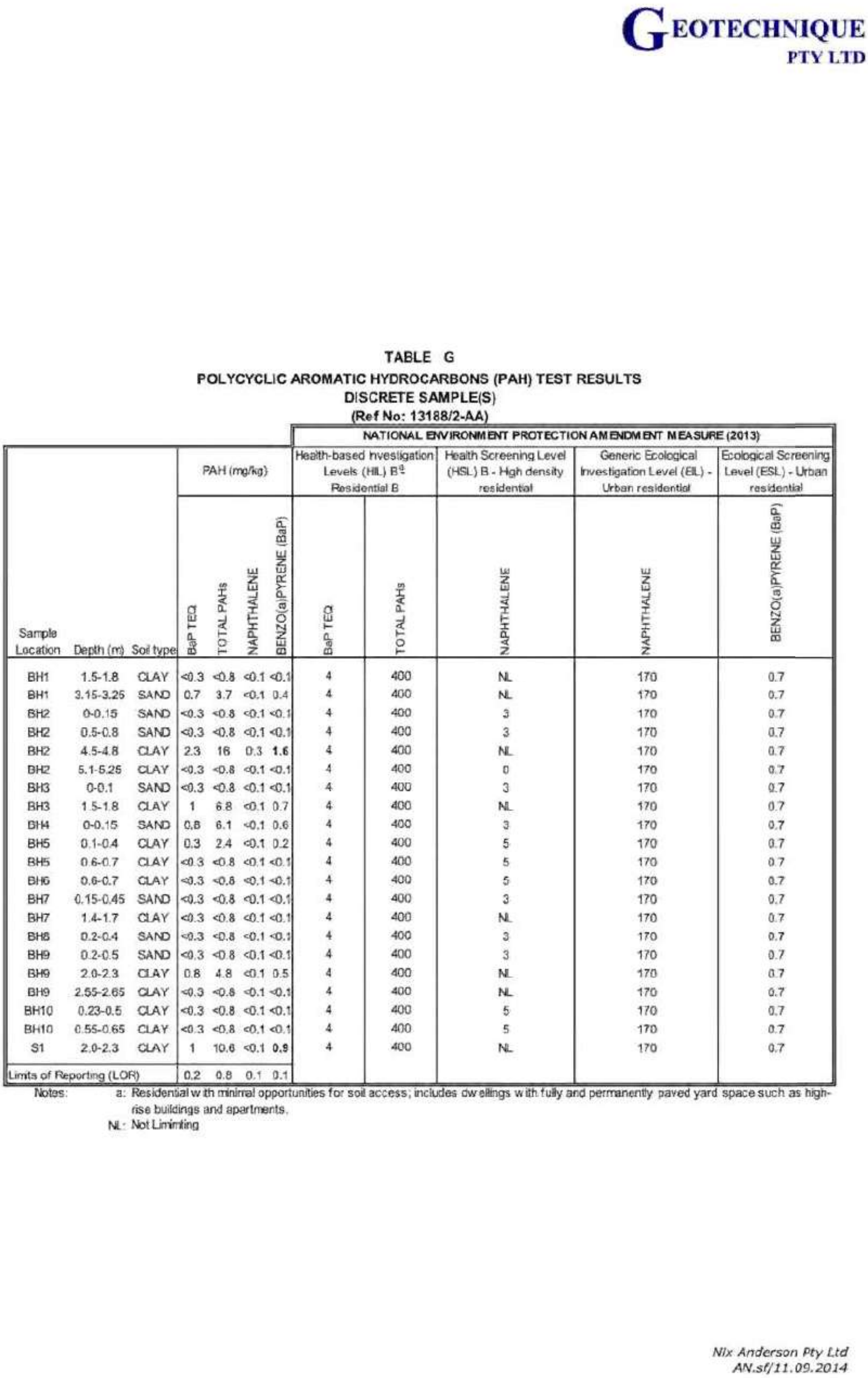


TABLE G
POLYCYCLIC AROMATIC HYDROCARBONS (PAH) TEST RESULTS
DISCRETE SAMPLE(S)
(Ref No: 13188/2-AA)

							NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)				
			PAH (mg/kg)				Health-based Investigation Levels (HIL) B^{a} Residential B		Health Screening Level (HSL) B - High density residential	Generic Ecological Investigation Level (EIL) - Urban residential	Ecological Screening Level (ESL) - Urban residential
Sample Location	Depth (m)	Soil type	BaP TEQ	TOTAL PAHs	NAPHTHALENE	BENZO(a)PYRENE (BaP)	BaP TEQ	TOTAL PAHs	NAPHTHALENE	NAPHTHALENE	BENZO(a)PYRENE (BaP)
BH1	1.5-1.8	CLAY	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7
BH1	3.15-3.25	SAND	0.7	3.7	<0.1	0.4	4	400	NL	170	0.7
BH2	0-0.15	SAND	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH2	0.5-0.8	SAND	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH2	4.5-4.8	CLAY	2.3	16	0.3	**1.6**	4	400	NL	170	0.7
BH2	5.1-5.25	CLAY	<0.3	<0.8	<0.1	<0.1	4	400	0	170	0.7
BH3	0-0.1	SAND	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH3	1.5-1.8	CLAY	1	6.8	<0.1	0.7	4	400	NL	170	0.7
BH4	0-0.15	SAND	0.8	6.1	<0.1	0.6	4	400	3	170	0.7
BH5	0.1-0.4	CLAY	0.3	2.4	<0.1	0.2	4	400	5	170	0.7
BH5	0.6-0.7	CLAY	<0.3	<0.8	<0.1	<0.1	4	400	5	170	0.7
BH6	0.6-0.7	CLAY	<0.3	<0.8	<0.1	<0.1	4	400	5	170	0.7
BH7	0.15-0.45	SAND	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH7	1.4-1.7	CLAY	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7
BH8	0.2-0.4	SAND	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH9	0.2-0.5	SAND	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH9	2.0-2.3	CLAY	0.8	4.8	<0.1	0.5	4	400	NL	170	0.7
BH9	2.55-2.65	CLAY	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7
BH10	0.23-0.5	CLAY	<0.3	<0.8	<0.1	<0.1	4	400	5	170	0.7
BH10	0.55-0.65	CLAY	<0.3	<0.8	<0.1	<0.1	4	400	5	170	0.7
S1	2.0-2.3	CLAY	1	10.6	<0.1	**0.9**	4	400	NL	170	0.7
Limits of Reporting (LOR)			0.2	0.8	0.1	0.1					

Notes: a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
NL: Not Limiting

Nix Anderson Pty Ltd
AN.sf/11.09.2014

GEOTECHNIQUE
PTY LTD

TABLE H
ORGANOCHLORINE PESTICIDES (OCP), POLYCHLORINATED BIPHENYLS (PCB), CYANIDES & PHENOLS TEST
DISCRETE SAMPLE(S)
(Ref No: 13188/2-AA)

		OCP (mg/kg)										(mg/kg)	(mg/kg)	(mg/kg)
Sample Location	Depth (m)	HEXACHLOROBENZENE (HCB)	HEPTACHLOR	ALDRIN+DIELDRIN	ENDRIN	METHOXYCHLOR	MIREX	ENDOSULFAN (alpha, beta & sulphate)	DDD+DDE+DDT	DDT	CHLORDANE (alpha & gamma)	PCB	Cyanides	Phenols
BH1	1.5-1.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH1	3.15-3.25	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH2	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH2	0.5-0.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	0.2	0.6
BH2	4.5-4.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.1	0.4
BH2	5.1-5.25	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.1	<0.1
BH3	0-0.1	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH3	1.5-1.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	0.1	0.4
BH4	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH5	0.1-0.4	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	0.2	0.3
BH5	0.6-0.7	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	0.1	0.2
BH6	0.6-0.7	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH7	0.15-0.45	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH7	1.4-1.7	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH8	0.2-0.4	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	-	-	-
BH9	0.2-0.5	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.1	0.2
BH9	2.0-2.3	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	0.1	0.4
BH9	2.55-2.65	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.1	0.1
BH10	0.23-0.5	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.1	<0.1
BH10	0.55-0.65	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.1	<0.1
Limits of Reporting (LOR)		0.1	0.1	0.15	0.2	0.1	0.1	0.5	0.6	0.2	0.2	1	0.1	0.1
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)														
Health-based Investigation Levels (HIL)[a] B - Residential B		15	10	10	20	500	20	400	600		90	1	300	45000
Ecological Investigation Levels (EIL) - Urban residential										180[b]				

Notes: a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

b: Generic EIL for DDT

Nix Anderson Pty Ltd
AN.sf/11.09.2014

TABLE I
ASBESTOS TEST RESULTS
DISCRETE SAMPLE(S)
(Ref No: 13188/2-AA)

Sample Location	Depth (m)	ASBESTOS
BH1	1.5-1.8	No Asbestos Found
BH2	0-0.15	No Asbestos Found
BH2	0.5-0.8	No Asbestos Found
BH2	4.5-4.8	No Asbestos Found
BH3	0-0.1	No Asbestos Found
BH3	1.5-1.8	No Asbestos Found
BH4	0-0.15	No Asbestos Found
BH5	0.1-0.4	No Asbestos Found
BH5	0.6-0.7	No Asbestos Found
BH7	0.15-0.45	No Asbestos Found
BH7	1.4-1.7	No Asbestos Found
BH9	0.2-0.5	No Asbestos Found
BH9	2.0-2.3	No Asbestos Found
BH10	0.23-0.5	No Asbestos Found

GEOTECHNIQUE
PTY LTD

APPENDIX A

AREAS OF ENVIRONMENTAL CONCERN FROM SLR CONSULTING AUSTRALIA PTY LTD

Nix Anderson Pty Ltd
AN.sf/11.09.2014

GEOTECHNIQUE® PTY LTD

PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700
Fax: 02 4722 2777
e-mail info@geotech.com.au
www.geotech.com.au

NOTES

1. Site features are indicative and are not to scale.
2. This drawing has been produced using a base plan provided by others to which additional information e.g test pits, borehole locations or notes have been added. Some or all of the plan may not be relevant at the time of producing this drawing

Nix Management Pty Ltd
Proposed Development
Robert Timms Factory Site (Bushell's)
160 Burwood Road, Concord

Proposed Borehole Locations

Drawing No: Q6616-1
Job No: Q6616
Drawn By: MH
Date: 2 May 2014
Checked By: ER

File No: Q6616
Layers: 0, Lay1

→ Recommended direction for the existing boreholes to be moved

Table Areas of Environmental Concern and Contaminants of Potential Concern

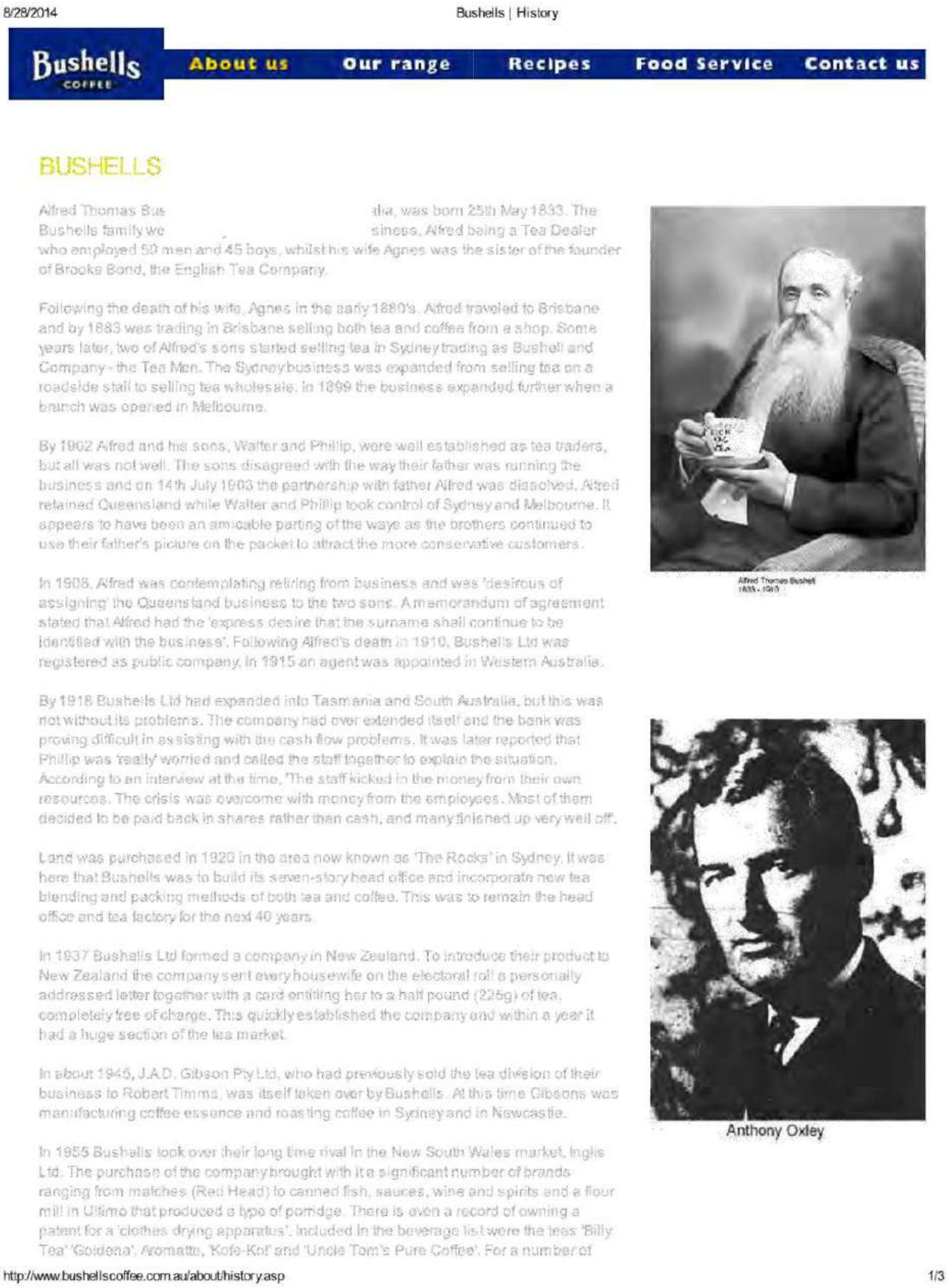
ID	AEC	Contaminants of Potential Concern
AEC 1	Former above ground tanks (ASTs)	Hydrocarbons, metals, asbestos
AEC 2	Former building at the site	Metals, asbestos, pesticides
AEC 3	Reclaimed land	Metals, hydrocarbons, pesticides, asbestos
AEC 4	Potential underground fuel tanks and the transformer area	Hydrocarbons, metals, asbestos, PCBs
AEC 5	Potential underground fuel tanks	Hydrocarbons, metals, aesthetics
AEC 6	Filled area within the vicinity of the administration building	Hydrocarbons, metals, asbestos
AEC 7	Storage of liquid nitrogen, phosphorous acid and hydrochloric acid	
AEC 8	Caustic soda room, ejector's room and separator's room	
AEC 9	Grout area and oil water separator room	Hydrocarbons, metals
AEC 10	Former stockpile area	Hydrocarbons, metals, asbestos
AEC 11	Trucks manoeuvring area	Hydrocarbons, metals, asbestos

GEOTECHNIQUE
PTY LTD

APPENDIX B

BUSHELL'S HISTORY

Nix Anderson Pty Ltd
AN.sf/11.09.2014



8/28/2014 Bushells | History

Bushells COFFEE

About us Our range Recipes Food Service Contact us

BUSHELLS

Alfred Thomas Bus alia, was born 25th May 1833. The Bushells family we siness, Alfred being a Tea Dealer who employed 50 men and 45 boys, whilst his wife Agnes was the sister of the founder of Brooke Bond, the English Tea Company.

Following the death of his wife, Agnes in the early 1880's. Alfred traveled to Brisbane and by 1883 was trading in Brisbane selling both tea and coffee from a shop. Some years later, two of Alfred's sons started selling tea in Sydney trading as Bushell and Company - the Tea Men. The Sydney business was expanded from selling tea on a roadside stall to selling tea wholesale. In 1899 the business expanded further when a branch was opened in Melbourne.

By 1902 Alfred and his sons, Walter and Phillip, were well established as tea traders, but all was not well. The sons disagreed with the way their father was running the business and on 14th July 1903 the partnership with father Alfred was dissolved. Alfred retained Queensland while Walter and Phillip took control of Sydney and Melbourne. It appears to have been an amicable parting of the ways as the brothers continued to use their father's picture on the packet to attract the more conservative customers.

In 1908, Alfred was contemplating retiring from business and was 'desirous of assigning' the Queensland business to the two sons. A memorandum of agreement stated that Alfred had the 'express desire that the surname shall continue to be identified with the business'. Following Alfred's death in 1910, Bushells Ltd was registered as public company. In 1915 an agent was appointed in Western Australia.

By 1918 Bushells Ltd had expanded into Tasmania and South Australia, but this was not without its problems. The company had over extended itself and the bank was proving difficult in assisting with the cash flow problems. It was later reported that Phillip was 'really' worried and called the staff together to explain the situation. According to an interview at the time, 'The staff kicked in the money from their own resources. The crisis was overcome with money from the employees. Most of them decided to be paid back in shares rather than cash, and many finished up very well off'.

Land was purchased in 1920 in the area now known as 'The Rocks' in Sydney. It was here that Bushells was to build its seven-story head office and incorporate new tea blending and packing methods of both tea and coffee. This was to remain the head office and tea factory for the next 40 years.

In 1937 Bushells Ltd formed a company in New Zealand. To introduce their product to New Zealand the company sent every housewife on the electoral roll a personally addressed letter together with a card entitling her to a half pound (226g) of tea, completely free of charge. This quickly established the company and within a year it had a huge section of the tea market.

In about 1945, J.A.D. Gibson Pty Ltd, who had previously sold the tea division of their business to Robert Timms, was itself taken over by Bushells. At this time Gibsons was manufacturing coffee essence and roasting coffee in Sydney and in Newcastle.

In 1955 Bushells took over their long time rival in the New South Wales market, Inglis Ltd. The purchase of the company brought with it a significant number of brands ranging from matches (Red Head) to canned fish, sauces, wine and spirits and a flour mill in Ultimo that produced a type of porridge. There is even a record of owning a patent for a 'clothes drying apparatus'. Included in the beverage list were the teas 'Billy Tea' 'Goldena', Aromatte, 'Kofe-Kof' and 'Uncle Tom's Pure Coffee'. For a number of

Alfred Thomas Bushell
1833 - 1910

Anthony Oxley

http://www.bushellscoffee.com.au/about/history.asp 1/3 years the company continued to trade in its own name, but gradually the factories and depots were amalgamated into Bushells.

In the mid 50's a decision was made to move the Bushells Head Office. Employees at the time state that the main reason for deciding to move west was the belief that the city itself was expanding that way. Several sites were examined before the current Concord site was chosen. According to records the purchase date is identified as being on Christmas Eve, 1956 and was for 85,000 pounds ($170,000).


Alfred Bushell's Family
From left: Phillip, Walter, Laura, George, Charles.

It is believed that a timber yard was operating on the site prior to the purchase, with a weatherboard building along one boundary leading onto a jetty sitting on piles. Apart from this the site was substantially clear and ready for immediate development, so indicative plans were drawn up and spray drying equipment and six instant coffee extractors were ordered from America.

The initial design of the Concord factory was to accommodate tea packing and warehousing. Indications are that some tea production commenced at the Concord site early in 1958 and that the equipment was transferred from The Rocks. The Newcastle tea plant was closed in 1963, as progressively were the other factories in Perth, Queensland and Victoria.

In 1978 the Bushells family made the decision to sell their shares and approached their cousins, Brooke, in England. The Brooke Bond company was still substantially owned by the Brooke family, but operated under the name of Brooke Bond Liebig Ltd.

At the time, newspaper reports indicated that there was some resistance to a non-Australian company purchasing the business, but the government was in the process of relaxing its policy of overseas ownership. Objections to the take over by Brooke Bond Liebig Ltd were overcome and following the sale of the shares, Bushells donated and established a public plaza. The plaza, known as 'Bushell Place', is in The Rocks area in Sydney.


Bushell & Co. Sydney
Circa 1912

Throughout the 1980's the company continued to make substantial investments in its coffee business. The instant coffee extraction plant was rebuilt in 1981, a new continuous roaster for the instant coffee was installed in 1982 and a new instant coffee agglomerator in was installed in 1985. Unilever acquired the company through their purchase of the Brooke Bond business in 1988.

In 1998, as part of an acquisition of coffee brands from Unilever, FreshFood Services Pty Ltd purchased the Bushells coffee brand. The tea brand still remains with Unilever. The coffee continues to be produced at the Concord Factory. FreshFood also purchased the New Zealand division of Bushells coffee.

TO TOP OF PAGE

APPENDIX C

ENVIROLAB SERVICES CERTIFICATES OF ANALYSIS AND SGS ENVIRONMENTAL SERVICES ANALYTICAL REPORT

ENVIROLAB SERVICES

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 114771

Client:
Geotechnique Pty Ltd
PO Box 880
Penrith
NSW 2751

Attention: An Nguyen

Sample log in details:

Your Reference: **13188/2, Concord**
No. of samples: 1 Soil
Date samples received / completed instructions received 18/08/14 / 18/08/14

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date: 25/08/14 / 22/08/14
Date of Preliminary Report: Not Issued
NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

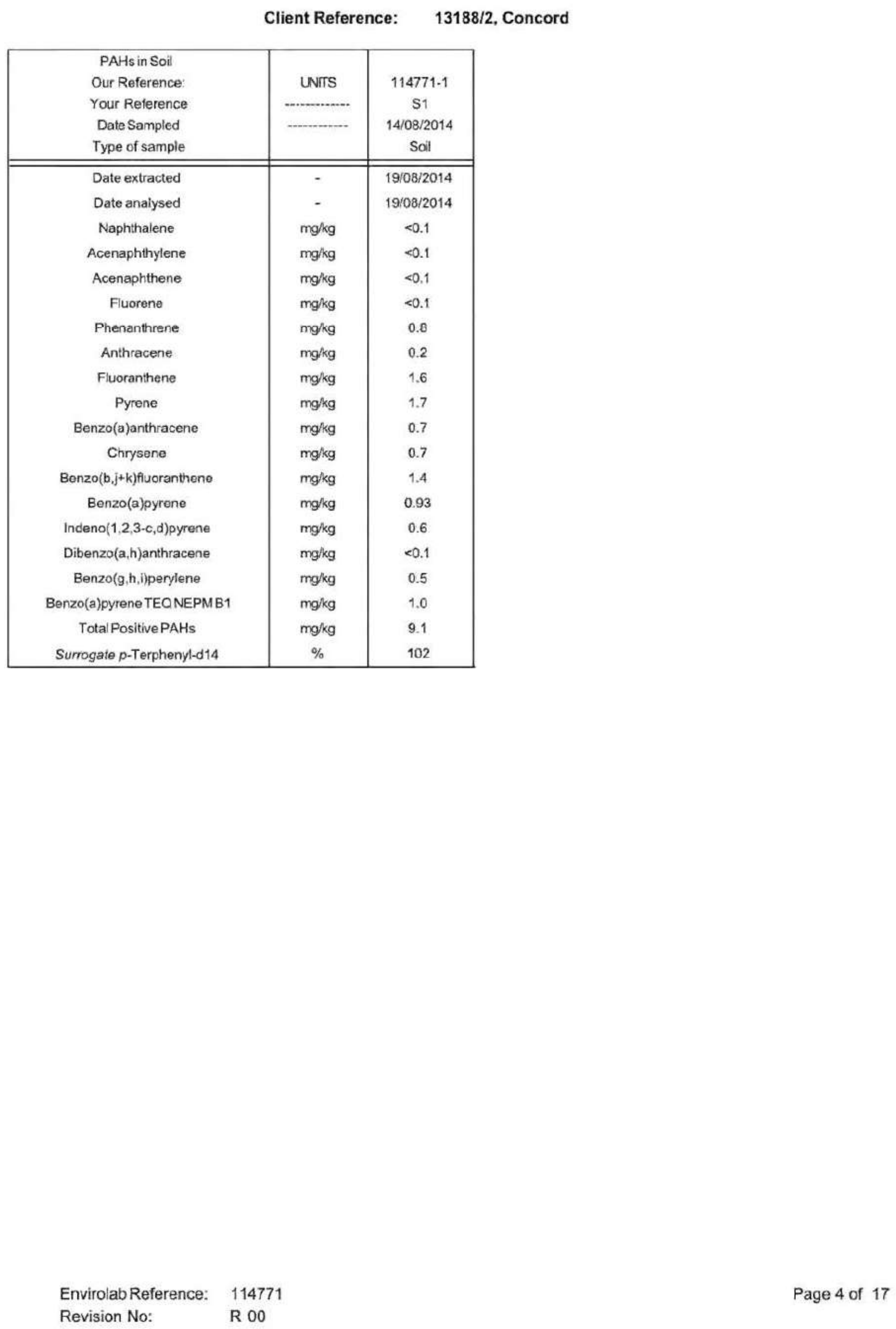
Jacinta Hurst
Laboratory Manager

Client Reference: **13188/2, Concord**

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	114771-1 S1 14/08/2014 Soil
Date extracted	-	19/08/2014
Date analysed	-	20/08/2014
TRHC_6 - C_9	mg/kg	<25
TRHC_6 - C_{10}	mg/kg	<25
vTPHC_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	133

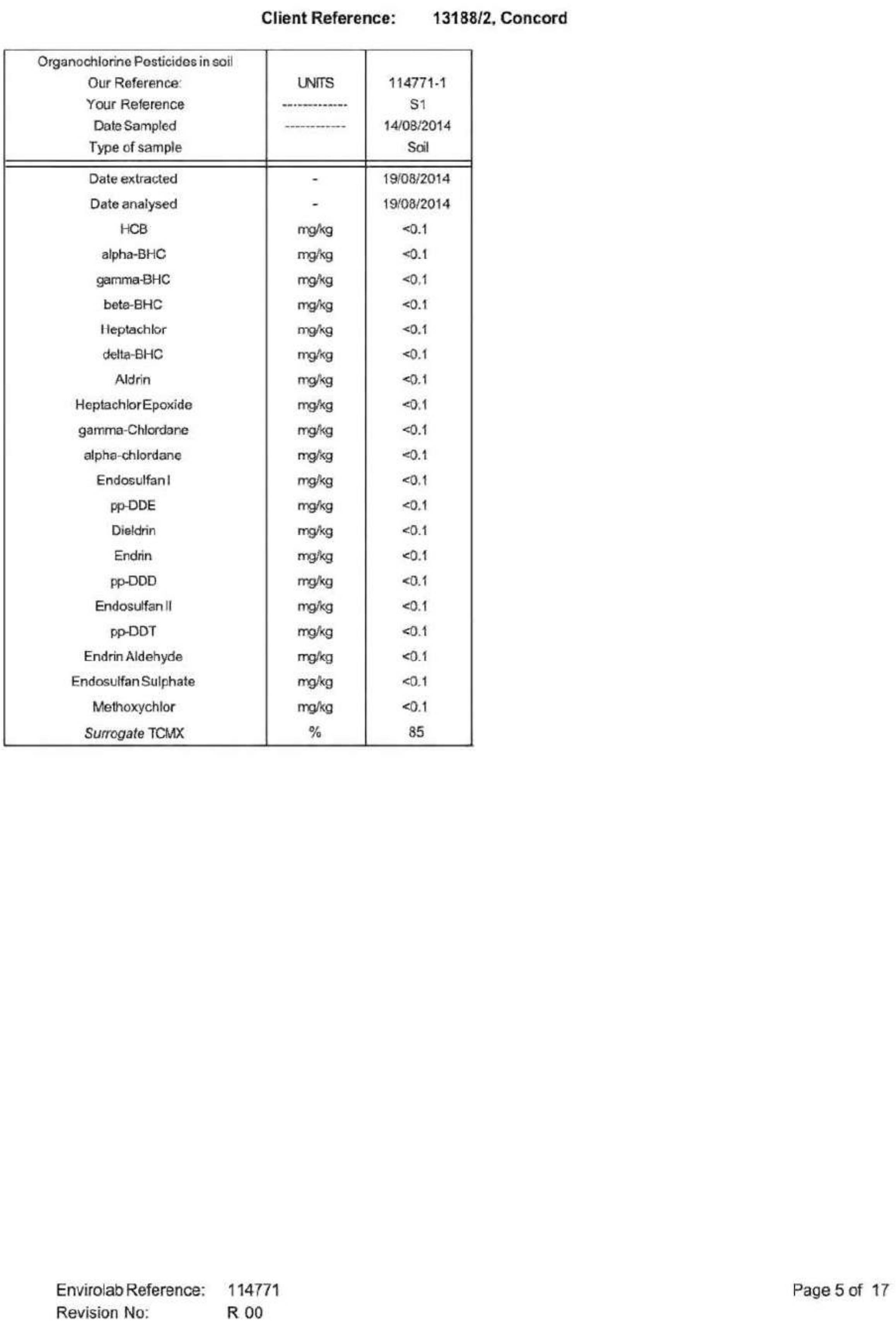
Client Reference: 13188/2, Concord

svTRH (C10-C40) in Soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
TRHC_{10} - C_{14}	mg/kg	<50
TRHC_{15} - C_{28}	mg/kg	<100
TRHC_{29} - C_{36}	mg/kg	<100
TRH>C_{10}-C_{16}	mg/kg	<50
TRH>C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH>C_{16}-C_{34}	mg/kg	<100
TRH>C_{34}-C_{40}	mg/kg	<100
Surrogate o-Terphenyl	%	90



Client Reference: 13188/2, Concord

PAHs in Soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.8
Anthracene	mg/kg	0.2
Fluoranthene	mg/kg	1.6
Pyrene	mg/kg	1.7
Benzo(a)anthracene	mg/kg	0.7
Chrysene	mg/kg	0.7
Benzo(b,j+k)fluoranthene	mg/kg	1.4
Benzo(a)pyrene	mg/kg	0.93
Indeno(1,2,3-c,d)pyrene	mg/kg	0.6
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	0.5
Benzo(a)pyrene TEQ NEPM B1	mg/kg	1.0
Total Positive PAHs	mg/kg	9.1
Surrogate p-Terphenyl-d14	%	102



Client Reference: 13188/2, Concord

Organochlorine Pesticides in soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
HCB	mg/kg	<0.1
alpha-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Surrogate TCMX	%	85

Client Reference: **13188/2, Concord**

PCBs in Soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	114771-1 S1 14/08/2014 Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
Arochlor 1016	mg/kg	<0.1
Arochlor 1221	mg/kg	<0.1
Arochlor 1232	mg/kg	<0.1
Arochlor 1242	mg/kg	<0.1
Arochlor 1248	mg/kg	<0.1
Arochlor 1254	mg/kg	<0.1
Arochlor 1260	mg/kg	<0.1
Surrogate TCLMX	%	85

Client Reference: 13188/2, Concord

Total Phenolics in Soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
Total Phenolics (as Phenol)	mg/kg	<5

Client Reference: 13188/2, Concord

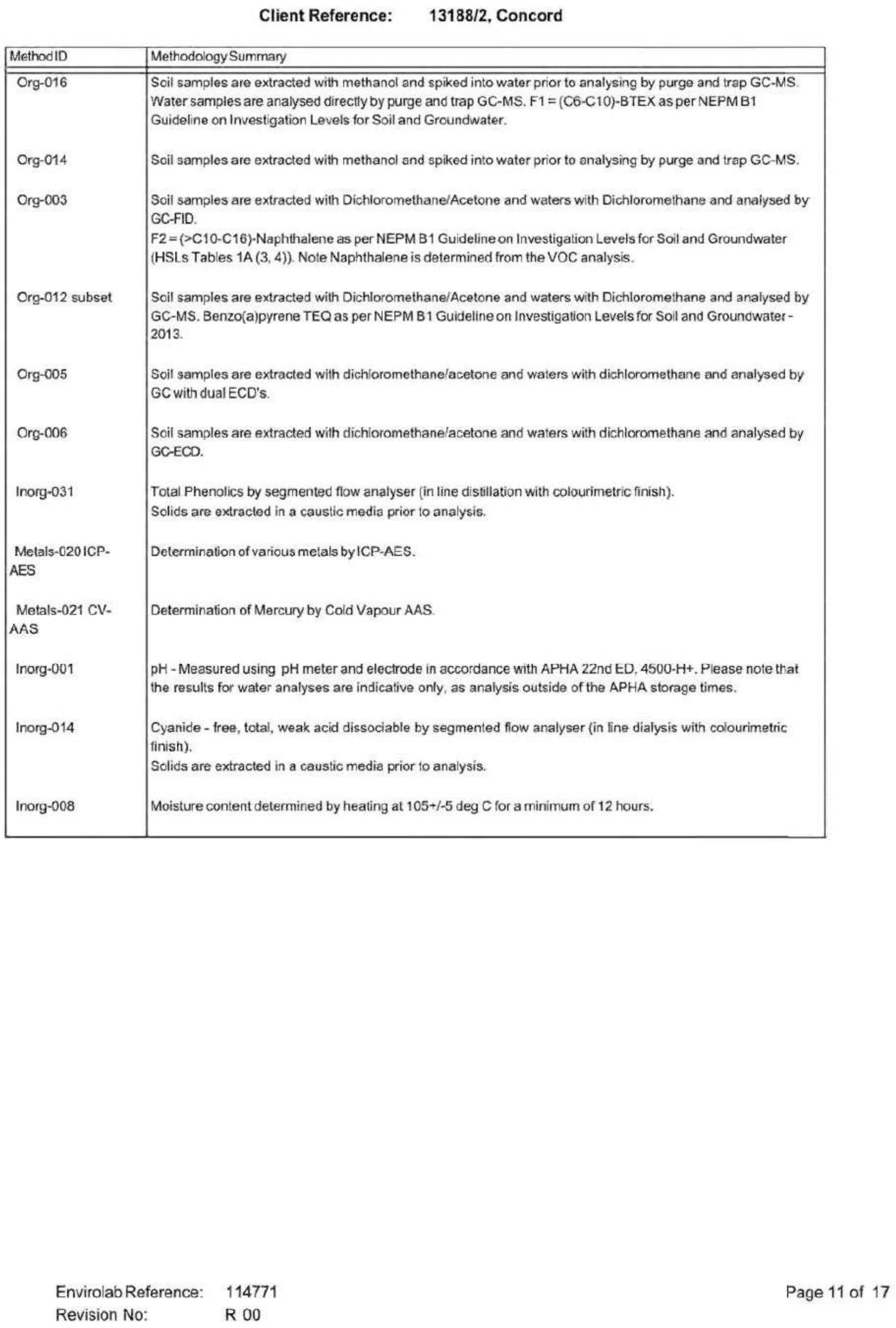
Acid Extractable metals in soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date digested	-	19/08/2014
Date analysed	-	20/08/2014
Arsenic	mg/kg	20
Cadmium	mg/kg	<0.4
Chromium	mg/kg	25
Copper	mg/kg	32
Lead	mg/kg	50
Mercury	mg/kg	0.3
Nickel	mg/kg	3
Zinc	mg/kg	100

Client Reference: 13188/2, Concord

Miscellaneous Inorg - soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date prepared	-	19/08/2014
Date analysed	-	19/08/2014
pH 1:5 soil:water	pH Units	7.2
Total Cyanide	mg/kg	<0.5

Client Reference: **13188/2, Concord**

Moisture		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date prepared	-	19/08/2014
Date analysed	-	20/08/2014
Moisture	%	22



Client Reference: 13188/2, Concord

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.

Client Reference: 13188/2, Concord

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			20/08/2014	[NT]	[NT]	LCS-1	20/08/2014
TRHC_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-1	120%
TRHC_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-1	120%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-1	115%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-1	121%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-1	120%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-1	122%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-1	130%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	139	[NT]	[NT]	LCS-1	133%
QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
TRHC_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-1	85%
TRHC_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-1	100%
TRHC_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-1	86%
TRH>C_{10}-C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-1	85%
TRH>C_{16}-C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-1	100%
TRH>C_{34}-C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-1	86%
Surrogate o-Terphenyl	%		Org-003	85	[NT]	[NT]	LCS-1	93%
QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	101%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	97%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	97%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	100%

Client Reference: 13188/2, Concord

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	100%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	94%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	[NT]	[NT]	LCS-1	104%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	99	[NT]	[NT]	LCS-1	98%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	89%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	86%
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	86%
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	92%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	92%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	95%
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	82%
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	94%
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	96%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	90%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%		Org-005	85	[NT]	[NT]	LCS-1	81%

Client Reference: 13188/2, Concord

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	LCS-1	106%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	85	[NT]	[NT]	LCS-1	76%

QUALITY CONTROL Total Phenolics in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	LCS-1	101%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			19/08/2014	[NT]	[NT]	LCS-2	19/08/2014
Date analysed	-			20/08/2014	[NT]	[NT]	LCS-2	20/08/2014
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-2	103%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-2	110%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	108%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	106%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	104%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-2	89%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	107%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	106%

Client Reference: 13188/2, Concord

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-1	101%
Total Cyanide	mg/kg	0.5	Inorg-014	<0.5	[NT]	[NT]	LCS-1	87%

Client Reference: **13188/2, Concord**

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Client Reference: **13188/2, Concord**

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

SGS

ANALYTICAL REPORT

NATA
WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS

Contact	An Nguyen
Client	Geotechnique
Address	P.O. Box 880 NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	anguyen@geotech.com.au
Project	**13188-2 - Concord**
Order Number	(Not specified)
Samples	28
Date Received	18/8/2014

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE130614 R0**
Report Number	0000089952
Date Reported	26/8/2014
Date Started	20/8/2014

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

Sample # 11:portion of the sample supplied has been sub-sampled for asbestos according to SGS In-house procedures. We therefore cannot guarantee that the sub-sample is representative of the entire sample supplied.
SGS Environmental Services recommends supplying approximately 50-100g of sample in a separate container.
No respirable fibres detected in all samples using trace analysis technique.
Asbestos analysed by Approved Identifier Yusuf Kuthpudin.

SIGNATORIES

Andy Sutton
Senior Organic Chemist

Dong Liang
Metals/Inorganics Team Leader

Huong Crawford
Production Manager

Jaimie Cheung
Metals Chemist

Ly Kim Ha
Organic Section Head

Sheila Lepasana
Senior Technician

SGS

ANALYTICAL RESULTS

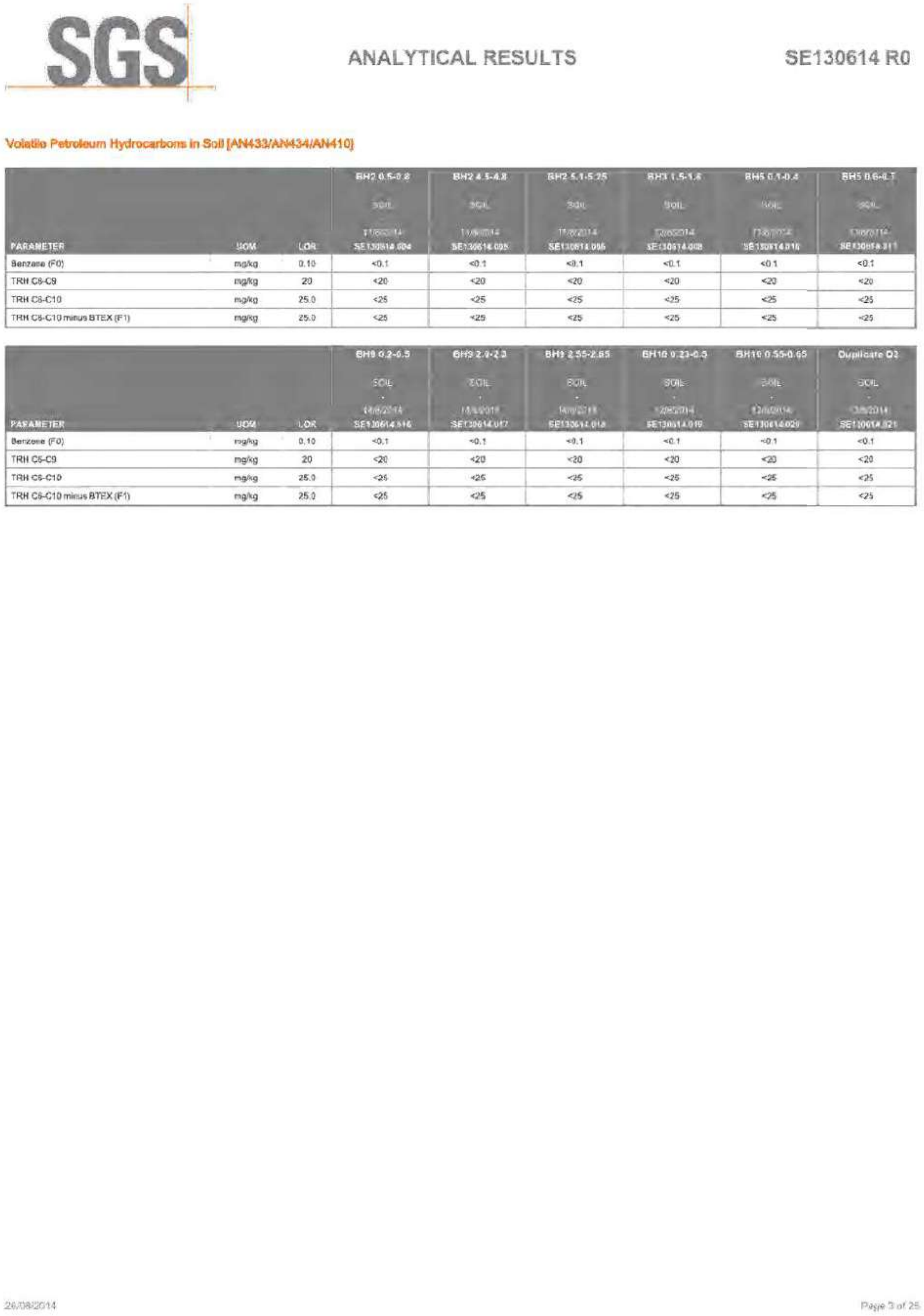
SE130614 R0

VOC's in Soil [AN433/AN434]

PARAMETER	UOM	LOR	BH2 0.5-0.8 SOIL - 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL - 11/8/2014 SE130614.005	BH2 5.1-5.25 SOIL - 11/8/2014 SE130614.006	BH3 1.5-1.8 SOIL - 12/8/2014 SE130614.008	BH5 0.1-0.4 SOIL - 11/8/2014 SE130614.010	BH5 0.6-0.7 SOIL - 13/8/2014 SE130614.011
Benzene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes*	mg/kg	0.30	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX*	mg/kg	0.60	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6

PARAMETER	UOM	LOR	BH9 0.2-0.5 SOIL - 14/8/2014 SE130614.016	BH9 2.0-2.3 SOIL - 14/8/2014 SE130614.017	BH9 2.55-2.65 SOIL - 14/8/2014 SE130614.018	BH10 0.23-0.5 SOIL - 12/8/2014 SE130614.019	BH10 0.55-0.95 SOIL - 13/8/2014 SE130614.020	Duplicate D1 SOIL - 13/8/2014 SE130614.021
Benzene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes*	mg/kg	0.30	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX*	mg/kg	0.60	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6

PARAMETER	UOM	LOR	Trip Spike TS1 SOIL - 12/8/2014 SE130614.022	Trip Spike TS2 SOIL - 14/8/2014 SE130614.023
Benzene	mg/kg	0.10	[65%]	[73%]
Toluene	mg/kg	0.10	[79%]	[91%]
Ethylbenzene	mg/kg	0.10	[81%]	[95%]
m/p-xylene	mg/kg	0.20	[81%]	[97%]
o-xylene	mg/kg	0.10	[86%]	[97%]
Naphthalene	mg/kg	0.10	<0.1	<0.1
Total Xylenes*	mg/kg	0.30	-	-
Total BTEX*	mg/kg	0.60	-	-



SGS

ANALYTICAL RESULTS

SE130614 R0

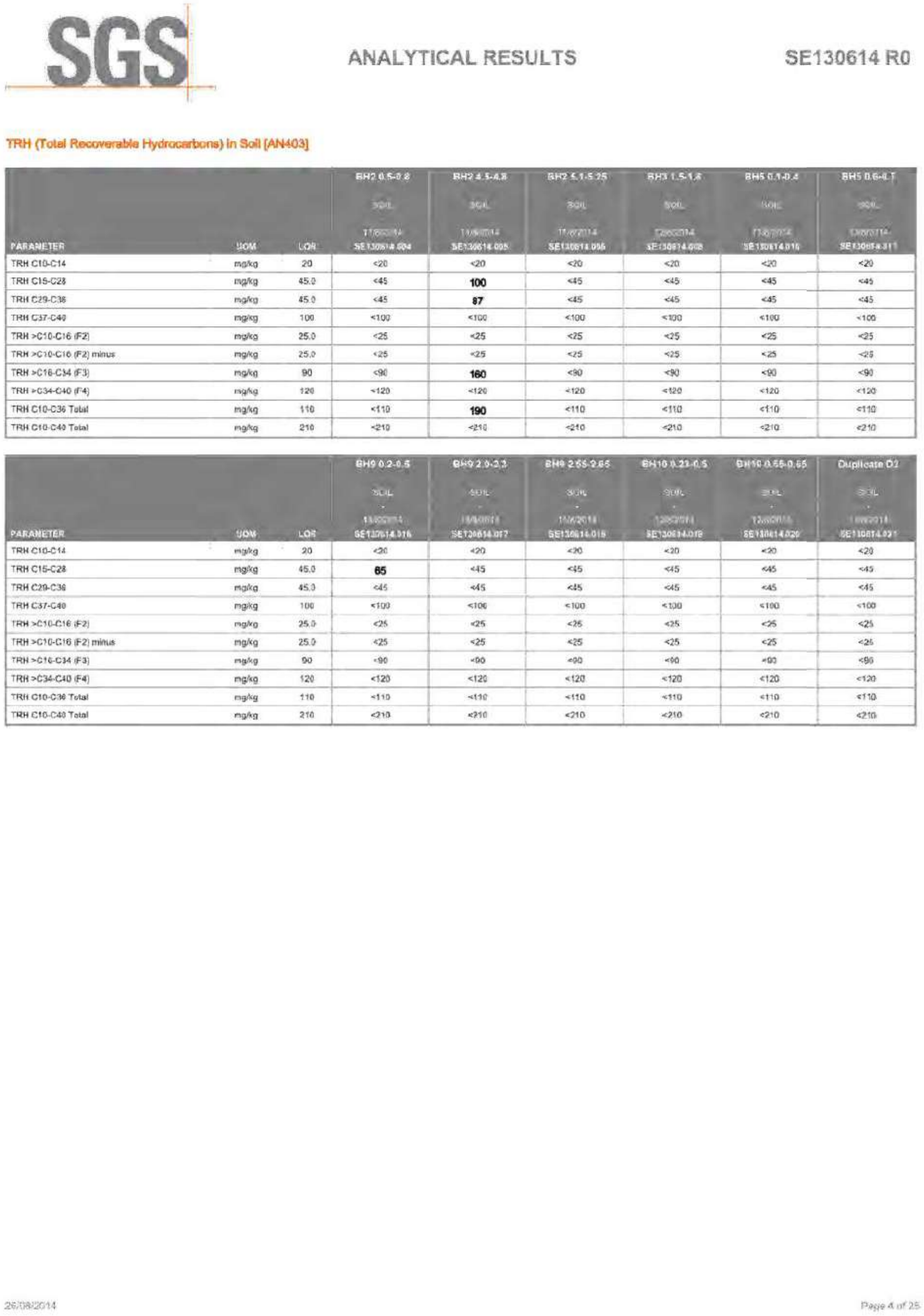
Volatile Petroleum Hydrocarbons in Soil [AN433/AN434/AN410]

			BH2 0.5-0.8 SOIL 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/8/2014 SE130614.005	BH2 5.1-5.25 SOIL 11/8/2014 SE130614.006	BH3 1.5-1.6 SOIL 12/8/2014 SE130614.008	BH5 0.1-0.4 SOIL 13/8/2014 SE130614.010	BH5 0.6-0.7 SOIL 13/8/2014 SE130614.011
PARAMETER	UOM	LOR						
Benzene (F0)	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C9	mg/kg	20	<20	<20	<20	<20	<20	<20
TRH C6-C10	mg/kg	25.0	<25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25.0	<25	<25	<25	<25	<25	<25

			BH9 0.2-0.5 SOIL - 14/8/2014 SE130614.016	BH9 2.0-2.3 SOIL - 14/8/2014 SE130614.017	BH9 2.55-2.65 SOIL - 14/8/2014 SE130614.018	BH10 0.23-0.5 SOIL - 12/8/2014 SE130614.019	BH10 0.55-0.65 SOIL - 12/8/2014 SE130614.020	Duplicate D2 SOIL - 13/8/2014 SE130614.021
PARAMETER	UOM	LOR						
Benzene (F0)	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C9	mg/kg	20	<20	<20	<20	<20	<20	<20
TRH C6-C10	mg/kg	25.0	<25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25.0	<25	<25	<25	<25	<25	<25

26/08/2014

Page 3 of 25



SGS

ANALYTICAL RESULTS

SE130614 R0

TRH (Total Recoverable Hydrocarbons) in Soil [AN403]

PARAMETER	UOM	LOR	BH2 0.5-0.8 SOIL - 11/08/2014 SE130614.004	BH2 4.5-4.8 SOIL - 11/08/2014 SE130614.005	BH2 5.1-5.25 SOIL - 11/8/2014 SE130614.006	BH3 1.5-1.8 SOIL - 12/08/2014 SE130614.008	BH5 0.1-0.4 SOIL - 11/8/2014 SE130614.010	BH5 0.6-0.7 SOIL - 12/08/2014 SE130614.011
TRH C10-C14	mg/kg	20	<20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45.0	<45	**100**	<45	<45	<45	<45
TRH C29-C36	mg/kg	45.0	<45	**87**	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25.0	<25	<25	<25	<25	<25	<25
TRH >C10-C16 (F2) minus	mg/kg	25.0	<25	<25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	**160**	<90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	**190**	<110	<110	<110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210	<210	<210	<210

PARAMETER	UOM	LOR	BH9 0.2-0.5 SOIL - 11/08/2014 SE130614.016	BH9 2.0-2.3 SOIL - 11/08/2014 SE130614.017	BH9 2.55-2.65 SOIL - 11/8/2014 SE130614.018	BH10 0.23-0.5 SOIL - 12/08/2014 SE130614.019	BH10 0.55-0.65 SOIL - 12/08/2014 SE130614.020	Duplicate D2 SOIL - 11/08/2014 SE130614.021
TRH C10-C14	mg/kg	20	<20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45.0	**65**	<45	<45	<45	<45	<45
TRH C29-C36	mg/kg	45.0	<45	<45	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25.0	<25	<25	<25	<25	<25	<25
TRH >C10-C16 (F2) minus	mg/kg	25.0	<25	<25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90	<90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110	<110	<110	<110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210	<210	<210	<210

26/08/2014

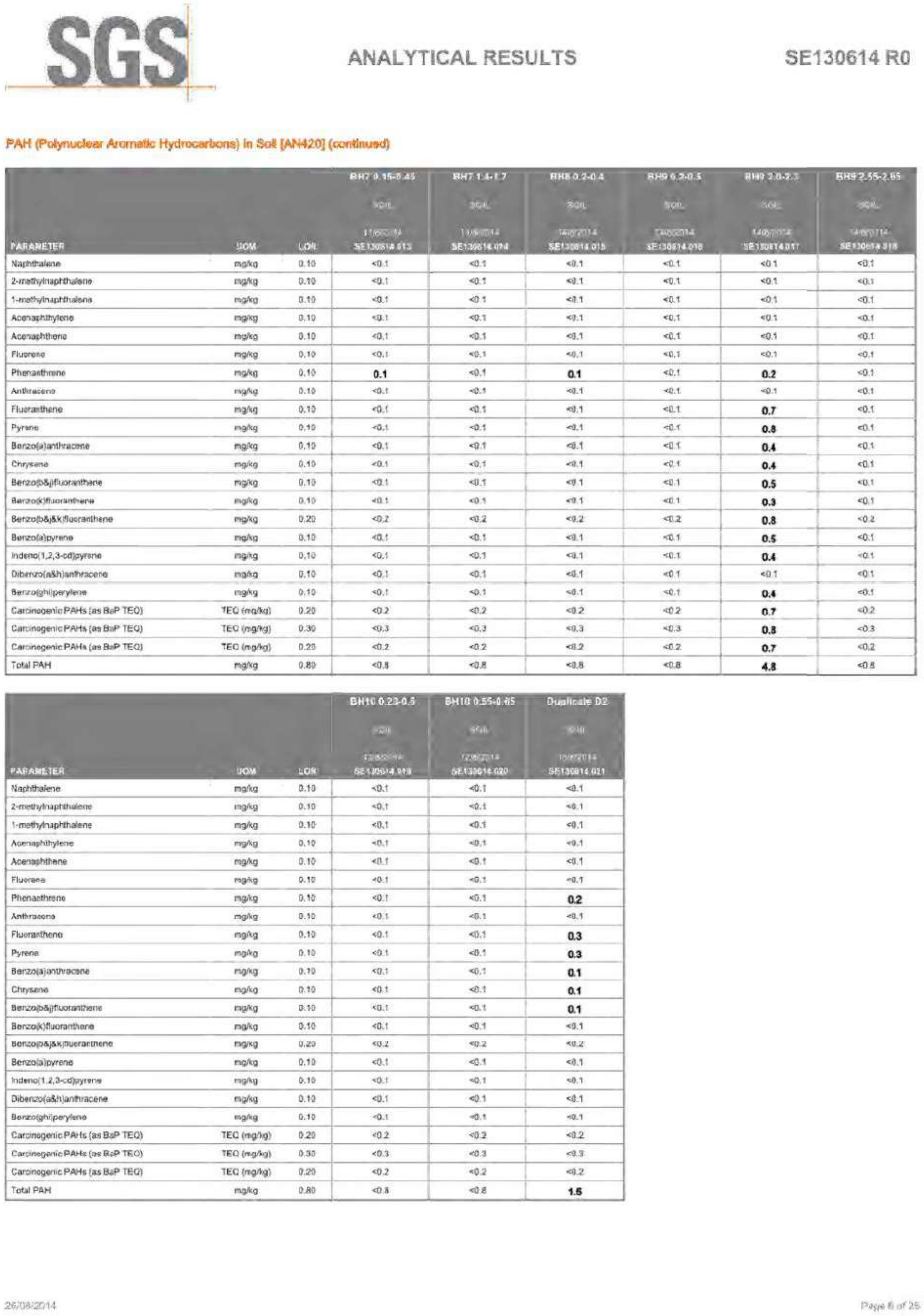
Page 4 of 25

ANALYTICAL RESULTS SE130614 R0

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420]

PARAMETER	UOM	LOR	BH1 1.5-1.8 SOIL 7/8/2014 SE130614.001	BH1 3.15-3.25 SOIL 7/8/2014 SE130614.002	BH2 0-0.15 SOIL 11/8/2014 SE130614.003	BH2 0.5-0.8 SOIL 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/8/2014 SE130614.005	BH2 5.1-5.25 SOIL 11/8/2014 SE130614.006
Naphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.3**	<0.1
2-methylnaphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1
Acenaphthene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.8**	<0.1
Anthracene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1
Fluoranthene	mg/kg	0.10	<0.1	**0.5**	<0.1	<0.1	**2.4**	<0.1
Pyrene	mg/kg	0.10	<0.1	**0.5**	<0.1	<0.1	**3.1**	<0.1
Benzo(a)anthracene	mg/kg	0.10	<0.1	**0.3**	<0.1	<0.1	**1.1**	<0.1
Chrysene	mg/kg	0.10	<0.1	**0.3**	<0.1	<0.1	**1.1**	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.10	<0.1	**0.5**	<0.1	<0.1	**1.8**	<0.1
Benzo(k)fluoranthene	mg/kg	0.10	<0.1	**0.3**	<0.1	<0.1	**0.8**	<0.1
Benzo(b&j&k)fluoranthene	mg/kg	0.20	<0.2	**0.7**	<0.2	<0.2	**2.6**	<0.2
Benzo(a)pyrene	mg/kg	0.10	<0.1	**0.4**	<0.1	<0.1	**1.6**	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.10	<0.1	**0.4**	<0.1	<0.1	**1.3**	<0.1
Dibenzo(a&h)anthracene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1
Benzo(ghi)perylene	mg/kg	0.10	<0.1	**0.4**	<0.1	<0.1	**1.2**	<0.1
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.20	<0.2	**0.6**	<0.2	<0.2	**2.3**	<0.2
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.30	<0.3	**0.7**	<0.3	<0.3	**2.3**	<0.3
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.20	<0.2	**0.6**	<0.2	<0.2	**2.3**	<0.2
Total PAH	mg/kg	0.80	<0.8	**3.7**	<0.8	<0.8	**16**	<0.8

PARAMETER	UOM	LOR	BH3 0-0.1 SOIL 12/8/2014 SE130614.007	BH3 1.5-1.8 SOIL 12/8/2014 SE130614.008	BH4 0-0.15 SOIL 12/8/2014 SE130614.009	BH5 0.1-0.4 SOIL 13/8/2014 SE130614.010	BH5 0.6-0.7 SOIL 13/8/2014 SE130614.011	BH6 0.6-0.7 SOIL 13/8/2014 SE130614.012
Naphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.10	<0.1	**0.4**	**0.5**	**0.3**	<0.1	<0.1
Anthracene	mg/kg	0.10	<0.1	**0.1**	**0.1**	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.10	<0.1	**1.0**	**1.0**	**0.5**	**0.2**	<0.1
Pyrene	mg/kg	0.10	<0.1	**1.2**	**1.2**	**0.4**	**0.2**	<0.1
Benzo(a)anthracene	mg/kg	0.10	<0.1	**0.6**	**0.5**	**0.2**	<0.1	<0.1
Chrysene	mg/kg	0.10	<0.1	**0.6**	**0.5**	**0.2**	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.10	<0.1	**0.7**	**0.6**	**0.2**	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.10	<0.1	**0.3**	**0.3**	**0.1**	<0.1	<0.1
Benzo(b&j&k)fluoranthene	mg/kg	0.20	<0.2	**1.0**	**0.9**	**0.3**	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.10	<0.1	**0.7**	**0.6**	**0.2**	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.10	<0.1	**0.6**	**0.5**	**0.1**	<0.1	<0.1
Dibenzo(a&h)anthracene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.10	<0.1	**0.5**	**0.4**	**0.1**	<0.1	<0.1
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.20	<0.2	**0.9**	**0.7**	**0.2**	<0.2	<0.2
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.30	<0.3	**1.0**	**0.8**	**0.3**	<0.3	<0.3
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.20	<0.2	**1.0**	**0.8**	**0.3**	<0.2	<0.2
Total PAH	mg/kg	0.80	<0.8	**6.8**	**6.1**	**2.4**	<0.8	<0.8



SGS

ANALYTICAL RESULTS

SE130614 R0

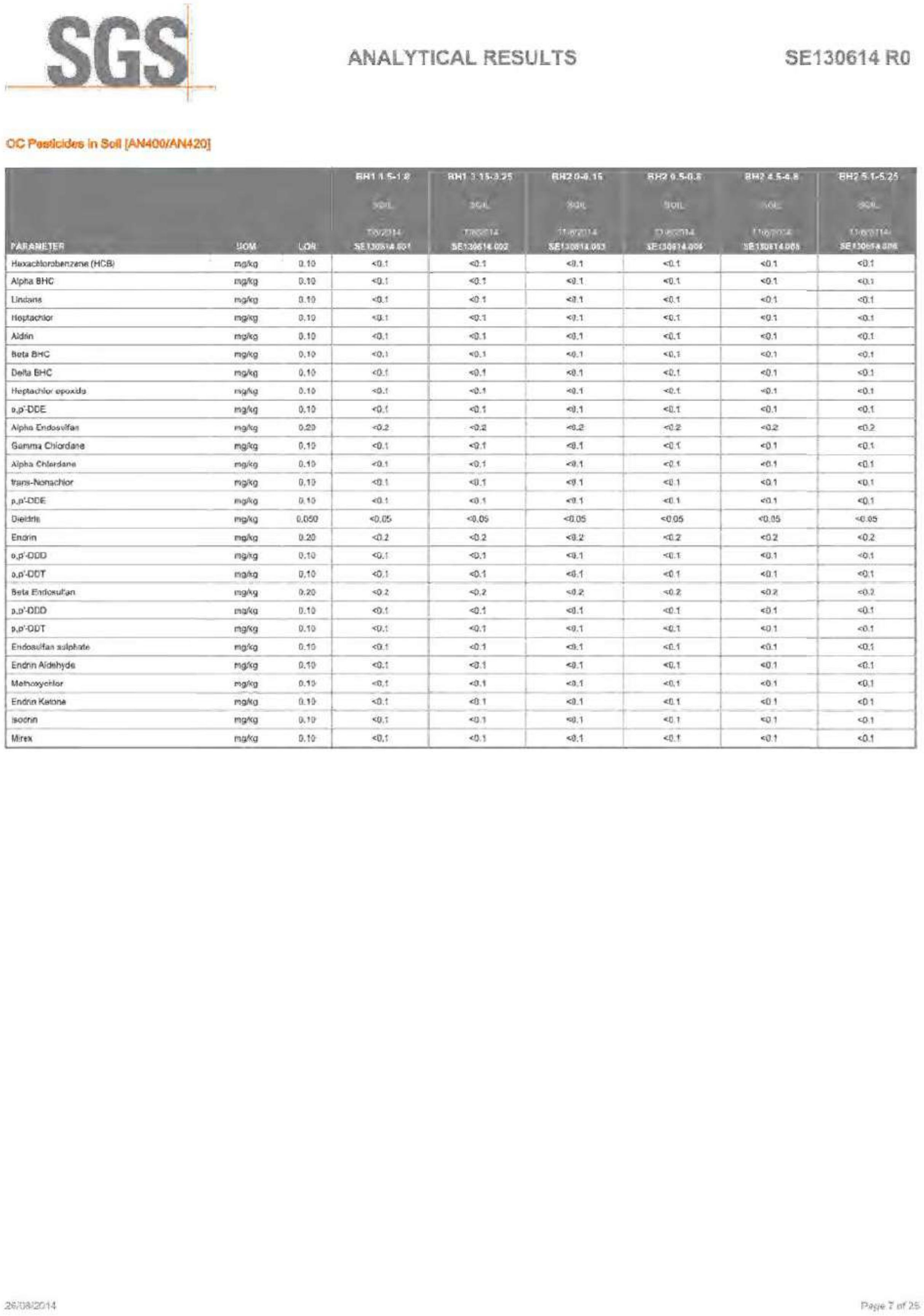
PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] (continued)

			BH7 0.15-0.45 SOIL 11/08/2014 SE130614.013	BH7 1.4-1.7 SOIL 11/08/2014 SE130614.014	BH8 0.2-0.4 SOIL 14/08/2014 SE130614.015	BH9 0.2-0.5 SOIL 14/08/2014 SE130614.016	BH9 2.0-2.3 SOIL 14/08/2014 SE130614.017	BH9 2.55-2.65 SOIL 14/08/2014 SE130614.018
PARAMETER	**UOM**	**LOR**						
Naphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.10	**0.1**	<0.1	**0.1**	<0.1	**0.2**	<0.1
Anthracene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.7**	<0.1
Pyrene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.8**	<0.1
Benzo(a)anthracene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.4**	<0.1
Chrysene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.4**	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.5**	<0.1
Benzo(k)fluoranthene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.3**	<0.1
Benzo(b&j&k)fluoranthene	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	**0.8**	<0.2
Benzo(a)pyrene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.5**	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.4**	<0.1
Dibenzo(a&h)anthracene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	**0.4**	<0.1
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.20	<0.2	<0.2	<0.2	<0.2	**0.7**	<0.2
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.30	<0.3	<0.3	<0.3	<0.3	**0.8**	<0.3
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.20	<0.2	<0.2	<0.2	<0.2	**0.7**	<0.2
Total PAH	mg/kg	0.80	<0.8	<0.8	<0.8	<0.8	**4.8**	<0.8

			BH10 0.23-0.5 SOIL 12/08/2014 SE130614.019	BH10 0.55-0.65 SOIL 12/08/2014 SE130614.020	Duplicate D2 SOIL 15/08/2014 SE130614.021
PARAMETER	**UOM**	**LOR**			
Naphthalene	mg/kg	0.10	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.10	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.10	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.10	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.10	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.10	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.10	<0.1	<0.1	**0.2**
Anthracene	mg/kg	0.10	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.10	<0.1	<0.1	**0.3**
Pyrene	mg/kg	0.10	<0.1	<0.1	**0.3**
Benzo(a)anthracene	mg/kg	0.10	<0.1	<0.1	**0.1**
Chrysene	mg/kg	0.10	<0.1	<0.1	**0.1**
Benzo(b&j)fluoranthene	mg/kg	0.10	<0.1	<0.1	**0.1**
Benzo(k)fluoranthene	mg/kg	0.10	<0.1	<0.1	<0.1
Benzo(b&j&k)fluoranthene	mg/kg	0.20	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.10	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.10	<0.1	<0.1	<0.1
Dibenzo(a&h)anthracene	mg/kg	0.10	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.10	<0.1	<0.1	<0.1
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.20	<0.2	<0.2	<0.2
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.30	<0.3	<0.3	<0.3
Carcinogenic PAHs (as BaP TEQ)	TEQ (mg/kg)	0.20	<0.2	<0.2	<0.2
Total PAH	mg/kg	0.80	<0.8	<0.8	**1.5**

26/08/2014

Page 6 of 25



SGS

ANALYTICAL RESULTS

SE130614 R0

OC Pesticides in Soil [AN400/AN420]

PARAMETER	UOM	LOR	BH1 1.5-1.8 SOIL 7/8/2014 SE130614.001	BH1 3.15-3.25 SOIL 7/8/2014 SE130614.002	BH2 0-0.15 SOIL 11/8/2014 SE130614.003	BH2 0.5-0.8 SOIL 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/8/2014 SE130614.005	BH2 5.1-5.25 SOIL 11/8/2014 SE130614.006
Hexachlorobenzene (HCB)	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.050	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

26/08/2014

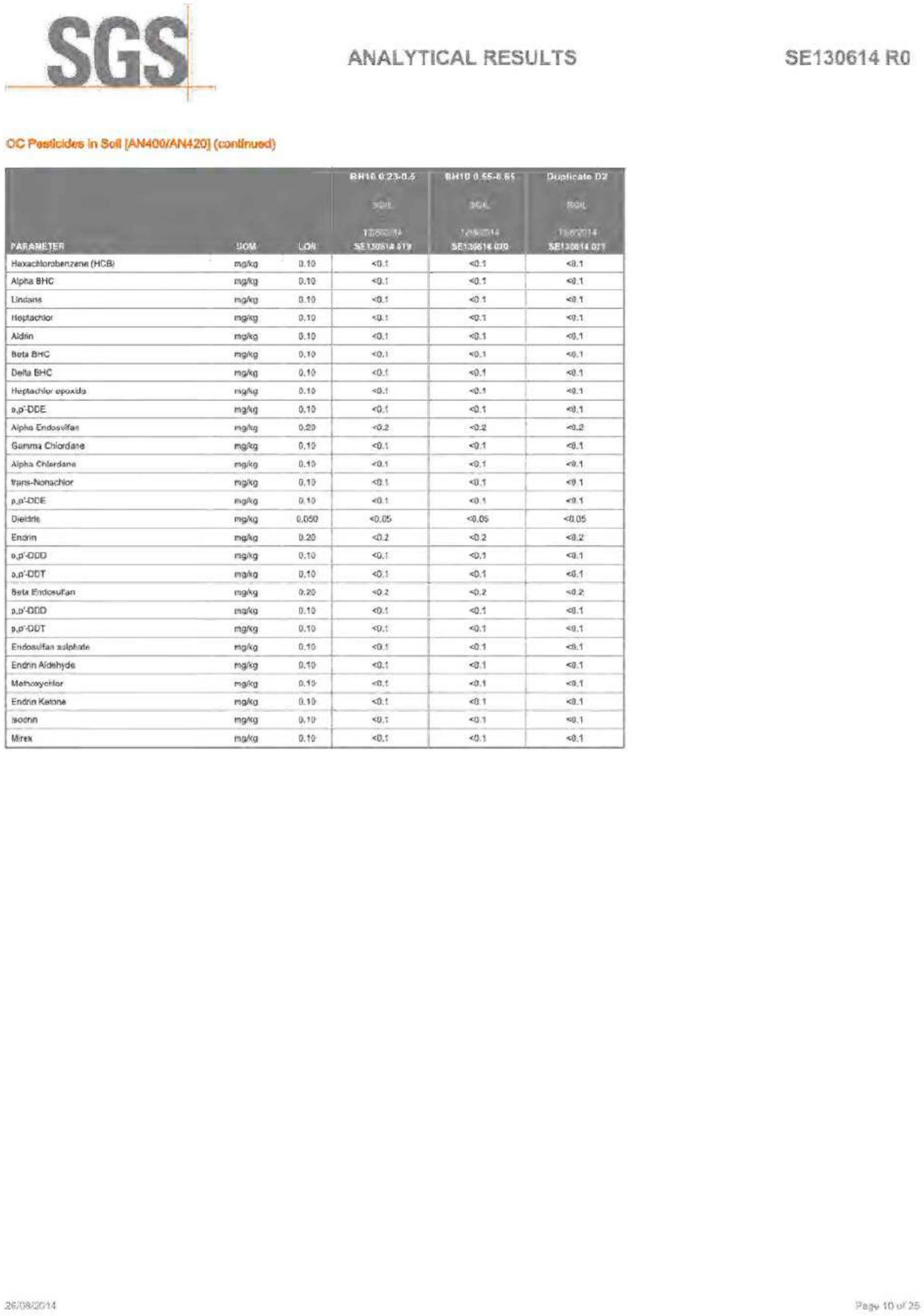
Page 7 of 25

OC Pesticides in Soil [AN400/AN420] (continued)

			BH3 0-0.1	BH3 1.5-1.8	BH4 0-0.15	BH5 0.1-0.4	BH5 0.6-0.7	BH6 0.6-0.7
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			12/08/2014	12/08/2014	12/08/2014	13/08/2014	13/08/2014	13/08/2014
PARAMETER	UOM	LOR	SE130614.007	SE130614.008	SE130614.009	SE130614.010	SE130614.011	SE130614.012
Hexachlorobenzene (HCB)	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.050	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

OC Pesticides in Soil [AN400/AN420] (continued)

PARAMETER	UOM	LOR	BH7 0.15-0.45 SOIL 11/8/2014 SE130614.013	BH7 1.4-1.7 SOIL 11/8/2014 SE130614.014	BH8 0.2-0.4 SOIL 14/8/2014 SE130614.015	BH9 0.2-0.5 SOIL 14/8/2014 SE130614.016	BH9 2.0-2.3 SOIL 14/8/2014 SE130614.017	BH9 2.55-2.85 SOIL 14/8/2014 SE130614.018
Hexachlorobenzene (HCB)	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.050	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1



SGS

ANALYTICAL RESULTS

SE130614 R0

OC Pesticides in Soil [AN400/AN420] (continued)

PARAMETER	UOM	LOR	BH10 0.23-0.5 SOIL 12/08/2014 SE130614.019	BH10 0.55-0.65 SOIL 12/08/2014 SE130614.020	Duplicate D2 SOIL 13/08/2014 SE130614.027
Hexachlorobenzene (HCB)	mg/kg	0.10	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.10	<0.1	<0.1	<0.1
Lindane	mg/kg	0.10	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.10	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.10	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.10	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.10	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.10	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.10	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.20	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.10	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.10	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.10	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.10	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.050	<0.05	<0.05	<0.05
Endrin	mg/kg	0.20	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.10	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.10	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.20	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.10	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.10	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.10	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.10	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.10	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.10	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.10	<0.1	<0.1	<0.1
Mirex	mg/kg	0.10	<0.1	<0.1	<0.1

26/08/2014

Page 10 of 25

SGS

ANALYTICAL RESULTS

SE130614 R0

PCBs in Soil [AN400/AN420]

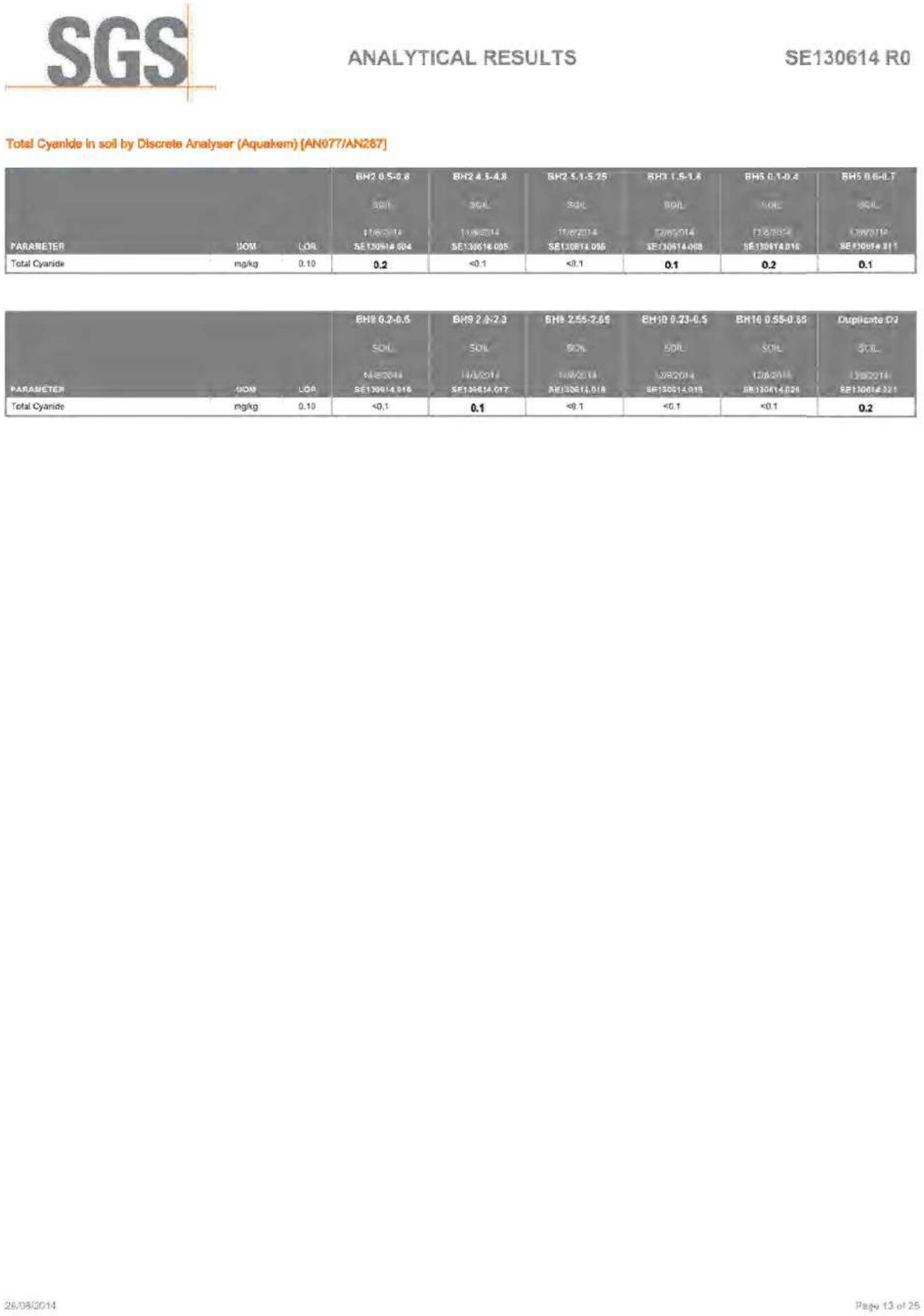
PARAMETER	UOM	LOR	BH2 0.5-0.8 SOIL 11/06/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/06/2014 SE130614.005	BH2 5.1-5.25 SOIL 11/6/2014 SE130614.006	BH3 1.5-1.8 SOIL 12/06/2014 SE130614.008	BH5 0.1-0.4 SOIL 11/6/2014 SE130614.010	BH5 0.6-0.7 SOIL 12/6/2014 SE130614.011
Arochlor 1016	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1.0	<1	<1	<1	<1	<1	<1

PARAMETER	UOM	LOR	BH9 0.2-0.5 SOIL - 11/6/2014 SE130614.016	BH9 2.0-2.3 SOIL - 11/6/2014 SE130614.017	BH9 2.55-2.65 SOIL - 11/6/2014 SE130614.018	BH10 0.23-0.5 SOIL - 12/6/2014 SE130614.019	BH10 0.55-0.65 SOIL - 12/6/2014 SE130614.020	Duplicate D2 SOIL - 11/6/2014 SE130614.021
Arochlor 1016	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1.0	<1	<1	<1	<1	<1	<1

Total Phenolics in Soil [AN289]

PARAMETER	UOM	LOR	BH2 0.5-0.8 SOIL 11/08/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/08/2014 SE130614.005	BH2 5.1-5.25 SOIL 11/8/2014 SE130614.006	BH3 1.5-1.6 SOIL 12/08/2014 SE130614.008	BH5 0.1-0.4 SOIL 13/8/2014 SE130614.010	BH5 0.6-0.7 SOIL 13/08/2014 SE130614.011
Total Phenols	mg/kg	0.10	**0.6**	**0.4**	<0.1	**0.4**	**0.3**	**0.2**

PARAMETER	UOM	LOR	BH9 0.2-0.5 SOIL 14/8/2014 SE130614.016	BH9 2.0-2.3 SOIL 14/8/2014 SE130614.017	BH9 2.55-2.65 SOIL 14/8/2014 SE130614.018	BH10 0.23-0.5 SOIL 12/8/2014 SE130614.019	BH10 0.56-0.65 SOIL 12/8/2014 SE130614.020	Duplicate D3 SOIL 13/8/2014 SE130614.021
Total Phenols	mg/kg	0.10	**0.2**	**0.4**	**0.1**	<0.1	<0.1	**0.1**



SGS

ANALYTICAL RESULTS

SE130614 R0

Total Cyanide in soil by Discrete Analyser (Aquakem) [AN077/AN287]

PARAMETER	UOM	LOR	BH2 0.5-0.8 SOIL 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/8/2014 SE130614.005	BH2 5.1-5.25 SOIL 11/8/2014 SE130614.006	BH3 1.5-1.6 SOIL 12/8/2014 SE130614.008	BH5 0.1-0.4 SOIL 11/8/2014 SE130614.010	BH5 0.6-0.7 SOIL 12/8/2014 SE130614.011
Total Cyanide	mg/kg	0.10	**0.2**	<0.1	<0.1	**0.1**	**0.2**	**0.1**

PARAMETER	UOM	LOR	BH8 0.2-0.5 SOIL 14/8/2014 SE130614.016	BH9 2.0-2.3 SOIL 14/8/2014 SE130614.017	BH9 2.55-2.65 SOIL 11/8/2014 SE130614.018	BH10 0.23-0.5 SOIL 12/8/2014 SE130614.019	BH10 0.55-0.65 SOIL 12/8/2014 SE130614.020	Duplicate D2 SOIL 13/8/2014 SE130614.021
Total Cyanide	mg/kg	0.10	<0.1	**0.1**	<0.1	<0.1	<0.1	**0.2**

26/08/2014

Page 13 of 25

pH in soil (1:5) [AN101]

			BH1 1.5-1.8	BH1 3.15-3.25	BH2 0-0.15	BH2 0.5-0.8	BH2 4.5-4.8	BH2 5.1-5.25
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			7/8/2014	7/8/2014	11/8/2014	11/8/2014	11/8/2014	11/8/2014
PARAMETER	UOM	LOR	SE130614.001	SE130614.002	SE130614.003	SE130614.004	SE130614.005	SE130614.006
pH	pH Units	-	4.3	5.9	5.3	5.8	8.0	7.6

			BH3 0-0.1	BH3 1.5-1.8	BH4 0-0.15	BH5 0.1-0.4	BH5 0.6-0.7	BH6 0.6-0.7
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			12/8/2014	12/8/2014	12/8/2014	13/8/2014	13/8/2014	13/8/2014
PARAMETER	UOM	LOR	SE130614.007	SE130614.008	SE130614.009	SE130614.010	SE130614.011	SE130614.012
pH	pH Units	-	6.1	7.0	7.5	6.0	5.9	4.8

			BH7 0.15-0.45	BH7 1.4-1.7	BH8 0.2-0.4	BH9 0.2-0.5	BH9 2.0-2.3	BH9 2.55-2.65
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			11/8/2014	11/8/2014	14/8/2014	14/8/2014	14/8/2014	14/8/2014
PARAMETER	UOM	LOR	SE130614.013	SE130614.014	SE130614.015	SE130614.016	SE130614.017	SE130614.018
pH	pH Units	-	9.1	6.2	7.8	8.4	6.5	5.2

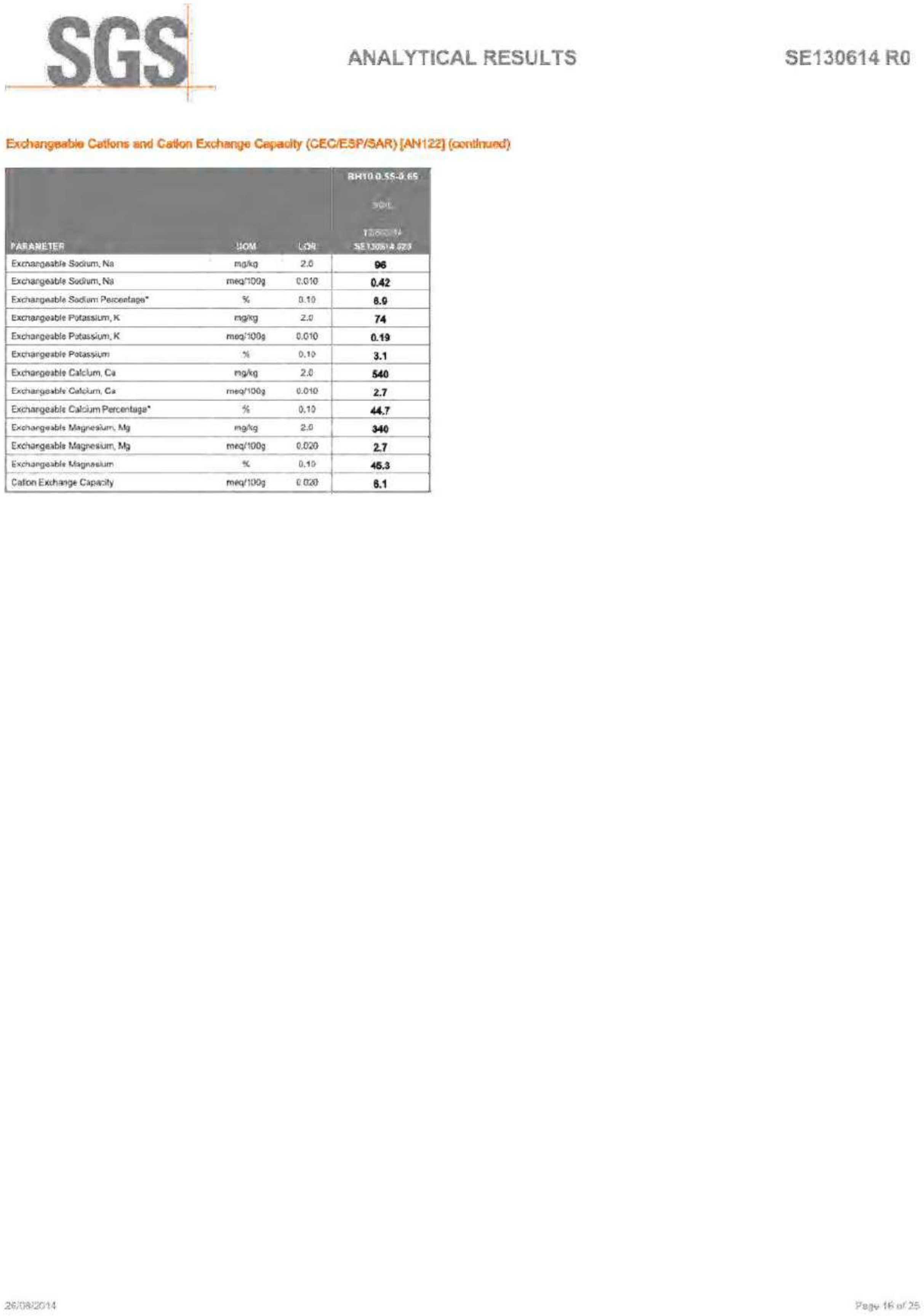
			BH10 0.23-0.5	BH10 0.55-0.65	Duplicate D2
			SOIL	SOIL	SOIL
			12/8/2014	12/8/2014	13/8/2014
PARAMETER	UOM	LOR	SE130614.019	SE130614.020	SE130614.021
pH	pH Units	-	8.5	4.7	5.7

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) [AN122]

PARAMETER	UOM	LOR	BH1 1.5-1.8 SOIL 7/8/2014 SE130614.001	BH1 3.15-3.25 SOIL 7/8/2014 SE130614.002	BH2 0-0.15 SOIL 11/8/2014 SE130614.003	BH2 0.5-0.8 SOIL 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/8/2014 SE130614.005	BH2 5.1-5.25 SOIL 11/8/2014 SE130614.006
Exchangeable Sodium, Na	mg/kg	2.0	200	110	24	36	400	700
Exchangeable Sodium, Na	meq/100g	0.010	0.89	0.49	0.10	0.16	1.7	3.1
Exchangeable Sodium Percentage*	%	0.10	13.3	6.5	1.1	1.6	6.9	22.7
Exchangeable Potassium, K	mg/kg	2.0	93	100	220	120	110	280
Exchangeable Potassium, K	meq/100g	0.010	0.24	0.26	0.56	0.30	0.29	0.70
Exchangeable Potassium	%	0.10	3.6	3.4	5.9	3.0	1.1	5.2
Exchangeable Calcium, Ca	mg/kg	2.0	570	1000	1200	1400	3800	1000
Exchangeable Calcium, Ca	meq/100g	0.010	2.8	5.2	6.2	7.1	19	5.0
Exchangeable Calcium Percentage*	%	0.10	42.7	69.6	65.1	72.4	74.2	37.3
Exchangeable Magnesium, Mg	mg/kg	2.0	330	190	320	280	550	570
Exchangeable Magnesium, Mg	meq/100g	0.020	2.7	1.5	2.7	2.3	4.5	4.7
Exchangeable Magnesium	%	0.10	40.5	20.6	27.9	23.0	17.8	34.8
Cation Exchange Capacity	meq/100g	0.020	6.7	7.5	9.5	9.8	25	13

PARAMETER	UOM	LOR	BH3 0-0.1 SOIL - 12/8/2014 SE130614.007	BH3 1.5-1.6 SOIL - 12/8/2014 SE130614.008	BH4 0-0.15 SOIL - 12/8/2014 SE130614.009	BH5 0.1-0.4 SOIL - 13/8/2014 SE130614.010	BH5 0.6-0.7 SOIL - 13/8/2014 SE130614.011	BH6 0.6-0.7 SOIL - 13/8/2014 SE130614.012
Exchangeable Sodium, Na	mg/kg	2.0	33	26	31	48	22	63
Exchangeable Sodium, Na	meq/100g	0.010	0.14	0.11	0.14	0.21	0.10	0.27
Exchangeable Sodium Percentage*	%	0.10	2.0	1.0	0.8	1.9	1.4	4.7
Exchangeable Potassium, K	mg/kg	2.0	120	74	92	130	70	45
Exchangeable Potassium, K	meq/100g	0.010	0.31	0.19	0.24	0.34	0.18	0.12
Exchangeable Potassium	%	0.10	4.2	1.6	1.3	3.2	2.6	2.0
Exchangeable Calcium, Ca	mg/kg	2.0	1100	2000	3300	1700	1200	530
Exchangeable Calcium, Ca	meq/100g	0.010	5.5	10	16	8.6	5.9	2.7
Exchangeable Calcium Percentage*	%	0.10	75.6	86.5	90.4	79.1	85.1	45.2
Exchangeable Magnesium, Mg	mg/kg	2.0	160	160	170	210	91	350
Exchangeable Magnesium, Mg	meq/100g	0.020	1.3	1.3	1.4	1.7	0.75	2.8
Exchangeable Magnesium	%	0.10	18.2	10.9	7.6	15.8	10.9	48.1
Cation Exchange Capacity	meq/100g	0.020	7.3	12	18	11	6.9	5.9

PARAMETER	UOM	LOR	BH7 0.15-0.45 SOIL 11/8/2014 SE130614.013	BH7 1.4-1.7 SOIL 11/8/2014 SE130614.014	BH9 0.2-0.5 SOIL 14/8/2014 SE130614.016	BH9 2.0-2.3 SOIL 14/8/2014 SE130614.017	BH9 2.55-2.65 SOIL 14/8/2014 SE130614.018	BH10 0.25-0.5 SOIL 12/8/2014 SE130614.019
Exchangeable Sodium, Na	mg/kg	2.0	170	180	300	170	180	140
Exchangeable Sodium, Na	meq/100g	0.010	0.73	0.80	1.3	0.74	0.79	0.59
Exchangeable Sodium Percentage*	%	0.10	8.3	10.2	3.8	4.9	14.2	3.9
Exchangeable Potassium, K	mg/kg	2.0	56	88	97	160	99	85
Exchangeable Potassium, K	meq/100g	0.010	0.14	0.23	0.25	0.41	0.25	0.22
Exchangeable Potassium	%	0.10	1.6	2.9	0.7	2.7	4.6	1.4
Exchangeable Calcium, Ca	mg/kg	2.0	1100	820	5600	2400	320	1700
Exchangeable Calcium, Ca	meq/100g	0.010	5.6	4.1	28	12	1.6	8.4
Exchangeable Calcium Percentage*	%	0.10	64.0	52.8	83.0	79.1	29.2	56.2
Exchangeable Magnesium, Mg	mg/kg	2.0	280	330	510	250	350	700
Exchangeable Magnesium, Mg	meq/100g	0.020	2.3	2.7	4.2	2.0	2.9	5.8
Exchangeable Magnesium	%	0.10	26.1	34.1	12.5	13.3	51.9	38.4
Cation Exchange Capacity	meq/100g	0.020	8.8	7.8	34	15	5.5	15



SGS

ANALYTICAL RESULTS SE130614 R0

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) [AN122] (continued)

			BH10 0.55-0.65 SOIL 12/08/2014
PARAMETER	UOM	LOR	SE130614.028
Exchangeable Sodium, Na	mg/kg	2.0	**96**
Exchangeable Sodium, Na	meq/100g	0.010	**0.42**
Exchangeable Sodium Percentage*	%	0.10	**6.9**
Exchangeable Potassium, K	mg/kg	2.0	**74**
Exchangeable Potassium, K	meq/100g	0.010	**0.19**
Exchangeable Potassium	%	0.10	**3.1**
Exchangeable Calcium, Ca	mg/kg	2.0	**540**
Exchangeable Calcium, Ca	meq/100g	0.010	**2.7**
Exchangeable Calcium Percentage*	%	0.10	**44.7**
Exchangeable Magnesium, Mg	mg/kg	2.0	**340**
Exchangeable Magnesium, Mg	meq/100g	0.020	**2.7**
Exchangeable Magnesium	%	0.10	**45.3**
Cation Exchange Capacity	meq/100g	0.020	**6.1**

SGS

ANALYTICAL RESULTS

SE130614 R0

TOC in Soil [AN188]

			BH1 1.5-1.8	BH1 3.15-3.25	BH2 0-0.15	BH2 0.5-0.8	BH2 4.5-4.8	BH2 5.1-5.25
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			5/8/2014	7/8/2014	11/8/2014	11/8/2014	11/8/2014	11/8/2014
PARAMETER	UOM	LOR	SE130614.001	SE130614.002	SE130614.003	SE130614.004	SE130614.005	SE130614.006
Total Organic Carbon	%w/w	0.050	**0.10**	**1.6**	**4.3**	**1.9**	**3.3**	**0.19**

			BH3 0-0.1	BH3 1.5-1.8	BH4 0-0.15	BH5 0.1-0.4	BH5 0.6-0.7	BH6 0.6-0.7
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			13/8/2014	12/8/2014	12/8/2014	13/8/2014	13/8/2014	13/8/2014
PARAMETER	UOM	LOR	SE130614.007	SE130614.008	SE130614.009	SE130614.010	SE130614.011	SE130614.012
Total Organic Carbon	%w/w	0.050	**1.6**	**1.5**	**1.5**	**1.2**	**0.62**	**0.14**

			BH7 0.15-0.45	BH7 1.4-1.7	BH9 0.2-0.5	BH9 2.0-2.3	BH9 2.55-2.65	BH10 0.23-0.3
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			11/8/2014	11/8/2014	14/8/2014	14/8/2014	14/8/2014	12/8/2014
PARAMETER	UOM	LOR	SE130614.013	SE130614.014	SE130614.016	SE130614.017	SE130614.018	SE130614.019
Total Organic Carbon	%w/w	0.050	**0.46**	**0.23**	**0.38**	**1.3**	**0.31**	**0.19**

			BH10 0.55-0.65
			SOIL
			12/8/2014
PARAMETER	UOM	LOR	SE130614.020
Total Organic Carbon	%w/w	0.050	**0.16**

SGS

ANALYTICAL RESULTS

SE130614 R0

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest [AN040/AN320]

PARAMETER	UOM	LOR	BH1 1.5-1.8 SOIL - 7/8/2014 SE130614.001	BH1 3.15-3.25 SOIL - 7/8/2014 SE130614.002	BH2 0-0.15 SOIL - 11/8/2014 SE130614.003	BH2 0.5-0.8 SOIL - 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL - 11/8/2014 SE130614.005	BH2 5.1-5.25 SOIL - 11/8/2014 SE130614.006
Arsenic, As	mg/kg	3.0	7	9	<3	4	30	10
Cadmium, Cd	mg/kg	0.30	0.4	<0.3	<0.3	0.3	0.8	0.3
Chromium, Cr	mg/kg	0.30	16	14	9.1	12	52	18
Copper, Cu	mg/kg	0.50	6.7	4.1	17	15	130	8.5
Lead, Pb	mg/kg	1.0	18	18	28	20	120	22
Nickel, Ni	mg/kg	0.50	1.5	3.1	5.3	4.5	8.3	1.9
Zinc, Zn	mg/kg	0.50	7.7	11	54	38	260	19

PARAMETER	UOM	LOR	BH3 0-0.1 SOIL - 12/8/2014 SE130614.007	BH3 1.5-1.8 SOIL - 12/8/2014 SE130614.008	BH4 0-0.15 SOIL - 12/8/2014 SE130614.009	BH5 0.1-0.4 SOIL - 14/8/2014 SE130614.010	BH5 0.6-0.7 SOIL - 14/8/2014 SE130614.011	BH6 0.6-0.7 SOIL - 14/8/2014 SE130614.012
Arsenic, As	mg/kg	3.0	<3	7	12	520	62	7
Cadmium, Cd	mg/kg	0.30	<0.3	<0.3	0.4	0.6	0.4	0.6
Chromium, Cr	mg/kg	0.30	8.4	12	18	37	28	27
Copper, Cu	mg/kg	0.50	8.0	9.0	16	41	12	14
Lead, Pb	mg/kg	1.0	13	35	38	120	43	14
Nickel, Ni	mg/kg	0.50	5.5	2.6	4.9	10	2.1	15
Zinc, Zn	mg/kg	0.50	26	54	62	150	31	17

PARAMETER	UOM	LOR	BH7 0.15-0.45 SOIL - 11/8/2014 SE130614.013	BH7 1.4-1.7 SOIL - 11/8/2014 SE130614.014	BH8 0.2-0.4 SOIL - 11/8/2014 SE130614.015	BH9 0.2-0.5 SOIL - 14/8/2014 SE130614.016	BH9 2.0-2.3 SOIL - 14/8/2014 SE130614.017	BH9 2.65-2.66 SOIL - 14/8/2014 SE130614.018
Arsenic, As	mg/kg	3.0	<3	4	4	6	12	5
Cadmium, Cd	mg/kg	0.30	<0.3	<0.3	0.5	0.4	0.4	0.3
Chromium, Cr	mg/kg	0.30	11	11	97	23	20	9.3
Copper, Cu	mg/kg	0.50	8.6	9.3	15	18	20	12
Lead, Pb	mg/kg	1.0	9	13	10	23	42	24
Nickel, Ni	mg/kg	0.50	8.6	5.9	50	15	2.3	0.7
Zinc, Zn	mg/kg	0.50	20	17	35	43	67	13

PARAMETER	UOM	LOR	BH10 0.23-0.5 SOIL - 13/8/2014 SE130614.019	BH10 0.55-0.65 SOIL - 12/8/2014 SE130614.020	Duplicate D2 SOIL - 15/8/2014 SE130614.021
Arsenic, As	mg/kg	3.0	6	4	260
Cadmium, Cd	mg/kg	0.30	0.4	<0.3	0.7
Chromium, Cr	mg/kg	0.30	16	7.2	36
Copper, Cu	mg/kg	0.50	22	23	43
Lead, Pb	mg/kg	1.0	15	13	110
Nickel, Ni	mg/kg	0.50	19	19	9.5
Zinc, Zn	mg/kg	0.50	16	15	150

SGS

ANALYTICAL RESULTS

SE130614 R0

Mercury in Soil [AN312]

PARAMETER	UOM	LOR	BH1 1.5-1.8 SOIL 7/8/2014 SE130614.001	BH1 3.15-3.25 SOIL 7/8/2014 SE130614.002	BH2 0-0.15 SOIL 11/8/2014 SE130614.003	BH2 0.5-0.8 SOIL 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/8/2014 SE130614.005	BH2 5.1-5.25 SOIL 11/8/2014 SE130614.006
Mercury	mg/kg	0.010	**0.02**	**0.02**	**0.02**	**0.01**	**0.40**	**0.02**

PARAMETER	UOM	LOR	BH3 0-0.1 SOIL 12/8/2014 SE130614.007	BH3 1.5-1.8 SOIL 12/8/2014 SE130614.008	BH4 0-0.15 SOIL 12/8/2014 SE130614.009	BH5 0.1-0.4 SOIL 13/8/2014 SE130614.010	BH5 0.6-0.7 SOIL 13/8/2014 SE130614.011	BH6 0.0-0.1 SOIL 13/8/2014 SE130614.012
Mercury	mg/kg	0.010	**0.01**	**0.04**	**0.04**	**0.06**	**0.06**	**0.01**

PARAMETER	UOM	LOR	BH7 0.15-0.45 SOIL 11/8/2014 SE130614.013	BH7 1.4-1.7 SOIL 11/8/2014 SE130614.014	BH8 0.2-0.4 SOIL 14/8/2014 SE130614.015	BH9 0.2-0.5 SOIL 14/8/2014 SE130614.016	BH9 2.0-2.3 SOIL 14/8/2014 SE130614.017	BH9 2.55-2.65 SOIL 14/8/2014 SE130614.018
Mercury	mg/kg	0.010	**0.01**	**0.01**	**0.02**	**0.02**	**0.16**	**0.05**

PARAMETER	UOM	LOR	BH10 0.23-0.5 SOIL 13/8/2014 SE130614.019	BH10 0.55-0.65 SOIL 13/8/2014 SE130614.020	Duplicate D2 SOIL 13/8/2014 SE130614.021
Mercury	mg/kg	0.010	**0.01**	<0.01	**0.08**

Fibre identification in soil [AN602]

PARAMETER	UOM	LOR	BH1 1.5-1.8 SOIL 7/8/2014 SE130614.001	BH2 0-0.15 SOIL 11/8/2014 SE130614.003	BH2 0.5-0.8 SOIL 11/8/2014 SE130614.004	BH2 4.5-4.8 SOIL 11/8/2014 SE130614.005	BH3 0-0.1 SOIL 13/8/2014 SE130614.007	BH3 1.5-1.8 SOIL 12/8/2014 SE130614.008
Asbestos Detected	No unit	-	No	No	No	No	No	No
Estimated Fibres	%w/w	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

PARAMETER	UOM	LOR	BH4 0-0.15 SOIL 12/8/2014 SE130614.009	BH5 0.1-0.4 SOIL 13/8/2014 SE130614.010	BH5 0.6-0.7 SOIL 13/8/2014 SE130614.011	BH7 0.15-0.45 SOIL 14/8/2014 SE130614.012	BH7 1.4-1.7 SOIL 11/8/2014 SE130614.014	BH9 0.2-0.5 SOIL 14/8/2014 SE130614.016
Asbestos Detected	No unit	-	No	No	No	No	No	No
Estimated Fibres	%w/w	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

PARAMETER	UOM	LOR	BH9 2.0-2.3 SOIL 14/8/2014 SE130614.017	BH10 0.23-0.5 SOIL 12/8/2014 SE130614.019
Asbestos Detected	No unit	-	No	No
Estimated Fibres	%w/w	0.010	<0.01	<0.01

SGS

ANALYTICAL RESULTS

SE130614 R0

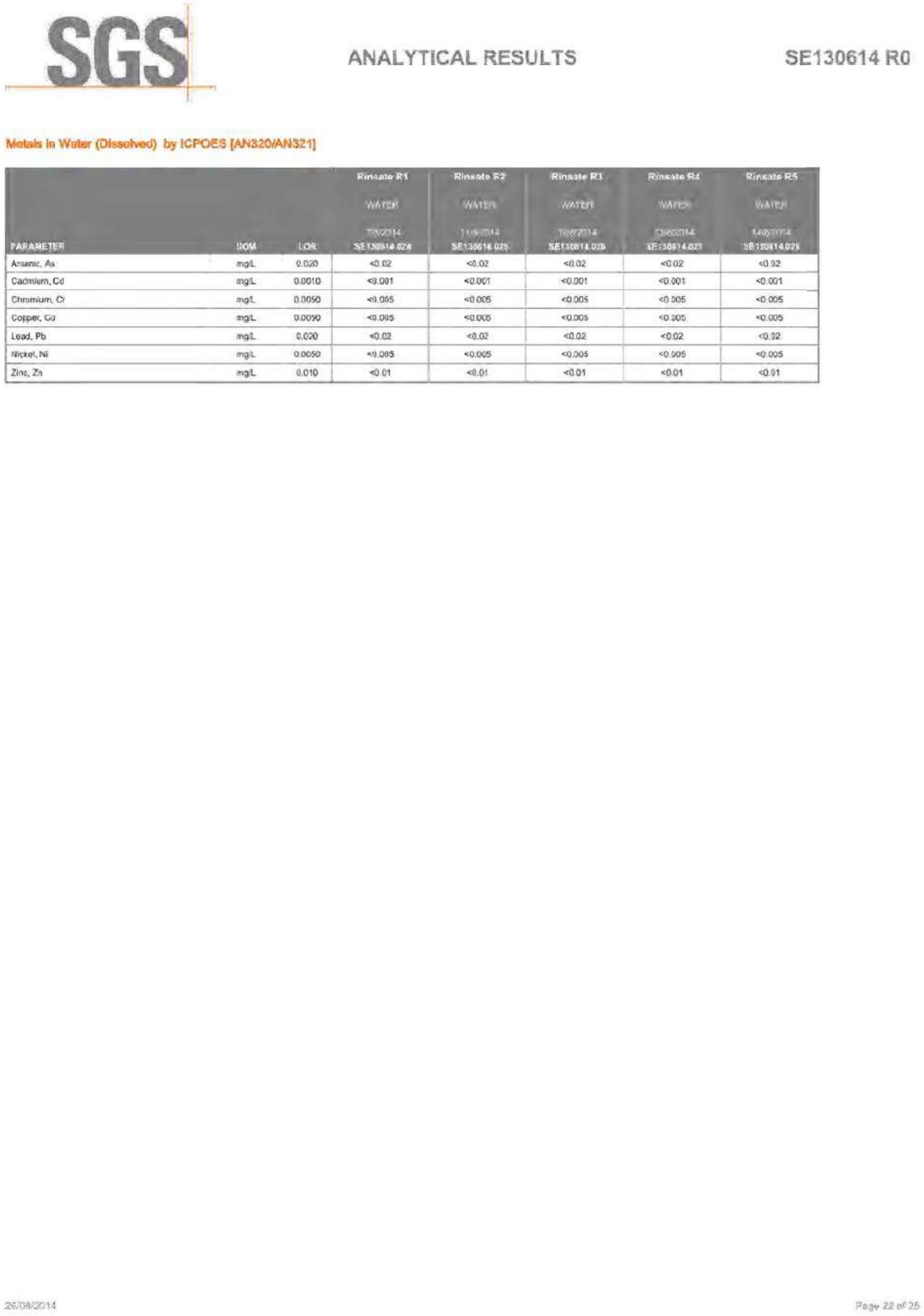
Moisture Content [AN002]

			BH1 1.5-1.8	BH1 3.15-3.25	BH2 0-0.15	BH2 0.5-0.8	BH2 4.5-4.8	BH2 5.1-5.25
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			7/8/2014	7/8/2014	11/8/2014	11/8/2014	11/8/2014	11/8/2014
PARAMETER	UOM	LOR	SE130614.001	SE130614.002	SE130614.003	SE130614.004	SE130614.005	SE130614.006
% Moisture	%	0.50	13	20	16	13	27	21

			BH3 0-0.1	BH3 1.5-1.8	BH4 0-0.15	BH5 0.1-0.4	BH5 0.6-0.7	BH6 0.6-0.7
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			12/8/2014	12/8/2014	12/8/2014	13/8/2014	13/8/2014	13/8/2014
PARAMETER	UOM	LOR	SE130614.007	SE130614.008	SE130614.009	SE130614.010	SE130614.011	SE130614.012
% Moisture	%	0.50	13	17	17	23	19	10

			BH7 0.15-0.45	BH7 1.4-1.7	BH8 0.2-0.4	BH9 0.2-0.5	BH9 2.0-2.3	BH9 2.55-2.65
			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			11/8/2014	11/8/2014	14/8/2014	14/8/2014	14/8/2014	14/8/2014
PARAMETER	UOM	LOR	SE130614.013	SE130614.014	SE130614.015	SE130614.016	SE130614.017	SE130614.018
% Moisture	%	0.50	9.9	13	19	15	22	18

			BH10 0.23-0.5	BH10 0.55-0.65	Duplicate D2
			SOIL	SOIL	SOIL
			12/8/2014	12/8/2014	13/8/2014
PARAMETER	UOM	LOR	SE130614.019	SE130614.020	SE130614.021
% Moisture	%	0.50	17	16	21



SGS

ANALYTICAL RESULTS

SE130614 R0

Metals in Water (Dissolved) by ICPOES [AN320/AN321]

PARAMETER	UOM	LOR	Rinsate R1 WATER 7/8/2014 SE130614.024	Rinsate R2 WATER 11/8/2014 SE130614.025	Rinsate R3 WATER 12/8/2014 SE130614.026	Rinsate R4 WATER 13/8/2014 SE130614.027	Rinsate R5 WATER 14/8/2014 SE130614.028
Arsenic, As	mg/L	0.020	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium, Cd	mg/L	0.0010	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium, Cr	mg/L	0.0050	<0.005	<0.005	<0.005	<0.005	<0.005
Copper, Cu	mg/L	0.0050	<0.005	<0.005	<0.005	<0.005	<0.005
Lead, Pb	mg/L	0.020	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel, Ni	mg/L	0.0050	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc, Zn	mg/L	0.010	<0.01	<0.01	<0.01	<0.01	<0.01

Mercury (dissolved) in Water [AN311/AN312]

			Rinsate R1	Rinsate R2	Rinsate R3	Rinsate R4	Rinsate R5
			WATER	WATER	WATER	WATER	WATER
			8/8/2014	11/8/2014	12/8/2014	13/8/2014	14/8/2014
PARAMETER	UOM	LOR	SE130614.024	SE130614.025	SE130614.026	SE130614.027	SE130614.028
Mercury	mg/L	0.00010	**0.0002**	<0.0001	<0.0001	<0.0001	<0.0001

SGS

METHOD SUMMARY

SE130614 R0

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analsysis by ASS or ICP as per USEPA Method 200.8.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN077	Hydrogen cyanide is liberated from an acidified alkali soil extract by distillation and purging with air. The hydrogen cyanide gas is then collected by passing it through a sodium hydroxide scrubbing solution. The scrubbing solution will then be analysed for cyanide by the appropriate method.
AN088	Orbital rolling for Organic pollutants are extracted from soil/sediment by transferring an appropriate mass of sample to a clear soil jar and extracting with 1:1 Dichloromethane/Acetone. Orbital Rolling method is intended for the extraction of semi-volatile organic compounds from soil/sediment samples, and is based somewhat on USEPA method 3570 (Micro Organic extraction and sample preparation). Method 3700.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN122	Exchangeable Cations, CEC and ESP: Soil sample is extracted in 1M Ammonium Acetate at pH=7 (or 1M Ammonium Chloride at pH=7) with cations (Na, K, Ca & Mg) then determined by ICP OES/ICP MS and reported as Exchangeable Cations. For saline soils, these results can be corrected for water soluble cations and reported as Exchangeable cations in meq/100g or soil can be pretreated (aqueous ethanol/aqueous glycerol) prior to extraction. Cation Exchange Capacity (CEC) is the sum of the exchangeable cations in meq/100g.
AN188	The organic material in the soil sample is oxidised with chromic acid in the presence of excess sulphuric acid, without external heat being applied. The excess dichromate ion is determined by titration with standard ammonium iron (II) sulphate solution and the amount of oxidised material is calculated from the quantity of dichromate reduced. Referenced to NEPM 105 and AS1289.1.1.1.
AN287	A buffered distillate or water sample is treated with chloramine/barbituric acid reagents and the intensity of the colour developed is proportional to the cyanide concentration by Aquakem DA.
AN289	Analysis of Total Phenols in Soil Sediment and Water: Steam distillable phenols react with 4-aminoantipyrine at pH 7.9±0.1 in the presence of potassium ferricyanide to form a coloured antipyrine dye analysed by Discrete Analyser. Reference APHA 5530 B/D.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN400	OC and OP Pesticides by GC-ECD: The determination of organochlorine (OC) and organophosphorus (OP) pesticides and polychlorinated biphenyls (PCBs) in soils, sludges and groundwater. (Based on USEPA methods 3510, 3550, 8140 and 8080.)
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).

SGS

METHOD SUMMARY

SE130614 R0

AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN433/AN434/AN410	VOCs and C6-C9/C6-C10 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic 'clues', which provide a reasonable degree of certainty, dispersion staining is a mandatory 'clue' for positive identification. If sufficient 'clues' are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.

FOOTNOTES

*	Analysis not covered by the scope of accreditation.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
^	Performed by outside laboratory.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

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

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

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

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions/General-Conditions-of-Services-English.aspx. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This report must not be reproduced, except in full.

28/08/2014

Page 25 of 25

SGS

STATEMENT OF QA/QC PERFORMANCE

SE130614 R0

CLIENT DETAILS

Contact	An Nguyen	Manager	Huong Crawford
Client	Geotechnique	Laboratory	SGS Alexandria Environmental
Address	P.O. Box 880 NSW 2751	Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	02 4722 2700	Telephone	+61 2 8594 0400
Facsimile	02 4722 6161	Facsimile	+61 2 8594 0499
Email	anguyen@geotech.com.au	Email	au.environmental.sydney@sgs.com
Project	**13188-2 - Concord**	SGS Reference	SE130614 R0
Order Number	(Not specified)	Report Number	0000090000
Samples	28	Date Reported	27 Aug 2014

LABORATORY DETAILS

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS Environmental Services' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	pH in soil (1:5)	8 items
Analysis Date	pH in soil (1:5)	21 items
Duplicate	Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest	1 item

SAMPLE SUMMARY

Sample counts by matrix	21 Soils, 5 Waters	Type of documentation received	COC
Date documentation received	18/08/2014@02:31p	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	4.5°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

SGS

HOLDING TIME SUMMARY

SE130614 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062800	07 Aug 2014	18 Aug 2014	04 Sep 2014	22 Aug 2014	04 Sep 2014	25 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062800	07 Aug 2014	18 Aug 2014	04 Sep 2014	22 Aug 2014	04 Sep 2014	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062800	11 Aug 2014	18 Aug 2014	08 Sep 2014	22 Aug 2014	08 Sep 2014	25 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062800	11 Aug 2014	18 Aug 2014	08 Sep 2014	22 Aug 2014	08 Sep 2014	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062800	11 Aug 2014	18 Aug 2014	08 Sep 2014	22 Aug 2014	08 Sep 2014	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062800	11 Aug 2014	18 Aug 2014	08 Sep 2014	22 Aug 2014	08 Sep 2014	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062800	12 Aug 2014	18 Aug 2014	09 Sep 2014	22 Aug 2014	09 Sep 2014	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062800	12 Aug 2014	18 Aug 2014	09 Sep 2014	22 Aug 2014	09 Sep 2014	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062800	12 Aug 2014	18 Aug 2014	09 Sep 2014	22 Aug 2014	09 Sep 2014	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062800	13 Aug 2014	18 Aug 2014	10 Sep 2014	22 Aug 2014	10 Sep 2014	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062800	13 Aug 2014	18 Aug 2014	10 Sep 2014	22 Aug 2014	10 Sep 2014	25 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062800	13 Aug 2014	18 Aug 2014	10 Sep 2014	22 Aug 2014	10 Sep 2014	25 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062800	11 Aug 2014	18 Aug 2014	08 Sep 2014	22 Aug 2014	08 Sep 2014	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062800	11 Aug 2014	18 Aug 2014	08 Sep 2014	22 Aug 2014	08 Sep 2014	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062800	14 Aug 2014	18 Aug 2014	11 Sep 2014	22 Aug 2014	11 Sep 2014	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062800	14 Aug 2014	18 Aug 2014	11 Sep 2014	22 Aug 2014	11 Sep 2014	25 Aug 2014
BH9 2.55-2.85	SE130614.018	LB062801	14 Aug 2014	18 Aug 2014	11 Sep 2014	22 Aug 2014	11 Sep 2014	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062801	12 Aug 2014	18 Aug 2014	09 Sep 2014	22 Aug 2014	09 Sep 2014	25 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062801	12 Aug 2014	18 Aug 2014	09 Sep 2014	22 Aug 2014	09 Sep 2014	25 Aug 2014

Fibre Identification in soil

Method: ME-(AU)-[ENV]AN602

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062740	07 Aug 2014	18 Aug 2014	07 Aug 2015	21 Aug 2014	07 Aug 2015	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062740	11 Aug 2014	18 Aug 2014	11 Aug 2015	21 Aug 2014	11 Aug 2015	25 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062740	11 Aug 2014	18 Aug 2014	11 Aug 2015	21 Aug 2014	11 Aug 2015	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062740	11 Aug 2014	18 Aug 2014	11 Aug 2015	21 Aug 2014	11 Aug 2015	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062740	12 Aug 2014	18 Aug 2014	12 Aug 2015	21 Aug 2014	12 Aug 2015	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062740	12 Aug 2014	18 Aug 2014	12 Aug 2015	21 Aug 2014	12 Aug 2015	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062740	12 Aug 2014	18 Aug 2014	12 Aug 2015	21 Aug 2014	12 Aug 2015	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062740	13 Aug 2014	18 Aug 2014	13 Aug 2015	21 Aug 2014	13 Aug 2015	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062740	13 Aug 2014	18 Aug 2014	13 Aug 2015	21 Aug 2014	13 Aug 2015	25 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062740	11 Aug 2014	18 Aug 2014	11 Aug 2015	21 Aug 2014	11 Aug 2015	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062740	11 Aug 2014	18 Aug 2014	11 Aug 2015	21 Aug 2014	11 Aug 2015	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062740	14 Aug 2014	18 Aug 2014	14 Aug 2015	21 Aug 2014	14 Aug 2015	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062740	14 Aug 2014	18 Aug 2014	14 Aug 2015	21 Aug 2014	14 Aug 2015	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062740	12 Aug 2014	18 Aug 2014	12 Aug 2015	21 Aug 2014	12 Aug 2015	25 Aug 2014

Mercury (dissolved) in Water

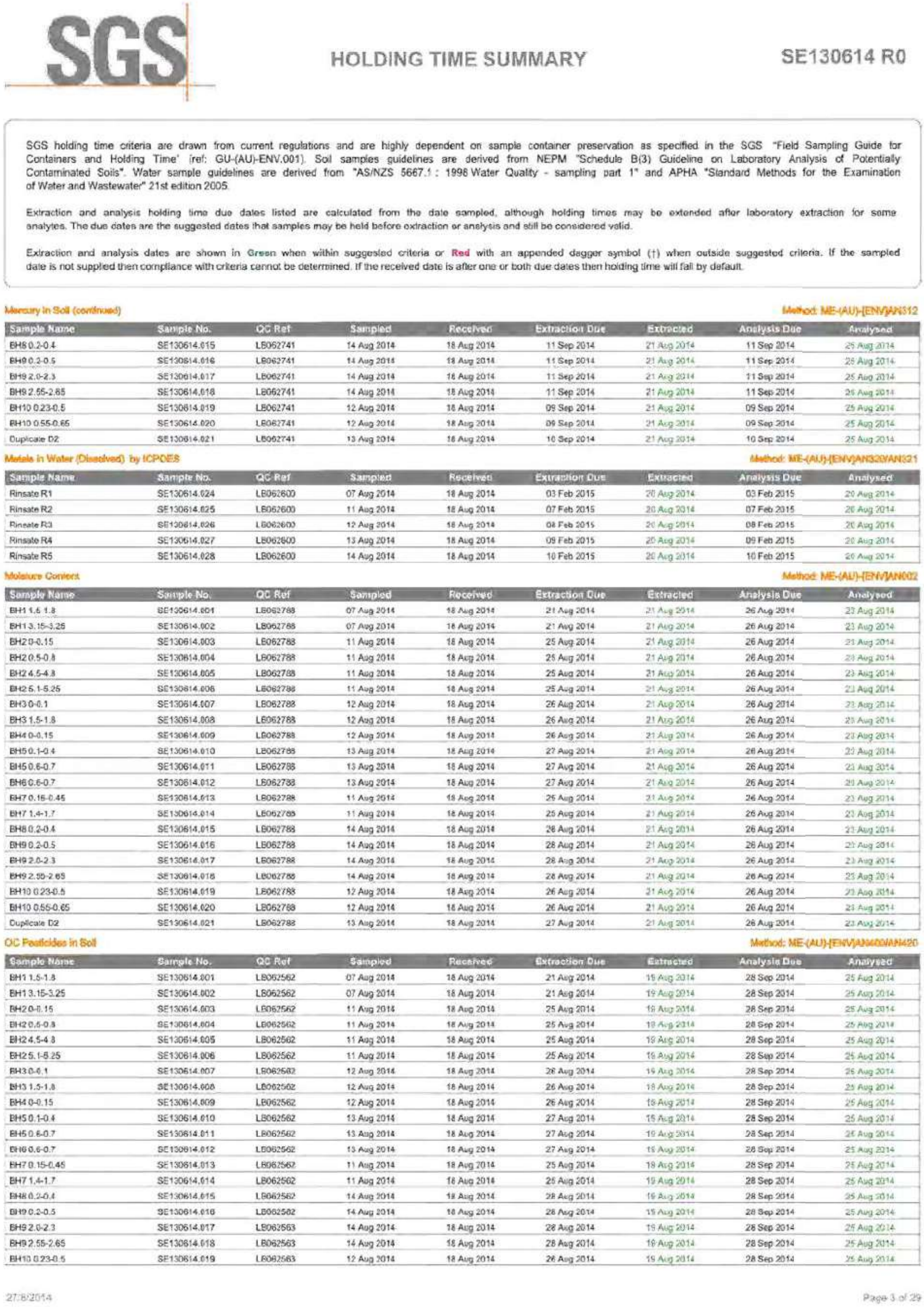
Method: ME-(AU)-[ENV]AN311/AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
Rinsate R1	SE130614.024	LB062755	07 Aug 2014	18 Aug 2014	04 Sep 2014	22 Aug 2014	04 Sep 2014	22 Aug 2014
Rinsate R2	SE130614.025	LB062755	11 Aug 2014	18 Aug 2014	08 Sep 2014	22 Aug 2014	08 Sep 2014	22 Aug 2014
Rinsate R3	SE130614.026	LB062755	12 Aug 2014	18 Aug 2014	09 Sep 2014	22 Aug 2014	09 Sep 2014	22 Aug 2014
Rinsate R4	SE130614.027	LB062755	13 Aug 2014	18 Aug 2014	10 Sep 2014	22 Aug 2014	10 Sep 2014	22 Aug 2014
Rinsate R5	SE130614.028	LB062755	14 Aug 2014	18 Aug 2014	11 Sep 2014	22 Aug 2014	11 Sep 2014	22 Aug 2014

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062739	07 Aug 2014	18 Aug 2014	04 Sep 2014	21 Aug 2014	04 Sep 2014	25 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062739	07 Aug 2014	18 Aug 2014	04 Sep 2014	21 Aug 2014	04 Sep 2014	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062739	11 Aug 2014	18 Aug 2014	08 Sep 2014	21 Aug 2014	08 Sep 2014	25 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062739	11 Aug 2014	18 Aug 2014	08 Sep 2014	21 Aug 2014	08 Sep 2014	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062739	11 Aug 2014	18 Aug 2014	08 Sep 2014	21 Aug 2014	08 Sep 2014	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062741	11 Aug 2014	18 Aug 2014	08 Sep 2014	21 Aug 2014	08 Sep 2014	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062741	12 Aug 2014	18 Aug 2014	09 Sep 2014	21 Aug 2014	09 Sep 2014	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062741	12 Aug 2014	18 Aug 2014	09 Sep 2014	21 Aug 2014	09 Sep 2014	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062741	12 Aug 2014	18 Aug 2014	09 Sep 2014	21 Aug 2014	09 Sep 2014	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062741	13 Aug 2014	18 Aug 2014	10 Sep 2014	21 Aug 2014	10 Sep 2014	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062741	13 Aug 2014	18 Aug 2014	10 Sep 2014	21 Aug 2014	10 Sep 2014	25 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062741	13 Aug 2014	18 Aug 2014	10 Sep 2014	21 Aug 2014	10 Sep 2014	25 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062741	11 Aug 2014	18 Aug 2014	08 Sep 2014	21 Aug 2014	08 Sep 2014	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062741	11 Aug 2014	18 Aug 2014	08 Sep 2014	21 Aug 2014	08 Sep 2014	25 Aug 2014



SGS

HOLDING TIME SUMMARY

SE130614 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Mercury in Soil (continued) — Method: ME-(AU)-[ENV]AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH8 0.2-0.4	SE130614.015	LB062741	14 Aug 2014	18 Aug 2014	11 Sep 2014	21 Aug 2014	11 Sep 2014	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062741	14 Aug 2014	18 Aug 2014	11 Sep 2014	21 Aug 2014	11 Sep 2014	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062741	14 Aug 2014	18 Aug 2014	11 Sep 2014	21 Aug 2014	11 Sep 2014	25 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062741	14 Aug 2014	18 Aug 2014	11 Sep 2014	21 Aug 2014	11 Sep 2014	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062741	12 Aug 2014	18 Aug 2014	09 Sep 2014	21 Aug 2014	09 Sep 2014	25 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062741	12 Aug 2014	18 Aug 2014	09 Sep 2014	21 Aug 2014	09 Sep 2014	25 Aug 2014
Duplicate D2	SE130614.021	LB062741	13 Aug 2014	18 Aug 2014	10 Sep 2014	21 Aug 2014	10 Sep 2014	25 Aug 2014

Metals in Water (Dissolved) by ICPOES — Method: ME-(AU)-[ENV]AN320/AN321

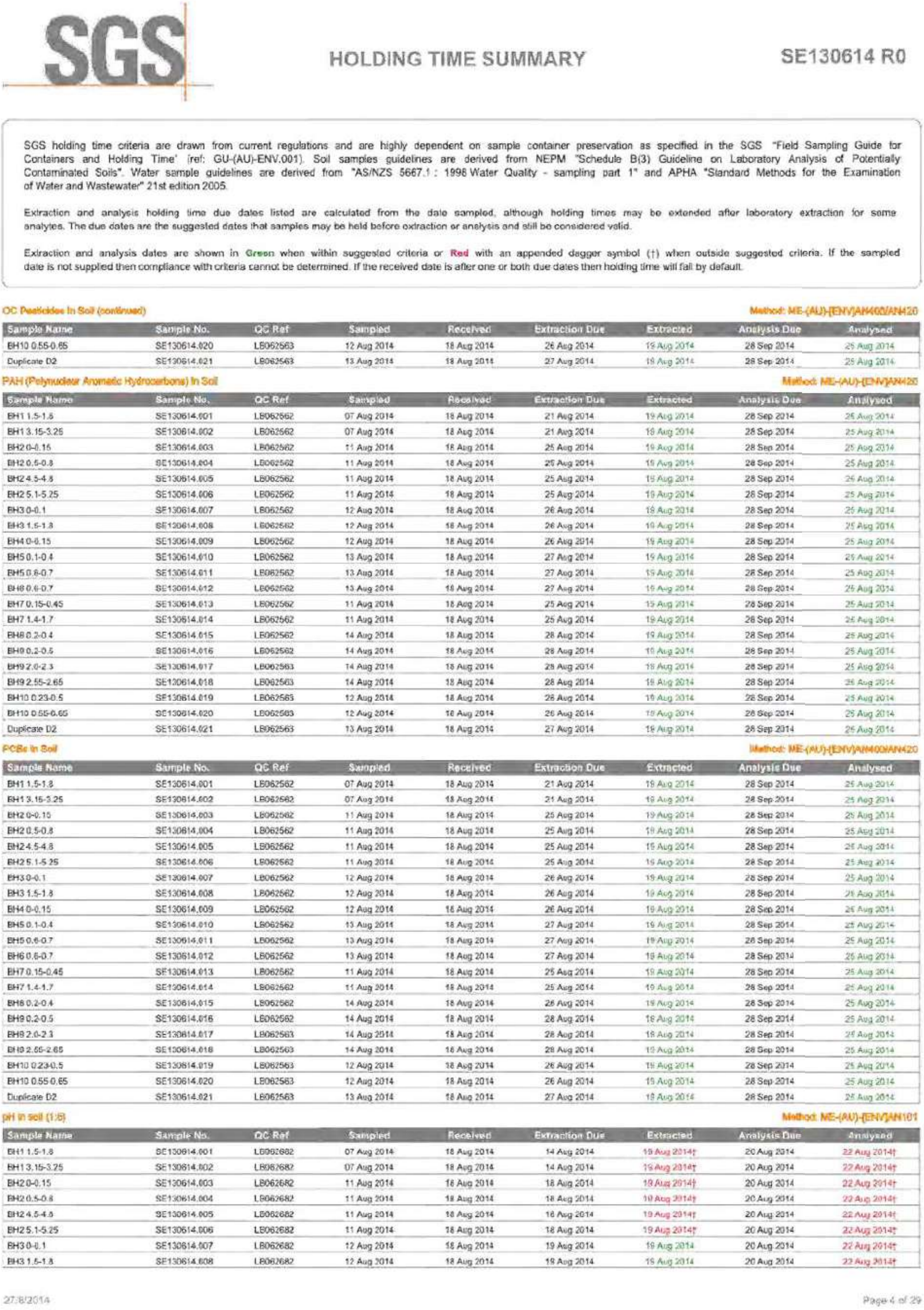
Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
Rinsate R1	SE130614.024	LB062600	07 Aug 2014	18 Aug 2014	03 Feb 2015	20 Aug 2014	03 Feb 2015	20 Aug 2014
Rinsate R2	SE130614.025	LB062600	11 Aug 2014	18 Aug 2014	07 Feb 2015	20 Aug 2014	07 Feb 2015	20 Aug 2014
Rinsate R3	SE130614.026	LB062600	12 Aug 2014	18 Aug 2014	08 Feb 2015	20 Aug 2014	08 Feb 2015	20 Aug 2014
Rinsate R4	SE130614.027	LB062600	13 Aug 2014	18 Aug 2014	09 Feb 2015	20 Aug 2014	09 Feb 2015	20 Aug 2014
Rinsate R5	SE130614.028	LB062600	14 Aug 2014	18 Aug 2014	10 Feb 2015	20 Aug 2014	10 Feb 2015	20 Aug 2014

Moisture Content — Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062788	07 Aug 2014	18 Aug 2014	21 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062788	07 Aug 2014	18 Aug 2014	21 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH2 0-0.15	SE130614.003	LB062788	11 Aug 2014	18 Aug 2014	25 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062788	11 Aug 2014	18 Aug 2014	25 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062788	11 Aug 2014	18 Aug 2014	25 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062788	11 Aug 2014	18 Aug 2014	25 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH3 0-0.1	SE130614.007	LB062788	12 Aug 2014	18 Aug 2014	26 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062788	12 Aug 2014	18 Aug 2014	26 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH4 0-0.15	SE130614.009	LB062788	12 Aug 2014	18 Aug 2014	26 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062788	13 Aug 2014	18 Aug 2014	27 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062788	13 Aug 2014	18 Aug 2014	27 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062788	13 Aug 2014	18 Aug 2014	27 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062788	11 Aug 2014	18 Aug 2014	25 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062788	11 Aug 2014	18 Aug 2014	25 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH8 0.2-0.4	SE130614.015	LB062788	14 Aug 2014	18 Aug 2014	28 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062788	14 Aug 2014	18 Aug 2014	28 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062788	14 Aug 2014	18 Aug 2014	28 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062788	14 Aug 2014	18 Aug 2014	28 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062788	12 Aug 2014	18 Aug 2014	26 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062788	12 Aug 2014	18 Aug 2014	26 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014
Duplicate D2	SE130614.021	LB062788	13 Aug 2014	18 Aug 2014	27 Aug 2014	21 Aug 2014	26 Aug 2014	23 Aug 2014

OC Pesticides in Soil — Method: ME-(AU)-[ENV]AN400/AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062562	07 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062562	07 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH8 0.2-0.4	SE130614.015	LB062562	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062562	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062563	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062563	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062563	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014



SGS

HOLDING TIME SUMMARY

SE130614 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

OC Pesticides in Soil (continued) Method: ME-(AU)-[ENV]AN400/AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH10 0.55-0.65	SE130614.020	LB062563	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
Duplicate D2	SE130614.021	LB062563	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014

PAH (Polynuclear Aromatic Hydrocarbons) in Soil Method: ME-(AU)-[ENV]AN420

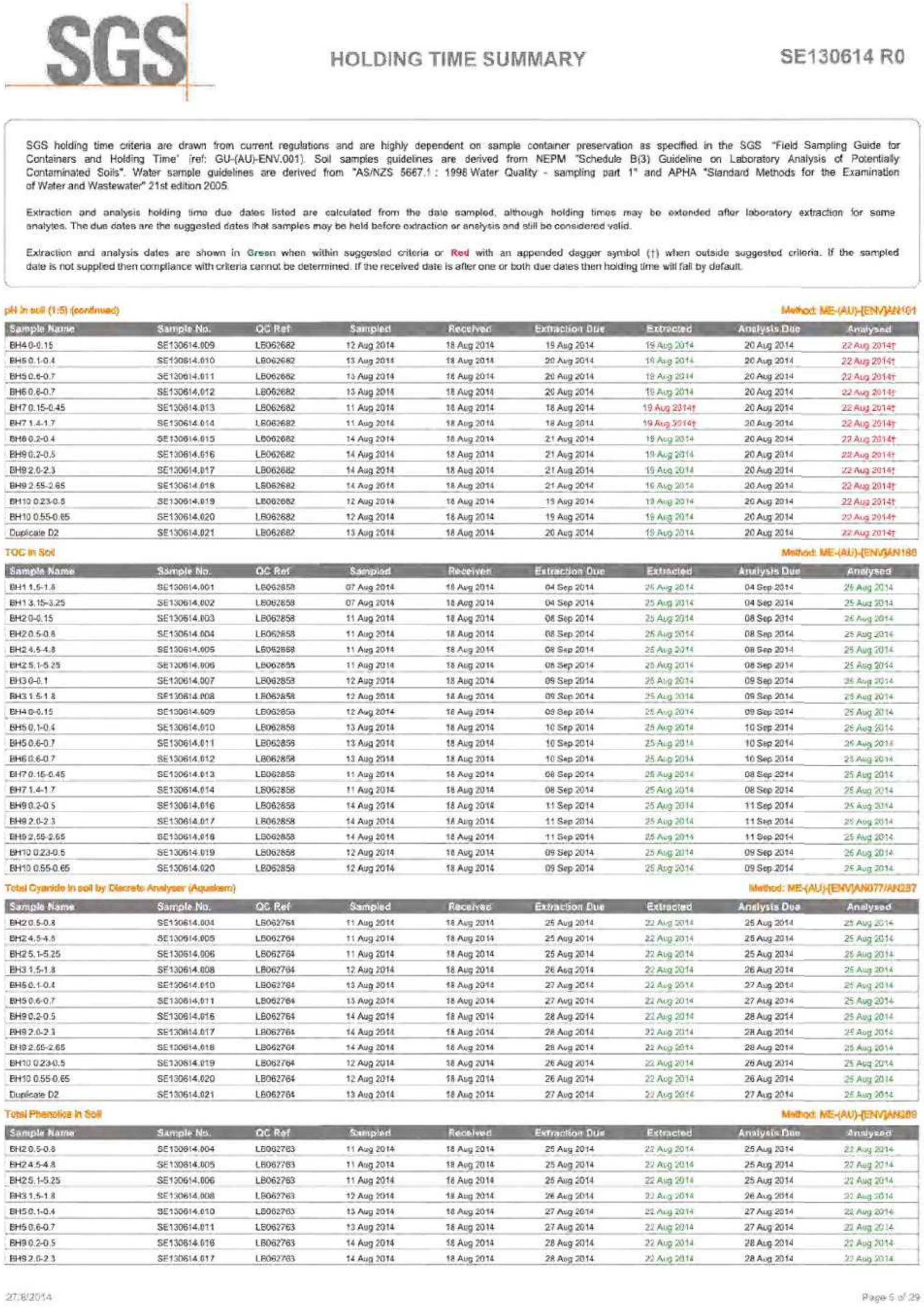
Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062562	07 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062562	07 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH8 0.2-0.4	SE130614.015	LB062562	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062562	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062563	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062563	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062563	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062563	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
Duplicate D2	SE130614.021	LB062563	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014

PCBs in Soil Method: ME-(AU)-[ENV]AN400/AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062562	07 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062562	07 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH8 0.2-0.4	SE130614.015	LB062562	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062562	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062563	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062563	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062563	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062563	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
Duplicate D2	SE130614.021	LB062563	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062682	07 Aug 2014	18 Aug 2014	14 Aug 2014	19 Aug 2014†	20 Aug 2014	22 Aug 2014†
BH1 3.15-3.25	SE130614.002	LB062682	07 Aug 2014	18 Aug 2014	14 Aug 2014	19 Aug 2014†	20 Aug 2014	22 Aug 2014†
BH2 0-0.15	SE130614.003	LB062682	11 Aug 2014	18 Aug 2014	18 Aug 2014	19 Aug 2014†	20 Aug 2014	22 Aug 2014†
BH2 0.5-0.8	SE130614.004	LB062682	11 Aug 2014	18 Aug 2014	18 Aug 2014	19 Aug 2014†	20 Aug 2014	22 Aug 2014†
BH2 4.5-4.8	SE130614.005	LB062682	11 Aug 2014	18 Aug 2014	18 Aug 2014	19 Aug 2014†	20 Aug 2014	22 Aug 2014†
BH2 5.1-5.25	SE130614.006	LB062682	11 Aug 2014	18 Aug 2014	18 Aug 2014	19 Aug 2014†	20 Aug 2014	22 Aug 2014†
BH3 0-0.1	SE130614.007	LB062682	12 Aug 2014	18 Aug 2014	19 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH3 1.5-1.8	SE130614.008	LB062682	12 Aug 2014	18 Aug 2014	19 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†



HOLDING TIME SUMMARY

SE130614 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH4 0-0.15	SE130614.009	LB062682	12 Aug 2014	18 Aug 2014	19 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH5 0.1-0.4	SE130614.010	LB062682	13 Aug 2014	18 Aug 2014	20 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH5 0.6-0.7	SE130614.011	LB062682	13 Aug 2014	18 Aug 2014	20 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH6 0.6-0.7	SE130614.012	LB062682	13 Aug 2014	18 Aug 2014	20 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH7 0.15-0.45	SE130614.013	LB062682	11 Aug 2014	18 Aug 2014	18 Aug 2014	19 Aug 2014†	20 Aug 2014	22 Aug 2014†
BH7 1.4-1.7	SE130614.014	LB062682	11 Aug 2014	18 Aug 2014	18 Aug 2014	19 Aug 2014†	20 Aug 2014	22 Aug 2014†
BH8 0.2-0.4	SE130614.015	LB062682	14 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH9 0.2-0.5	SE130614.016	LB062682	14 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH9 2.0-2.3	SE130614.017	LB062682	14 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH9 2.55-2.65	SE130614.018	LB062682	14 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH10 0.23-0.5	SE130614.019	LB062682	12 Aug 2014	18 Aug 2014	19 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
BH10 0.55-0.65	SE130614.020	LB062682	12 Aug 2014	18 Aug 2014	19 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†
Duplicate D2	SE130614.021	LB062682	13 Aug 2014	18 Aug 2014	20 Aug 2014	19 Aug 2014	20 Aug 2014	22 Aug 2014†

TOC in Soil Method: ME-(AU)-[ENV]AN188

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062858	07 Aug 2014	18 Aug 2014	04 Sep 2014	25 Aug 2014	04 Sep 2014	25 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062858	07 Aug 2014	18 Aug 2014	04 Sep 2014	25 Aug 2014	04 Sep 2014	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062858	11 Aug 2014	18 Aug 2014	08 Sep 2014	25 Aug 2014	08 Sep 2014	26 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062858	11 Aug 2014	18 Aug 2014	08 Sep 2014	25 Aug 2014	08 Sep 2014	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062858	11 Aug 2014	18 Aug 2014	08 Sep 2014	25 Aug 2014	08 Sep 2014	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062858	11 Aug 2014	18 Aug 2014	08 Sep 2014	25 Aug 2014	08 Sep 2014	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062858	12 Aug 2014	18 Aug 2014	09 Sep 2014	25 Aug 2014	09 Sep 2014	26 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062858	12 Aug 2014	18 Aug 2014	09 Sep 2014	25 Aug 2014	09 Sep 2014	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062858	12 Aug 2014	18 Aug 2014	09 Sep 2014	25 Aug 2014	09 Sep 2014	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062858	13 Aug 2014	18 Aug 2014	10 Sep 2014	25 Aug 2014	10 Sep 2014	26 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062858	13 Aug 2014	18 Aug 2014	10 Sep 2014	25 Aug 2014	10 Sep 2014	26 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062858	13 Aug 2014	18 Aug 2014	10 Sep 2014	25 Aug 2014	10 Sep 2014	25 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062858	11 Aug 2014	18 Aug 2014	08 Sep 2014	25 Aug 2014	08 Sep 2014	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062858	11 Aug 2014	18 Aug 2014	08 Sep 2014	25 Aug 2014	08 Sep 2014	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062858	14 Aug 2014	18 Aug 2014	11 Sep 2014	25 Aug 2014	11 Sep 2014	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062858	14 Aug 2014	18 Aug 2014	11 Sep 2014	25 Aug 2014	11 Sep 2014	25 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062858	14 Aug 2014	18 Aug 2014	11 Sep 2014	25 Aug 2014	11 Sep 2014	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062858	12 Aug 2014	18 Aug 2014	09 Sep 2014	25 Aug 2014	09 Sep 2014	26 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062858	12 Aug 2014	18 Aug 2014	09 Sep 2014	25 Aug 2014	09 Sep 2014	26 Aug 2014

Total Cyanide in soil by Discrete Analyser (Aquakem) Method: ME-(AU)-[ENV]AN077/AN287

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH2 0.5-0.8	SE130614.004	LB062764	11 Aug 2014	18 Aug 2014	25 Aug 2014	22 Aug 2014	25 Aug 2014	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062764	11 Aug 2014	18 Aug 2014	25 Aug 2014	22 Aug 2014	25 Aug 2014	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062764	11 Aug 2014	18 Aug 2014	25 Aug 2014	22 Aug 2014	25 Aug 2014	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062764	12 Aug 2014	18 Aug 2014	26 Aug 2014	22 Aug 2014	26 Aug 2014	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062764	13 Aug 2014	18 Aug 2014	27 Aug 2014	22 Aug 2014	27 Aug 2014	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062764	13 Aug 2014	18 Aug 2014	27 Aug 2014	22 Aug 2014	27 Aug 2014	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062764	14 Aug 2014	18 Aug 2014	28 Aug 2014	22 Aug 2014	28 Aug 2014	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062764	14 Aug 2014	18 Aug 2014	28 Aug 2014	22 Aug 2014	28 Aug 2014	25 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062764	14 Aug 2014	18 Aug 2014	28 Aug 2014	22 Aug 2014	28 Aug 2014	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062764	12 Aug 2014	18 Aug 2014	26 Aug 2014	22 Aug 2014	26 Aug 2014	25 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062764	12 Aug 2014	18 Aug 2014	26 Aug 2014	22 Aug 2014	26 Aug 2014	25 Aug 2014
Duplicate D2	SE130614.021	LB062764	13 Aug 2014	18 Aug 2014	27 Aug 2014	22 Aug 2014	27 Aug 2014	25 Aug 2014

Total Phenolics in Soil Method: ME-(AU)-[ENV]AN289

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH2 0.5-0.8	SE130614.004	LB062763	11 Aug 2014	18 Aug 2014	25 Aug 2014	22 Aug 2014	25 Aug 2014	22 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062763	11 Aug 2014	18 Aug 2014	25 Aug 2014	22 Aug 2014	25 Aug 2014	22 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062763	11 Aug 2014	18 Aug 2014	25 Aug 2014	22 Aug 2014	25 Aug 2014	22 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062763	12 Aug 2014	18 Aug 2014	26 Aug 2014	22 Aug 2014	26 Aug 2014	22 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062763	13 Aug 2014	18 Aug 2014	27 Aug 2014	22 Aug 2014	27 Aug 2014	22 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062763	13 Aug 2014	18 Aug 2014	27 Aug 2014	22 Aug 2014	27 Aug 2014	22 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062763	14 Aug 2014	18 Aug 2014	28 Aug 2014	22 Aug 2014	28 Aug 2014	22 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062763	14 Aug 2014	18 Aug 2014	28 Aug 2014	22 Aug 2014	28 Aug 2014	22 Aug 2014

HOLDING TIME SUMMARY

SE130614 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time' (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fall by default.

Total Phenolics in Soil (continued)

Method: ME-(AU)-[ENV]AN289

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH9 2.55-2.65	SE130614.018	LB062763	14 Aug 2014	18 Aug 2014	28 Aug 2014	22 Aug 2014	28 Aug 2014	22 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062763	12 Aug 2014	18 Aug 2014	26 Aug 2014	22 Aug 2014	26 Aug 2014	22 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062835	12 Aug 2014	18 Aug 2014	26 Aug 2014	23 Aug 2014	26 Aug 2014	26 Aug 2014
Duplicate D2	SE130614.021	LB062835	13 Aug 2014	18 Aug 2014	27 Aug 2014	23 Aug 2014	27 Aug 2014	23 Aug 2014

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest

Method: ME-(AU)-[ENV]AN040/AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062732	07 Aug 2014	18 Aug 2014	03 Feb 2015	21 Aug 2014	03 Feb 2015	25 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062732	07 Aug 2014	18 Aug 2014	03 Feb 2015	21 Aug 2014	03 Feb 2015	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062732	11 Aug 2014	18 Aug 2014	07 Feb 2015	21 Aug 2014	07 Feb 2015	26 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062732	11 Aug 2014	18 Aug 2014	07 Feb 2015	21 Aug 2014	07 Feb 2015	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062732	11 Aug 2014	18 Aug 2014	07 Feb 2015	21 Aug 2014	07 Feb 2015	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062733	11 Aug 2014	18 Aug 2014	07 Feb 2015	21 Aug 2014	07 Feb 2015	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062733	12 Aug 2014	18 Aug 2014	08 Feb 2015	21 Aug 2014	08 Feb 2015	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062733	12 Aug 2014	18 Aug 2014	08 Feb 2015	21 Aug 2014	08 Feb 2015	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062733	12 Aug 2014	18 Aug 2014	08 Feb 2015	21 Aug 2014	08 Feb 2015	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062733	13 Aug 2014	18 Aug 2014	09 Feb 2015	21 Aug 2014	09 Feb 2015	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062733	13 Aug 2014	18 Aug 2014	09 Feb 2015	21 Aug 2014	09 Feb 2015	25 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062733	13 Aug 2014	18 Aug 2014	09 Feb 2015	21 Aug 2014	09 Feb 2015	26 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062733	11 Aug 2014	18 Aug 2014	07 Feb 2015	21 Aug 2014	07 Feb 2015	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062733	11 Aug 2014	18 Aug 2014	07 Feb 2015	21 Aug 2014	07 Feb 2015	25 Aug 2014
BH8 0.2-0.4	SE130614.015	LB062733	14 Aug 2014	18 Aug 2014	10 Feb 2015	21 Aug 2014	10 Feb 2015	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062733	14 Aug 2014	18 Aug 2014	10 Feb 2015	21 Aug 2014	10 Feb 2015	26 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062733	14 Aug 2014	18 Aug 2014	10 Feb 2015	21 Aug 2014	10 Feb 2015	25 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062733	14 Aug 2014	18 Aug 2014	10 Feb 2015	21 Aug 2014	10 Feb 2015	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062733	12 Aug 2014	18 Aug 2014	08 Feb 2015	21 Aug 2014	08 Feb 2015	26 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062733	12 Aug 2014	18 Aug 2014	08 Feb 2015	21 Aug 2014	08 Feb 2015	26 Aug 2014
Duplicate D2	SE130614.021	LB062733	13 Aug 2014	18 Aug 2014	09 Feb 2015	21 Aug 2014	09 Feb 2015	25 Aug 2014

TRH (Total Recoverable Hydrocarbons) in Soil

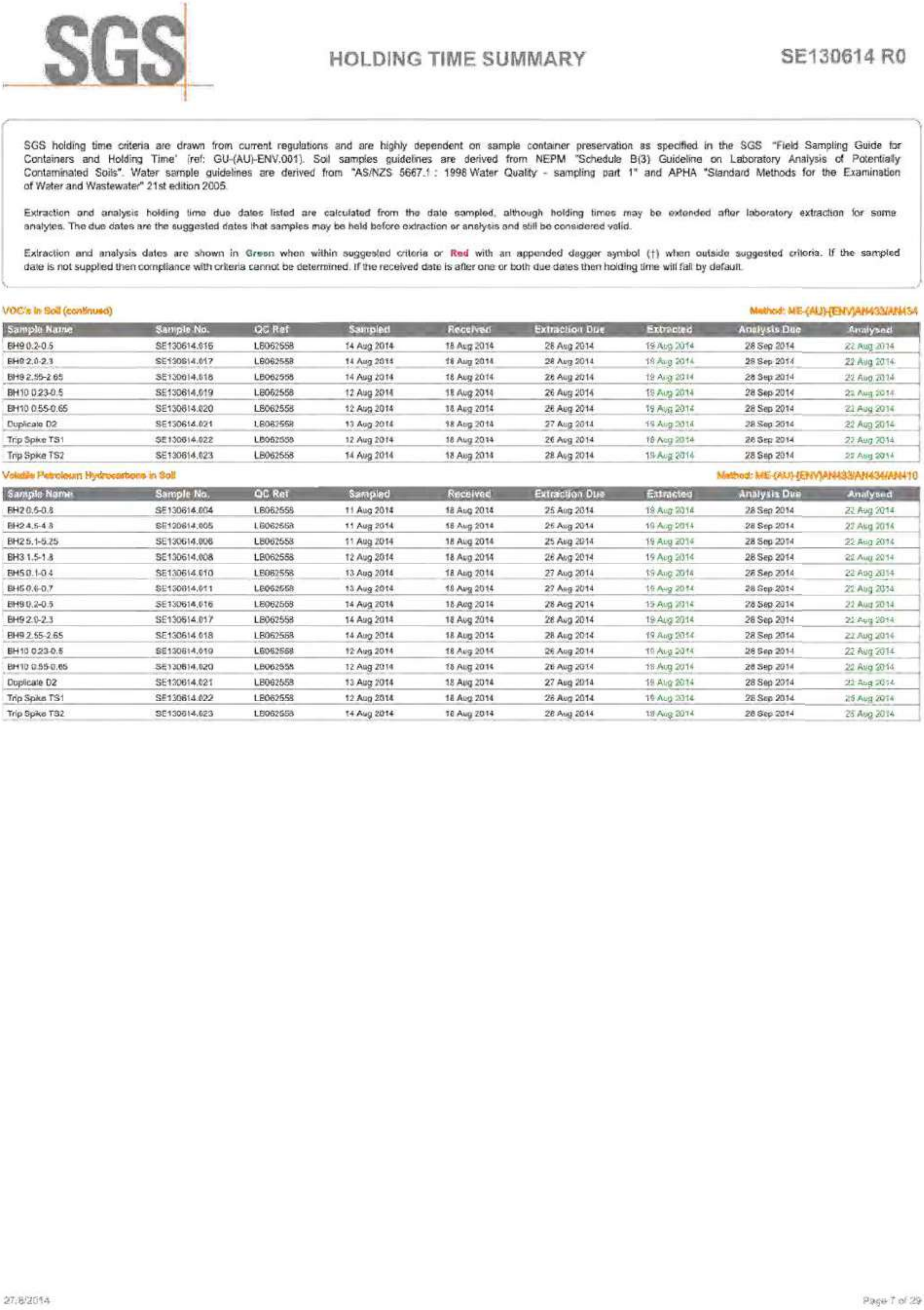
Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1 1.5-1.8	SE130614.001	LB062562	07 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH1 3.15-3.25	SE130614.002	LB062562	07 Aug 2014	18 Aug 2014	21 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 0-0.15	SE130614.003	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 0.5-0.8	SE130614.004	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH3 0-0.1	SE130614.007	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH4 0-0.15	SE130614.009	LB062562	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH6 0.6-0.7	SE130614.012	LB062562	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH7 0.15-0.45	SE130614.013	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH7 1.4-1.7	SE130614.014	LB062562	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH8 0.2-0.4	SE130614.015	LB062562	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062562	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062563	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062563	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062563	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062563	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
Duplicate D2	SE130614.021	LB062563	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH2 0.5-0.8	SE130614.004	LB062558	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062558	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062558	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062558	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062558	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062558	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014



HOLDING TIME SUMMARY

SE130614 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

VOC's in Soil (continued) Method: ME-(AU)-[ENV]AN433/AN434

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH9 0.2-0.5	SE130614.016	LB062558	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062558	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062558	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062558	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062558	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
Duplicate D2	SE130614.021	LB062558	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
Trip Spike TS1	SE130614.022	LB062558	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
Trip Spike TS2	SE130614.023	LB062558	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014

Volatile Petroleum Hydrocarbons in Soil Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH2 0.5-0.8	SE130614.004	LB062558	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH2 4.5-4.8	SE130614.005	LB062558	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH2 5.1-5.25	SE130614.006	LB062558	11 Aug 2014	18 Aug 2014	25 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH3 1.5-1.8	SE130614.008	LB062558	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH5 0.1-0.4	SE130614.010	LB062558	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH5 0.6-0.7	SE130614.011	LB062558	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH9 0.2-0.5	SE130614.016	LB062558	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH9 2.0-2.3	SE130614.017	LB062558	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH9 2.55-2.65	SE130614.018	LB062558	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH10 0.23-0.5	SE130614.019	LB062558	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
BH10 0.55-0.65	SE130614.020	LB062558	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
Duplicate D2	SE130614.021	LB062558	13 Aug 2014	18 Aug 2014	27 Aug 2014	19 Aug 2014	28 Sep 2014	22 Aug 2014
Trip Spike TS1	SE130614.022	LB062558	12 Aug 2014	18 Aug 2014	26 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014
Trip Spike TS2	SE130614.023	LB062558	14 Aug 2014	18 Aug 2014	28 Aug 2014	19 Aug 2014	28 Sep 2014	25 Aug 2014

27/8/2014 Page 7 of 29

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	BH1 1.5-1.8	SE130614.001	%	60 - 130%	107
	BH1 3.15-3.25	SE130614.002	%	60 - 130%	108
	BH2 0-0.15	SE130614.003	%	60 - 130%	105
	BH2 0.5-0.8	SE130614.004	%	60 - 130%	109
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	111
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	111
	BH3 0-0.1	SE130614.007	%	60 - 130%	105
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	107
	BH4 0-0.15	SE130614.009	%	60 - 130%	109
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	111
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	107
	BH6 0.6-0.7	SE130614.012	%	60 - 130%	105
	BH7 0.15-0.45	SE130614.013	%	60 - 130%	106
	BH7 1.4-1.7	SE130614.014	%	60 - 130%	107
	BH8 0.2-0.4	SE130614.015	%	60 - 130%	109
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	109
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	111
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	110
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	107
	BH10 0.65-0.66	SE130614.020	%	60 - 130%	103
	Duplicate D2	SE130614.021	%	60 - 130%	98

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	BH1 1.5-1.8	SE130614.001	%	60 - 130%	84
	BH1 3.15-3.25	SE130614.002	%	60 - 130%	84
	BH2 0-0.15	SE130614.003	%	60 - 130%	90
	BH2 0.5-0.8	SE130614.004	%	60 - 130%	88
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	88
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	89
	BH3 0-0.1	SE130614.007	%	60 - 130%	88
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	84
	BH4 0-0.15	SE130614.009	%	60 - 130%	88
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	86
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	89
	BH6 0.6-0.7	SE130614.012	%	60 - 130%	84
	BH7 0.15-0.45	SE130614.013	%	60 - 130%	86
	BH7 1.4-1.7	SE130614.014	%	60 - 130%	82
	BH8 0.2-0.4	SE130614.015	%	60 - 130%	84
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	86
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	88
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	88
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	82
	BH10 0.65-0.65	SE130614.020	%	60 - 130%	80
	Duplicate D2	SE130614.021	%	60 - 130%	86
d14-p-terphenyl (Surrogate)	BH1 1.5-1.8	SE130614.001	%	60 - 130%	94
	BH1 3.15-3.25	SE130614.002	%	60 - 130%	94
	BH2 0-0.15	SE130614.003	%	60 - 130%	103
	BH2 0.5-0.8	SE130614.004	%	60 - 130%	96
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	94
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	96
	BH3 0-0.1	SE130614.007	%	60 - 130%	98
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	94
	BH4 0-0.15	SE130614.009	%	60 - 130%	96
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	96
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	90
	BH6 0.6-0.7	SE130614.012	%	60 - 130%	96
	BH7 0.15-0.45	SE130614.013	%	60 - 130%	98
	BH7 1.4-1.7	SE130614.014	%	60 - 130%	92
	BH8 0.2-0.4	SE130614.015	%	60 - 130%	92
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	100

SGS

SURROGATES

SE130614 R0

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
d14-p-terphenyl (Surrogate)	BH9 2.0-2.3	SE130614.017	%	60 - 130%	95
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	96
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	96
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	96
	Duplicate D2	SE130614.021	%	60 - 130%	94
d5-nitrobenzene (Surrogate)	BH1 1.5-1.8	SE130614.001	%	60 - 130%	86
	BH1 3.15-3.25	SE130614.002	%	60 - 130%	86
	BH2 0-0.15	SE130614.003	%	60 - 130%	92
	BH2 0.5-0.8	SE130614.004	%	60 - 130%	90
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	90
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	92
	BH3 0-0.1	SE130614.007	%	60 - 130%	92
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	84
	BH4 0-0.15	SE130614.009	%	60 - 130%	88
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	92
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	86
	BH6 0.6-0.7	SE130614.012	%	60 - 130%	96
	BH7 0.15-0.45	SE130614.013	%	60 - 130%	89
	BH7 1.4-1.7	SE130614.014	%	60 - 130%	86
	BH8 0.2-0.4	SE130614.015	%	60 - 130%	85
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	85
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	90
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	90
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	88
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	84
	Duplicate D2	SE130614.021	%	60 - 130%	88

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	109
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	111
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	111
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	107
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	111
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	107
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	109
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	111
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	110
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	107
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	103
	Duplicate D2	SE130614.021	%	60 - 130%	99

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	108
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	122
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	104
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	114
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	114
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	114
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	119
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	100
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	96
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	116
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	116
	Duplicate D2	SE130614.021	%	60 - 130%	118
	Trip Spike TS1	SE130614.022	%	60 - 130%	116
	Trip Spike TS2	SE130614.023	%	60 - 130%	110
d4-1,2-dichloroethane (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	79
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	93
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	96
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	114

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil (continued) **Method: ME-(AU)-[ENV]AN433/AN434**

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
d4-1,2-dichloroethane (Surrogate)	BH5 0.1-0.4	SE130614.010	%	60 - 130%	114
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	114
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	119
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	97
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	104
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	107
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	115
	Duplicate D2	SE130614.021	%	60 - 130%	108
	Trip Spike TS1	SE130614.022	%	60 - 130%	117
	Trip Spike TS2	SE130614.023	%	60 - 130%	106
d8-toluene (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	110
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	117
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	99
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	115
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	116
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	119
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	119
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	98
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	99
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	111
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	118
	Duplicate D2	SE130614.021	%	60 - 130%	105
	Trip Spike TS1	SE130614.022	%	60 - 130%	123
	Trip Spike TS2	SE130614.023	%	60 - 130%	100
Dibromofluoromethane (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	89
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	101
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	107
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	124
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	122
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	120
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	127
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	104
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	108
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	113
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	114
	Duplicate D2	SE130614.021	%	60 - 130%	115
	Trip Spike TS1	SE130614.022	%	60 - 130%	122
	Trip Spike TS2	SE130614.023	%	60 - 130%	110

Volatile Petroleum Hydrocarbons in Soil **Method: ME-(AU)-[ENV]AN433/AN434/AN410**

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	105
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	122
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	104
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	114
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	114
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	114
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	119
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	102
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	90
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	116
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	116
	Duplicate D2	SE130614.021	%	60 - 130%	118
d4-1,2-dichloroethane (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	79
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	93
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	96
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	114
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	114
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	114
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	119
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	97

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Volatile Petroleum Hydrocarbons in Soil (continued)

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
d4-1,2-dichloroethane (Surrogate)	BH9 2.55-2.65	SE130614.018	%	60 - 130%	104
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	107
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	115
	Duplicate D2	SE130614.021	%	60 - 130%	108
d8-toluene (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	110
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	117
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	99
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	115
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	116
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	119
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	119
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	96
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	90
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	111
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	118
	Duplicate D2	SE130614.021	%	60 - 130%	105
Dibromofluoromethane (Surrogate)	BH2 0.5-0.8	SE130614.004	%	60 - 130%	89
	BH2 4.5-4.8	SE130614.005	%	60 - 130%	101
	BH2 5.1-5.25	SE130614.006	%	60 - 130%	107
	BH3 1.5-1.8	SE130614.008	%	60 - 130%	124
	BH5 0.1-0.4	SE130614.010	%	60 - 130%	122
	BH5 0.6-0.7	SE130614.011	%	60 - 130%	120
	BH9 0.2-0.5	SE130614.016	%	60 - 130%	127
	BH9 2.0-2.3	SE130614.017	%	60 - 130%	104
	BH9 2.55-2.65	SE130614.018	%	60 - 130%	108
	BH10 0.23-0.5	SE130614.019	%	60 - 130%	113
	BH10 0.55-0.65	SE130614.020	%	60 - 130%	114
	Duplicate D2	SE130614.021	%	60 - 130%	115

METHOD BLANKS

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria.

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

Sample Number	Parameter	Units	LOR

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Sample Number	Parameter	Units	LOR	Result
LB062755.001	Mercury	mg/L	0.0001	<0.0001

Mercury in Soil Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result
LB062739.001	Mercury	mg/kg	0.01	<0.01
LB062741.001	Mercury	mg/kg	0.01	<0.01

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Sample Number	Parameter	Units	LOR	Result
LB062600.001	Arsenic, As	mg/L	0.02	<0.02
	Cadmium, Cd	mg/L	0.001	<0.001
	Chromium, Cr	mg/L	0.005	<0.005
	Copper, Cu	mg/L	0.005	<0.005
	Lead, Pb	mg/L	0.02	<0.02
	Nickel, Ni	mg/L	0.005	<0.005
	Zinc, Zn	mg/L	0.01	<0.01

OC Pesticides in Soil Method: ME-(AU)-[ENV]AN400/AN420

Sample Number	Parameter	Units	LOR	Result
LB062562.001	Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
	Alpha BHC	mg/kg	0.1	<0.1
	Lindane	mg/kg	0.1	<0.1
	Heptachlor	mg/kg	0.1	<0.1
	Aldrin	mg/kg	0.1	<0.1
	Beta BHC	mg/kg	0.1	<0.1
	Delta BHC	mg/kg	0.1	<0.1
	Heptachlor epoxide	mg/kg	0.1	<0.1
	Alpha Endosulfan	mg/kg	0.2	<0.2
	Gamma Chlordane	mg/kg	0.1	<0.1
	Alpha Chlordane	mg/kg	0.1	<0.1
	p,p'-DDE	mg/kg	0.1	<0.1
	Dieldrin	mg/kg	0.05	<0.05
	Endrin	mg/kg	0.2	<0.2
	Beta Endosulfan	mg/kg	0.2	<0.2
	p,p'-DDD	mg/kg	0.1	<0.1
	p,p'-DDT	mg/kg	0.1	<0.1
	Endosulfan sulphate	mg/kg	0.1	<0.1
	Endrin Aldehyde	mg/kg	0.1	<0.1
	Methoxychlor	mg/kg	0.1	<0.1
	Endrin Ketone	mg/kg	0.1	<0.1
	Isodrin	mg/kg	0.1	<0.1
	Mirex	mg/kg	0.1	<0.1
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	101
LB062563.001	Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
	Alpha BHC	mg/kg	0.1	<0.1
	Lindane	mg/kg	0.1	<0.1
	Heptachlor	mg/kg	0.1	<0.1
	Aldrin	mg/kg	0.1	<0.1
	Beta BHC	mg/kg	0.1	<0.1
	Delta BHC	mg/kg	0.1	<0.1
	Heptachlor epoxide	mg/kg	0.1	<0.1
	Alpha Endosulfan	mg/kg	0.2	<0.2
	Gamma Chlordane	mg/kg	0.1	<0.1
	Alpha Chlordane	mg/kg	0.1	<0.1

SGS

METHOD BLANKS

SE130614 R0

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria.

OC Pesticides in Soil (continued)

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number		Parameter	Units	LOR	Result
LB062563.001		p,p'-DDE	mg/kg	0.1	<0.1
		Dieldrin	mg/kg	0.05	<0.05
		Endrin	mg/kg	0.2	<0.2
		Beta Endosulfan	mg/kg	0.2	<0.2
		p,p'-DDD	mg/kg	0.1	<0.1
		p,p'-DDT	mg/kg	0.1	<0.1
		Endosulfan sulphate	mg/kg	0.1	<0.1
		Endrin Aldehyde	mg/kg	0.1	<0.1
		Methoxychlor	mg/kg	0.1	<0.1
		Endrin Ketone	mg/kg	0.1	<0.1
		Isodrin	mg/kg	0.1	<0.1
		Mirex	mg/kg	0.1	<0.1
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	103

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result
LB062582.001		Naphthalene	mg/kg	0.1	<0.1
		2-methylnaphthalene	mg/kg	0.1	<0.1
		1-methylnaphthalene	mg/kg	0.1	<0.1
		Acenaphthylene	mg/kg	0.1	<0.1
		Acenaphthene	mg/kg	0.1	<0.1
		Fluorene	mg/kg	0.1	<0.1
		Phenanthrene	mg/kg	0.1	<0.1
		Anthracene	mg/kg	0.1	<0.1
		Fluoranthene	mg/kg	0.1	<0.1
		Pyrene	mg/kg	0.1	<0.1
		Benzo(a)anthracene	mg/kg	0.1	<0.1
		Chrysene	mg/kg	0.1	<0.1
		Benzo(b&j&k)fluoranthene	mg/kg	0.2	<0.2
		Benzo(a)pyrene	mg/kg	0.1	<0.1
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
		Dibenzo(a&h)anthracene	mg/kg	0.1	<0.1
		Benzo(ghi)perylene	mg/kg	0.1	<0.1
		Total PAH	mg/kg	0.8	<0.8
	Surrogates	d5-nitrobenzene (Surrogate)	%	-	102
		2-fluorobiphenyl (Surrogate)	%	-	96
		d14-p-terphenyl (Surrogate)	%	-	102
LB062563.001		Naphthalene	mg/kg	0.1	<0.1
		2-methylnaphthalene	mg/kg	0.1	<0.1
		1-methylnaphthalene	mg/kg	0.1	<0.1
		Acenaphthylene	mg/kg	0.1	<0.1
		Acenaphthene	mg/kg	0.1	<0.1
		Fluorene	mg/kg	0.1	<0.1
		Phenanthrene	mg/kg	0.1	<0.1
		Anthracene	mg/kg	0.1	<0.1
		Fluoranthene	mg/kg	0.1	<0.1
		Pyrene	mg/kg	0.1	<0.1
		Benzo(a)anthracene	mg/kg	0.1	<0.1
		Chrysene	mg/kg	0.1	<0.1
		Benzo(b&j&k)fluoranthene	mg/kg	0.2	<0.2
		Benzo(a)pyrene	mg/kg	0.1	<0.1
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
		Dibenzo(a&h)anthracene	mg/kg	0.1	<0.1
		Benzo(ghi)perylene	mg/kg	0.1	<0.1
		Total PAH	mg/kg	0.8	<0.8
	Surrogates	d5-nitrobenzene (Surrogate)	%	-	86
		2-fluorobiphenyl (Surrogate)	%	-	80
		d14-p-terphenyl (Surrogate)	%	-	90

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number	Parameter	Units	LOR

SGS

METHOD BLANKS

SE130614 R0

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria.

PCBs in Soil (continued)

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number		Parameter	Units	LOR	Result
LB062562.001		Arochlor 1016	mg/kg	0.2	<0.2
		Arochlor 1221	mg/kg	0.2	<0.2
		Arochlor 1232	mg/kg	0.2	<0.2
		Arochlor 1242	mg/kg	0.2	<0.2
		Arochlor 1248	mg/kg	0.2	<0.2
		Arochlor 1254	mg/kg	0.2	<0.2
		Arochlor 1260	mg/kg	0.2	<0.2
		Arochlor 1262	mg/kg	0.2	<0.2
		Arochlor 1268	mg/kg	0.2	<0.2
		Total PCBs (Arochlors)	mg/kg	1	<1
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	101
LB062563.001		Arochlor 1016	mg/kg	0.2	<0.2
		Arochlor 1221	mg/kg	0.2	<0.2
		Arochlor 1232	mg/kg	0.2	<0.2
		Arochlor 1242	mg/kg	0.2	<0.2
		Arochlor 1248	mg/kg	0.2	<0.2
		Arochlor 1254	mg/kg	0.2	<0.2
		Arochlor 1260	mg/kg	0.2	<0.2
		Arochlor 1262	mg/kg	0.2	<0.2
		Arochlor 1268	mg/kg	0.2	<0.2
		Total PCBs (Arochlors)	mg/kg	1	<1
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	103

Total Cyanide in soil by Discrete Analyser (Aquakem)

Method: ME-(AU)-[ENV]AN077/AN287

Sample Number	Parameter	Units	LOR	Result
LB062754.001	Total Cyanide	mg/kg	0.1	<0.1

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN289

Sample Number	Parameter	Units	LOR	Result
LB062783.001	Total Phenols	mg/kg	0.1	<0.1
LB062835.001	Total Phenols	mg/kg	0.1	<0.1

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result
LB062732.001	Arsenic, As	mg/kg	3	<3
	Cadmium, Cd	mg/kg	0.3	<0.3
	Chromium, Cr	mg/kg	0.3	<0.3
	Copper, Cu	mg/kg	0.5	<0.5
	Lead, Pb	mg/kg	1	<1
	Nickel, Ni	mg/kg	0.5	<0.5
	Zinc, Zn	mg/kg	0.5	<0.5
LB062733.001	Arsenic, As	mg/kg	3	<3
	Cadmium, Cd	mg/kg	0.3	<0.3
	Chromium, Cr	mg/kg	0.3	<0.3
	Copper, Cu	mg/kg	0.5	<0.5
	Lead, Pb	mg/kg	1	<1
	Nickel, Ni	mg/kg	0.5	<0.5
	Zinc, Zn	mg/kg	0.5	<0.5

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB062562.001	TRH C10-C14	mg/kg	20	<20
	TRH C15-C28	mg/kg	45	<45
	TRH C29-C36	mg/kg	45	<45
	TRH C37-C40	mg/kg	100	<100
	TRH C10-C36 Total	mg/kg	110	<110
LB062563.001	TRH C10-C14	mg/kg	20	<20
	TRH C15-C28	mg/kg	45	<45
	TRH C29-C36	mg/kg	45	<45
	TRH C37-C40	mg/kg	100	<100

SGS

METHOD BLANKS

SE130614 R0

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria.

TRH (Total Recoverable Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB062563.001	TRH C10-C36 Total	mg/kg	110	<110

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result
LB062558.001	Monocyclic Aromatic Hydrocarbons	Benzene	mg/kg	0.1	<0.1
		Toluene	mg/kg	0.1	<0.1
		Ethylbenzene	mg/kg	0.1	<0.1
		m/p-xylene	mg/kg	0.2	<0.2
		o-xylene	mg/kg	0.1	<0.1
	Polycyclic VOCs	Naphthalene	mg/kg	0.1	<0.1
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	96
		d4-1,2-dichloroethane (Surrogate)	%	-	92
		d8-toluene (Surrogate)	%	-	107
		Bromofluorobenzene (Surrogate)	%	-	96
	Totals	Total BTEX*	mg/kg	0.6	<0.6

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Number		Parameter	Units	LOR	Result
LB062558.001		TRH C6-C9	mg/kg	20	<20
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	96
		d4-1,2-dichloroethane (Surrogate)	%	-	92
		d8-toluene (Surrogate)	%	-	107

SGS

DUPLICATES

SE130614 R0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130689.001	LB062755.014	Mercury	µg/L	0.0001	<0.00005	0.00000	200	6
SE130742.002	LB062755.019	Mercury	µg/L	0.0001	<0.0001	<0.0001	200	0

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130591.008	LB062739.014	Mercury	mg/kg	0.01	<0.01	<0.01	200	0
SE130614.005	LB062739.024	Mercury	mg/kg	0.01	0.40	0.46	42	14
SE130614.015	LB062741.014	Mercury	mg/kg	0.01	0.02	0.02	200	0
SE130617.003	LB062741.024	Mercury	mg/kg	0.01	0.02	0.02	200	0

Moisture Content

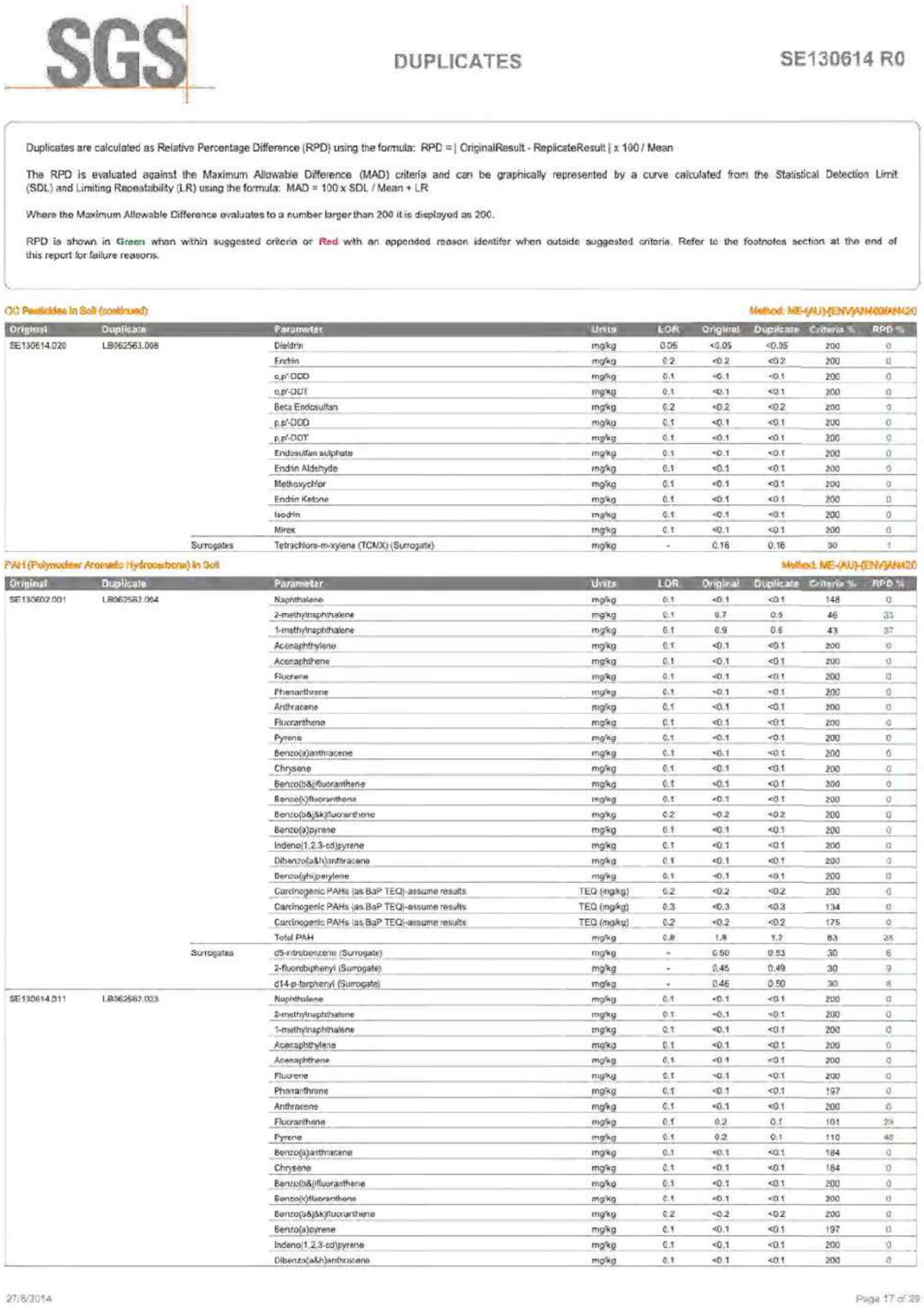
Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.018	LB062788.011	% Moisture	%w/w	0.5	23	23	34	1
SE130614.020	LB062788.022	% Moisture	%	0.5	16	17	36	8
SE130614.021	LB062788.024	% Moisture	%	0.5	21	21	35	1

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.011	LB062562.020		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	200	0
			Alpha BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Lindane	mg/kg	0.1	<0.1	<0.1	200	0
			Heptachlor	mg/kg	0.1	<0.1	<0.1	200	0
			Aldrin	mg/kg	0.1	<0.1	<0.1	200	0
			Beta BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Delta BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	200	0
			o,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0
			Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
			Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	200	0
			Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	200	0
			trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	200	0
			p,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0
			Dieldrin	mg/kg	0.05	<0.05	<0.05	200	0
			Endrin	mg/kg	0.2	<0.2	<0.2	200	0
			o,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0
			o,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
			Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
			p,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0
			p,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
			Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	200	0
			Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	200	0
			Methoxychlor	mg/kg	0.1	<0.1	<0.1	200	0
			Endrin Ketone	mg/kg	0.1	<0.1	<0.1	200	0
			Isodrin	mg/kg	0.1	<0.1	<0.1	200	0
			Mirex	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.16	0.16	30	1
SE130614.020	LB062563.008		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	200	0
			Alpha BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Lindane	mg/kg	0.1	<0.1	<0.1	200	0
			Heptachlor	mg/kg	0.1	<0.1	<0.1	200	0
			Aldrin	mg/kg	0.1	<0.1	<0.1	200	0
			Beta BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Delta BHC	mg/kg	0.1	<0.1	<0.1	200	0
			Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	200	0
			o,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0
			Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
			Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	200	0
			Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	200	0
			trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	200	0
			p,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0



SGS

DUPLICATES

SE130614 R0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil (continued) Method: ME-(AU)-[ENV]AN400/AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.020	LB062563.008		Dieldrin	mg/kg	0.05	<0.05	<0.05	200	0
			Endrin	mg/kg	0.2	<0.2	<0.2	200	0
			o,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0
			o,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
			Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
			p,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0
			p,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
			Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	200	0
			Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	200	0
			Methoxychlor	mg/kg	0.1	<0.1	<0.1	200	0
			Endrin Ketone	mg/kg	0.1	<0.1	<0.1	200	0
			Isodrin	mg/kg	0.1	<0.1	<0.1	200	0
			Mirex	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.16	0.16	30	1

PAH (Polynuclear Aromatic Hydrocarbons) in Soil Method: ME-(AU)-[ENV]AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130602.001	LB062562.004		Naphthalene	mg/kg	0.1	<0.1	<0.1	148	0
			2-methylnaphthalene	mg/kg	0.1	0.7	0.5	46	33
			1-methylnaphthalene	mg/kg	0.1	0.9	0.6	43	37
			Acenaphthylene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluorene	mg/kg	0.1	<0.1	<0.1	200	0
			Phenanthrene	mg/kg	0.1	<0.1	<0.1	200	0
			Anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Chrysene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(b&j&k)fluoranthene	mg/kg	0.2	<0.2	<0.2	200	0
			Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Dibenzo(a&h)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	200	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	<0.2	<0.2	200	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.3	<0.3	<0.3	134	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	<0.2	<0.2	175	0
			Total PAH	mg/kg	0.8	1.8	1.2	83	35
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.50	0.53	30	6
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.45	0.49	30	9
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.46	0.50	30	8
SE130614.011	LB062562.023		Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthylene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluorene	mg/kg	0.1	<0.1	<0.1	200	0
			Phenanthrene	mg/kg	0.1	<0.1	<0.1	197	0
			Anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluoranthene	mg/kg	0.1	0.2	0.1	101	29
			Pyrene	mg/kg	0.1	0.2	0.1	110	40
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	184	0
			Chrysene	mg/kg	0.1	<0.1	<0.1	184	0
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(b&j&k)fluoranthene	mg/kg	0.2	<0.2	<0.2	200	0
			Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	197	0
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Dibenzo(a&h)anthracene	mg/kg	0.1	<0.1	<0.1	200	0

SGS

DUPLICATES

SE130614 R0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.011	LB062562.023		Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	200	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	<0.2	<0.2	200	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.3	<0.3	<0.3	134	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	<0.2	<0.2	175	0
			Total PAH	mg/kg	0.8	<0.8	<0.8	155	0
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.43	0.43	30	0
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.40	0.41	30	2
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.45	0.47	30	4
SE130614.020	LB062563.008		Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthylene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluorene	mg/kg	0.1	<0.1	<0.1	200	0
			Phenanthrene	mg/kg	0.1	<0.1	<0.1	200	0
			Anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Chrysene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(b&j&k)fluoranthene	mg/kg	0.2	<0.2	<0.2	200	0
			Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Dibenzo(a&h)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	200	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	<0.2	<0.2	200	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.3	<0.3	<0.3	134	0
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	<0.2	<0.2	175	0
			Total PAH	mg/kg	0.8	<0.8	<0.8	200	0
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.42	0.42	30	0
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.40	0.40	30	0
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.46	0.48	30	0

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.011	LB062562.020		Arochlor 1016	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1221	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1232	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1242	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1248	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1254	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1260	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1262	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1268	mg/kg	0.2	<0.2	<0.2	200	0
			Total PCBs (Arochlors)	mg/kg	1	<1	<1	200	0
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0	0	30	1
SE130614.020	LB062563.006		Arochlor 1016	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1221	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1232	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1242	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1248	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1254	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1260	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1262	mg/kg	0.2	<0.2	<0.2	200	0
			Arochlor 1268	mg/kg	0.2	<0.2	<0.2	200	0
			Total PCBs (Arochlors)	mg/kg	1	<1	<1	200	0
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0	0	30	1

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Original	Duplicate		Parameter	Units	LOR

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

pH in soil (1:5) (continued)

Method: ME-(AU)-[ENV]AN101

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.011	LB062682.014	pH	pH Units	-	5.9	5.9	32	1
SE130614.020	LB062682.024	pH	pH Units	-	4.7	4.5	32	3

TOC in Soil

Method: ME-(AU)-[ENV]AN188

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.011	LB062858.015	Total Organic Carbon	%w/w	0.05	0.62	0.59	23	4
SE130614.020	LB062858.024	Total Organic Carbon	%w/w	0.05	0.16	0.16	46	3

Total Cyanide in soil by Discrete Analyser (Aquakem)

Method: ME-(AU)-[ENV]AN077/AN287

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.004	LB062704.004	Total Cyanide	mg/kg	0.1	0.2	0.2	200	0

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN289

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.004	LB062763.004	Total Phenols	mg/kg	0.1	0.6	0.7	30	13
SE130614.020	LB062835.004	Total Phenols	mg/kg	0.1	<0.1	0.2	94	66
SE130633.001	LB062763.015	Total Phenols	mg/kg	0.1	1.8	1.9	21	6

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130591.008	LB062732.014	Arsenic, As	mg/kg	3	<3	<3	200	0
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.3	2.8	2.7	45	2
		Copper, Cu	mg/kg	0.5	<0.5	<0.5	200	0
		Lead, Pb	mg/kg	1	<1	<1	200	0
		Nickel, Ni	mg/kg	0.5	1.3	1.3	69	1
		Zinc, Zn	mg/kg	0.5	0.9	0.5	200	0
SE130614.005	LB062732.024	Arsenic, As	mg/kg	3	30	29	33	1
		Cadmium, Cd	mg/kg	0.3	0.8	0.7	70	4
		Chromium, Cr	mg/kg	0.3	52	50	31	4
		Copper, Cu	mg/kg	0.5	130	130	30	1
		Lead, Pb	mg/kg	1	120	110	31	5
		Nickel, Ni	mg/kg	0.5	8.3	7.7	36	7
		Zinc, Zn	mg/kg	0.5	260	240	31	7
SE130614.015	LB062733.014	Arsenic, As	mg/kg	3	4	5	51	15
		Cadmium, Cd	mg/kg	0.3	0.5	0.5	95	4
		Chromium, Cr	mg/kg	0.3	97	57	31	52 ②
		Copper, Cu	mg/kg	0.5	15	14	33	9
		Lead, Pb	mg/kg	1	10	9	41	2
		Nickel, Ni	mg/kg	0.5	50	42	31	17
		Zinc, Zn	mg/kg	0.5	35	32	36	8
SE130617.003	LB062733.024	Arsenic, As	mg/kg	3	<3	<3	200	0
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.3	3.6	3.5	44	5
		Copper, Cu	mg/kg	0.5	2.9	2.8	48	5
		Lead, Pb	mg/kg	1	15	19	36	24
		Nickel, Ni	mg/kg	0.5	2.6	2.5	49	4
		Zinc, Zn	mg/kg	0.5	12	15	45	18

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130602.001	LB062562.004		TRH C10-C14	mg/kg	20	140	120	45	14
			TRH C15-C28	mg/kg	45	<45	<45	200	0
			TRH C29-C36	mg/kg	45	<45	<45	200	0
			TRH C37-C40	mg/kg	100	<100	<100	200	0
			TRH C10-C36 Total	mg/kg	110	140	120	114	14
			TRH C10-C40 Total	mg/kg	210	<210	<210	190	0
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	150	130	48	15

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

TRH (Total Recoverable Hydrocarbons) in Soil (continued) Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130602.001	LB062562.004	TRH F Bands	TRH >C16-C34 (F3)	mg/kg	90	<90	<90	200	0
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	200	0
SE130614.011	LB062562.021		TRH C10-C14	mg/kg	20	<20	<20	200	0
			TRH C15-C28	mg/kg	45	<45	<45	200	0
			TRH C29-C36	mg/kg	45	<45	<45	200	0
			TRH C37-C40	mg/kg	100	<100	<100	200	0
			TRH C10-C36 Total	mg/kg	110	<110	<110	200	0
			TRH C10-C40 Total	mg/kg	210	<210	<210	200	0
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	<25	<25	200	0
			TRH >C10-C16 (F2) minus Naphthalene	mg/kg	25	<25	<25	200	0
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	200	0
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	200	0
SE130614.020	LB062561.006		TRH C10-C14	mg/kg	20	<20	<20	200	0
			TRH C15-C28	mg/kg	45	<45	<45	200	0
			TRH C29-C36	mg/kg	45	<45	<45	200	0
			TRH C37-C40	mg/kg	100	<100	<100	200	0
			TRH C10-C36 Total	mg/kg	110	<110	<110	200	0
			TRH C10-C40 Total	mg/kg	210	<210	<210	200	0
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	<25	<25	200	0
			TRH >C10-C16 (F2) minus Naphthalene	mg/kg	25	<25	<25	200	0
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	200	0
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	200	0

VOC's in Soil Method: ME-(AU)-[ENV]AN433/AN434

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.011	LB062558.015	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1	<0.1	200	0
			Toluene	mg/kg	0.1	<0.1	<0.1	200	0
			Ethylbenzene	mg/kg	0.1	<0.1	<0.1	200	0
			m/p-xylene	mg/kg	0.2	<0.2	<0.2	200	0
			o-xylene	mg/kg	0.1	<0.1	<0.1	200	0
		Polycyclic	Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	6.0	5.6	50	7
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	5.7	5.2	50	10
			d8-toluene (Surrogate)	mg/kg	-	5.9	5.4	50	9
			Bromofluorobenzene (Surrogate)	mg/kg	-	5.7	5.8	50	3
		Totals	Total Xylenes*	mg/kg	0.3	<0.3	<0.3	200	0
			Total BTEX*	mg/kg	0.6	<0.6	<0.6	200	0
SE130614.021	LB062558.022	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1	<0.1	200	0
			Toluene	mg/kg	0.1	<0.1	<0.1	200	0
			Ethylbenzene	mg/kg	0.1	<0.1	<0.1	200	0
			m/p-xylene	mg/kg	0.2	<0.2	<0.2	200	0
			o-xylene	mg/kg	0.1	<0.1	<0.1	200	0
		Polycyclic	Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	5.8	5.6	50	3
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	5.4	5.3	50	2
			d8-toluene (Surrogate)	mg/kg	-	5.2	5.2	50	1
			Bromofluorobenzene (Surrogate)	mg/kg	-	5.9	5.4	50	9
		Totals	Total Xylenes*	mg/kg	0.3	<0.3	<0.3	200	0
			Total BTEX*	mg/kg	0.6	<0.6	<0.6	200	0

Volatile Petroleum Hydrocarbons in Soil Method: ME-(AU)-[ENV]AN433/AN434/AN410

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.011	LB062558.015		TRH C6-C10	mg/kg	25	<25	<25	200	0
			TRH C6-C9	mg/kg	20	<20	<20	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	6.0	5.6	30	7
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	5.7	5.2	30	10
			d8-toluene (Surrogate)	mg/kg	-	5.9	5.4	30	9
			Bromofluorobenzene (Surrogate)	mg/kg	-	5.7	5.8	30	3
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	<0.1	200	0
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	200	0
SE130614.021	LB062558.022		TRH C6-C10	mg/kg	25	<25	<25	200	0
			TRH C6-C9	mg/kg	20	<20	<20	200	0

SGS DUPLICATES SE130614 R0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

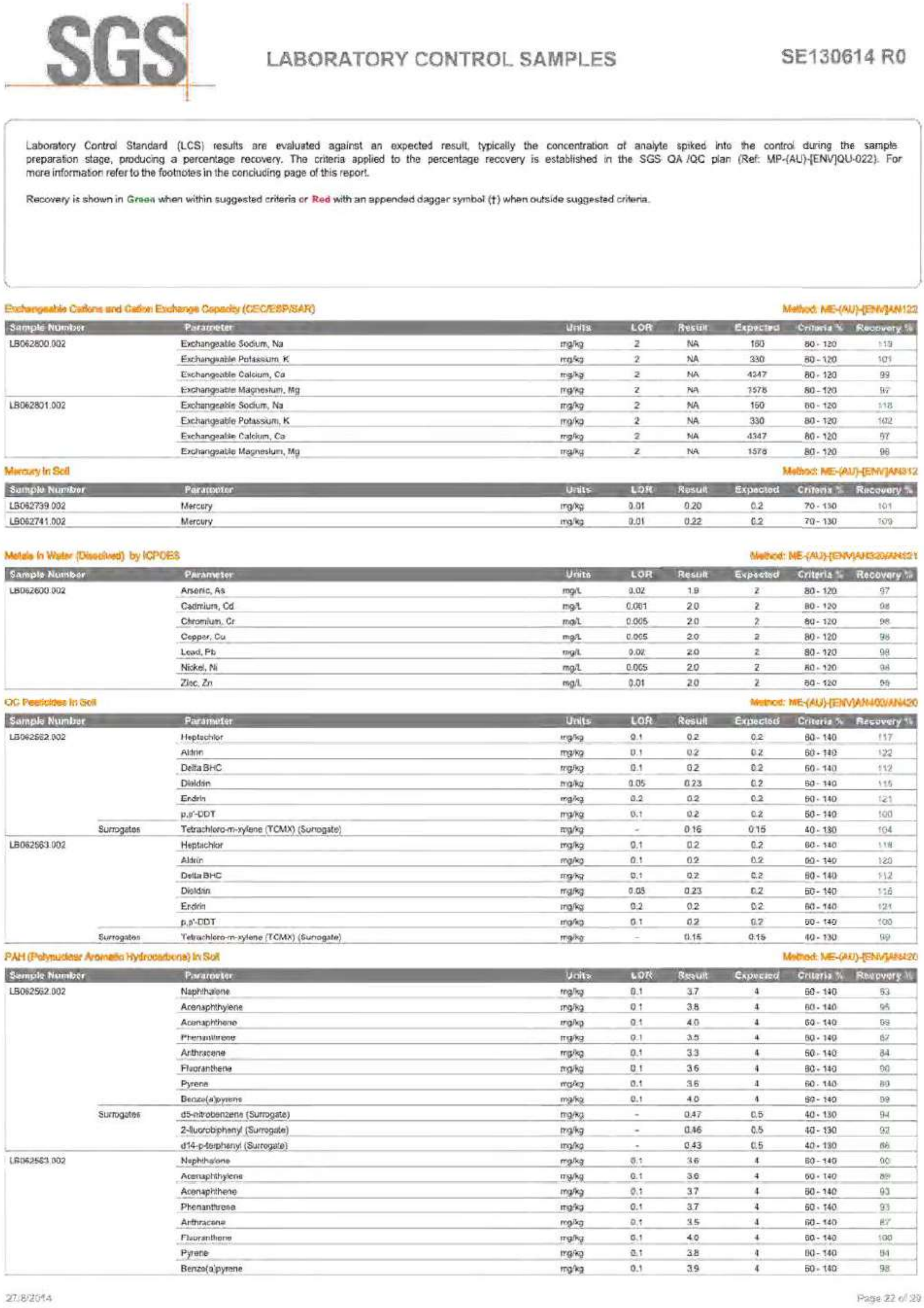
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Volatile Petroleum Hydrocarbons in Soil (continued) Method: ME-(AU)-[ENV]AN433/AN434/AN410

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.021	LB062558.022	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	5.8	5.6	30	2
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	5.4	5.3	30	2
			d8-toluene (Surrogate)	mg/kg	-	5.2	5.2	30	1
			Bromofluorobenzene (Surrogate)	mg/kg	-	5.9	5.4	30	9
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	<0.1	200	0
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	200	0



LABORATORY CONTROL SAMPLES

SE130614 R0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria.

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062800.002	Exchangeable Sodium, Na	mg/kg	2	NA	160	80 - 120	119
	Exchangeable Potassium, K	mg/kg	2	NA	330	80 - 120	101
	Exchangeable Calcium, Ca	mg/kg	2	NA	4347	80 - 120	99
	Exchangeable Magnesium, Mg	mg/kg	2	NA	1578	80 - 120	97
LB062801.002	Exchangeable Sodium, Na	mg/kg	2	NA	150	80 - 120	118
	Exchangeable Potassium, K	mg/kg	2	NA	330	80 - 120	102
	Exchangeable Calcium, Ca	mg/kg	2	NA	4347	80 - 120	97
	Exchangeable Magnesium, Mg	mg/kg	2	NA	1578	80 - 120	98

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062739.002	Mercury	mg/kg	0.01	0.20	0.2	70 - 130	101
LB062741.002	Mercury	mg/kg	0.01	0.22	0.2	70 - 130	109

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320/AN321

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062600.002	Arsenic, As	mg/L	0.02	1.9	2	80 - 120	97
	Cadmium, Cd	mg/L	0.001	2.0	2	80 - 120	98
	Chromium, Cr	mg/L	0.005	2.0	2	80 - 120	98
	Copper, Cu	mg/L	0.005	2.0	2	80 - 120	98
	Lead, Pb	mg/L	0.02	2.0	2	80 - 120	98
	Nickel, Ni	mg/L	0.005	2.0	2	80 - 120	98
	Zinc, Zn	mg/L	0.01	2.0	2	80 - 120	99

OC Pesticides in Soil

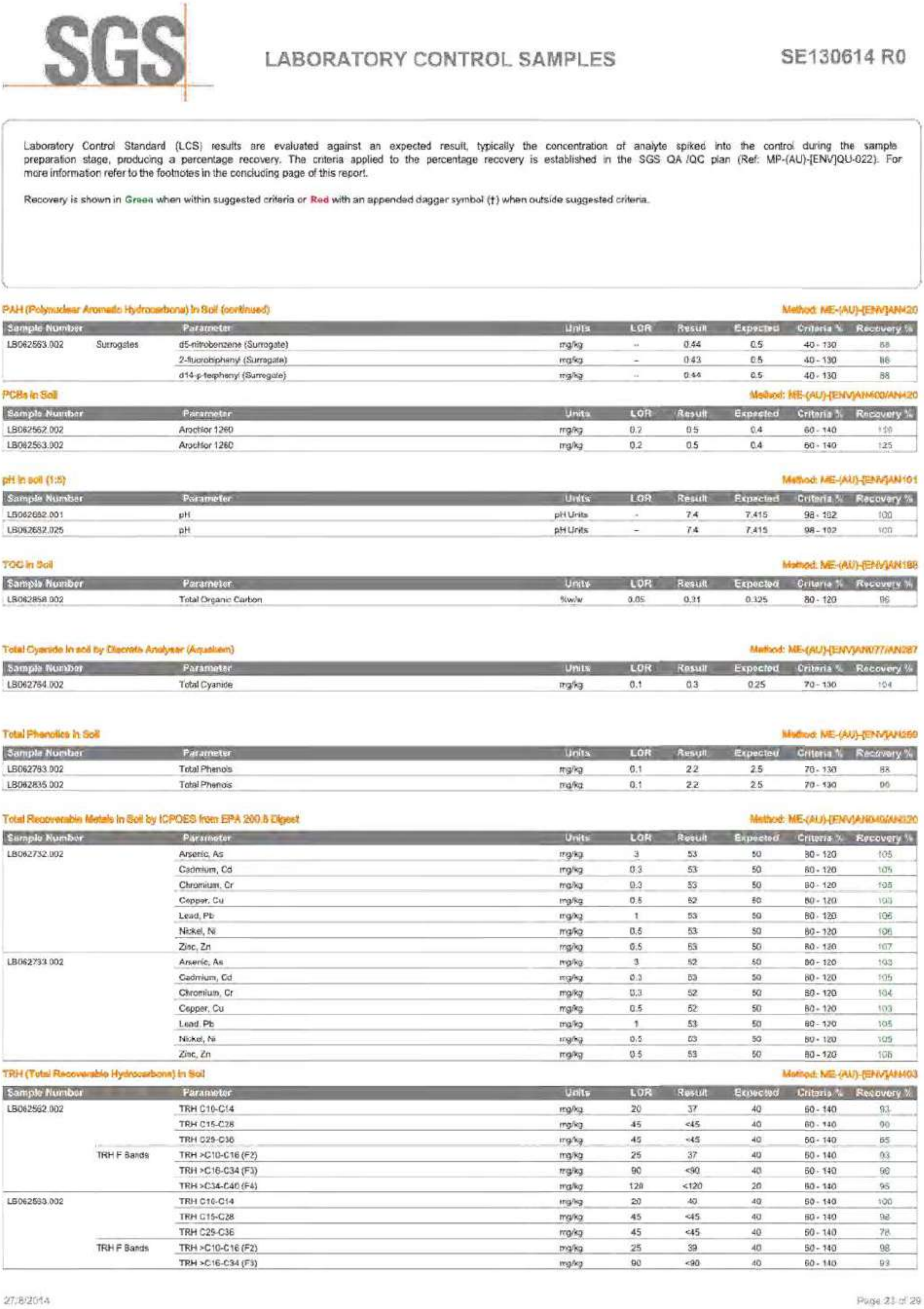
Method: ME-(AU)-[ENV]AN400/AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062562.002		Heptachlor	mg/kg	0.1	0.2	0.2	60 - 140	117
		Aldrin	mg/kg	0.1	0.2	0.2	60 - 140	122
		Delta BHC	mg/kg	0.1	0.2	0.2	60 - 140	112
		Dieldrin	mg/kg	0.05	0.23	0.2	60 - 140	115
		Endrin	mg/kg	0.2	0.2	0.2	60 - 140	121
		p,p'-DDT	mg/kg	0.1	0.2	0.2	60 - 140	100
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.16	0.15	40 - 130	104
LB062563.002		Heptachlor	mg/kg	0.1	0.2	0.2	60 - 140	118
		Aldrin	mg/kg	0.1	0.2	0.2	60 - 140	120
		Delta BHC	mg/kg	0.1	0.2	0.2	60 - 140	112
		Dieldrin	mg/kg	0.05	0.23	0.2	60 - 140	116
		Endrin	mg/kg	0.2	0.2	0.2	60 - 140	121
		p,p'-DDT	mg/kg	0.1	0.2	0.2	60 - 140	100
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.15	0.15	40 - 130	99

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062562.002		Naphthalene	mg/kg	0.1	3.7	4	60 - 140	93
		Acenaphthylene	mg/kg	0.1	3.8	4	60 - 140	95
		Acenaphthene	mg/kg	0.1	4.0	4	60 - 140	99
		Phenanthrene	mg/kg	0.1	3.5	4	60 - 140	87
		Anthracene	mg/kg	0.1	3.3	4	60 - 140	84
		Fluoranthene	mg/kg	0.1	3.6	4	60 - 140	90
		Pyrene	mg/kg	0.1	3.6	4	60 - 140	89
		Benzo(a)pyrene	mg/kg	0.1	4.0	4	60 - 140	99
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.47	0.5	40 - 130	94
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.46	0.5	40 - 130	92
		d14-p-terphenyl (Surrogate)	mg/kg	-	0.43	0.5	40 - 130	86
LB062563.002		Naphthalene	mg/kg	0.1	3.6	4	60 - 140	90
		Acenaphthylene	mg/kg	0.1	3.6	4	60 - 140	89
		Acenaphthene	mg/kg	0.1	3.7	4	60 - 140	93
		Phenanthrene	mg/kg	0.1	3.7	4	60 - 140	93
		Anthracene	mg/kg	0.1	3.5	4	60 - 140	87
		Fluoranthene	mg/kg	0.1	4.0	4	60 - 140	100
		Pyrene	mg/kg	0.1	3.8	4	60 - 140	94
		Benzo(a)pyrene	mg/kg	0.1	3.9	4	60 - 140	98



SGS

LABORATORY CONTROL SAMPLES

SE130614 R0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062563.002	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.44	0.5	40 - 130	88
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.43	0.5	40 - 130	86
		d14-p-terphenyl (Surrogate)	mg/kg	-	0.44	0.5	40 - 130	88

PCBs in Soil

Method: ME-(AU)-[ENV]AN400/AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062562.002	Arochlor 1260	mg/kg	0.2	0.5	0.4	60 - 140	120
LB062563.002	Arochlor 1260	mg/kg	0.2	0.5	0.4	60 - 140	125

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062682.001	pH	pH Units	-	7.4	7.415	98 - 102	100
LB062682.025	pH	pH Units	-	7.4	7.415	98 - 102	100

TOC in Soil

Method: ME-(AU)-[ENV]AN188

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062858.002	Total Organic Carbon	%w/w	0.05	0.31	0.325	80 - 120	96

Total Cyanide in soil by Discrete Analyser (Aquakem)

Method: ME-(AU)-[ENV]AN077/AN287

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062764.002	Total Cyanide	mg/kg	0.1	0.3	0.25	70 - 130	104

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN289

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062783.002	Total Phenols	mg/kg	0.1	2.2	2.5	70 - 130	88
LB062835.002	Total Phenols	mg/kg	0.1	2.2	2.5	70 - 130	90

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062732.002	Arsenic, As	mg/kg	3	53	50	80 - 120	105
	Cadmium, Cd	mg/kg	0.3	53	50	80 - 120	105
	Chromium, Cr	mg/kg	0.3	53	50	80 - 120	106
	Copper, Cu	mg/kg	0.5	52	50	80 - 120	103
	Lead, Pb	mg/kg	1	53	50	80 - 120	106
	Nickel, Ni	mg/kg	0.5	53	50	80 - 120	106
	Zinc, Zn	mg/kg	0.5	53	50	80 - 120	107
LB062733.002	Arsenic, As	mg/kg	3	52	50	80 - 120	103
	Cadmium, Cd	mg/kg	0.3	53	50	80 - 120	105
	Chromium, Cr	mg/kg	0.3	52	50	80 - 120	104
	Copper, Cu	mg/kg	0.5	52	50	80 - 120	103
	Lead, Pb	mg/kg	1	53	50	80 - 120	105
	Nickel, Ni	mg/kg	0.5	53	50	80 - 120	105
	Zinc, Zn	mg/kg	0.5	53	50	80 - 120	106

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062562.002		TRH C10-C14	mg/kg	20	37	40	60 - 140	93
		TRH C15-C28	mg/kg	45	<45	40	60 - 140	90
		TRH C29-C36	mg/kg	45	<45	40	60 - 140	85
	TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	37	40	60 - 140	93
		TRH >C16-C34 (F3)	mg/kg	90	<90	40	60 - 140	90
		TRH >C34-C40 (F4)	mg/kg	120	<120	20	60 - 140	95
LB062563.002		TRH C10-C14	mg/kg	20	40	40	60 - 140	100
		TRH C15-C28	mg/kg	45	<45	40	60 - 140	98
		TRH C29-C36	mg/kg	45	<45	40	60 - 140	78
	TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	39	40	60 - 140	98
		TRH >C16-C34 (F3)	mg/kg	90	<90	40	60 - 140	93

SGS

LABORATORY CONTROL SAMPLES

SE130614 R0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in Green when within suggested criteria or Red with an appended dagger symbol (†) when outside suggested criteria.

TRH (Total Recoverable Hydrocarbons) in Soil (continued) Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062563.002	TRH F Bands	TRH >C34-C40 (F4)	mg/kg	120	<120	20	60 - 140	75

VOC's in Soil Method: ME-(AU)-[ENV]AN432/AN434

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062558.002	Monocyclic Aromatic	Benzene	mg/kg	0.1	2.1	2.9	60 - 140	73
		Toluene	mg/kg	0.1	2.6	2.9	60 - 140	89
		Ethylbenzene	mg/kg	0.1	2.4	2.9	60 - 140	83
		m/p-xylene	mg/kg	0.2	4.6	5.8	60 - 140	80
		o-xylene	mg/kg	0.1	2.4	2.9	60 - 140	82
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.5	5	60 - 140	90
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.5	5	60 - 140	89
		d8-toluene (Surrogate)	mg/kg	-	5.2	5	60 - 140	104
		Bromofluorobenzene (Surrogate)	mg/kg	-	5.1	5	60 - 140	102

Volatile Petroleum Hydrocarbons in Soil Method: ME-(AU)-[ENV]AN433/AN434/AN410

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB062558.002		TRH C6-C10	mg/kg	25	<25	24.65	60 - 140	92
		TRH C6-C9	mg/kg	20	20	23.2	60 - 140	87
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.5	5	60 - 140	90
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.5	5	60 - 140	89
		d8-toluene (Surrogate)	mg/kg	-	5.2	5	60 - 140	104
		Bromofluorobenzene (Surrogate)	mg/kg	-	5.1	5	60 - 140	102
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	7.25	60 - 140	119

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury (dissolved) in Water — Method: ME-(AU)-[ENV]AN311/AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130614.024	LB062755.004	Mercury	mg/L	0.0001	0.0076	0.0002	0.008	93

Mercury in Soil — Method: ME-(AU)-[ENV]AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130590.012	LB062739.004	Mercury	mg/kg	0.01	0.19	<0.01	0.2	92
SE130614.006	LB062741.004	Mercury	mg/kg	0.01	0.21	0.02	0.2	94

Metals in Water (Dissolved) by ICPOES — Method: ME-(AU)-[ENV]AN320/AN321

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130614.024	LB062600.004	Arsenic, As	mg/L	0.02	2.0	<0.02	2	100
		Cadmium, Cd	mg/L	0.001	2.0	<0.001	2	100
		Chromium, Cr	mg/L	0.005	2.0	<0.005	2	100
		Copper, Cu	mg/L	0.005	2.0	<0.005	2	100
		Lead, Pb	mg/L	0.02	2.0	<0.02	2	101
		Nickel, Ni	mg/L	0.005	2.0	<0.005	2	101
		Zinc, Zn	mg/L	0.01	2.0	<0.01	2	102

OC Pesticides in Soil — Method: ME-(AU)-[ENV]AN400/AN420

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130614.012	LB062562.022		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	-	-
			Alpha BHC	mg/kg	0.1	<0.1	<0.1	-	-
			Lindane	mg/kg	0.1	<0.1	<0.1	-	-
			Heptachlor	mg/kg	0.1	0.3	<0.1	0.2	128
			Aldrin	mg/kg	0.1	0.3	<0.1	0.2	128
			Beta BHC	mg/kg	0.1	<0.1	<0.1	-	-
			Delta BHC	mg/kg	0.1	0.2	<0.1	0.2	119
			Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	-	-
			o,p'-DDE	mg/kg	0.1	<0.1	<0.1	-	-
			Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	-	-
			Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	-	-
			Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	-	-
			trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	-	-
			p,p'-DDE	mg/kg	0.1	<0.1	<0.1	-	-
			Dieldrin	mg/kg	0.05	0.24	<0.05	0.2	122
			Endrin	mg/kg	0.2	0.3	<0.2	0.2	127
			o,p'-DDD	mg/kg	0.1	<0.1	<0.1	-	-
			o,p'-DDT	mg/kg	0.1	<0.1	<0.1	-	-
			Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	-	-
			p,p'-DDD	mg/kg	0.1	<0.1	<0.1	-	-
			p,p'-DDT	mg/kg	0.1	0.2	<0.1	0.2	109
			Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	-	-
			Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	-	-
			Methoxychlor	mg/kg	0.1	<0.1	<0.1	-	-
			Endrin Ketone	mg/kg	0.1	<0.1	<0.1	-	-
			Isodrin	mg/kg	0.1	<0.1	<0.1	-	-
			Mirex	mg/kg	0.1	<0.1	<0.1	-	-
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.16	0.16	-	106

PAH (Polynuclear Aromatic Hydrocarbons) in Soil — Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130614.001	LB062562.010	Naphthalene	mg/kg	0.1	3.6	<0.1	4	90
		2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	-	-
		1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	-	-
		Acenaphthylene	mg/kg	0.1	3.4	<0.1	4	86
		Acenaphthene	mg/kg	0.1	3.7	<0.1	4	93
		Fluorene	mg/kg	0.1	<0.1	<0.1	-	-
		Phenanthrene	mg/kg	0.1	3.6	<0.1	4	91
		Anthracene	mg/kg	0.1	3.5	<0.1	4	88
		Fluoranthene	mg/kg	0.1	4.4	<0.1	4	111

SGS

MATRIX SPIKES

SE130614 R0

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130614.001	LB062562.010		Pyrene	mg/kg	0.1	3.7	<0.1	4	92
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	-	-
			Chrysene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(b&j&k)fluoranthene	mg/kg	0.2	<0.2	<0.2	-	-
			Benzo(a)pyrene	mg/kg	0.1	3.7	<0.1	4	93
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	-	-
			Dibenzo(a&h)anthracene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	-	-
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	3.7	<0.2	-	-
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.3	3.9	<0.3	-	-
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	3.8	<0.2	-	-
			Total PAH	mg/kg	0.8	30	<0.8	-	-
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.43	0.43	-	86
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.42	0.42	-	84
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.45	0.47	-	90

TOC in Soil

Method: ME-(AU)-[ENV]AN188

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130614.001	LB062858.004	Total Organic Carbon	%w/w	0.05	0.42	0.10	-	-

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN288

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130617.008	LB062835.014	Total Phenols	mg/kg	0.1	2.3	<0.1	2.5	92

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest

Method: ME-(AU)-[ENV]AN040/AN320

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130590.012	LB062732.004	Arsenic, As	mg/kg	3	47	<3	50	88
		Cadmium, Cd	mg/kg	0.3	46	<0.3	50	92
		Chromium, Cr	mg/kg	0.3	58	12	50	92
		Copper, Cu	mg/kg	0.5	47	<0.5	50	94
		Lead, Pb	mg/kg	1	63	17	50	91
		Nickel, Ni	mg/kg	0.5	47	0.8	50	93
		Zinc, Zn	mg/kg	0.5	49	1.5	50	94
SE130614.006	LB062733.004	Arsenic, As	mg/kg	3	52	10	50	85
		Cadmium, Cd	mg/kg	0.3	44	0.3	50	88
		Chromium, Cr	mg/kg	0.3	60	16	50	85
		Copper, Cu	mg/kg	0.5	53	8.5	50	88
		Lead, Pb	mg/kg	1	61	22	50	78
		Nickel, Ni	mg/kg	0.5	46	1.9	50	89
		Zinc, Zn	mg/kg	0.5	60	19	50	83

VOC's in Soil

Method: ME-(AU)-[ENV]AN433/AN434

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130602.004	LB062558.009	Monocyclic Aromatic	Benzene	mg/kg	0.1	2.1	<0.1	2.9	73
			Toluene	mg/kg	0.1	2.5	<0.1	2.9	87
			Ethylbenzene	mg/kg	0.1	2.2	<0.1	2.9	75
			m/p-xylene	mg/kg	0.2	4.1	<0.2	5.8	71
			o-xylene	mg/kg	0.1	2.2	<0.1	2.9	74
		Polycyclic	Naphthalene	mg/kg	0.1	<0.1	<1.0	-	-
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.7	4.1	5	95
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.7	3.9	5	93
			d8-toluene (Surrogate)	mg/kg	-	5.2	4.8	5	104
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.6	5.2	5	92
		Totals	Total Xylenes*	mg/kg	0.3	6.3	<0.3	-	-
			Total BTEX*	mg/kg	0.6	13	<0.3	-	-

SGS

MATRIX SPIKES

SE130614 R0

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Volatile Petroleum Hydrocarbons in Soil Method: ME-(AU)-[ENV]AN433/AN434/AN410

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE130614.004	LB062558.009		TRH C6-C10	mg/kg	25	<25	<25	24.65	86
			TRH C6-C9	mg/kg	20	<20	<20	23.2	81
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.7	4.5	5	95
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.7	4.0	5	93
			d8-toluene (Surrogate)	mg/kg	-	5.2	5.5	5	104
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.6	5.4	5	92
		VPH F	Benzene (F0)	mg/kg	0.1	2.1	<0.1	-	-
		Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	7.25	112

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in Green when within suggested criteria or Red with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil

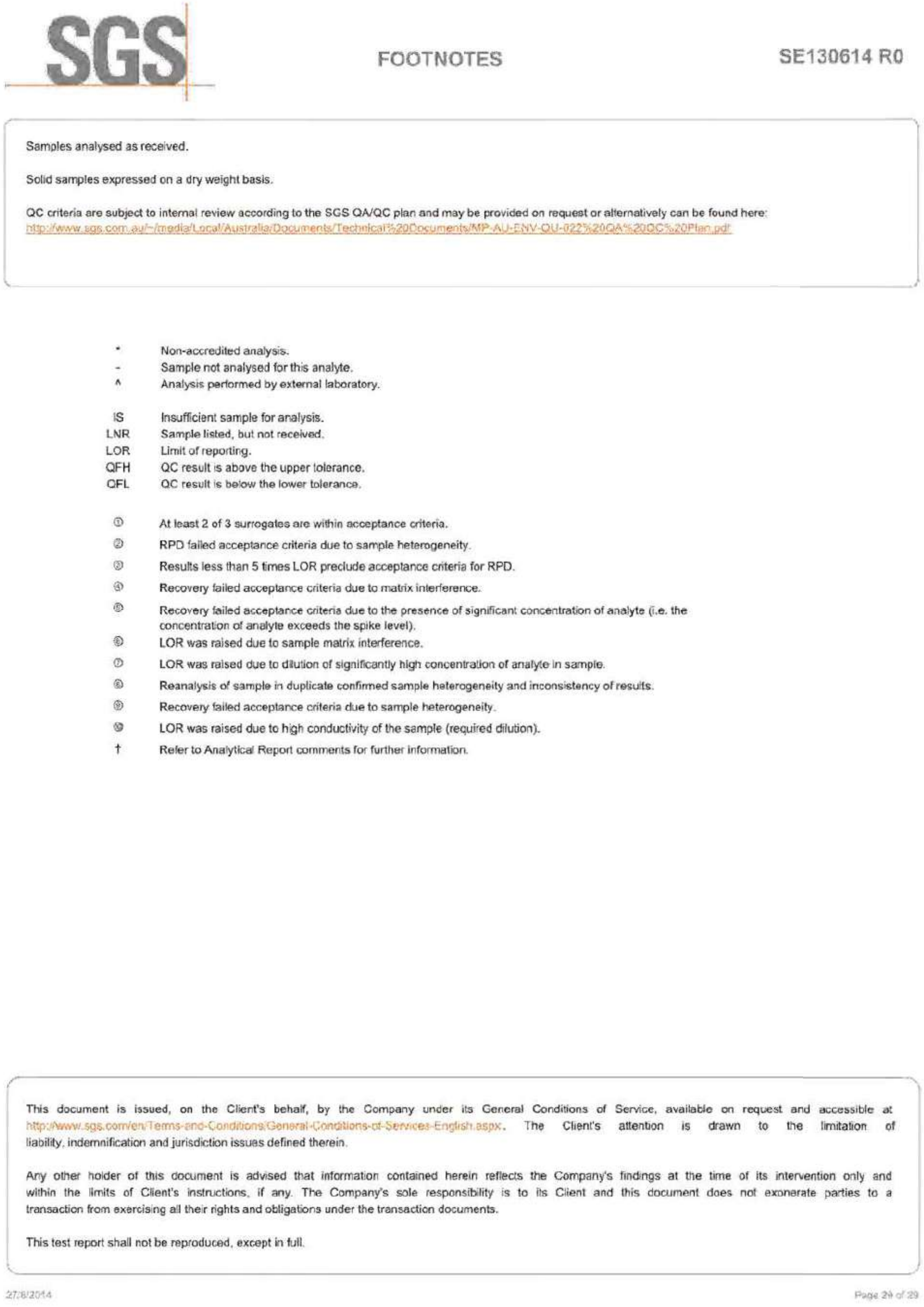
Method: ME-(AU)-[ENV]AN400/AN420

QC Sample	Sample Number		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.012	LB062562.023		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	200	-
			Alpha BHC	mg/kg	0.1	<0.1	<0.1	200	-
			Lindane	mg/kg	0.1	<0.1	<0.1	200	-
			Heptachlor	mg/kg	0.1	0.3	0.3	69	1
			Aldrin	mg/kg	0.1	0.3	0.3	69	2
			Beta BHC	mg/kg	0.1	<0.1	<0.1	200	-
			Delta BHC	mg/kg	0.1	0.2	0.2	72	3
			Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	200	-
			o,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	-
			Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	200	-
			Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	200	-
			Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	200	-
			trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	200	-
			p,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	-
			Dieldrin	mg/kg	0.05	0.24	0.25	71	1
			Endrin	mg/kg	0.2	0.3	0.3	69	2
			o,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	-
			o,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	-
			Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	200	-
			p,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	-
			p,p'-DDT	mg/kg	0.1	0.2	0.2	76	0
			Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	200	-
			Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	200	-
			Methoxychlor	mg/kg	0.1	<0.1	<0.1	200	-
			Endrin Ketone	mg/kg	0.1	<0.1	<0.1	200	-
			Isodrin	mg/kg	0.1	<0.1	<0.1	200	-
			Mirex	mg/kg	0.1	<0.1	<0.1	200	-
		Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.16	0.16	30	1

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE130614.001	LB062562.011		Naphthalene	mg/kg	0.1	3.6	3.7	33	2
			2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	-
			1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	-
			Acenaphthylene	mg/kg	0.1	3.4	3.7	33	7
			Acenaphthene	mg/kg	0.1	3.7	3.8	33	2
			Fluorene	mg/kg	0.1	<0.1	<0.1	200	-
			Phenanthrene	mg/kg	0.1	3.6	3.7	33	2
			Anthracene	mg/kg	0.1	3.5	3.5	33	2
			Fluoranthene	mg/kg	0.1	4.4	4.3	32	2
			Pyrene	mg/kg	0.1	3.7	3.8	33	5
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	200	-
			Chrysene	mg/kg	0.1	<0.1	<0.1	200	-
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	-
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	-
			Benzo(b&j&k)fluoranthene	mg/kg	0.2	<0.2	<0.2	200	-
			Benzo(a)pyrene	mg/kg	0.1	3.7	3.8	33	3
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	200	-
			Dibenzo(a&h)anthracene	mg/kg	0.1	<0.1	<0.1	200	-
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	200	-
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	3.7	3.8	15	-
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.3	3.9	4.0	18	-
			Carcinogenic PAHs (as BaP TEQ)-assume results	TEQ (mg/kg)	0.2	3.8	3.9	15	-
			Total PAH	mg/kg	0.8	30	30	33	-
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.43	0.44	30	2
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.42	0.43	30	2
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.45	0.46	30	2



SGS

FOOTNOTES

SE130614 R0

Samples analysed as received.

Solid samples expressed on a dry weight basis.

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

*	Non-accredited analysis.
-	Sample not analysed for this analyte.
^	Analysis performed by external laboratory.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to Analytical Report comments for further information.

SGS

ANALYTICAL REPORT

NATA
WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS

Contact	An Nguyen
Client	Geotechnique
Address	P.O. Box 880 NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	anguyen@geotech.com.au
Project	**13188-2 - Concord**
Order Number	(Not specified)
Samples	28

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	SE130614 R0
Report Number	0000089956
Date Reported	26 Aug 2014
Date Received	18 Aug 2014

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

Sample # 11:portion of the sample supplied has been sub-sampled for asbestos according to SGS In-house procedures. We therefore cannot guarantee that the sub-sample is representative of the entire sample supplied.
SGS Environmental Services recommends supplying approximately 50-100g of sample in a separate container.
No respirable fibres detected in all samples using trace analysis technique.
Asbestos analysed by Approved Identifier Yusuf Kuthpudin.

SIGNATORIES

Andy Sutton
Senior Organic Chemist

Dong Liang
Metals/Inorganics Team Leader

Huong Crawford
Production Manager

Jaimie Cheung
Metals Chemist

Ly Kim Ha
Organic Section Head

Sheila Lepasana
Senior Technician

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental Services | Unit 16 33 Maddox St | Alexandria NSW 2015 | Australia | t +61 2 8594 0400 | f +61 2 8594 0499 | www.au.sgs.com
PO Box 6432 Bourke Rd BC | Alexandria NSW 2015 | Australia

Member of the SGS Group

26/08/2014

Page 1 of 3

SGS

ANALYTICAL REPORT

SE130614 R0

RESULTS

Fibre Identification in soil Method AN602

Laboratory Reference	Client Reference	Matrix	Sample Description	Date Sampled	Fibre Identification	Est.%w/w
SE130614.001	BH1 1.5-1.8	Soil	56 g Clay	07 Aug 2014	No Asbestos Found	<0.01
SE130614.003	BH2 0-0.15	Soil	80 g Clay,sand,soil,rocks	11 Aug 2014	No Asbestos Found Organic Fibres Detected	<0.01
SE130614.004	BH2 0.5-0.8	Soil	182 g Clay,sand,soil,rocks	11 Aug 2014	No Asbestos Found	<0.01
SE130614.005	BH2 4.5-4.8	Soil	180 g Clay,sand,soil,rocks	11 Aug 2014	No Asbestos Found Organic Fibres Detected	<0.01
SE130614.007	BH3 0-0.1	Soil	81 g Sand,soil,rocks	12 Aug 2014	No Asbestos Found Organic Fibres Detected	<0.01
SE130614.008	BH3 1.5-1.8	Soil	142 g Clay,sand,soil	12 Aug 2014	No Asbestos Found Organic Fibres Detected	<0.01
SE130614.009	BH4 0-0.15	Soil	102 g Clay,sand,soil,rocks	12 Aug 2014	No Asbestos Found Organic Fibres Detected	<0.01
SE130614.010	BH5 0.1-0.4	Soil	145 g Clay,soil,rocks	13 Aug 2014	No Asbestos Found Organic Fibres Detected	<0.01
SE130614.011	BH5 0.6-0.7	Soil	104 g Clay,sand,soil	13 Aug 2014	No Asbestos Found	<0.01
SE130614.013	BH7 0.15-0.45	Soil	120 g Sand,soil,rocks	11 Aug 2014	No Asbestos Found	<0.01
SE130614.014	BH7 1.4-1.7	Soil	125 g Clay,sand,rocks	11 Aug 2014	No Asbestos Found	<0.01
SE130614.016	BH9 0.2-0.5	Soil	148 g Clay,soil,rocks	14 Aug 2014	No Asbestos Found	<0.01
SE130614.017	BH9 2.0-2.3	Soil	132 g Clay,soil,rocks	14 Aug 2014	No Asbestos Found	<0.01
SE130614.019	BH10 0.23-0.5	Soil	88 g Clay,soil	12 Aug 2014	No Asbestos Found	<0.01

SGS

METHOD SUMMARY

SE130614 R0

METHOD	METHODOLOGY SUMMARY
AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.
AN602	Fibres/material that cannot be unequivocably identified as one of the three asbestos forms, will be reported as unknown mineral fibres (umf).
AN602	AS4964.2004 Method for the Qualitative Identification of Asbestos in Bulk Samples, Section 8.4, Trace Analysis Criteria, Note 4 states:"Depending upon sample condition and fibre type, the detection limit of this technique has been found to lie generally in the range of 1 in 1,000 to 1 in 10,000 parts by weight, equivalent to 1 to 0.1 g/kg."

FOOTNOTES

Amosite	-	Brown Asbestos	NA	-	Not Analysed
Chrysotile	-	White Asbestos	LNR	-	Listed, Not Required
Crocidolite	-	Blue Asbestos	*	-	Not Accredited
Amphiboles	-	Amosite and/or Crocidolite	**	-	Indicative data, theoretical holding time exceeded

This report does not comply with the analytical reporting recommendations in the Western Australian Department of Health Guidelines for the Assessment and Remediation and Management of Asbestos Contaminated sites in Western Australia - May 2009.

Sampled by the client.

Where reported: 'Asbestos Detected': Asbestos detected by polarized light microscopy, including dispersion staining.
Where reported: 'No Asbestos Found': No Asbestos Found by polarized light microscopy, including dispersion staining.
Where reported: 'UMF Detected': Mineral fibres of unknown type detected by polarized light microscopy, including dispersion staining. Confirmation by another independent analytical technique may be necessary.

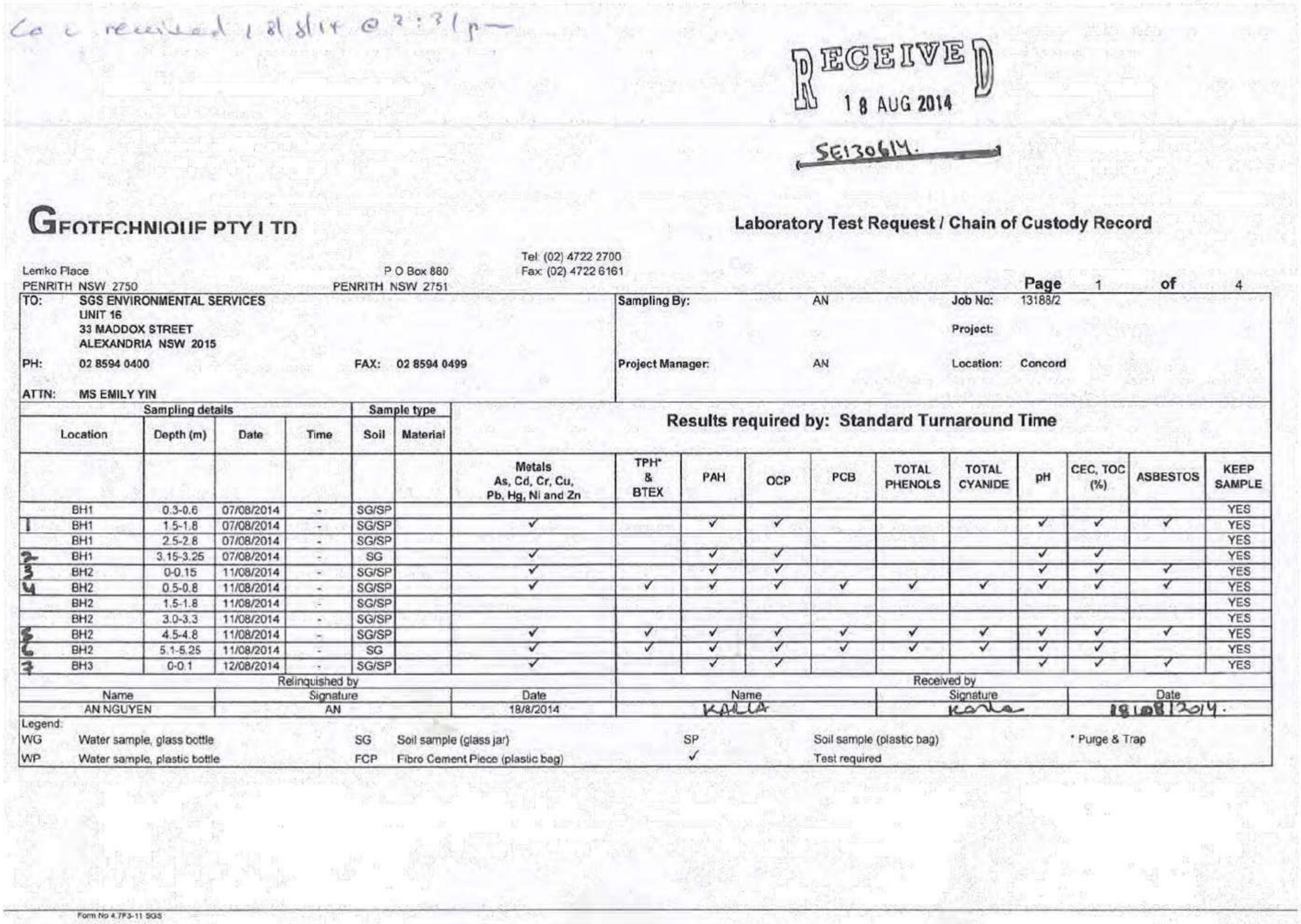
Even after disintegration it can be very difficult, or impossible, to detect the presence of asbestos in some asbestos -containing bulk materials using polarised light microscopy. This is due to the low grade or small length or diameter of asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials.

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

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions/General-Conditions-of-Services-English.aspx. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This test report shall not be reproduced, except in full.



Coc received 18/8/14 @ 2:31pm

RECEIVED
18 AUG 2014

SE130614.

GEOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

Lemko Place
PENRITH NSW 2750

P O Box 880
PENRITH NSW 2751

Tel: (02) 4722 2700
Fax: (02) 4722 6161

Page 1 **of** 4

TO:	**SGS ENVIRONMENTAL SERVICES** **UNIT 16** **33 MADDOX STREET** **ALEXANDRIA NSW 2015**	**Sampling By:** AN	**Job No:** 13188/2 **Project:**
PH:	**02 8594 0400** **FAX: 02 8594 0499**	**Project Manager:** AN	**Location:** Concord
ATTN:	**MS EMILY YIN**		

Results required by: Standard Turnaround Time

	Sampling details				Sample type													
	Location	Depth (m)	Date	Time	Soil	Material	Metals As, Cd, Cr, Cu, Pb, Hg, Ni and Zn	TPH* & BTEX	PAH	OCP	PCB	TOTAL PHENOLS	TOTAL CYANIDE	pH	CEC, TOC (%)	ASBESTOS	KEEP SAMPLE
	BH1	0.3-0.6	07/08/2014	-	SG/SP												YES
1	BH1	1.5-1.8	07/08/2014	-	SG/SP		✓		✓	✓				✓	✓	✓	YES
	BH1	2.5-2.8	07/08/2014	-	SG/SP												YES
2	BH1	3.15-3.25	07/08/2014	-	SG		✓		✓	✓				✓	✓		YES
3	BH2	0-0.15	11/08/2014	-	SG/SP		✓		✓	✓				✓	✓	✓	YES
4	BH2	0.5-0.8	11/08/2014	-	SG/SP		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	YES
	BH2	1.5-1.8	11/08/2014	-	SG/SP												YES
	BH2	3.0-3.3	11/08/2014	-	SG/SP												YES
5	BH2	4.5-4.8	11/08/2014	-	SG/SP		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	YES
6	BH2	5.1-5.25	11/08/2014	-	SG		✓	✓	✓	✓	✓	✓	✓	✓	✓		YES
7	BH3	0-0.1	12/08/2014	-	SG/SP		✓		✓	✓				✓	✓	✓	YES

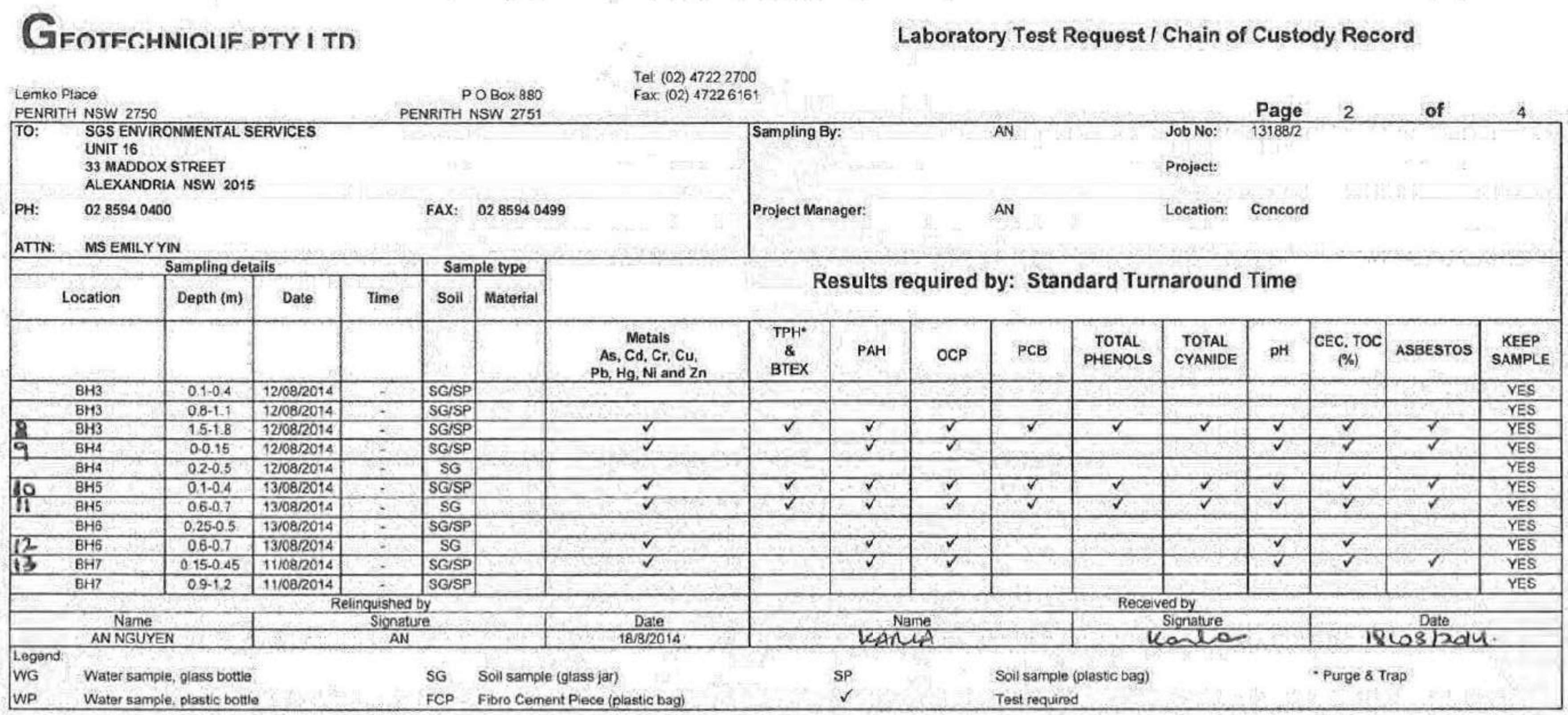
Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
AN NGUYEN	AN	18/8/2014	KALLA	Karla	18/08/2014.

Legend:

WG	Water sample, glass bottle	SG	Soil sample (glass jar)	SP	Soil sample (plastic bag)
WP	Water sample, plastic bottle	FCP	Fibro Cement Piece (plastic bag)	✓	Test required

* Purge & Trap

Form No 4.7F3-11 SGS



GEOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

Lemko Place
PENRITH NSW 2750

P O Box 880
PENRITH NSW 2751

Tel: (02) 4722 2700
Fax: (02) 4722 6161

Page 2 **of** 4

TO: SGS ENVIRONMENTAL SERVICES UNIT 16 33 MADDOX STREET ALEXANDRIA NSW 2015		Sampling By: AN	Job No: 13188/2
			Project:
PH: 02 8594 0400	FAX: 02 8594 0499	Project Manager: AN	Location: Concord
ATTN: MS EMILY YIN			

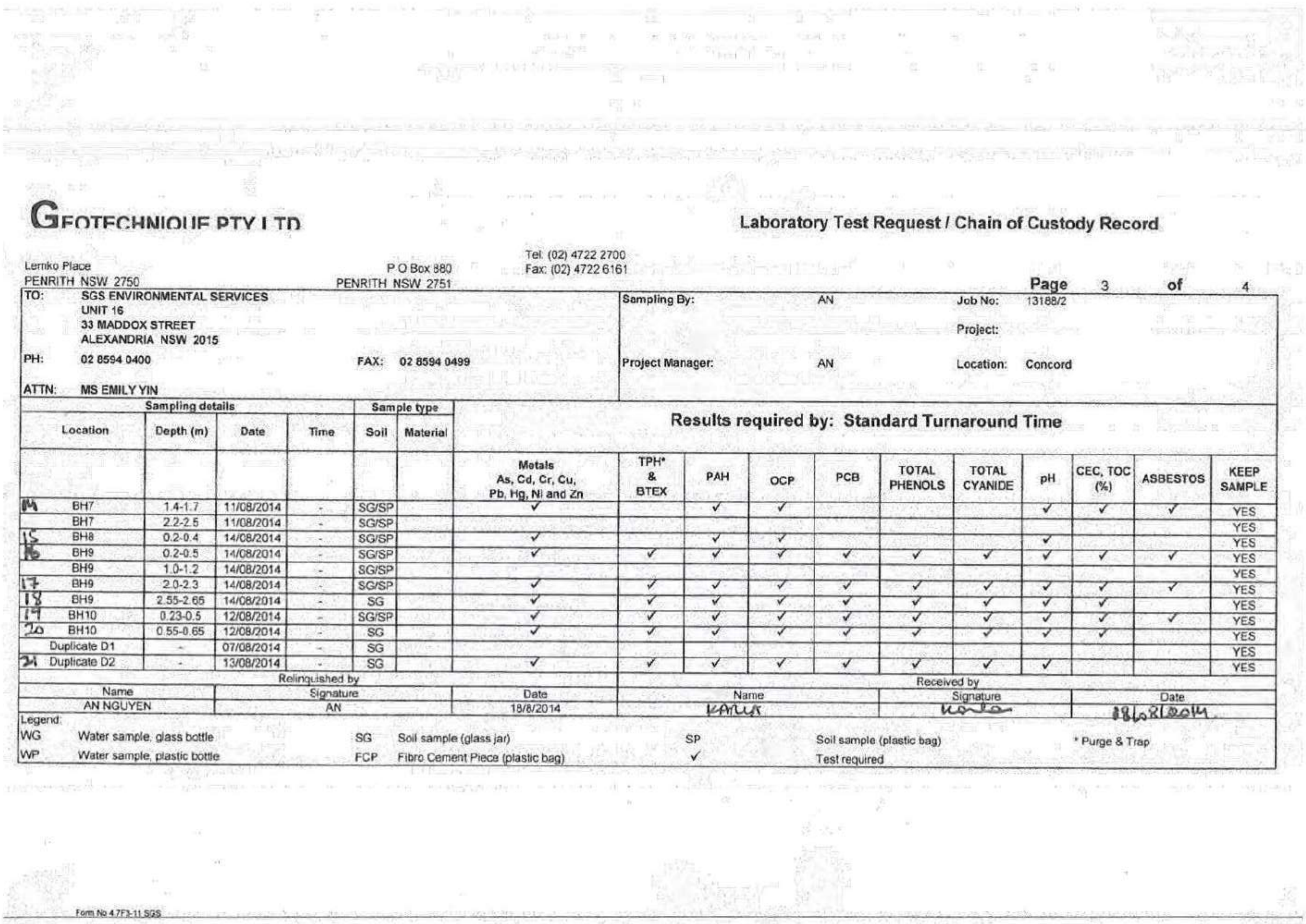
Results required by: Standard Turnaround Time

Sampling details				Sample type												
Location	Depth (m)	Date	Time	Soil	Material	Metals As, Cd, Cr, Cu, Pb, Hg, Ni and Zn	TPH* & BTEX	PAH	OCP	PCB	TOTAL PHENOLS	TOTAL CYANIDE	pH	CEC, TOC (%)	ASBESTOS	KEEP SAMPLE
BH3	0.1-0.4	12/08/2014	-	SG/SP												YES
BH3	0.8-1.1	12/08/2014	-	SG/SP												YES
8 BH3	1.5-1.8	12/08/2014	-	SG/SP		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	YES
9 BH4	0-0.15	12/08/2014	-	SG/SP		✓		✓	✓				✓	✓	✓	YES
BH4	0.2-0.5	12/08/2014	-	SG												YES
10 BH5	0.1-0.4	13/08/2014	-	SG/SP		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	YES
11 BH5	0.6-0.7	13/08/2014	-	SG		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	YES
BH6	0.25-0.5	13/08/2014	-	SG/SP												YES
12 BH6	0.6-0.7	13/08/2014	-	SG		✓		✓	✓				✓	✓		YES
13 BH7	0.15-0.45	11/08/2014	-	SG/SP		✓		✓	✓				✓	✓	✓	YES
BH7	0.9-1.2	11/08/2014	-	SG/SP												YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
AN NGUYEN	AN	18/8/2014	Kanya	Kanta	18/08/2014.

Legend:
WG Water sample, glass bottle
WP Water sample, plastic bottle
SG Soil sample (glass jar)
FCP Fibro Cement Piece (plastic bag)
SP Soil sample (plastic bag)
✓ Test required
* Purge & Trap

Form No 4.7F3-11 SGS



GEOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

Lemko Place
PENRITH NSW 2750

P O Box 880
PENRITH NSW 2751

Tel: (02) 4722 2700
Fax: (02) 4722 6161

Page 3 of 4

TO: SGS ENVIRONMENTAL SERVICES
UNIT 16
33 MADDOX STREET
ALEXANDRIA NSW 2015

PH: 02 8594 0400

FAX: 02 8594 0499

ATTN: MS EMILY YIN

Sampling By: AN

Job No: 13188/2

Project:

Project Manager: AN

Location: Concord

Results required by: Standard Turnaround Time

	Sampling details				Sample type												
	Location	Depth (m)	Date	Time	Soil	Material	Metals As, Cd, Cr, Cu, Pb, Hg, Ni and Zn	TPH* & BTEX	PAH	OCP	PCB	TOTAL PHENOLS	TOTAL CYANIDE	pH	CEC, TOC (%)	ASBESTOS	KEEP SAMPLE
14	BH7	1.4-1.7	11/08/2014	-	SG/SP		✓		✓	✓				✓	✓	✓	YES
	BH7	2.2-2.5	11/08/2014	-	SG/SP												YES
15	BH8	0.2-0.4	14/08/2014	-	SG/SP		✓		✓	✓				✓			YES
16	BH9	0.2-0.5	14/08/2014	-	SG/SP		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	YES
	BH9	1.0-1.2	14/08/2014	-	SG/SP												YES
17	BH9	2.0-2.3	14/08/2014	-	SG/SP		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	YES
18	BH9	2.55-2.65	14/08/2014	-	SG		✓	✓	✓	✓	✓	✓	✓	✓	✓		YES
19	BH10	0.23-0.5	12/08/2014	-	SG/SP		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	YES
20	BH10	0.55-0.65	12/08/2014	-	SG		✓	✓	✓	✓	✓	✓	✓	✓	✓		YES
	Duplicate D1	-	07/08/2014	-	SG												YES
21	Duplicate D2	-	13/08/2014	-	SG		✓	✓	✓	✓	✓	✓	✓	✓			YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
AN NGUYEN	AN	18/8/2014	KARLA		18/08/2014

Legend:

WG	Water sample, glass bottle	SG	Soil sample (glass jar)	SP	Soil sample (plastic bag)
WP	Water sample, plastic bottle	FCP	Fibro Cement Piece (plastic bag)	✓	Test required

* Purge & Trap

Form No 4.7F3-11 SGS

GEOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

Lemko Place
PENRITH NSW 2750

P O Box 880
PENRITH NSW 2751

Tel: (02) 4722 2700
Fax: (02) 4722 6161

Page 4 of 4

TO: **SGS ENVIRONMENTAL SERVICES**
UNIT 16
33 MADDOX STREET
ALEXANDRIA NSW 2015

PH: **02 8594 0400** **FAX:** **02 8594 0499**

ATTN: **MS EMILY YIN**

Sampling By: AN
Job No: 13188/2
Project:
Project Manager: AN
Location: Concord

Results required by: Standard Turnaround Time

Sampling details				Sample type											
Location	Depth (m)	Date	Time	Soil	Water	Metals As, Cd, Cr, Cu, Pb, Hg, Ni and Zn	BTEX								KEEP SAMPLE
22 Trip spike TS1	-	12/08/2014	-	SG			✓								YES
23 Trip spike TS2	-	14/08/2014	-	SG			✓								YES
24 Rinsate R1	-	07/08/2014	-		WG	✓									YES
25 Rinsate R2	-	11/08/2014	-		WG	✓									YES
26 Rinsate R3	-	12/08/2014	-		WG	✓									YES
27 Rinsate R4	-	13/08/2014	-		WG	✓									YES
28 Rinsate R5	-	14/08/2014	-		WG	✓									YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
AN NGUYEN	AN	18/8/2014	KANIA		18/08/2014.

Legend:

WG	Water sample, glass bottle	SG	Soil sample (glass jar)	SP	Soil sample (plastic bag)	* Purge & Trap
WP	Water sample, plastic bottle	FCP	Fibro Cement Piece (plastic bag)	✓	Test required	

Form No 4 7F3-11 SGS

SGS

SAMPLE RECEIPT ADVICE

SE130614

CLIENT DETAILS

Contact	An Nguyen
Client	Geotechnique
Address	P.O. Box 880 NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	anguyen@geotech.com.au
Project	**13188-2 - Concord**
Order Number	(Not specified)
Samples	28

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Mon 18/8/2014
Report Due	Mon 25/8/2014
SGS Reference	**SE130614**

SUBMISSION DETAILS

This is to confirm that 28 samples were received on Monday 18/8/2014. Results are expected to be ready by Monday 25/8/2014. Please quote SGS reference SE130614 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	21 Soils, 5 Waters	Type of documentation received	COC
Date documentation received	18/08/2014@02:31pm	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	4.5°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

A separate homogenised portion (~100g) was not supplied for Asbestos analysis on sample "BH5 0.6-0.7". SGS will proceed by sub-sampling a portion from the glass jar supplied, on the provision that a comment will be reflected on the final report regarding this sub-sampling.
12 soil samples, which were not marked for analyses on the COC, have been placed on hold. These samples will not be processed.

SGS

SAMPLE RECEIPT ADVICE

SE130614

CLIENT DETAILS

Client Geotechnique

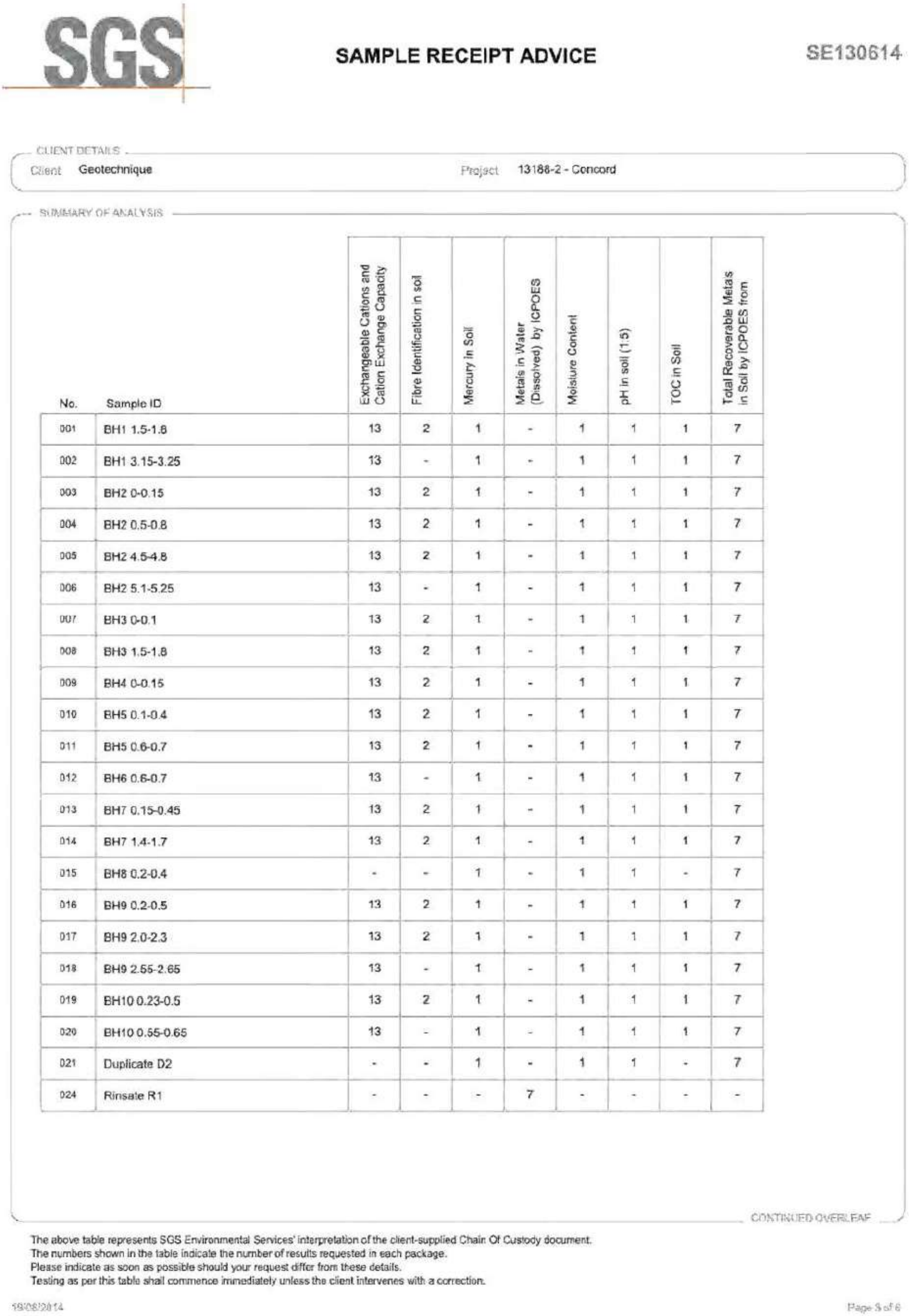
Project 13188-2 - Concord

SUMMARY OF ANALYSIS

No.	Sample ID	OC Pesticides in Soil	PAH (Polynuclear Aromatic Hydrocarbons) in	PCBs in Soil	Total Cyanide in soil by Discrete Analyser	Total Phenolics in Soil	TRH (Total Recoverable Hydrocarbons) in Soil	VOC's in Soil	Volatile Petroleum Hydrocarbons in Soil
001	BH1 1.5-1.8	28	26	-	-	-	-	-	-
002	BH1 3.15-3.25	28	26	-	-	-	-	-	-
003	BH2 0-0.15	28	26	-	-	-	-	-	-
004	BH2 0.5-0.8	28	26	11	1	1	10	12	8
005	BH2 4.5-4.8	28	26	11	1	1	10	12	8
006	BH2 5.1-5.25	28	26	11	1	1	10	12	8
007	BH3 0-0.1	28	26	-	-	-	-	-	-
008	BH3 1.5-1.8	28	26	11	1	1	10	12	8
009	BH4 0-0.15	28	26	-	-	-	-	-	-
010	BH5 0.1-0.4	28	26	11	1	1	10	12	8
011	BH5 0.6-0.7	28	26	11	1	1	10	12	8
012	BH6 0.6-0.7	28	26	-	-	-	-	-	-
013	BH7 0.15-0.45	28	26	-	-	-	-	-	-
014	BH7 1.4-1.7	28	26	-	-	-	-	-	-
015	BH8 0.2-0.4	28	26	-	-	-	-	-	-
016	BH9 0.2-0.5	28	26	11	1	1	10	12	8
017	BH9 2.0-2.3	28	26	11	1	1	10	12	8
018	BH9 2.55-2.65	28	26	11	1	1	10	12	8
019	BH10 0.23-0.5	28	26	11	1	1	10	12	8
020	BH10 0.55-0.65	28	26	11	1	1	10	12	8
021	Duplicate D2	28	26	11	1	1	10	12	8
022	Trip Spike TS1	-	-	-	-	-	-	12	-
023	Trip Spike TS2	-	-	-	-	-	-	12	-

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.



SGS

SAMPLE RECEIPT ADVICE

SE130614

CLIENT DETAILS

Client Geotechnique

Project 13188-2 - Concord

SUMMARY OF ANALYSIS

No.	Sample ID	Exchangeable Cations and Cation Exchange Capacity	Fibre Identification in soil	Mercury in Soil	Metals in Water (Dissolved) by ICPOES	Moisture Content	pH in soil (1:5)	TOC in Soil	Total Recoverable Metas in Soil by ICPOES from
001	BH1 1.5-1.8	13	2	1	-	1	1	1	7
002	BH1 3.15-3.25	13	-	1	-	1	1	1	7
003	BH2 0-0.15	13	2	1	-	1	1	1	7
004	BH2 0.5-0.8	13	2	1	-	1	1	1	7
005	BH2 4.5-4.8	13	2	1	-	1	1	1	7
006	BH2 5.1-5.25	13	-	1	-	1	1	1	7
007	BH3 0-0.1	13	2	1	-	1	1	1	7
008	BH3 1.5-1.8	13	2	1	-	1	1	1	7
009	BH4 0-0.15	13	2	1	-	1	1	1	7
010	BH5 0.1-0.4	13	2	1	-	1	1	1	7
011	BH5 0.6-0.7	13	2	1	-	1	1	1	7
012	BH6 0.6-0.7	13	-	1	-	1	1	1	7
013	BH7 0.15-0.45	13	2	1	-	1	1	1	7
014	BH7 1.4-1.7	13	2	1	-	1	1	1	7
015	BH8 0.2-0.4	-	-	1	-	1	1	-	7
016	BH9 0.2-0.5	13	2	1	-	1	1	1	7
017	BH9 2.0-2.3	13	2	1	-	1	1	1	7
018	BH9 2.55-2.65	13	-	1	-	1	1	1	7
019	BH10 0.23-0.5	13	2	1	-	1	1	1	7
020	BH10 0.55-0.65	13	-	1	-	1	1	1	7
021	Duplicate D2	-	-	1	-	1	1	-	7
024	Rinsate R1	-	-	-	7	-	-	-	-

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.

SGS

SAMPLE RECEIPT ADVICE

SE130614

CLIENT DETAILS

Client Geotechnique

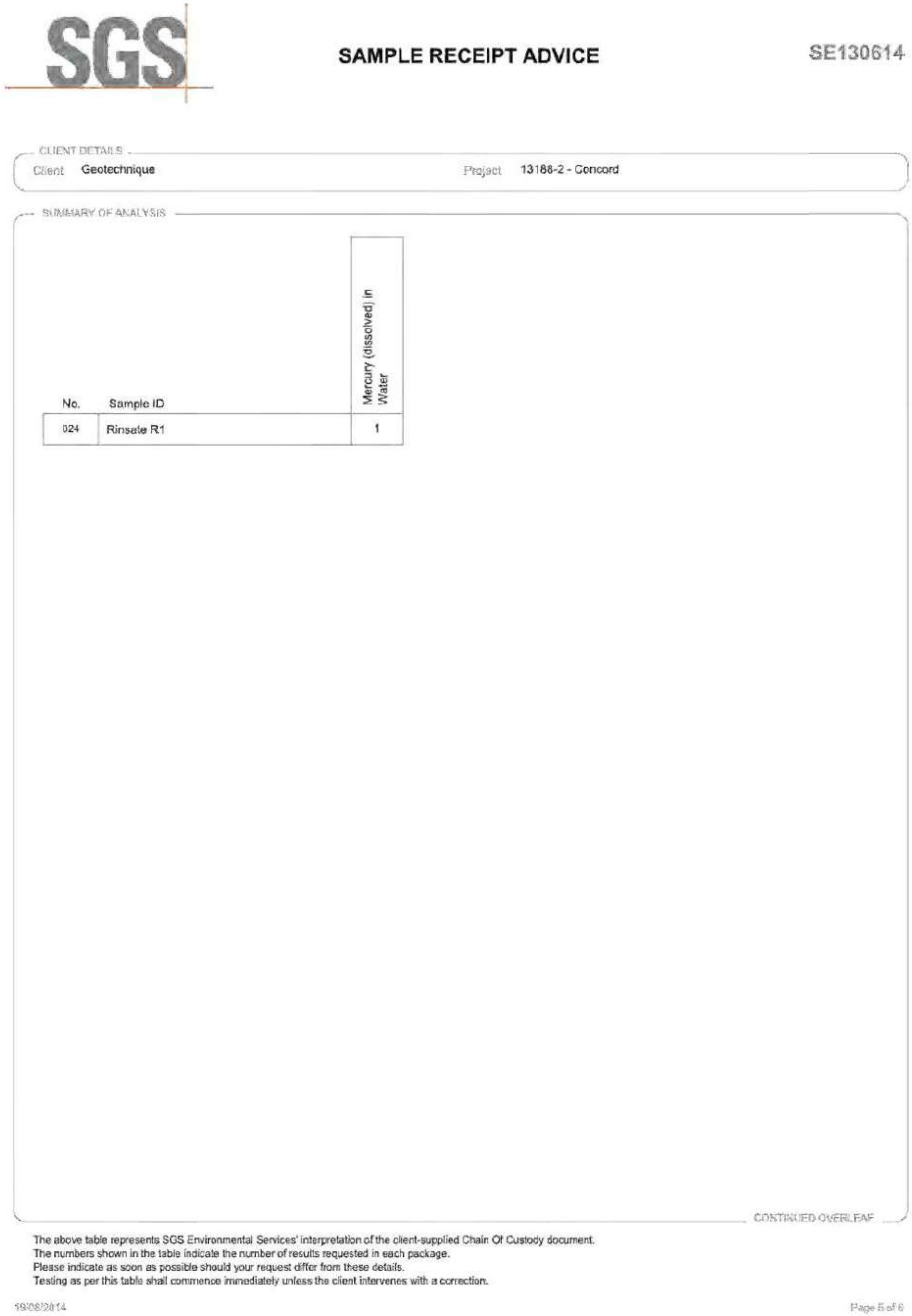
Project 13188-2 - Concord

SUMMARY OF ANALYSIS

No.	Sample ID	Metals in Water (Dissolved) by ICPOES
025	Rinsate R2	7
026	Rinsate R3	7
027	Rinsate R4	7
028	Rinsate R5	7

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.



SAMPLE RECEIPT ADVICE

SE130614

CLIENT DETAILS

Client Geotechnique

Project 13188-2 - Concord

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury (dissolved) in Water
024	Rinsate R1	1

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.

SGS

SAMPLE RECEIPT ADVICE

SE130614

CLIENT DETAILS

Client Geotechnique

Project 13188-2 - Concord

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury (dissolved) in Water
025	Rinsate R2	1
026	Rinsate R3	1
027	Rinsate R4	1
028	Rinsate R5	1

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.

APPENDIX D

ENVIRONMENTAL NOTES

GEOTECHNIQUE
PTY LTD

IMPORTANT INFORMATION REGARDING YOUR ENVIRONMENTAL SITE ASSESSMENT

These notes have been prepared by Geotechnique Pty Ltd, using guidelines prepared by the ASFE (Associated Soil and Foundation Engineers). The notes are offered to assist in the interpretation of your environmental site assessment report.

REASONS FOR AN ENVIRONMENTAL ASSESSMENT

Environmental site assessments are typically, though not exclusively, performed in the following circumstances:

- As a pre-acquisition assessment on behalf of a purchaser or a vendor, when a property is to be sold
- As a pre-development assessment, when a property or area of land is to be redeveloped, or the land use has changed, e.g. from a factory to a residential subdivision
- As a pre-development assessment of greenfield sites, to establish baseline conditions and assess environmental, geological and hydrological constraints to the development of e.g. a landfill
- As an audit of the environmental effects of previous and present site usage

Each circumstance requires a specific approach to assessment of soil and groundwater contamination. In all cases the objective is to identify and if possible quantify the risks that unrecognised contamination poses to the ongoing proposed activity. Such risks may be financial (clean-up costs or limitations in site use) and physical (health risks to site users or the public).

ENVIRONMENTAL SITE ASSESSMENT LIMITATIONS

Although information provided by an environmental site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment might not detect all contamination within a site. Contaminants could be present in areas that were not surveyed or sampled, or migrate to areas that did not show signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant that may occur; only the most likely contaminants are screened.

AN ENVIRONMENTAL SITE ASSESSMENT REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

In the following events and in order to avoid cost problems, you should ask your consultant to assess any changes in the conclusion and recommendations made in the assessment:

- When the nature of the proposed development is changed e.g. if a residential development is proposed, rather than a commercial development
- When the size or configuration of the proposed development is altered e.g. if a basement is added
- When the location or orientation of the proposed structure is modified
- When there is a change of land ownership, or
- For application to an adjacent site

ENVIRONMENTAL SITE ASSESSMENT FINDINGS ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual sub-surface conditions only at those points where samples are taken, when they are taken. Data obtained from the sampling and subsequent laboratory analyses are interpreted by geologists, engineers or scientists and opinions are drawn about the overall sub-surface conditions, the nature and extent of contamination, the likely impact on any proposed development and appropriate remediation measures. Actual conditions may differ from those inferred, because no professional, no matter how qualified and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, however, steps can be taken to help minimise the impact. For this reason site owners should retain the services of their consultants throughout the development stages of the project in order to identify variances, conduct additional tests that may be necessary and to recommend solutions to problems encountered on site.

Soil and groundwater contamination is a field in which legislation and interpretation of legislation by government departments is changing rapidly. Whilst every attempt is made by Geotechnique Pty Ltd to be familiar with current policy, our interpretation of the investigation findings should not be taken to be that of the relevant authority. When approval from a statutory authority is required for a project, approval should be directly sought.

Environotes-Ed3-04/06

STABILITY OF SUB-SURFACE CONDITIONS

Sub-surface conditions can change by natural processes and site activities. As an environmental site assessment is based on conditions existing at the time of the investigation, project decisions should not be based on environmental site assessment data that may have been affected by time. The consultant should be requested to advise if additional tests are required.

ENVIRONMENTAL SITE ASSESSMENTS ARE PERFORMED FOR SPECIFIC PURPOSES AND CLIENTS

Environmental site assessments are prepared in response to a specific scope of work required to meet the specific needs of specific individuals e.g. an assessment prepared for a consulting civil engineer may not be adequate to a construction contractor or another consulting civil engineer.

An assessment should not be used by other persons for any purpose or by the client for a different purpose. No individual, other than the client, should apply an assessment, even for its intended purpose, without first conferring with the consultant. No person should apply an assessment for any purpose other than that originally contemplated, without first conferring with the consultant.

MISINTERPRETATION OF ENVIRONMENTAL SITE ASSESSMENTS

Costly problems can occur when design professionals develop plans based on misinterpretation of an environmental site assessment. In order to minimise problems, the environmental consultant should be retained to work with appropriate design professionals, to explain relevant findings and to review the adequacy of plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE REPORT

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists, based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these would not be redrawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however, contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. Should this occur, delays and disputes, or unanticipated costs may result.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of sub-surface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations, such as contractors.

READ RESPONSIBILITY CLAUSES CLOSELY

An environmental site assessment is based extensively on judgement and opinion; therefore, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. In order to aid in prevention of this problem, model clauses have been developed for use in written transmittals. These are definitive clauses, designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment and you are encouraged to read them closely. Your consultant will be happy to give full and frank answers to any questions you may have.

GEOTECHNIQUE®
PTY LTD
ABN 64 002 841 063

ACLCA

Job No: 13188/4
Our Ref: 13188/4-AA
3 August 2015

Nix Anderson Pty Ltd
17 Chuter Street
MCMAHONS POINT NSW 2060
Email: robert.mcguinness@nxa.com.au

Attention: Mr R McGuinness

Dear Sir

re: **Proposed Redevelopment**
160 Burwood Road, Concord
Additional Contamination Assessment

Further to the contamination assessment report (Report 13188/1-AA dated 12 September 2014); this letter report presents the results of an additional contamination assessment (ACA) at locations (BH11 to BH16) as indicated on the Drawing No 13188/3-AA1. Field sampling was carried out in conjunction with additional geotechnical investigation. The additional geotechnical investigation report is being submitted separately.

The investigation was commissioned by Mr R Ewing of Propertylink Holdings Pty Ltd through a subcontract agreement and was carried out in general accordance with Geotechnique Pty Ltd proposal Q6614-AC dated 12 June 2015.

Proposed Development

We understand that Nix Anderson has been retained by Propertylink to assist in carrying out feasibility review of the above site to assess the development potential on behalf of the site owners – Freshfood Australia Holdings Pty Ltd. It is also understood that the existing Robert Timms Factory (Bushell's) will be relocated prior to development and the site will be developed as an Urban Regeneration Project – an integrated Residential Community.

As requested, assessment of soils in the area between the pathway and the seawall was conducted with recovery and analysis of soil samples from additional boreholes (BH11 to BH16) as nominated by the client.

The objective of the assessment was to ascertain whether the soils being assessed are likely to present a risk of harm to human health and the environment under the conditions for the proposed residential development.

SCOPE OF WORK

In order to achieve the objective of this report, the following scope of work was carried out:

- Site inspection.
- Additional soil sampling by a Geotechnical/Environmental Engineer from Geotechnique in conjunction with geotechnical investigation.

Lemko Place, Penrith NSW 2750 PO Box 880, Penrith NSW 2751
Telephone (02) 4722 2700 Facsimile (02) 4722 2777
e-mail: info@geotech.com.au www.geotech.com.au

- Chemical analysis by laboratories accredited by the National Association of Testing Authorities (NATA), in accordance with Chains of Custody (COC) prepared by Geotechnique.
- Assessment of field and laboratory Quality Assurance (QA) and Quality Control (QC).
- Assessment of the laboratory analytical results.
- Assessment of soil at the sampled borehole locations.

Regional Geology and Landscape

Reference to the Geological Map of Sydney (Herbert 1983) indicates that the bedrock at the site is likely to be Hawkesbury Sandstone, comprising medium grained quartz sandstone.

Reference to the Soil Landscape Map of Sydney (Chapman et al., 2004) indicates that the landscape at the site belongs to the Gymea Group, which is characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone. However, the site is likely to have been filled in the past to raise levels for development.

FIELD SAMPLING AND LABORATORY TESTING

An Environmental Engineer from Geotechnique was responsible for sampling and logging the sub-surface profile encountered during the field work on 9, 10 and 13 July 2015.

Reference should be made to the engineering borehole logs in Attachment A for detailed descriptions of the soil profile encountered during the field work. Generally, the samples did not have obvious asbestos sheets/pieces, odour, staining or discolouration that would indicate the potential for contamination.

The sampled borehole locations are indicated on the attached Drawing No 13188/3-AA1.

To prevent the potential loss of any volatile compounds, the recovered soil sample for laboratory analysis was immediately transferred into a labelled, laboratory supplied, 250ml glass jar and sealed with an airtight, Teflon screw top lid. The fully filled jar was then placed in a chilled container.

Samples were recovered using one-off nitrile gloves in order to avoid cross contamination between the sampling locations.

In order to ensure the analytical performance of the primary laboratory, duplicate and split samples were prepared and kept in labelled, laboratory supplied, glass jars (acid-washed and solvent-rinsed) sealed with airtight, Teflon screw top lids. The fully filled jars were placed in a chilled container.

The recovered fill sample for asbestos analysis was transferred into a small labelled, plastic bags. The small plastic bags were placed inside a large plastic bag.

At completion of field sampling the chilled container was transported to our Penrith office. All the jars and bottle were then transferred to a refrigerator where the temperature was maintained below 4 °C.

The chilled container with recovered samples was forwarded under Chain of Custody (COC) conditions to the primary laboratory SGS Environmental Services (SGS) and the secondary laboratory, Envirolab Services Pty Ltd (Envirolab), both NATA accredited.

On receipt of the samples the laboratories returned the Sample Receipt Advice verifying the integrity of all samples received.

Within the holding times detailed in Schedule B(3) of The *National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 (April 2013)* by the National Environment Protection Council (NEPC), the recovered soil samples were analysed for the following potential contaminants of concern:

- Metals, including, arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn).
- Total Recoverable Hydrocarbons (TRH).
- Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX).
- Organochlorine Pesticides (OCP).
- Polycyclic Aromatic Hydrocarbons (PAH).
- Polychlorinated Biphenyls (PCB).
- Cyanides.
- Phenols.
- Asbestos.

FIELD QUALITY ASSURANCE & QUALITY CONTROL (QA & QC)

The following QA/QC procedures were implemented for the sampling and analytical program.

Trip Spike Sample

Trip spike samples are obtained from the laboratory on a regular basis, prior to conducting field sampling where volatile substances are suspected. The samples are held at Geotechnique in the Penrith office, at less than 4 degrees Celsius, for a period of not more than seven days. During the fieldwork, the trip spike samples are kept in the chilled container with soil samples recovered from the site. The trip spike sample is then forwarded to the primary laboratory together with the soil samples recovered from the site.

The trip spike is prepared by the laboratory by adding a known amount of a pure petrol standard to a clean sand sample. The sample is mixed thoroughly to ensure a relatively homogenous distribution of the spike throughout the sample. When the sample is submitted for analysis, the same procedure is adopted for testing as the soil samples being analysed from the site.

The purpose of the trip spike is to detect any loss or potential loss of volatiles from the soil samples, during field work, transportation, sample extraction or testing.

A trip spike sample (TS1) was forwarded to the primary analytical laboratory with the samples collected from the site and tested for BTEX. The test results for the trip spike sample, reported as a percentage recovery of the applied and known spike concentrations, are shown in Table A.

As indicated in Table A, the results show a generally good recovery (ranging from 99% to 107%) of the spike concentrations.

Based on the above, it is considered that any loss of volatiles from the recovered samples that might have occurred would not affect the outcome / conclusions of this report.

Duplicate Sample

In order to ensure reliable analytical results from the laboratory, one duplicate soil sample was prepared from an original sample and submitted blind to the primary laboratory (SGS Environmental Services) for analysis. The test results for the duplicate sample were compared with the test results of the corresponding original sample and are summarised in the attached Table B. The duplicate frequency adopted complies with the NEPM, which recommends a duplicate frequency of at least 5% (achieved with 1 duplicate sample analysed from 20 samples analysed, i.e. 5%).

A comparison was made and the Relative Percentage Differences (RPD) was computed to assess the difference between the original and duplicate. RPD within 30% are generally considered acceptable. As indicated in Table B, the comparisons between the duplicate and corresponding original sample indicated generally acceptable RPD with the exceptions of higher RPDs for Chromium, lead, nickel and zinc, which were considered due to the heterogeneity of the samples recovered. The concentration of arsenic, copper, lead and nickel of the pairs of samples analysed were also well below the assessment criteria adopted, therefore, the variations are not considered significant and the test results provided by the primary laboratory are deemed reliable for this assessment.

Split Sample

Split samples provide a check on the analytical performance of the primary laboratory. One split sample was submitted for analysis to a secondary laboratory (Envirolab Services Pty Ltd). The split sample frequency adopted complies with the NEPM, which recommends a frequency of 5% (achieved with 1 split sample analysed from 20 samples analysed, i.e. 5%).

Based on Schedule B (3) of the NEPM, the difference in the results between the split samples should in general be within 30% of the mean concentration determined by both laboratories, i.e., RPD should be within 30%. However, this variation can be higher for organic analysis than for inorganics and for low concentrations of analytes. The test results are summarised in the attached Table C.

As indicated in Table C, the comparisons between the split and corresponding original samples indicated generally acceptable RPD with the exception for arsenic, copper, lead and nickel. Higher RPDs calculated for arsenic, copper, lead and nickel were considered due to heterogeneity of the samples analysed. The concentrations of arsenic, copper, lead and nickel for the pairs of samples analysed were also well below the assessment criteria adopted, therefore the variations are not considered significant and the test results provided by the primary laboratory are deemed reliable for this assessment.

LABORATORY QA & QC

Geotechnique uses only NATA accredited laboratories for chemical analyses. The laboratory must also incorporate quality laboratory management systems to ensure trained analysts using validated methods and suitably calibrated equipment in order to produce reliable results.

In addition to the quality control samples, the laboratory must also ensure that all analysts receive certification as to their competence in carrying out the analysis and participate in national and international proficiency studies. SGS and Envirolab are both accredited by NATA. The two laboratories also operate Quality Systems that are designed to comply with ISO/IEC 17025.

All reported laboratory limits of reporting (LOR) / practical quantitation limits (PQL) were less than the assessment criteria.

Nix Anderson Pty Ltd
DS.sf/03.08.2015

As part of the analytical run for the project, the laboratories included laboratory blanks, duplicate samples, laboratory control samples, matrix spikes and surrogate spikes.

We have checked the QA/QC procedures and results adopted by the laboratories against the appropriate guidelines. The quality control sample numbers adopted by SGS and Envirolab are considered adequate for the analyses undertaken and generally conform to recommendations provided in the National Environment Protection Measure (NEPM) 1999 (April 2013) "*Guideline on Laboratory Analysis of Potentially Contaminated Soils*".

Overall, the quality control elements adopted by SGS and Envirolab indicate the analytical data to fall within acceptable levels of accuracy and precision for the analysis of soils. The analytical data provided, is therefore considered to be reliable and useable for this assessment.

ASSESSMENT CRITERIA

Investigation levels and screening levels developed in the NEPM 2013 were used in this assessment, as follows:

- Risk-based Health Investigation Levels (HIL) for a broad range of metals and organic substances. The HIL are applicable for assessing human health risk via all relevant pathways of exposure. The HIL as listed in Table 1A (1) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" are provided for different land uses.

  The site is located within a parcel of industrial land, which will be developed into high density residential community. As such, with regard to human health, analytical results will be assessed against risk based HIL for *residential with minimal opportunities for soil access; including dwellings with fully and permanently paved yard space such as high-rise buildings and apartments* (HIL B).

- Health Screening Levels (HSL) for selected petroleum compounds, fractions and Naphthalene are applicable for assessing human health risk via inhalation and direct contact pathways. The HSL depend on specific soil physicochemical properties, land use scenarios and the characteristics of building structures. The HSL listed in Table 1A(3) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" apply to different soil types and depths below surface to >4 m.

  For this assessment, the analytical result was assessed against the available HSL for *with minimal opportunities for soil access; including dwellings with fully and permanently paved yard space such as high-rise buildings and apartments* (HSL B) for clay to depth of 0m to <1m and for sand to depth of 0m to <1m.

- Ecological Screening Levels (ESL) for selected petroleum hydrocarbon compounds, TPH fractions and Benzo(a)Pyrene are applicable for assessing the risk to terrestrial ecosystems. ESL listed in Table 1B(6) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" broadly apply to coarse and fine-grained soils and various land uses and are generally applicable to the top 2m of soil.

  The analytical results were assessed against the available ESL for *urban residential* for coarse and fine-grained soils.

- Ecological Investigation Levels (EIL), a specific type of Soil Quality Guidelines (SQG) for selected metals are applicable for assessing the risk to terrestrial ecosystems. EIL listed in Table 1B(1-5) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2m of soil. The EIL are calculated using 30% effect concentration (EC30) or lowest observed effect concentrations (LOEC) toxicity data. For arsenic and lead generic EIL for *urban residential* land use for aged contamination are adopted. For other metals, where available, EIL are calculated directly by using EIL calculator developed by CSIRO for NEPC.

  For this assessment the analytical results were assessed against the available SQG / EIL for *urban residential* land use for aged contamination in soil for low traffic volume.

- With regard to protection of the environment and impact on plant growth the available Provisional Phytotoxicity Based Investigation Levels (PIL) published in the *Guidelines for the NSW Site Auditor Scheme* (NSW EPA / DEC, 2006) and EIL published in the NEPM 1999 for cadmium and mercury are used.

For discrete soil samples, the individual concentrations of analytes, except Cd and Hg, were assessed against the HIL B / HSL B / ESL / EIL. The individual concentrations of Cd and Hg were assessed against the PIL and HIL B.

For asbestos, the assessed soil must not contain bonded ACM in excess of 0.01%w/w and surface soil within the site should be free of visible ACM, and friable asbestos in the soil should not exceed 0.001% w/w.

The soil will be deemed contaminated or containing contamination "hot spots" if the above criteria are unfulfilled. Further investigation, remediation and/or management will be recommended if the area of concern is found to be contaminated or contain contamination "hot spots".

LABORATORY TEST RESULTS, ASSESSMENT & DISCUSSION

Copies of the actual laboratory test results certificates from SGS are kept in the offices of Geotechnique and will be provided upon request. The test results are also presented in Tables D to H together with the available assessment criteria adopted. A discussion of the test data is presented in the following sub-sections.

Metals

The Metals test results for discrete selected soil samples are presented in Tables D1 and D2 and as shown, all concentrations of Metals were below the available relevant EIL, HIL B. All Cd and Hg concentrations were also below the relevant PIL.

TRH and BTEX

The TRH and BTEX test results for the discrete selected soil samples are presented in Table E. As shown in Table F the concentrations of F1 (TRH C6-C10 less BTEX), F2 (TRH >C10-C16 less Naphthalene), F3 (TRH >C16-C34), F4 (TRH >C34-C40) and BTEX were below the relevant HSL B and / or ESL adopted.

PAH

The PAH test results for the selected discrete soil samples are presented in Table F and as shown, all BaP, BaP TEQ, Naphthalene and Total PAH were below the relevant HIL B or ESL or HSL B or EIL adopted.

OCP
The OCP test results for selected discrete soil samples are presented in Table G and as indicated, OCP were well below the relevant HIL B. The concentrations of DDT were also below the EIL.

PCB
The PCB test results for the selected discrete soil samples are presented in Table G and as shown, the PCB concentrations were below the relevant HIL B adopted.

Phenols
The Phenols test results for the selected discrete soil samples are presented in Table G and as shown, the Phenols concentrations were well below the relevant HIL B adopted.

Cyanides
The Cyanides test results for the selected discrete soil samples are presented in Table G and as shown, the Cyanides concentrations were well below the relevant HIL B adopted.

Asbestos
The asbestos results for the selected discrete soil samples are presented in Table H and as shown, no friable asbestos was detected at the laboratory detection limit of 0.001%.

CONCLUSION AND RECOMMENDATIONS

Based on this assessment, it is considered that soil samples, recovered from boreholes BH11 to BH16 in conjunction with geotechnical investigation, are unlikely to pose a risk of harm to human health and the terrestrial environment and are environmentally suitable for the proposed development.

If suspect materials (identified by unusual staining, odour, discolouration or inclusions such as building rubble, asbestos sheets / pieces, ash material, etc) are encountered during the construction stage, we recommend that this office is contacted for assessment and necessary action.

LIMITATIONS

Within the stated scope of work, the services performed by Geotechnique in preparation of this report were conducted in a manner consistent with the level of quality and skill generally exercised by members of the profession and consulting practice.

This report has been prepared for Nix Anderson Pty Ltd for the purpose stated within. Any reliance on this report by other parties shall be at such parties' sole risk as the report might not contain sufficient information for other purposes.

This report shall only be presented in full and may not be used to support any other objective than those set out in the report, except where written approval is provided by Geotechnique.

The information in this report is considered accurate at completion of field sampling (13 July 2015) and in accordance with current site conditions. Any variations to the site form or use beyond this date might nullify the conclusions stated.

No contamination assessment can eliminate all risk; even a rigorous professional assessment might not detect all contamination within the investigated locations.

Reference should be made to the attached "Environmental Notes" for details of the limitations of this assessment.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

DANDA SAPKOTA
Senior Environmental Engineer

Attached	Attachment A	Drawing No 13188/3-AA1 (Borehole Locations)
	Attachment B	Engineering Borehole Logs
	Attachment C	Laboratory Analytical Results Summary Tables (Tables A to H)
	Attachment D	Environmental Notes

LIST OF REFERENCES

Chapman et al. 2004, *Soil Landscape Series Sheet 9030, Scale 1:100,000 (Sydney)*, Soil Conservation Service of NSW, Sydney.

Contaminated Land Management Act

Herbert C 1983, *Geological Series Sheet 9130, Scale 1:100,000 (Sydney)*, Department of Minerals and Energy, NSW, Sydney.

NEPM 1999 (April 2013), *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*, National Environmental Protection Council (NEPC), Australia.

Nix Anderson Pty Ltd
DS.sf/03.08.2015

ATTACHMENT A

Imagery ©2014 NearMap.com

GEOTECHNIQUE® PTY LTD

PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700
Fax: 02 4722 2777
e-mail: info@geotech.com.au
www.geotech.com.au

NOTES

1. Site features are indicative and are not to scale.
2. This drawing has been produced using a base plan provided by others to which additional information e.g test pits, borehole locations or notes have been added. Some or all of the plan may not be relevant at the time of producing this drawing

Nix Management Pty Ltd
Proposed Development
Robert Timms Factory Site (Bushell's)
160 Burwood Road, Concord

Borehole Locations

Drawing No: 13188/3-AA1
Job No: 13188/3
Drawn By: MH
Date: 30 July 2015
Checked By: ZA

File No: 13188-3
Layers: 0, AA1

ATTACHMENT B

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/3
Borehole No. : 11
Date : 09/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted
slope : **deg.**
R.L. surface : ≃3.5
hole diameter : 125 **mm**
bearing : **deg.**
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			ASPHALT PAVEMENT				
									FILL: Sandy Gravel, course grained, brown				
		GP			N=12 9,7,5				FILL: Sandy Gravel, coarse grained, yellow				
						1			FILL: Silty Sandy Clay, medium plasticity, red brown				
		GP			N=5 3,2,3								
						2							
		GP											
					N=5 3,2,3	3							
		GP											
	▼	G				4		SM	Silty SAND, fine to medium grained, brown to red, with some ironstone	W	D		Groundwater at 4.0m
					N=40 11,20,20				SANDSTONE, grey-brown, low to medium strength, extremely weathered				Bedrock
						5			Refer to Cored Borehole				
						6							
						7							
						8							
						9							

form no. 002 version 04 - 05/11

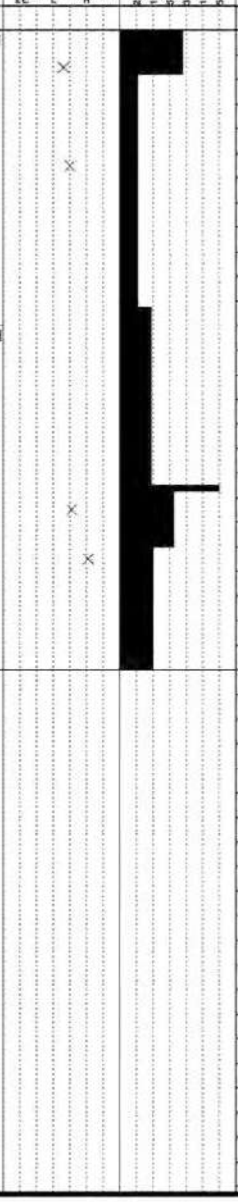
GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/3
Borehole No. : 11
Date : 09/07/2015
Logged/Checked by : MT

drill model and mounting : Utility Mounted
slope : deg.
R.L. surface : ≅3.5
core size: NMLC
bearing : deg.
datum : AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_S(50)$ EL VL L M H VH	defect spacing (mm) 2000 1000 500 300 100 50	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific General
				Coring Commenced at 5.0m					
		5		SANDSTONE, fine to coarse grained, grey to red-brown	DW-SW	L-M			
		7.5		SANDSTONE, fine to coarse grained, grey-brown	DW-SW	M-H			
		10.2		Borehole No. 11 terminated at 10.2m					

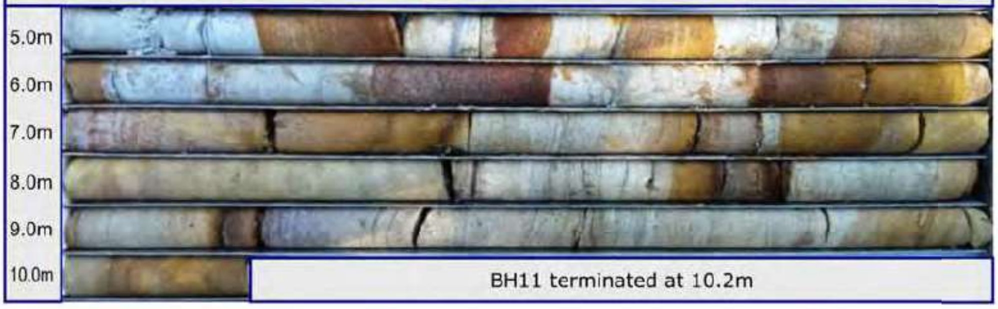


form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

GEOTECHNIQUE
PTY LTD

Job No 13188/3 BH11 Started Coring at 5m



Nix Anderson Pty Ltd
MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/3
Borehole No. : 12
Date : 09/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** deg. **R.L. surface :** ≃3.4
hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			TOPSOIL: Sandy Silt, low plasticity, dark brown, with some roots				
					N=7 3,3,4				FILL: Silty Clayey Sand, fine to coarse grained, with some gravel				
		GP							FILL: Silty Clay, medium plasticity, grey, with some gravel				
						1							
	▼	GP			N=8 4,3,5								Groundwater at 1.8m
						2							
		GP											
					N=5 1,2,3	3							
		GP											
		G				4		SC-SM	Silty Clayey SAND, fine to medium grained, black to dark brown, with some shell fragments	W			
					N=2 1,1,1			CI	Silty Sandy CLAY, medium plasticity, red to brown	M>PL	L		
						5							
					N=10 3,5,5	6							
						7							Becoming harder to drill
					N=R 12,16/ 100			SC-SM	Silty Clayey SAND, fine to coarse grained, grey-brown to red	W	MD		
									SANDSTONE, grey to red-brown, extremely weathered, low strength				Bedrock
						8							
						9							

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/3
Borehole No. : 12
Date : 09/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted
slope : deg.
R.L. surface : ≃3.4
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
									Borehole No. 12 terminated at 9.7m due to TC-Bit refusal				
						10							
						11							
						12							
						13							
						14							
						15							
						16							
						17							
						18							
						19							

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/3
Borehole No. : 13
Date : 10/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted
slope : **deg.**
R.L. surface : ≃3.4
hole diameter : 125 **mm**
bearing : **deg.**
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			TOPSOIL: Silty Sand, fine to medium grained, dark brown, with some grass roots				
									FILL: Silty Clay, medium plasticity, brown-orange, with some gravel				
		GP			N=12 4,7,5								
						1							
									FILL: Silty Clay, medium plasticity, brown-grey				
		GP			N=6 3,3,3								
						2							
	▼	GP						SC-SM	Silty Clayey SAND, fine to medium grained, yellow, with some sandstone gravel	W	MD		Groundwater at 2.5m
						3							
					N=8 3,4,4								
								SM	Silty SAND, fine to coarse grained, grey	W	D		
						4							
					N=R 5,8,20/50								
									SANDSTONE, fine to coarse grained, grey-brown to yellow, extremely weathered, low strength				Bedrock
						5							
									Refer to Cored Borehole				
						6							
						7							
						8							
						9							

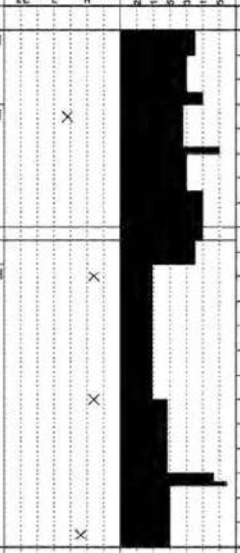
form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/3
Borehole No. : 13
Date : 10/07/2015
Logged/Checked by : MT

drill model and mounting : Utility Mounted
core size: NMLC
slope : deg.
bearing : deg.
R.L. surface : ≅3.4
datum : AHD



barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
				Coring Commenced at 5.8m				
		6		SANDSTONE, fine to coarse grained, brown to red-grey	DW	L-M		
				SANDSTONE, fine to coarse grained, grey to red-brown	DW	L-M		
		7						
				CORE LOSS: 7.4-7.5m			Core loss 100mm	
				SANDSTONE, fine to coarse grained, grey to red-brown	DW	M		
		8		SANDSTONE, fine to coarse grained, brown to grey	DW-SW	M-H		
		9						
		10		Borehole No. 13 terminated at 10.0m				
		11						
		12						
		13						
		14						
		15						

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

Job No 13188/3 BH13 Started Coring at 5.8m

BH13 terminated at 10.0m

Nix Anderson Pty Ltd
MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/3
Borehole No. : 14
Date : 10/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted
slope : deg.
R.L. surface : ≃3.2
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0			TOPSOIL: Silty Sand, fine to medium grained, brown, with some grass roots				
		GP			N=6 1,2,4				FILL: Silty Clay, medium plasticity, grey-brown				
		GP GP			N=20 11,15,5	1			FILL: Silty Sand, fine to medium grained, brown, with trace of iron shards				
	▼					2			Silty SAND, fine to medium grained, grey-brown				
					N=9 10,5,4	3		SM	Silty SAND, fine to coarse grained, grey-brown	W	MD		Groundwater at 3.0m
						4			Silty SAND, fine to medium grained, grey	W	MD		
					N=13 3,5,8	5		SC-SM	Silty Clayey SAND, fine to coarse grained, red-brown	W	MD		
					N=23 5,11,12	6		SM	Silty SAND, fine to coarse grained, red- brown, with some sandstone fragments	W	MD		
						7			SANDSTONE, red-brown to grey, extremely weathered, low strength				Bedrock
					N=R 25/50	8 9			SANDSTONE, grey to red, distinctly weathered, low to medium strength				

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/3
Borehole No. : 14
Date : 10/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** deg. **R.L. surface :** ≃3.2
hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						10			Borehole No. 14 terminated at 10.0m				
						11							
						12							
						13							
						14							
						15							
						16							
						17							
						18							
						19							

form no. 002 version 04 - 05/11

GEOTECHNIQUE PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 15
Date : 13/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted
slope : deg.
R.L. surface : ≃3.2
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			TOPSOIL: Silty Sand, fine to medium grained, brown, with some grass				
		GP			N=R 3,5,25/50				FILL: Silty Sandy Clay, medium plasticity, brown				
						1							
									Borehole No. 15 terminated at 1.3m due to refusal in possible sandstone boulder				
						2							
						3							
						4							
						5							
						6							
						7							
						8							
						9							

form no. 002 version 04 - 05/11

GEOTECHNIQUE PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 16
Date : 13/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** deg. **R.L. surface :** ≃3.2
hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0	░		TOPSOIL: Silty Sand, fine to medium grained, brown, with grass roots				
		GP			N=10 3,6,4		▨		FILL: Silty Clay, medium plasticity, grey-brown				
		GP			N=12 3,4,8	1	▨		FILL: Silty Sand, fine to coarse grained, brown, with some gravel				
					N=R 25/50	3	▨		FILL: Silty Sand, fine grained, brown, with some boulders				
						6	░	SM	Silty SAND, fine to medium grained, dark brown, with some shell fragments	W			
									Refer to Cored Borehole				

form no. 002 version 04 - 05/11

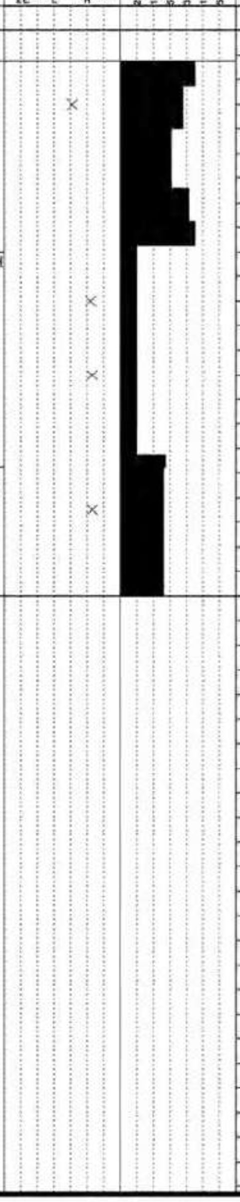
GEOTECHNIQUE PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/3
Borehole No. : 16
Date : 13/07/2015
Logged/Checked by : MT

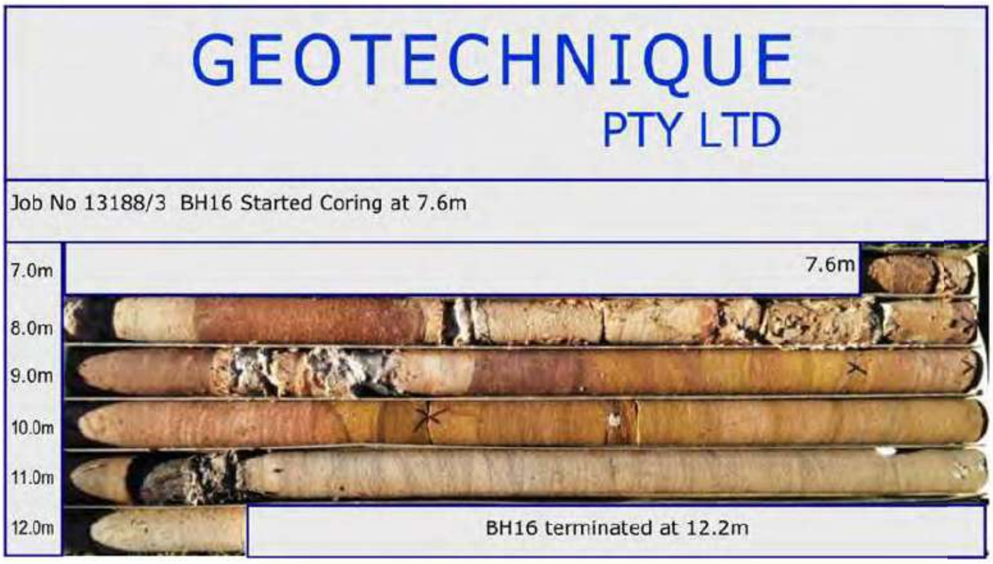
drill model and mounting : Utility Mounted
slope : deg.
R.L. surface : ≅3.2
core size: NMLC
bearing : deg.
datum : AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
				Coring Commenced at 7.6m				
				CORE LOSS: 7.6-7.85m			Core loss 250mm	
		8		SANDSTONE, fine to coarse grained, red-brown, grey	DW-SW	M		
		9.4		SANDSTONE, fine to coarse grained, red-brown	DW-SW	M-H		
		11.2		SANDSTONE, fine to coarse grained, grey	SW-FR	H-VH		
		12.2		Borehole No. 16 terminated at 12.2m				



form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD



Nix Anderson Pty Ltd
MT.mh/04.09.2014

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
■	Pavement (Bitumen, Concrete Slab, etc)
▩	Fill
░	Silty Sand
▦	Sandstone
✓	Topsoil
▨	Silty Clayey Sand
▨	Silty Sandy Clay medium plasticity
Misc. Symbols	
▼	Groundwater
Descriptions of various line types (solid, dotted, etc.)	
___	Profile change
_ _	Gradual profile change

Notes:

1. Exploratory borings were drilled between 13/07/2015 and 13/07/2015 using a 50, 100 and 125mm diameter continuous flight power auger.

2. These logs are subject to the limitations, conclusions and recommendations in this report.

3. Results of tests conducted on samples recovered are reported on the logs.

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
▦	Sandstone
□	Core Loss
Misc. Symbols	
×	Point Load Strength
Descriptions of various line types (solid, dotted, etc.)	
____	Profile change
— —	Gradual profile change

Notes:

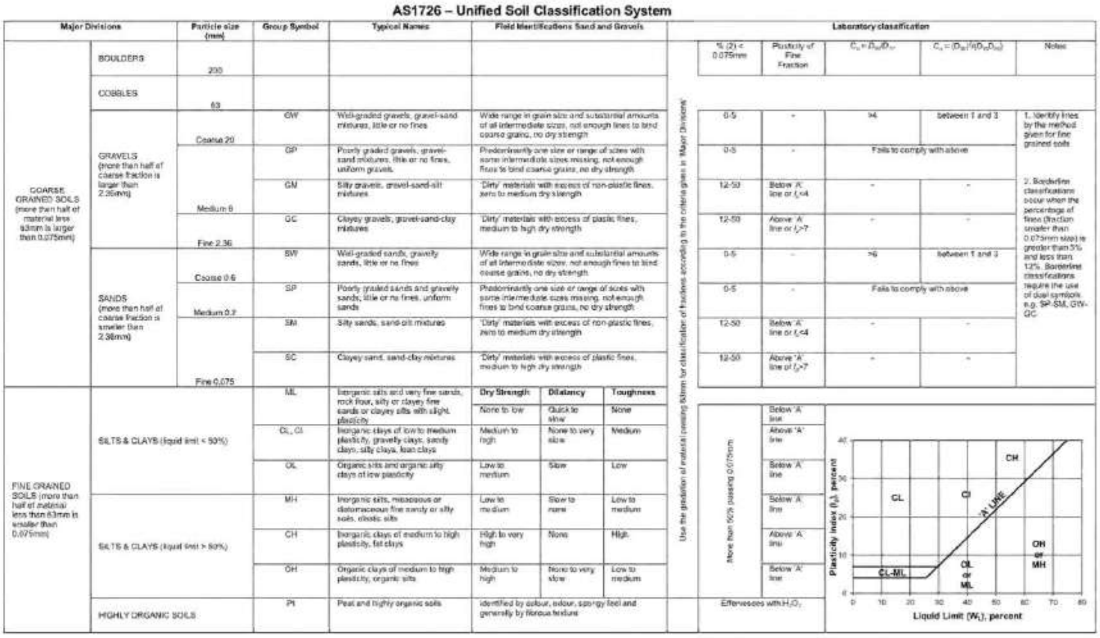
1. Exploratory borings were drilled between 13/07/2015 and 13/07/2015 using a 50, 100 and 125mm diameter continuous flight power auger.
2. These logs are subject to the limitations, conclusions and recommendations in this report.
3. Results of tests conducted on samples recovered are reported on the logs.

GEOTECHNIQUE PTY LTD

Log Symbols & Abbreviations (Non-cored Borehole Log)

Log Column	**Symbol/Value**	**Description**
Drilling Method	V-bit	Hardened steel 'V' shaped bit attached to auger
	TC-bit	Tungsten Carbide bit attached to auger
	RR	Tricone (Rock Roller) bit
	DB	Drag bit
	BB	Blade bit
Groundwater	Dry	Groundwater not encountered to the drilled or auger refusal depth
	▼	Groundwater level at depths shown on log
	►	Groundwater seepage at depths shown on log
Environment Sample	GP	Glass bottle and plastic bag sample over depths shown on log
	G	Glass bottle sample over depths shown on log
	P	Plastic bag sample over depths shown on log
PID Reading	100	PID reading in ppm
Geotechnical Sample	DS	Disturbed Small bag sample over depths shown on log
	DB	Disturbed Bulk sample over depths shown on log
	U_{50}	Undisturbed 50mm tube sample over depths shown on log
Field Test	N=10 3,5,5	Standard Penetration Test (SPT) 'N' value. Individual numbers indicate blows per 150mm penetration.
	N=R 10,15/100	'R' represents refusal to penetration in hard/very dense soils or in cobbles or boulders. The first number represents10 blows for 150mm penetration whereas the second number represents 15 blows for 100mm penetration where SPT met refusal
	DCP/PSP 5 6 R/10	Dynamic Cone Penetration (DCP) or Perth Sand Penetrometer (PSP). Each number represents blows per 100mm penetration. 'R/10' represents refusal after 10mm penetration in hard/very dense soils or in gravels or boulders.
Classification	GP	Poorly Graded GRAVEL
	GW	Well graded GRAVEL
	GM	Silty GRAVEL
	GC	Clayey GRAVEL
	SP	Poorly graded SAND
	SW	Well graded SAND
	SM	Silty SAND
	SC	Clayey SAND
	ML	SILT / Sandy SILT / clayey SILT, low plasticity
	MI	SILT / Sandy SILT / clayey SILT, medium plasticity
	MH	SILT / Sandy SILT / clayey SILT, high plasticity
	CL	CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, low plasticity
	CI	CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, medium plasticity
	CH	CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, high plasticity
Moisture Condition Cohesive soils	M<PL	Moisture content less than Plastic Limit
	M=PL	Moisture content equal to Plastic Limit
	M>PL	Moisture content to be greater than Plastic Limit
Cohesionless soils	D	Dry - Runs freely through hand
	M	Moist - Tends to cohere
	W	Wet - Tends to cohere
Consistency Cohesive soils		Term / Undrained shear strength, C_u (kPa) / Hand Penetrometer (Qu)
	VS	Very Soft / ≤12 / <25
	S	Soft / >12 ≤25 / 25 – 50
	F	Firm / >25 ≤50 / 50 – 100
	St	Stiff / >50 ≤100 / 100 – 200
	VSt	Very Stiff / >100 ≤200 / 200 – 400
	H	Hard / >200 / >400
Density Index Cohesionless soils		Term / Density Index, I_D (%) / SPT 'N' (blows/300mm)
	VL	Very Loose / ≤15 / ≤5
	L	Loose / >15 ≤35 / >5 ≤10
	M	Medium Dense / >35 ≤65 / >10 ≤30
	D	Dense / >65 ≤85 / >30 ≤50
	VD	Very Dense / >85 / >50
Hand Penetrometer	100 200	Unconfined compressive strength (q_u) in kPa determined using pocket penetrometer, at depths shown on log
Remarks		Geological origin of soils
	Residual	Residual soils above bedrock
	Alluvium	River deposited Alluvial soils
	Colluvial	Gravity deposited Colluvial soils
	Aeolian	Wind deposited Aeolian soils
	Marine	Marine Soils

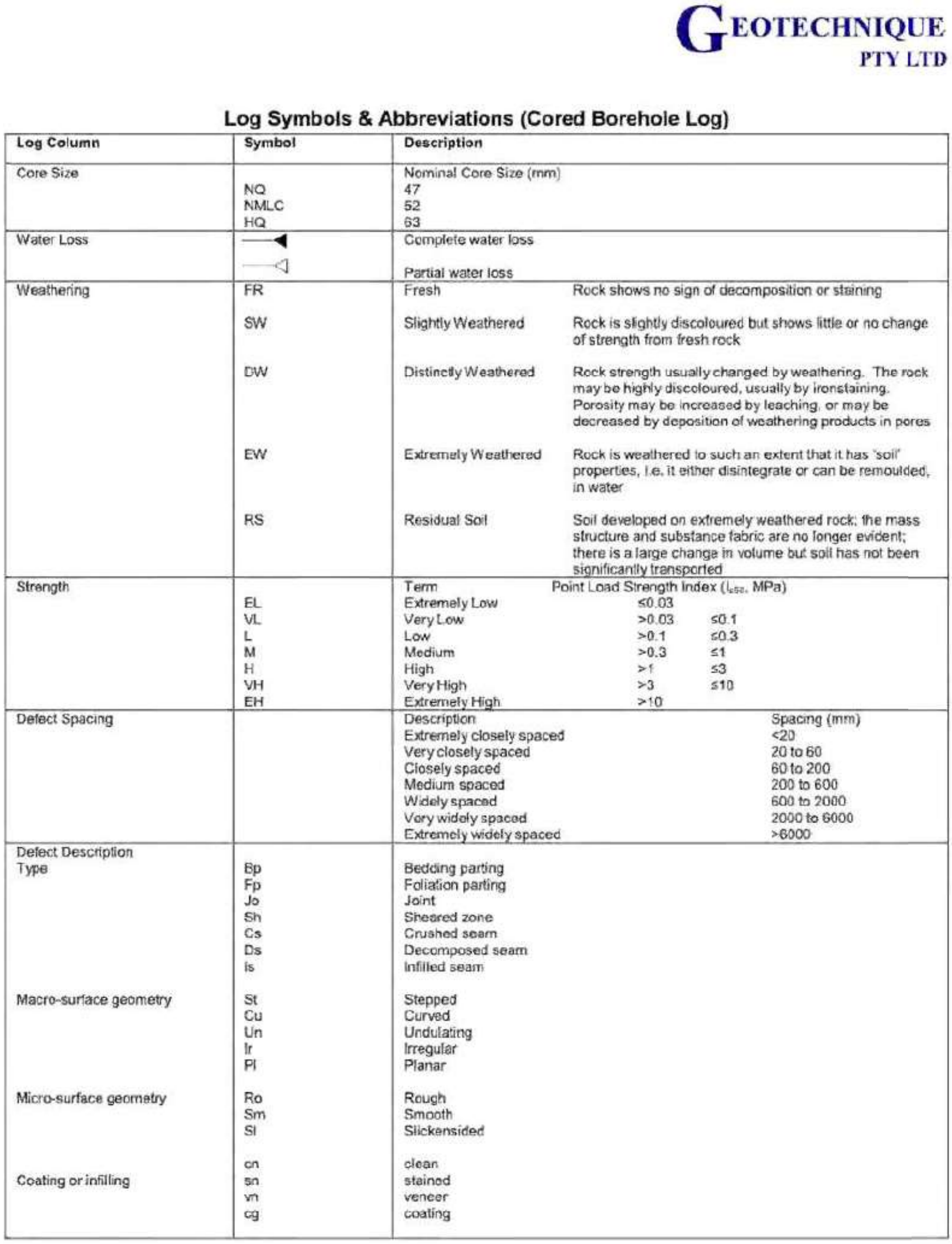
GEOTECHNIQUE
PTY LTD



AS1726 – Unified Soil Classification System

Major Divisions		Particle size (mm)	Group Symbol	Typical Names	Field Identifications Sand and Gravels			Laboratory classification				
								% (2) < 0.075mm	Plasticity of Fine Fraction	$C_u = D_{60}/D_{10}$	$C_c = (D_{30})^2/(D_{10}D_{60})$	Notes
COARSE GRAINED SOILS (more than half of material less 63mm is larger than 0.075mm)	BOULDERS	200										
	COBBLES	63										
	GRAVELS (more than half of coarse fraction is larger than 2.36mm)	Coarse 20	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength			0-5	-	>4	between 1 and 3	1. Identify fines by the method given for fine grained soils
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength			0-5	-	Fails to comply with above		
		Medium 6	GM	Silty gravels, gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength			12-50	Below 'A' line or I_p<4	-	-	2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.075mm size) is greater than 5% and less than 12%. Borderline classifications require the use of dual symbols e.g. SP-SM, GW-GC
		Fine 2.36	GC	Clayey gravels, gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength			12-50	Above 'A' line or I_p>7	-	-	
	SANDS (more than half of coarse fraction is smaller than 2.36mm)	Coarse 0.6	SW	Well-graded sands, gravelly sands, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength			0-5	-	>6	between 1 and 3	
		Medium 0.2	SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength			0-5	-	Fails to comply with above		
			SM	Silty sands, sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength			12-50	Below 'A' line or I_p<4	-	-	
		Fine 0.075	SC	Clayey sand, sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength			12-50	Above 'A' line of I_p>7	-	-	
					Dry Strength	**Dilatancy**	**Toughness**					
FINE GRAINED SOILS (more than half of material less than 63mm is smaller than 0.075mm)	SILTS & CLAYS (liquid limit < 50%)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	None to low	Quick to slow	None	More than 50% passing 0.075mm	Below 'A' line			
			CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Medium to high	None to very slow	Medium		Above 'A' line			
			OL	Organic silts and organic silty clays of low plasticity	Low to medium	Slow	Low		Below 'A' line			
	SILTS & CLAYS (liquid limit > 50%)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	Low to medium	Slow to none	Low to medium		Below 'A' line			
			CH	Inorganic clays of medium to high plasticity, fat clays	High to very high	None	High		Above 'A' line			
			OH	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Low to medium		Below 'A' line			
	HIGHLY ORGANIC SOILS		Pt	Peat and highly organic soils	Identified by colour, odour, spongy feel and generally by fibrous texture			Effervesces with H_2O_2				

Use the gradation of material passing 63mm for classification of fractions according to the criteria given in 'Major Divisions'



GEOTECHNIQUE PTY LTD

Log Symbols & Abbreviations (Cored Borehole Log)

Log Column	Symbol	Description		
Core Size		Nominal Core Size (mm)		
	NQ	47		
	NMLC	52		
	HQ	63		
Water Loss	—◀	Complete water loss		
	···◁	Partial water loss		
Weathering	FR	Fresh	Rock shows no sign of decomposition or staining	
	SW	Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	
	DW	Distinctly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased by deposition of weathering products in pores	
	EW	Extremely Weathered	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrate or can be remoulded, in water	
	RS	Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but soil has not been significantly transported	
Strength		Term	Point Load Strength Index (I_{s50}, MPa)	
	EL	Extremely Low	≤0.03	
	VL	Very Low	>0.03	≤0.1
	L	Low	>0.1	≤0.3
	M	Medium	>0.3	≤1
	H	High	>1	≤3
	VH	Very High	>3	≤10
	EH	Extremely High	>10	
Defect Spacing		Description	Spacing (mm)	
		Extremely closely spaced	<20	
		Very closely spaced	20 to 60	
		Closely spaced	60 to 200	
		Medium spaced	200 to 600	
		Widely spaced	600 to 2000	
		Very widely spaced	2000 to 6000	
		Extremely widely spaced	>6000	
Defect Description Type	Bp	Bedding parting		
	Fp	Foliation parting		
	Jo	Joint		
	Sh	Sheared zone		
	Cs	Crushed seam		
	Ds	Decomposed seam		
	Is	Infilled seam		
Macro-surface geometry	St	Stepped		
	Cu	Curved		
	Un	Undulating		
	Ir	Irregular		
	Pl	Planar		
Micro-surface geometry	Ro	Rough		
	Sm	Smooth		
	Sl	Slickensided		
	cn	clean		
Coating or infilling	sn	stained		
	vn	veneer		
	cg	coating		

AS1726 – Identification of Sedimentary Rocks for Engineering Purposes

<table>
<tr><td colspan="2">Grain Size mm</td><td colspan="10">Bedded rocks (mostly sedimentary)</td></tr>
<tr><td rowspan="3">More than 20</td><td>20</td><td colspan="2">Grain Size Description</td><td colspan="2" rowspan="3">CONGLOMERATE
Rounded boulders, cobbles and gravel cemented in a finer matrix

Breccia
Irregular rock fragments in a finer matrix</td><td colspan="4">At least 50% of grains are of carbonate</td><td>At least 50% of grains are of fine-grained volcanic rock</td><td></td></tr>
<tr><td>6</td><td colspan="2" rowspan="2">RUDACEOUS</td><td colspan="2" rowspan="5">LIMESTONE and DOLOMITE (undifferentiated)</td><td colspan="2" rowspan="2">Calcirudite</td><td rowspan="2">Fragments of volcanic ejecta in a finer matrix

Rounded grains
AGGLOMERATE
Angular grains
VOLCANIC BRECCIA</td><td rowspan="2">SALINE ROCKS

Halite

Anhydrite</td></tr>
<tr><td>2</td></tr>
<tr><td rowspan="3"></td><td>0.6</td><td rowspan="3">ARENACEOUS</td><td>Coarse</td><td colspan="2" rowspan="3">SANDSTONE
Angular or rounded grains, commonly cemented by clay, calcite or iron minerals

Quartzite
Quartz grains and siliceous cement

Arkose
Many feldspar grains
Greywacke
Many rock chips</td><td colspan="2" rowspan="3">Calcarenite</td><td rowspan="3">Cemented volcanic ash

TUFF</td><td rowspan="3">Gypsum</td></tr>
<tr><td>0.2</td><td>Medium</td></tr>
<tr><td>0.06</td><td>Fine</td></tr>
<tr><td rowspan="2"></td><td>0.002</td><td colspan="2" rowspan="2">ARGILLACEOUS</td><td rowspan="2">MUDSTONE

SHALE
Fissile</td><td>SILTSTONE
Mostly silt</td><td rowspan="2">Calcareous Mudstone</td><td rowspan="2"></td><td>Calcisiltite</td><td rowspan="2">CHALK</td><td>Fine-grained TUFF</td><td rowspan="2"></td></tr>
<tr><td>Less than 0.002</td><td>CLAYSTONE
Mostly clay</td><td>Calcilutite</td><td>Very fine-grained TUFF</td></tr>
<tr><td colspan="2">Amorphous or crypto-crystalline</td><td colspan="2"></td><td colspan="6">Flint: occurs as bands of nodules in the chalk
Chert: occurs as nodules and beds in limestone and calcareous sandstone</td><td></td><td>COAL
LIGNITE</td></tr>
<tr><td colspan="2" rowspan="3"></td><td colspan="2" rowspan="2"></td><td colspan="8">Granular cemented – except amorphous rocks</td></tr>
<tr><td colspan="2">SILICEOUS</td><td colspan="4">CALCAREOUS</td><td>SILICEOUS</td><td>CARBONACEOUS</td></tr>
<tr><td colspan="2"></td><td colspan="8">SEDIMENTARY ROCKS
Granular cemented rocks vary greatly in strength, some sandstones are stronger than many igneous rocks. Bedding may not show in hand specimens and is best seen in outcrop. Only sedimentary rocks, and some metamorphic rocks derived from them, contain fossils

Calcareous rocks contain calcite (calcium carbonate) which effervesces with dilute hydrochloric acid</td></tr>
</table>

AS1726 – Identification of Metamorphic and Igneous Rocks for Engineering Purposes

<table>
<tr><td colspan="2">Obviously foliated rocks (mostly metamorphic)</td><td colspan="6">Rocks with massive structure and crystalline texture (mostly igneous)</td><td>Grain size (mm)</td></tr>
<tr><td>Grain size description</td><td rowspan="3">GNEISS
Well developed but often widely spaced foliation sometimes with schistose bands

Migmatite
Irregularly foliated: mixed schists and gneisses</td><td rowspan="8">MARBLE

QUARTZITE

Granulite

HORNFELS

Amphibolite

Serpentine</td><td>Grain size description</td><td colspan="2">Pegmatite</td><td rowspan="3">GABBRO</td><td>Pyroxenite</td><td>More than 20

20</td></tr>
<tr><td rowspan="2">COARSE</td><td rowspan="2">COARSE</td><td>GRANITE</td><td>Diorite</td><td rowspan="2">Peridotite</td><td>6</td></tr>
<tr><td colspan="2">These rocks are sometimes phorphyritic and are then described, for example, as porphyritic granite</td><td>2</td></tr>
<tr><td rowspan="3">MEDIUM</td><td rowspan="3">SCHIST
Well developed undulose foliation; generally much mica</td><td rowspan="3">MEDIUM</td><td>Micorgranite</td><td>Microdiorite</td><td rowspan="3">Dolerite</td><td rowspan="3"></td><td>0.6</td></tr>
<tr><td colspan="2" rowspan="2">These rocks are sometimes phorphyritic and are then described as porphyries</td><td>0.2</td></tr>
<tr><td>0.06</td></tr>
<tr><td rowspan="2">FINE</td><td>PHYLLITE
Slightly undulose foliation; sometimes 'spotted'</td><td rowspan="2">FINE</td><td>RHYOLITE</td><td>ANDESITE</td><td rowspan="2">BASALT</td><td rowspan="2"></td><td>0.002</td></tr>
<tr><td>SLATE
Well developed plane cleavage (foliation)</td><td colspan="2">These rocks are sometimes phorphyritic and are then described as porphyries</td><td>Less than 0.002</td></tr>
<tr><td></td><td>Mylonite
Found in fault zones, mainly in igneous and metamorphic areas</td><td></td><td></td><td>Obsidian</td><td colspan="2">Volcanic glass</td><td></td><td>Amorphous or cryptocrystalline</td></tr>
<tr><td colspan="3">CRYSTALLINE</td><td></td><td colspan="4">Pale<——————————————>Dark</td><td></td></tr>
<tr><td colspan="2">SILICEOUS</td><td>Mainly SILICEOUS</td><td></td><td>ACID
Much quartz</td><td>INTERMEDIATE
Some quartz</td><td>BASIC
Little or no quartz</td><td>ULTRA BASIC</td><td></td></tr>
<tr><td colspan="3">METAMORPHIC ROCKS
Most metamorphic rocks are distinguished by foliation which may impart fissility. Foliation in gneisses is best observed in outcrop. Non-foliated metamorphics are difficult to recognize except by association. Any rock baked by contact metamorphism is described as 'hornfels' and is generally somewhat stronger than the parent rock

Most fresh metamorphic rocks are strong although perhaps fissile</td><td colspan="5">IGNEOUS ROCKS
Composed of closely interlocking mineral grains. Strong when fresh; not porous

Mode of occurrence : 1 Batholith; 2 Laccoliths; 3 Sills; 4 Dykes; 5 Lava Flows; 6 Veins</td><td></td></tr>
</table>

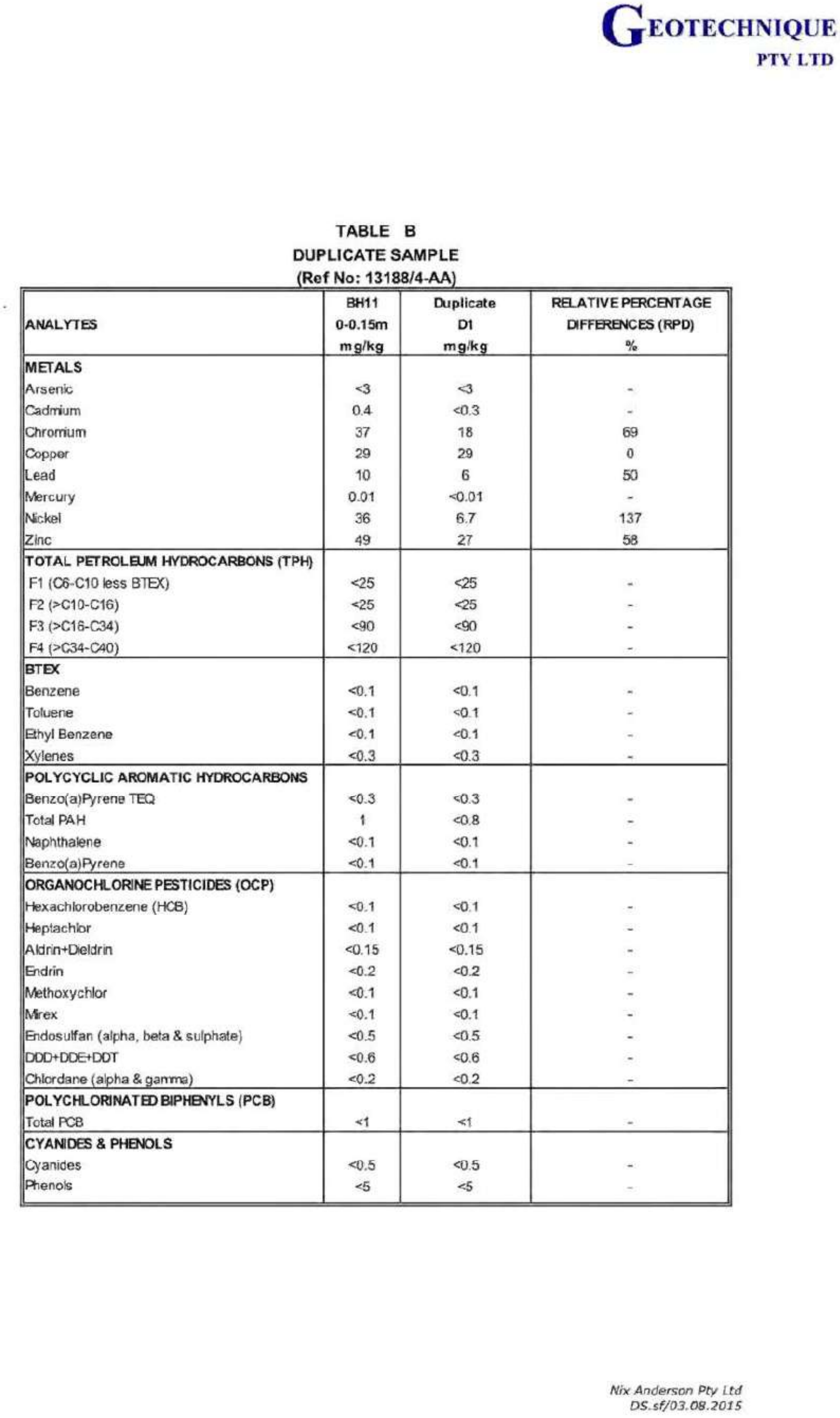
ATTACHMENT C

TABLE A
TRIP SPIKE SAMPLE
(Ref No: 13188/4-AA)

ANALYTES	Trip Spike TS1
BTEX	
Benzene	100%
Toluene	107%
Ethyl Benzene	99%
Xylenes	100%

Note : results are reported as percentage recovery of known spike concentrations

Nix Anderson Pty Ltd
DS.sf/03.08.2015

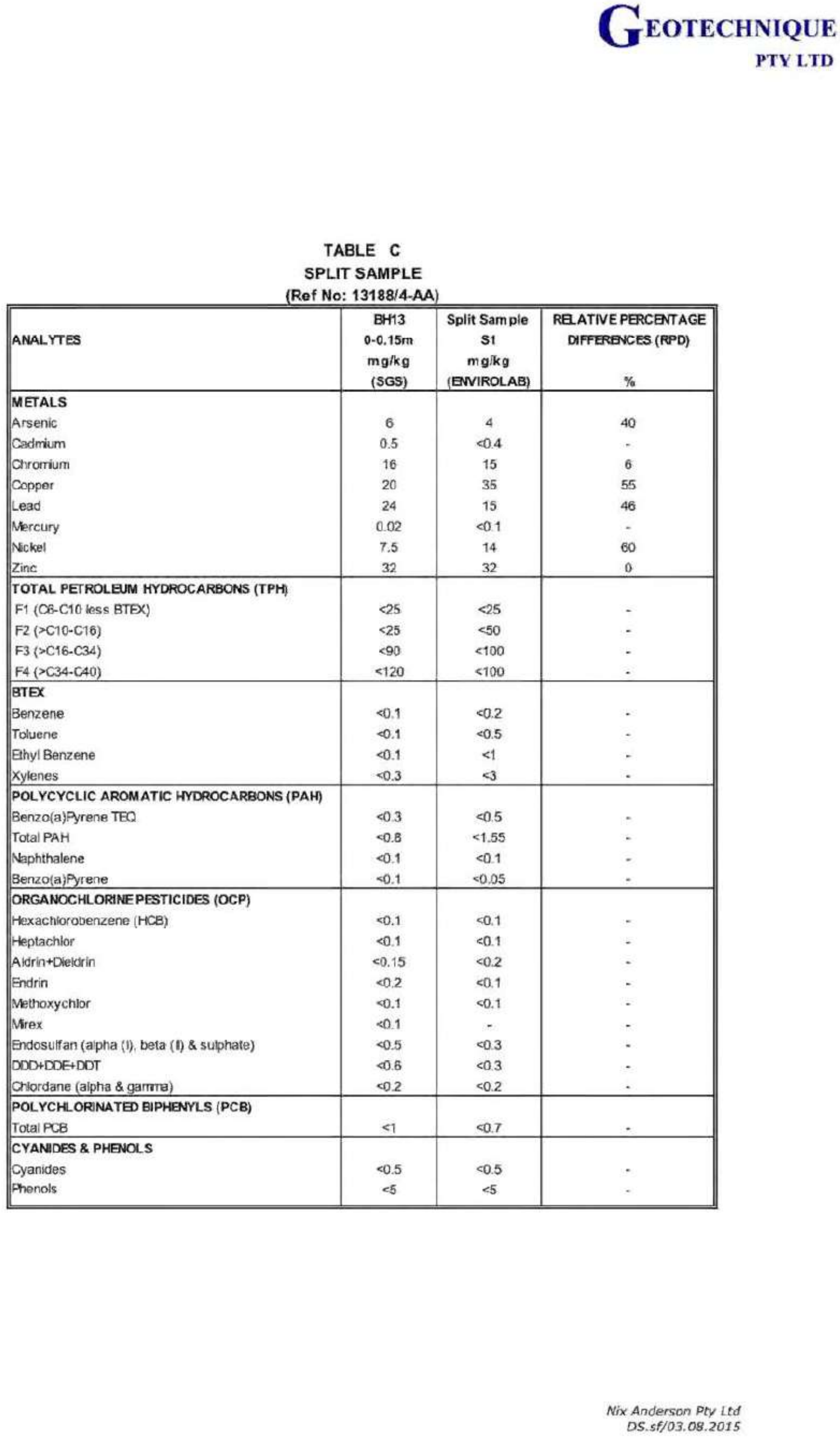


GEOTECHNIQUE
PTY LTD

TABLE B
DUPLICATE SAMPLE
(Ref No: 13188/4-AA)

ANALYTES	BH11 0-0.15m mg/kg	Duplicate D1 mg/kg	RELATIVE PERCENTAGE DIFFERENCES (RPD) %
METALS			
Arsenic	<3	<3	-
Cadmium	0.4	<0.3	-
Chromium	37	18	69
Copper	29	29	0
Lead	10	6	50
Mercury	0.01	<0.01	-
Nickel	36	6.7	137
Zinc	49	27	58
TOTAL PETROLEUM HYDROCARBONS (TPH)			
F1 (C6-C10 less BTEX)	<25	<25	-
F2 (>C10-C16)	<25	<25	-
F3 (>C16-C34)	<90	<90	-
F4 (>C34-C40)	<120	<120	-
BTEX			
Benzene	<0.1	<0.1	-
Toluene	<0.1	<0.1	-
Ethyl Benzene	<0.1	<0.1	-
Xylenes	<0.3	<0.3	-
POLYCYCLIC AROMATIC HYDROCARBONS			
Benzo(a)Pyrene TEQ	<0.3	<0.3	-
Total PAH	1	<0.8	-
Naphthalene	<0.1	<0.1	-
Benzo(a)Pyrene	<0.1	<0.1	-
ORGANOCHLORINE PESTICIDES (OCP)			
Hexachlorobenzene (HCB)	<0.1	<0.1	-
Heptachlor	<0.1	<0.1	-
Aldrin+Dieldrin	<0.15	<0.15	-
Endrin	<0.2	<0.2	-
Methoxychlor	<0.1	<0.1	-
Mirex	<0.1	<0.1	-
Endosulfan (alpha, beta & sulphate)	<0.5	<0.5	-
DDD+DDE+DDT	<0.6	<0.6	-
Chlordane (alpha & gamma)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<1	<1	-
CYANIDES & PHENOLS			
Cyanides	<0.5	<0.5	-
Phenols	<5	<5	-

Nix Anderson Pty Ltd
DS.sf/03.08.2015



GEOTECHNIQUE
PTY LTD

TABLE C
SPLIT SAMPLE
(Ref No: 13188/4-AA)

ANALYTES	BH13 0-0.15m mg/kg (SGS)	Split Sample S1 mg/kg (ENVIROLAB)	RELATIVE PERCENTAGE DIFFERENCES (RPD) %
METALS			
Arsenic	6	4	40
Cadmium	0.5	<0.4	-
Chromium	16	15	6
Copper	20	35	55
Lead	24	15	46
Mercury	0.02	<0.1	-
Nickel	7.5	14	60
Zinc	32	32	0
TOTAL PETROLEUM HYDROCARBONS (TPH)			
F1 (C6-C10 less BTEX)	<25	<25	-
F2 (>C10-C16)	<25	<50	-
F3 (>C16-C34)	<90	<100	-
F4 (>C34-C40)	<120	<100	-
BTEX			
Benzene	<0.1	<0.2	-
Toluene	<0.1	<0.5	-
Ethyl Benzene	<0.1	<1	-
Xylenes	<0.3	<3	-
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)			
Benzo(a)Pyrene TEQ	<0.3	<0.5	-
Total PAH	<0.8	<1.55	-
Naphthalene	<0.1	<0.1	-
Benzo(a)Pyrene	<0.1	<0.05	-
ORGANOCHLORINE PESTICIDES (OCP)			
Hexachlorobenzene (HCB)	<0.1	<0.1	-
Heptachlor	<0.1	<0.1	-
Aldrin+Dieldrin	<0.15	<0.2	-
Endrin	<0.2	<0.1	-
Methoxychlor	<0.1	<0.1	-
Mirex	<0.1	-	-
Endosulfan (alpha (I), beta (II) & sulphate)	<0.5	<0.3	-
DDD+DDE+DDT	<0.6	<0.3	-
Chlordane (alpha & gamma)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<1	<0.7	-
CYANIDES & PHENOLS			
Cyanides	<0.5	<0.5	-
Phenols	<5	<5	-

Nix Anderson Pty Ltd
DS.sf/03.08.2015

TABLE D1
METALS, CATION EXCHANGE CAPACITY (CEC) & pH TEST RESULTS
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

		METALS (mg/kg)									
Sample Location	Depth (m)	ARSENIC	CADMIUM	CHROMIUM (Total)	COPPER	LEAD	MERCURY	NICKEL	ZINC	CEC (cmol/kg)	pH
BH11	2.5-2.8	5	0.3	13	5.1	16	0.01	0.6	4.4	3.5	4.9
BH12	0-0.15	4	<0.3	12	17	19	0.02	4.9	26	8.4	7
BH12	1.5-1.8	6	0.3	12	16	21	0.02	2.2	21	-	-
BH13	0-0.15	6	0.5	16	20	24	0.02	7.5	32	10	7.9
BH13	1.5-1.8	6	0.4	13	6.8	20	0.01	1.4	8.8	8.1	7.2
BH14	0-0.15	4	0.3	14	16	20	0.11	6.3	36	-	-
BH14	2.0-2.1	<3	<0.3	19	4	7	0.03	2.1	100	-	-
BH15	0-0.15	6	0.4	13	21	28	0.01	5.5	36	-	-
BH15	0.5-0.8	5	0.4	14	21	29	0.02	6.4	32	12	7.1
BH16	0.5-0.8	5	0.3	16	19	19	0.02	5.5	22	-	-
BH16	1.5-1.8	<3	<0.3	32	21	19	0.03	2.4	34	2.6	9
Limits of Reporting (LOR)		3	0.3	0.5	0.5	1	0.05	0.5	0.5	0.02	-
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)											
Health-based Investigation Levels (HIL)[a] B - Residential B		500	150	500[c]	30000	1200	30[d]	1200	60000		
Ecological Investigation Levels (EIL)[b] - Urban residential		100[e]	-	400[f]	95	1100[g]	-	10	160		
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)											
Provisional Phytotoxity-Based Investigation Levels (PIL)			3				1				

Notes:

a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

b: EIL of aged chromium(III), nickel & zinc were derived from calculation spreadsheet developed by CSIRO for NEPC; old NSW suburb with low traffic volume; the lowest CEC=2.6 cmolc/kg & pH=4.9; the assumed clay content=10 % were selected for derivation of EIL; a conservative approach.

EIL of aged copper was calculated based on the pH and the CEC of the sample analysed and the lowest value of the ACL was adopted.

c: Chromium (VI)

d: Methyl Mercury

e: Generic EIL for aged arsenic

f: Chromium (III)

g: Generic added contaminant limit for aged lead + ambient background concentration; old NSW suburb with low traffic volume.

TABLE D2
METALS, CATION EXCHANGE CAPACITY (CEC) & pH TEST RESULTS
DISCRETE SAMPLE
(Ref No: 13188/4-AA)

		METALS (mg/kg)									
Sample Location	Depth (m)	ARSENIC	CADMIUM	CHROMIUM (Total)	COPPER	LEAD	MERCURY	NICKEL	ZINC	CEC (cmol/kg)	pH
BH11	0-0.15	<3	0.4	37	29	10	0.01	36	49	14	9.1
Limits of Reporting (LOR)		3	0.3	0.5	0.5	1	0.05	0.5	0.5	0.02	-
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)											
Health-based Investigation Levels (HIL)[a] B - Residential B		500	150	500[c]	30000	1200	30[d]	1200	60000		
Ecological Investigation Levels (EIL)[b] - Urban residential		100[e]	-	410[f]	190	1100[g]	-	210	600		
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)											
Provisional Phytotoxity-Based Investigation Levels (PIL)			3				1				

Notes:

a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

b: EIL of aged chromium(III), nickel & zinc were derived from calculation spreadsheet developed by CSIRO for NEPC; old NSW suburb with low traffic volume; CEC=14 cmolc/kg & pH=9.1; the assumed clay content=10 % were selected for derivation of EIL; a conservative approach.

EIL of aged copper was calculated based on the pH and the CEC of the sample analysed and the lower value of the two ACL was adopted.

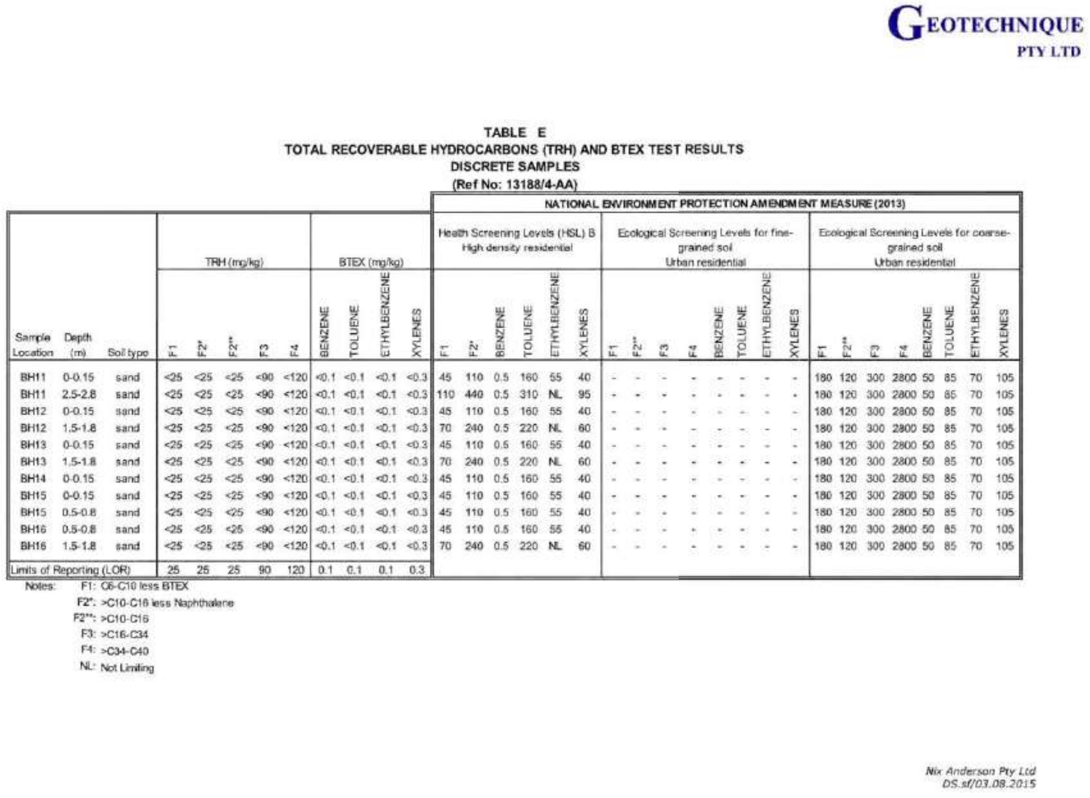
c: Chromium (VI)

d: Methyl Mercury

e: Generic EIL for aged arsenic

f: Chromium (III)

g: Generic added contaminant limit for aged lead + ambient background concentration; old NSW suburb with low traffic volume.



GEOTECHNIQUE
PTY LTD

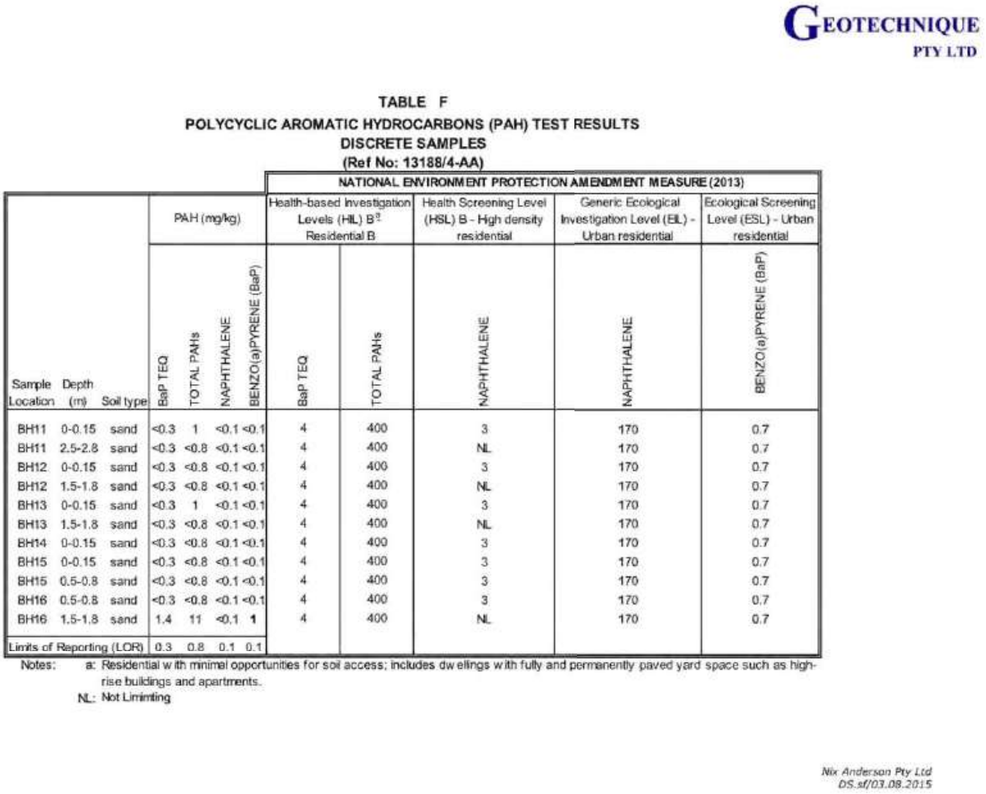
TABLE E
TOTAL RECOVERABLE HYDROCARBONS (TRH) AND BTEX TEST RESULTS
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

			TRH (mg/kg)					BTEX (mg/kg)				NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013) Health Screening Levels (HSL) B High density residential					
Sample Location	Depth (m)	Soil type	F1	F2*	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2*	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES
BH11	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40
BH11	2.5-2.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	110	440	0.5	310	NL	95
BH12	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40
BH12	1.5-1.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	70	240	0.5	220	NL	60
BH13	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40
BH13	1.5-1.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	70	240	0.5	220	NL	60
BH14	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40
BH15	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40
BH15	0.5-0.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40
BH16	0.5-0.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40
BH16	1.5-1.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	70	240	0.5	220	NL	60
Limits of Reporting (LOR)			25	25	25	90	120	0.1	0.1	0.1	0.3						

			NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013) Ecological Screening Levels for fine-grained soil Urban residential								Ecological Screening Levels for coarse-grained soil Urban residential							
Sample Location	Depth (m)	Soil type	F1	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES
BH11	0-0.15	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH11	2.5-2.8	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH12	0-0.15	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH12	1.5-1.8	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH13	0-0.15	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH13	1.5-1.8	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH14	0-0.15	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH15	0-0.15	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH15	0.5-0.8	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH16	0.5-0.8	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH16	1.5-1.8	sand	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
Limits of Reporting (LOR)																		

Notes:
F1: C6-C10 less BTEX
F2*: >C10-C16 less Naphthalene
F2**: >C10-C16
F3: >C16-C34
F4: >C34-C40
NL: Not Limiting

Nix Anderson Pty Ltd
DS.sf/03.08.2015



GEOTECHNIQUE
PTY LTD

TABLE F
POLYCYCLIC AROMATIC HYDROCARBONS (PAH) TEST RESULTS
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

							NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)				
			PAH (mg/kg)				Health-based Investigation Levels (HIL) B[a] Residential B		Health Screening Level (HSL) B - High density residential	Generic Ecological Investigation Level (EIL) - Urban residential	Ecological Screening Level (ESL) - Urban residential
Sample Location	Depth (m)	Soil type	BaP TEQ	TOTAL PAHs	NAPHTHALENE	BENZO(a)PYRENE (BaP)	BaP TEQ	TOTAL PAHs	NAPHTHALENE	NAPHTHALENE	BENZO(a)PYRENE (BaP)
BH11	0-0.15	sand	<0.3	1	<0.1	<0.1	4	400	3	170	0.7
BH11	2.5-2.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7
BH12	0-0.15	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH12	1.5-1.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7
BH13	0-0.15	sand	<0.3	1	<0.1	<0.1	4	400	3	170	0.7
BH13	1.5-1.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7
BH14	0-0.15	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH15	0-0.15	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH15	0.5-0.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH16	0.5-0.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7
BH16	1.5-1.8	sand	1.4	11	<0.1	**1**	4	400	NL	170	0.7
Limits of Reporting (LOR)			0.3	0.8	0.1	0.1					

Notes: a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

NL: Not Limiting

Nix Anderson Pty Ltd
DS.sf/03.08.2015

GEOTECHNIQUE
PTY LTD

TABLE G
ORGANOCHLORINE PESTICIDES (OCP), POLYCHLORINATED BIPHENYLS (PCB), CYANIDES & PHENOLS TEST
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

		OCP (mg/kg)										(mg/kg)	(mg/kg)	(mg/kg)
Sample Location	Depth (m)	HEXACHLOROBENZENE (HCB)	HEPTACHLOR	ALDRIN+DIELDRIN	ENDRIN	METHOXYCHLOR	MIREX	ENDOSULFAN (alpha, beta & sulphate)	DDD+DDE+DDT	DDT	CHLORDANE (alpha & gamma)	PCB	Cyanides	Phenols
BH11	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH11	2.5-2.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
BH12	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH12	1.5-1.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
BH13	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH13	1.5-1.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
BH14	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH15	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH15	0.5-0.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
BH16	0.5-0.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH16	1.5-1.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
Limits of Reporting (LOR)		0.1	0.1	0.15	0.2	0.1	0.1	0.5	0.6	0.2	0.2	1	0.1	0.1
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)														
Health-based Investigation Levels (HIL) [a]B - Residential B		15	10	10	20	500	20	400	600		90	1	300	45000
Ecological Investigation Levels (EIL) - Urban residential										180[b]				

Notes: a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

b: Generic EIL for DDT

Nix Anderson Pty Ltd
DS.sf/03.08.2015

GEOTECHNIQUE
PTY LTD

TABLE H
ASBESTOS TEST RESULTS
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

Sample Location	Depth (m)	ASBESTOS
BH11	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH11	2.5-2.8	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH12	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH13	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH14	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH15	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH16	0.5-0.8	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w

Nix Anderson Pty Ltd
DS.sf/03.08.2015

ATTACHMENT D

GEOTECHNIQUE
PTY LTD

IMPORTANT INFORMATION REGARDING YOUR ENVIRONMENTAL SITE ASSESSMENT

These notes have been prepared by Geotechnique Pty Ltd, using guidelines prepared by the ASFE (Associated Soil and Foundation Engineers). The notes are offered to assist in the interpretation of your environmental site assessment report.

REASONS FOR AN ENVIRONMENTAL ASSESSMENT

Environmental site assessments are typically, though not exclusively, performed in the following circumstances:

- As a pre-acquisition assessment on behalf of a purchaser or a vendor, when a property is to be sold
- As a pre-development assessment, when a property or area of land is to be redeveloped, or the land use has changed, e.g. from a factory to a residential subdivision
- As a pre-development assessment of greenfield sites, to establish baseline conditions and assess environmental, geological and hydrological constraints to the development of e.g. a landfill
- As an audit of the environmental effects of previous and present site usage

Each circumstance requires a specific approach to assessment of soil and groundwater contamination. In all cases the objective is to identify and if possible quantify the risks that unrecognised contamination poses to the ongoing proposed activity. Such risks may be financial (clean-up costs or limitations in site use) and physical (health risks to site users or the public).

ENVIRONMENTAL SITE ASSESSMENT LIMITATIONS

Although information provided by an environmental site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment might not detect all contamination within a site. Contaminants could be present in areas that were not surveyed or sampled, or migrate to areas that did not show signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant that may occur; only the most likely contaminants are screened.

AN ENVIRONMENTAL SITE ASSESSMENT REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

In the following events and in order to avoid cost problems, you should ask your consultant to assess any changes in the conclusion and recommendations made in the assessment:

- When the nature of the proposed development is changed e.g. if a residential development is proposed, rather than a commercial development
- When the size or configuration of the proposed development is altered e.g. if a basement is added
- When the location or orientation of the proposed structure is modified
- When there is a change of land ownership, or
- For application to an adjacent site

ENVIRONMENTAL SITE ASSESSMENT FINDINGS ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual sub-surface conditions only at those points where samples are taken, when they are taken. Data obtained from the sampling and subsequent laboratory analyses are interpreted by geologists, engineers or scientists and opinions are drawn about the overall sub-surface conditions, the nature and extent of contamination, the likely impact on any proposed development and appropriate remediation measures. Actual conditions may differ from those inferred, because no professional, no matter how qualified and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, however, steps can be taken to help minimise the impact. For this reason site owners should retain the services of their consultants throughout the development stages of the project in order to identify variances, conduct additional tests that may be necessary and to recommend solutions to problems encountered on site.

Soil and groundwater contamination is a field in which legislation and interpretation of legislation by government departments is changing rapidly. Whilst every attempt is made by Geotechnique Pty Ltd to be familiar with current policy, our interpretation of the investigation findings should not be taken to be that of the relevant authority. When approval from a statutory authority is required for a project, approval should be directly sought.

Environotes-Ed3-04/06

STABILITY OF SUB-SURFACE CONDITIONS

Sub-surface conditions can change by natural processes and site activities. As an environmental site assessment is based on conditions existing at the time of the investigation, project decisions should not be based on environmental site assessment data that may have been affected by time. The consultant should be requested to advise if additional tests are required.

ENVIRONMENTAL SITE ASSESSMENTS ARE PERFORMED FOR SPECIFIC PURPOSES AND CLIENTS

Environmental site assessments are prepared in response to a specific scope of work required to meet the specific needs of specific individuals e.g. an assessment prepared for a consulting civil engineer may not be adequate to a construction contractor or another consulting civil engineer.

An assessment should not be used by other persons for any purpose or by the client for a different purpose. No individual, other than the client, should apply an assessment, even for its intended purpose, without first conferring with the consultant. No person should apply an assessment for any purpose other than that originally contemplated, without first conferring with the consultant.

MISINTERPRETATION OF ENVIRONMENTAL SITE ASSESSMENTS

Costly problems can occur when design professionals develop plans based on misinterpretation of an environmental site assessment. In order to minimise problems, the environmental consultant should be retained to work with appropriate design professionals, to explain relevant findings and to review the adequacy of plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE REPORT

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists, based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these would not be redrawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however, contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. Should this occur, delays and disputes, or unanticipated costs may result.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of sub-surface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations, such as contractors.

READ RESPONSIBILITY CLAUSES CLOSELY

An environmental site assessment is based extensively on judgement and opinion; therefore, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. In order to aid in prevention of this problem, model clauses have been developed for use in written transmittals. These are definitive clauses, designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment and you are encouraged to read them closely. Your consultant will be happy to give full and frank answers to any questions you may have.

GEOTECHNIQUE® PTY LTD
Member of Australian Contaminated Land Consultants Association Inc
Quality ISO 9001
ABN 64 002 841 063

Job No: 13188/1
Our Ref: 13188/1-AA
12 September 2014

Nix Anderson Pty Ltd
17 Chuter Street
MCMAHONS POINT NSW 2060
Email: robert.mcguinness@nxa.com.au

Attention: Mr R McGuinness

Dear Sir

re: **Proposed Redevelopment**
160 Burwood Road, Concord
Preliminary Geotechnical Investigation

This report provides results of a preliminary geotechnical investigation at the above site. The investigation was commissioned by Mr R McGuinness of Nix Anderson through a subcontract agreement and was carried out in general accordance with Geotechnique Pty Ltd proposal Q6614 dated 2 May 2014.

We understand that Nix Anderson has been retained by Propertylink to assist in carrying out feasibility review of the above site to assess the development potential on behalf of the site owners – Freshfood Australia Holdings Pty Ltd. It is also understood that the existing Robert Timms Factory (Bushell's) will be relocated prior to development and the site will be developed as an Urban Regeneration Project – an integrated Residential Community.

A geotechnical investigation was required to assess existing surface and subsurface conditions and develop geotechnical recommendations for feasibility review of the proposed redevelopment.

Regional Geology and Landscape

Reference to the Geological Map of Sydney indicates that the bedrock at the site is likely to be Hawkesbury Sandstone, comprising medium grained quartz sandstone.

Reference to the Soil Landscape Map of Sydney indicates that the landscape at the site belongs to the Gymea Group, which is characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone. However, the site is likely to have been filled in the past to raise levels for development. The acid sulfate soil map indicates high probability of Acid Sulfate soils within nearby areas of the existing site.

Scope of Work
Field work for the investigation was carried out between 7th and 11th August 2014 and comprised of the following:

- Review services plans obtained from "Dial Before You Dig" to assess existing services across the site.
- Conduct an OH&S and walkover survey to assess existing site conditions.
- Scan proposed borehole locations for underground services. We engaged a specialist services locator for this purpose.
- Drill ten (10) boreholes (BH1 to BH10) to depths of 10m, using a using a truck mounted drilling rig fully equipped for geotechnical investigation. Boreholes were drilled at the locations specified at the site by Propertylink. All boreholes were initially drilled to V-Bit or TC-Bit refusal in bedrock and then continued using rock coring. Approximate borehole locations are shown on the attached Drawing 13188/1-AA1. Engineering logs detailing subsurface profiles encountered in boreholes and core photographs are also attached.
- Conduct Standard Penetration Testing (SPT) at regular depth intervals in the boreholes to assess strength characteristics of overburden soils.
- Recovery of representative soil and rock samples for visual assessment and laboratory testing (point load index on rock cores, acid sulfate and contamination testing on soil samples).
- Measure depths to groundwater/seepage level in boreholes, where encountered.

Field work was supervised by a Geotechnical Engineer, responsible for sampling and preparation of borehole logs.

Surface and Sub-surface Conditions
The following observations were made during the field work:

- The site is occupied by the multistorey Robert Timms Factory (Bushell's), administration building and guard room etc. Open areas of the site are covered with asphalt/bitumen seal, grass and scattered trees.
- The site is bound to the south by Burwood Rd, to the north by a Golf Course, to the east by residential building and Exile Bay and to the west by residential buildings and Duke Avenue.
- The topography of the site gently slopes towards the north east direction towards Exile Bay at about 3 to 5 degrees.

Sub-surface conditions encountered in the boreholes are detailed in the attached engineering logs and summarised below in Table 1.

Table 1 – Subsurface Conditions

BH	Top RL (m AHD)*	Termination Depth (m)	Topsoil (m)	Concrete / Asphalt (m)	Fill (m)	Natural (m)	Bedrock (m)
1	5.5	10.3	NE	0.0 – 0.02	0.02 – 3.1	3.1 – 3.3	3.3 –> 10.3
2	5.4	10.5	0.0 – 0.15	NE	0.15 – 5.0	5.0 – 9.6	9.6 –> 10.5
3	5.4	10.0	0.0 – 0.2	NE	0.2 – 2.5	2.5 – 3.0	3.0 –> 10.0

BH	Top RL (m AHD)*	Termination Depth (m)	Topsoil (m)	Concrete / Asphalt (m)	Fill (m)	Natural (m)	Bedrock (m)
4	5.8	10.4	0.0 – 0.2	NE	0.2 – 0.7	0.7 – 1.0	1.0 –> 10.4
5	6.7	10.1	0.0 – 0.1	NE	0.1 – 0.4	0.4 – 1.1	1.1 –> 10.1
6	6.3	10.0	NE	0.0 – 0.2	0.2 – 0.5	0.5 – 1.0	1.0 –> 10.0
7	5.6	10.8	NE	0.0 – 0.02	0.02 – 2.5	2.5 – 3.0	3.0 –> 10.8
8	5.7	9.7	NE	0.0 – 0.2	0.2 – 0.4	0.4 – 1.0	1.0 –> 9.7
9	7.1	9.3	NE	0.0 – 0.2	0.2 – 2.5	2.5 – 3.8	3.8 –> 9.3
10	5.9	10.2	NE	0.0 – 0.2	0.2 – 0.5	0.5 – 1.5	1.5 –> 10.2

** Approximate*

Table 1 indicates that the sub-surface profile across the site comprises a sequence of topsoil/concrete/asphalt overlying, fill overlying, natural soils overlying, bedrock. The fill was found to extend to depths ranging from 0.4m to 5m. Deeper fill was generally found in the north and north eastern portions (BH1, 2, 3, 7 and 9) of the site. The depth to bedrock across the site ranged from about 1m to 3.8m below existing ground surface. However, BH2 bedrock was found at about 9.6m depth.

Fill was classified as silty/sandy clay, medium to high plasticity. Sandstone floaters were also encountered within the fill. The fill was generally found to be well compacted. Natural soils were predominantly medium to high plasticity silty clay and silty sand with some gravel. Bedrock was consisted of sandstone, distinctly weathered to fresh and medium to high strength.

Groundwater/seepage was encountered at depths of about 3m, 5m and 2.5m in BH1, BH5 and BH9 respectively. The use of water for coring in other boreholes precluded measurement of groundwater level at the completion of drilling. It should however be noted that fluctuations in the level of groundwater might occur due to variations in rainfall and/or other factors.

Acid Sulfate Soil Material

Laboratory tests were carried out to confirm the presence or otherwise of acid sulfate soils. Laboratory investigation consisted of testing representative soil samples to determine **pH$_{KCl}$**, **pH$_{ox}$**, **TPA** (Total Peroxide Acidity), **TAA** (Titratable Actual Acidity), **S$_{POS}$%** (Percent Peroxide Oxidisable Sulphur) and **S$_{SCR}$%** (Chromium Reducible Sulphur).

Laboratory tests were carried out by SGS Australia Pty Ltd (NATA accredited) in accordance with SPOCAS (Suspension Peroxide Oxidation Combined Acidity & Sulfate)/Chromium Reducible Sulphur (SCR) methods recommended by the Queensland Department of Natural Resources, Mines and Energy (Qld NRM&E) (Reference 1). The test results are attached and summary is presented below in Table 2.

Table 2 – Acid Sulfate Tests Results

BH	Depth (m)	pH$_{KCl}$ Unit	Material Description	pH$_{ox}$ Unit	TPA mole H^{+}/t	TAA mole H+/t	S$_{POS}$ % w/w	S$_{SCR}$ % w/w
2	1.5-1.95	4.2	Sand	4.3	**56**	**60**	0.010	<0.005
3	3.0-3.2	6.6	Sandstone	5.2	<5	<5	**0.052**	**0.038**
6	0.5-0.75	5.5	Clay	6.2	<5	12	0.006	<0.005
7	3.0-3.4	5.4	Sandstone	4.7	**89**	27	**0.076**	**0.034**

BH	Depth (m)	pH_{KCl} Unit	Material Description	pH_{ox} Unit	TPA mole H^+/t	TAA mole H+/t	S_{POS} % w/w	S_{SCR} % w/w
10	1.5-1.65	4.4	Sandstone	4.9	**55**	**54**	0.008	<0.005
Action Criteria adopted #					18	18	0.03	0.03

Notes

pH_{KCl}:	*pH in a 1:40 (W/V) suspension of soil in a solution of 1M K_{Cl} extract*
pH_{ox}:	*pH in a suspension of soil in a solution after peroxide digestion in SPOCAS method*
TPA:	*Titratable Peroxidel Acidity (moles H^+/tonne)*
TAA:	*Titratable Actual Acidity (moles H^+/tonne)*
S_{POS}:	*Peroxide Oxidisable Sulphur (% w/w)*
S_{SCR}:	*Chromium Reducible Sulphur (% w/w)*
#:	*Action Criteria adopted (Reference 2)*

Based on the consideration that the soil to be disturbed would be more than 1000 tonnes and of fine texture (sand/clay), the laboratory test results in the above table indicate the following:

- For soil sample in BH6 (0.5m-0.75m), the TAA and TPA values were below the adopted "Action Criteria" of 18mol H+/tonne. The test results for oxidisable Sulphur SPos and SSCR were also below the adopted "Action Criteria" of 0.03%. The soils at this depth are unlikely to be actual acid sulfate soil or potential acid sulfate soil. Based on the test results, no acid sulfate management plan is required for disturbance of soil at this depth.
- For soil samples in BH2 (1.5m-1.95m) and BH10(1.5m-1.65m), the TAA and TPA values exceeded the adopted "Action Criteria" of 18 mol H+/tonne. The test results for oxidisable Sulphur (SPOs and SSCR) were below the "Action Criteria" of 0.03%. The low peroxide oxidisable sulphur (Spos/SCR) test result indicated that the presence of pyritic sulphur (i.e. inorganic sulphur) is unlikely. The relatively higher values for TAA and TPA indicate that soils to be disturbed at this depth are acidic soil not acid sulfate soil. Based on these test results, it is considered that the soils in the samples analysed are unlikely to be acid sulfate soil (ASS) but are acidic soils (i.e. non-sulfuric and non-sulphidic) which are unlikely to produce significant amount of acid after being exposed to air due to disturbance or oxidation. The local environment is adapted to these soils in undisturbed condition. However, excavation and placement of these soils in conditions with increased rate of soil drainage could contribute for the release of acidic leachates and management of these acidic soils is required, if disturbed. The treatment of acidic soils (non-acid sulfate soils) should be carried out in accordance with processes described in NSW Acid Sulfate Soil Manual 1998 for acid sulfate management plan. The treatment method will include neutralising soils to prevent generation of acidic leachates.
- For soil sample in BH3 (3.0m-3.2m), TAA and TPA were below the adopted "Action Criteria", however the oxidisable sulphur (Spos/SCR) values exceeded the adopted "Action Criteria of 0.03%. For soil sample in BH7 (3.0m-3.4m), TAA was below the action criteria, however TPA and the oxidisable sulphur (Spos/SCR) values exceeded the adopted "Action Criteria". The soils at this depth are considered to potential acid sulfate, and likely to produce acid if disturbed. Acid sulfate soil management plan would be required, if the soils are to be disturbed.

Point Load Strength Index

Rock cores obtained from the boreholes were photographed and tested at regular depth intervals for determination of Point Load Strength Index (I_{s50}). The point load strength indices for the rock cores and the assessed rock strengths, in accordance with Australian Standard AS1726-1993 (Reference 3) are summarised in the following Table 3.

Table 3 – Point Load Strength Index Test Results

BH	Depth (m)	Diametral $I_{s(50)}$ (MPa)	Axial $I_{s(50)}$ (MPa)	Diametral Assessed Strength	Axial Assessed Strength
1	5.90	1.45	1.86	High	High
	6.70	1.39	1.59	High	High
	7.60	1.20	1.41	High	High
	8.80	1.69	2.01	High	High
	9.20	3.82	3.73	Very High	Very High
3	4.80	0.10	0.50	Low	Medium
	5.60	2.03	2.86	High	High
	6.80	2.43	2.53	High	High
	7.50	1.29	1.14	High	High
	8.60	2.79	3.64	High	Very High
	9.50	3.00	3.62	Very High	Very High
4	3.20	1.25	1.75	High	High
	4.80	1.55	2.83	High	High
	5.60	3.33	4.48	Very High	Very High
	6.40	1.24	2.07	High	High
	7.20	3.22	5.34	Very High	Very High
	8.80	2.81	2.80	High	High
	9.30	3.00	2.50	Very High	High
5	2.00	2.24	1.95	High	High
	3.60	2.31	2.37	High	High
	4.70	1.71	3.28	High	Very High
	5.60	4.42	1.70	Very High	High
	6.60	3.37	3.42	Very High	Very High
	7.70	2.00	3.92	High	Very High
	8.90	2.69	2.00	High	High
	9.90	2.43	2.79	High	High
6	1.40	1.64	1.43	High	High
	2.20	2.27	2.98	High	High
	3.40	1.90	2.10	High	High
	4.40	1.15	2.00	High	High
	5.70	0.75	1.15	Medium	High
	6.40	0.65	1.61	Medium	High
	7.90	2.58	3.56	High	Very High
	8.90	1.84	4.01	High	Very High
7	4.10	2.24	2.19	High	High
	5.50	2.31	0.77	High	Medium
	6.80	1.71	1.46	High	High
	7.70	4.42	3.62	Very High	Very High
	8.50	3.37	3.91	Very High	Very High
	9.40	2.00	1.98	High	High

Nix Anderson Pty Ltd
MT.ZA.sf/12.09.2014

BH	Depth (m)	Diametral $I_{s(50)}$ (MPa)	Axial $I_{s(50)}$ (MPa)	Diametral Assessed Strength	Axial Assessed Strength
8	1.70	2.30	2.54	High	High
	2.55	1.63	2.83	High	High
	3.60	3.27	3.26	Very High	Very High
	4.60	2.55	3.95	High	Very High
	5.80	0.75	2.50	Medium	High
	6.90	0.94	2.51	Medium	High
	7.80	1.60	2.27	High	High
	8.70	1.10	1.07	High	High
	9.30	2.40	3.06	High	Very High
9	4.70	2.10	2.05	High	High
	5.10	2.50	3.99	High	Very High
	6.10	2.86	3.34	High	Very High
	7.80	3.11	2.17	Very High	High
	8.40	2.30	2.30	High	High
10	2.50	5.65	4.65	Very High	Very High
	3.20	0.38	1.73	Medium	High
	4.46	3.68	5.05	Very High	Very High
	5.45	1.70	1.78	High	High
	6.37	6.45	2.80	Very High	High
	7.32	3.20	2.71	Very High	High
	8.35	4.45	4.15	Very High	Very High
	9.40	4.32	4.75	Very High	Very High
	10.07	1.68	3.87	High	Very High

The point load strength index tests results generally indicate that the rock is high to very high in strength. However, it should be noted that the tests could only be carried out on intact (stronger) portions of the rock cores. Therefore, strength assessments presented in Table 3 indicate the upper limits of rock strengths.

DISCUSSION AND RECOMMENDATIONS

Excavation Conditions

No information regarding cut and fill for the proposed development was available. It is our assessment that excavation of soils (including topsoil, fill and natural soils) and extremely weathered and very low strength sandstone can be achieved using conventional earthmoving equipment such as excavators and dozers. However, excavation in distinctly weathered and medium to high strength sandstone bedrock would be considerably difficult and may require larger equipment (such as a rock saw, Caterpillar D9 or equivalent). Although selection of rock cutting equipment is based on site access, desired smoothness of the excavated rock surface and acceptable ground vibration during rock excavation, we recommend the use of a rock saw for excavation into sandstone bedrock on the site boundaries, in order to minimise ground vibration.

Groundwater/seepage was encountered at depths of about 3m, 5m and 2.5m in BH1, 5 and 9, respectively. The use of water for coring precluded further groundwater measurements in other boreholes. Depending on time of construction groundwater might be at below or above this depth. If excavation extends below the groundwater level (most likely to be at RL 0) extensive dewatering may be required. We recommend that further groundwater monitoring be carried out if it is planned to excavate 3m depth. Installation of piezometers might be required to monitor long term groundwater conditions. Although minor groundwater inflow could be managed by a conventional sump and pump method, we do suggest that a specialist dewatering contractor be contacted if significant groundwater inflow is encountered during basement excavation. It should also be noted that trafficability problems could arise locally during wet weather or if water is allowed to pond at the site.

Fill Placement

We consider that the proposed development works would require only minor fill placement, if any. The following procedures are recommended for placement of controlled fill, where required.

- Strip existing topsoil and stockpile separately for possible future uses. Excess materials should be disposed off the site.
- Undertake proof rolling (using an 8 to 10 tonnes roller) of the exposed natural soils or fill to detect potentially weak spots (ground heave). Excavate areas of localised heaving to a depth of about 300mm and replace with granular fill, compacted as described below. Proof rolling will not be required if stripping of unsuitable materials exposes bedrock. Fill is generally assessed to be well compacted.
- Undertake proof rolling of soft spots backfilled with granular fill, as described above. If the backfilled area shows movement during proof rolling, this office should be contacted for further recommendations.
- Place suitable fill materials on proof rolled residual soils or bedrock. The fill should be placed in horizontal layers of 200mm to 250mm maximum loose thickness and compacted to a Minimum Dry Density Ratio (MDDR) of 98% Standard, at moisture content within 2% of Optimum Moisture Content (OMC). Controlled fill should preferably comprise non-reactive fill (e.g. crushed sandstone), with a maximum particle size not exceeding 75mm, or low plasticity clay. The natural soils and bedrock obtained from excavations within the site may be used in controlled fill after removal of unsuitable materials, if any, crushing to sizes finer than 75mm, proper mixing and moisture conditioning.
- Fill placement should be supervised to ensure that material quality, layer thickness, testing frequency and compaction criteria conform to the specifications. We recommend "Level 2" or better supervision, in accordance with AS3798-2007 – "Guidelines on Earthworks for Commercial and Residential Developments" (Reference 4). It should be noted that a Geotechnical Inspection and Testing Authority will generally provide certification on the quality of entire compacted fill only if Level 1 supervision and testing is carried out.

Batter Slopes and Retaining Structures

Cut and fill slopes during and after development works should be battered for stability or retained by engineered retaining structures. Recommend batter slopes for stability of cut and fill slopes are presented in Table 4.

Table 4 – Recommended Batter Slopes for Excavation Faces

Material	Temporary (Horizontal : Vertical)		Permanent (Horizontal : Vertical)	
	Exposed	Protected	Exposed	Protected
Controlled fill / natural soil	1.5:1.0	1.0:1.0	2.5:1.0	2.0:1.0
Extremely weathered and low strength sandstone	1.0:1.0	0.75:1.0	1.5:1.0	1.0:1.0
Distinctly weathered to fresh and medium to high strength sandstone	Sub-vertical	Sub-vertical	Sub-vertical	Sub-vertical

Surface protection of the slopes can be provided by shotcreting, which may be reinforced. It is also recommended that batter slopes are provided with adequate surface and sub-surface drainage.

Sub-vertical excavation in distinctly weathered and medium to high strength sandstone, where required, will have a very low risk of instability. However, some local rock bolting or shotcreting would be required, depending on the relative orientation of the rock discontinuities (bedding partings and joint systems) and cut faces Therefore, the excavation faces should be inspected by a Geotechnical Engineer or an Engineering Geologist, as excavation progresses, at about every 1.5m depth interval, to assess localised rock bolting or shotcreting requirements.

Retaining structures, if required, could comprise a contiguous pier wall or secant pier walls installed prior to commencement of basement excavation. Secant pier wall will be required if excavation extends well below groundwater level. Earth pressure distribution on such retaining walls may be assumed to be triangular in shape and estimated as follows.

$$p_h = \gamma kH$$

Where,

p_h = Horizontal active pressure (kN/m^2)
γ = Total density of materials to be retained (kN/m^3)
k = Coefficient of earth pressure (k_a or k_o)
H = Retained height (m)

For design of flexible retaining structures where some lateral movement is acceptable, an active earth pressure coefficient (k_a) is recommended. If it is critical to limit the horizontal deformation of a retaining structure, use of an earth pressure coefficient at rest (k_0) is recommended. Recommended earth pressure coefficients for design of retaining structures are presented in the following Table 5.

Table 5 – Recommended Earth Pressure Parameters for Design of Retaining Structures

Retained Material	Unit Weight (kN/m^3)	Active Earth Pressure Coefficient	Passive Earth Pressure (kPa)	At Rest Earth Pressure Coefficient
Controlled fill / natural soil	18	0.40	Ignore	0.60
Extremely weathered and low strength sandstone	23	0.20	300	0.30
Distinctly weathered to fresh and medium to high strength sandstone	24	-	1000	-

The above coefficients are based on the assumption that ground level behind the retaining structure is horizontal and the retained material is effectively drained. Additional earth pressures resulting from surcharge load (buildings, infrastructures, etc) on retained materials and groundwater pressure, if any, should also be allowed for in design of retaining structures.

If the retaining structures are anchored or strutted the active earth pressure may be assumed to be rectangular and estimated as follows:

Active earth pressure $p_h = 0.8k\gamma H$

If basement excavation extends below groundwater level then the design of retaining structures should allow for groundwater pressure.

The design of any retaining structures should also be checked for bearing capacity, overturning, sliding and overall stability of the slope.

Footings

Footings for the proposed development can consist of shallow (pad or strip) or deep footings (bored piers). The following recommended allowable bearing pressure values can be used for the design of footings.

Table 6 – Recommended Allowable Bearing Pressures

Founding Material	Allowable Bearing Pressure (kPa)	Allowable Shaft Adhesion (kPa)
Controlled fill	100	Ignore
Stiff / Medium dense natural soils	125	Ignore
Very low to low strength sandstone	750	50
Medium to high strength sandstone	5000	500

The recommended allowable shaft adhesions against uplift pressures are halves of the shaft adhesions for compressive loads presented in Table 6.

If footings are founded above and within the 1 Horizontal to 1 Vertical line projected from the base of excavations, the recommended allowable bearing pressures presented in Table 6 are not applicable and appropriate allowable bearing pressure will have to be determined by reassessment of materials exposed in the excavation face.

As depths to natural soils and bedrock with the recommended allowable bearing pressures could vary across the site, the founding depths of footings to be constructed will also vary. Therefore, an experienced Geotechnical Engineer, on the basis of assessment made during footing excavation or pier hole drilling, should confirm founding levels during construction. The engineer should ensure that the design strength of bedrock is achieved.

For footings founded in controlled fill and natural soils the total settlements of footings under the recommended allowable bearing pressures are estimated to be in the range of 15mm to 20mm. However, for footings founded in bedrock total settlements under the recommended allowable bearing pressures are estimated to be about 1% of pier diameter or minimum footing dimension. Differential settlements are estimated to be about half the estimated total settlements.

Floor Slabs
Floor slabs could either be ground supported or suspended on footings. Floor slabs founded on controlled fill or natural soils could be designed for a modulus of subgrade reaction of 20kPa/mm.

Site Classification
Considering the presence of deep fill and existing structures the site is classified as Class "P" (Problematic) as per AS2870-2011 "Residential slabs and footings".

Rock Anchors
It is likely that retaining walls may require anchorage or tie-back, in order to resist lateral pressure. We suggest that all anchors are socketed in bedrock. The allowable grout to rock stress for use in rock anchorage design may be taken as 10% of the allowable bearing pressure given in Table 6. We also suggest that the anchors should have sufficient bond length outside the 1 Vertical to 1 Horizontal line drawn from the base of excavation.

Acid Sulfate Soil Assessment
The soil sample analysed for acid sulfate soil material at depth (0.5m-0.75m) are unlikely to be actual acid sulfate soil or potential acid sulfate soil. Based on the test results, no acid sulfate management plan is required for disturbance of soil at this depth.

The soil samples analysed at depth (1.5m -1.95m) are unlikely to be acid sulfate soil (ASS) but are acidic soils (i.e. non-sulfuric and non-sulfidic). However, excavation and placement of these soils in conditions with increased rate of soil drainage could contribute for the release of acidic leachates and management of these acidic soils is required, if disturbed. The treatment of acidic soils (non-acid sulfate soils) should be carried out in accordance with processes described in NSW Acid Sulfate Soil Manual 1998 for acid sulfate management plan (Reference 2). The treatment method will include neutralising soils to prevent generation of acidic leachates.

The soil samples analysed at depths (3.0m-3.4m) are considered to potential acid sulfate, and likely to produce acid if disturbed. Acid sulfate soil management plan would be required, if the soils are to be disturbed.

Assessment
Based on the investigation results the site is suitable for the proposed residential development. It is important that the recommendations made in this report are followed. If it is planned to construct deep basements, we recommend that further groundwater measurement be carried out prior to excavation.

General
Assessments and recommendations presented in this report are based on site observation and information from only limited number of boreholes. Although we believe that the sub-surface profile presented in this report is indicative of the general profile across the site, it is possible that the sub-surface profile across the site could differ from that encountered in the boreholes. Likewise, comments on depth to groundwater level are based on observation during field work. We recommend that this company is contacted for further advice if actual site conditions encountered during basement excavation differ from those presented in this report.

If you have any questions, please contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

MRIGESH TAMANG	ZIAUDDIN AHMED
Geotechnical Engineer	Senior Geotechnical Engineer

Attached	Drawing 13188/1-AA1 Engineering Borehole Logs, Core Photographs & Explanatory Notes Laboratory Test Results

References

1. Queensland, Department of Natural Resources, Mines and Energy, 2004 – Acid Sulphate Soils – Laboratory Methods Guidelines.
2. New South Wales, Acid Soil Management Advisory Committee, 1988 – Acid Sulphate Soil Manual
3. Australian Standard, Geotechnical Site Investigation, AS1726-1993.
4. Australian Standard AS3798-2007 - Guidelines on Earthworks for Commercial and Residential Developments, 2007.

Imagery ©2014 NearMap.com

GEOTECHNIQUE® PTY LTD

PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700
Fax: 02 4722 2777
e-mail:info@geotech.com.au
www.geotech.com.au

NOTES

1. Site features are indicative and are not to scale.
2. This drawing has been produced using a base plan provided by others to which additional information e.g test pits, borehole locations or notes have been added. Some or all of the plan may not be relevant at the time of producing this drawing

Nix Management Pty Ltd
Proposed Development
Robert Timms Factory Site (Bushell's)
160 Burwood Road, Concord

Borehole Locations

Drawing No: 13188/1-AA1
Job No: 13188/1
Drawn By: MH
Date: 20 August 2014
Checked By: ER

File No: 13188-1
Layers: 0, AA1

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 1
Date : 07/08/2014
Logged/Checked by: AN/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.5
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger						0			Asphaltic concrete	M			Well compacted
									Road base Sandy GRAVEL, fine to medium grained, grey	M			
									FILL; Sandstone Gravel, medium to coarse grained, red grey, with sand	M			
		DS							FILL; Silty Sand, fine grained, brown, with clay and gravel				
					N=R 6,15,7/50 Ref	0.5							
						1			FILL; Silty Clay, medium to high plasticity, grey, trace of ironstone	M<PL			
						1.5							
		DS			N=8 4,4,4								
						2							
									FILL; Sandy Clay, low plasticity, dark brown, trace of gravel	M<PL			
						2.5							
		DS											
	▼					3							
		DS			N=R 3,25/150			SM	Silty SAND, fine grained, dark grey	W	MD		Bedrock
									Commenced Coring at 3.3m				
						3.5							
						4							
						4.5							

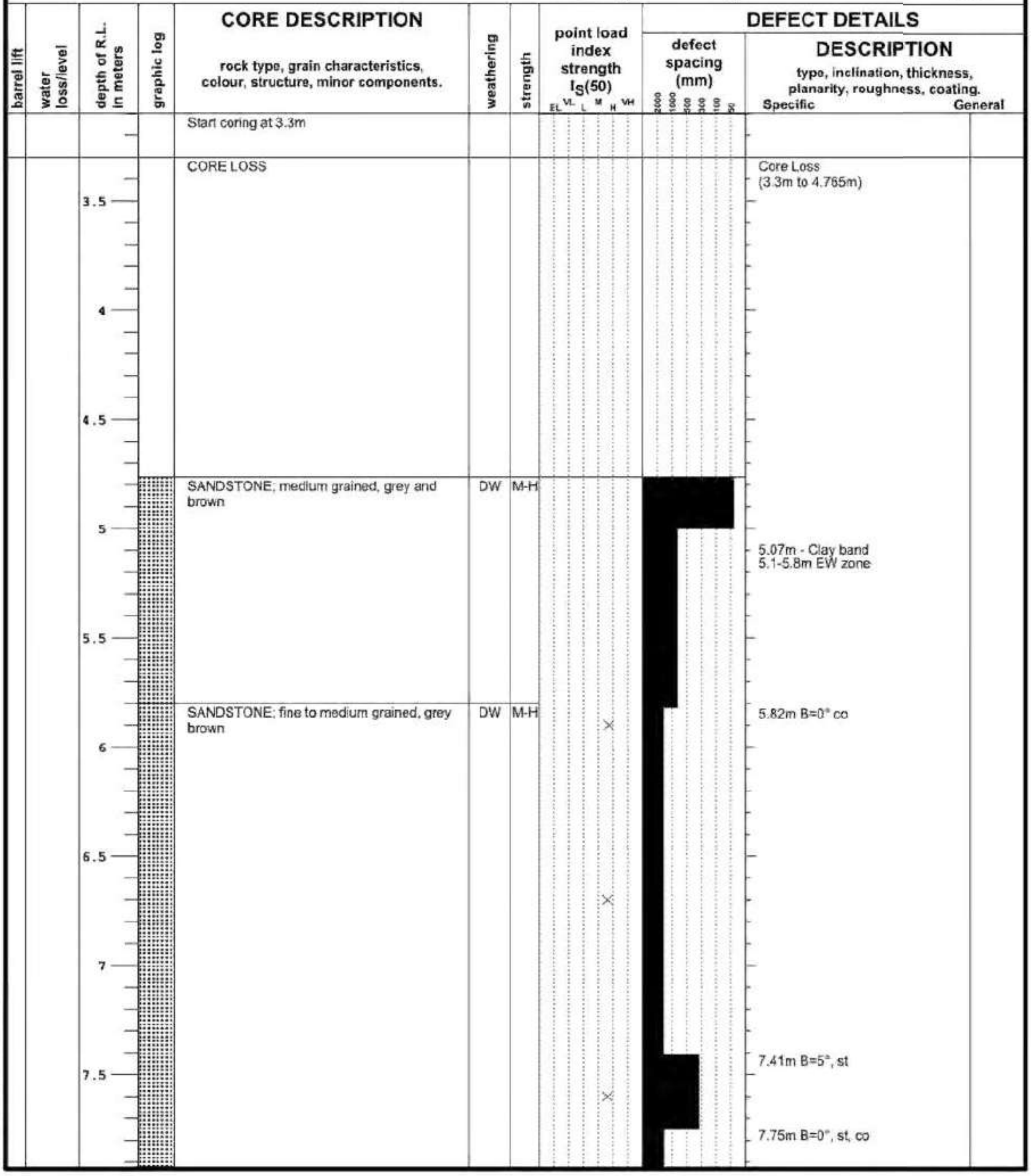
form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/1
Borehole No. : 1
Date : 11/08/2014
Logged/Checked by : AN

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.5
core size: NMLC
bearing : **deg.**
datum : AHD



barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength Is(50) EL VL L M H VH	defect spacing (mm) 2000 1000 500 300 100 50	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
				Start coring at 3.3m						
		3.5 4 4.5		CORE LOSS					Core Loss (3.3m to 4.765m)	
		5 5.5		SANDSTONE; medium grained, grey and brown	DW	M-H			5.07m - Clay band 5.1-5.8m EW zone	
		6 6.5 7 7.5		SANDSTONE; fine to medium grained, grey brown	DW	M-H	× × ×		5.82m B=0° co 7.41m B=5°, st 7.75m B=0°, st, co	

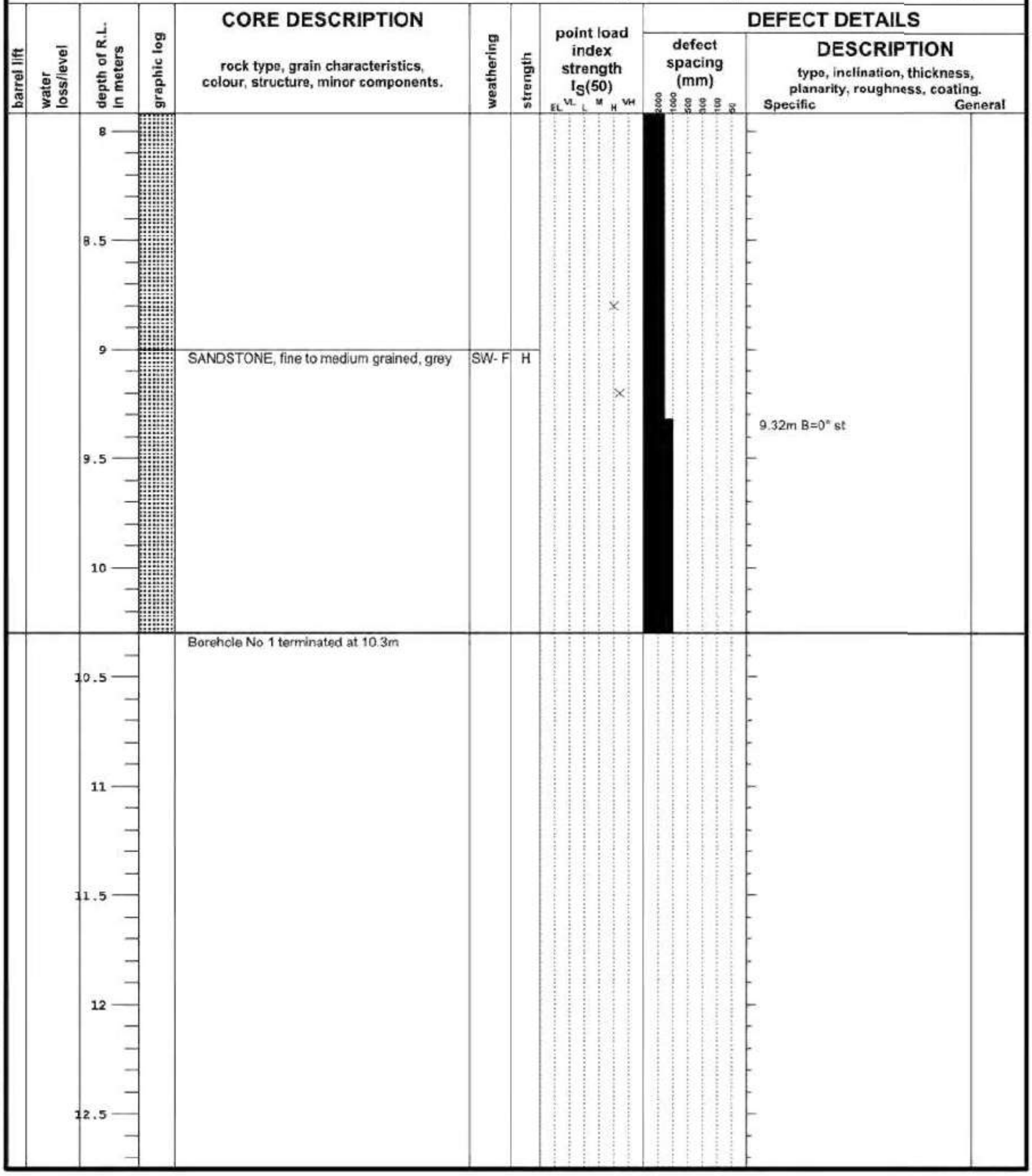
form no. 003 version 03 - 09/10

GEOTECHNIQUE PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/1
Borehole No. : 1
Date : 11/08/2014
Logged/Checked by : AN

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.5
core size: NMLC
bearing : **deg.**
datum : AHD



depth of R.L. in meters	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
9	SANDSTONE, fine to medium grained, grey	SW- F	H		
9.32				9.32m B=0° st	
10.3	Borehole No 1 terminated at 10.3m				

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 2
Date : 11/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.4
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		DS				0			TOPSOIL; Silty Sand, fine grained, grey, with inclusion of root fibre				
									FILL; Silty Sand, fine grained, grey, with inclusion of gravel				Well compacted
		DS			N=4 4,2,2	0.5							
						1							
		DS			N=11 5,6,5	1.5			FILL: Gravelly Sandy Clay, low plasticity, brown				Well compacted
						2							
						2.5							
		DS			N=4 2,2,2	3							
						3.5							
									FILL; Silty Clay, medium plasticity, dark grey, with inclusion of timber				Well compacted
						4							
		DS			N=3 2,1,2	4.5							

form no. 002 version 04 - 05/11

GEOTECHNIQUE PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 2
Date : 11/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.4
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger						5		CH	Sandy CLAY, high plasticity, brown and grey	M>PL	St-H		Residual
		DS											
						5.5							
						6							
					N=11 4,5,6								
						6.5							
						7							
						7.5							
						8							
						8.5							
						9							
						9.5							
									SANDSTONE; extremely weathered, extremely low strength, brown and grey				Bedrock

form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log - borehole

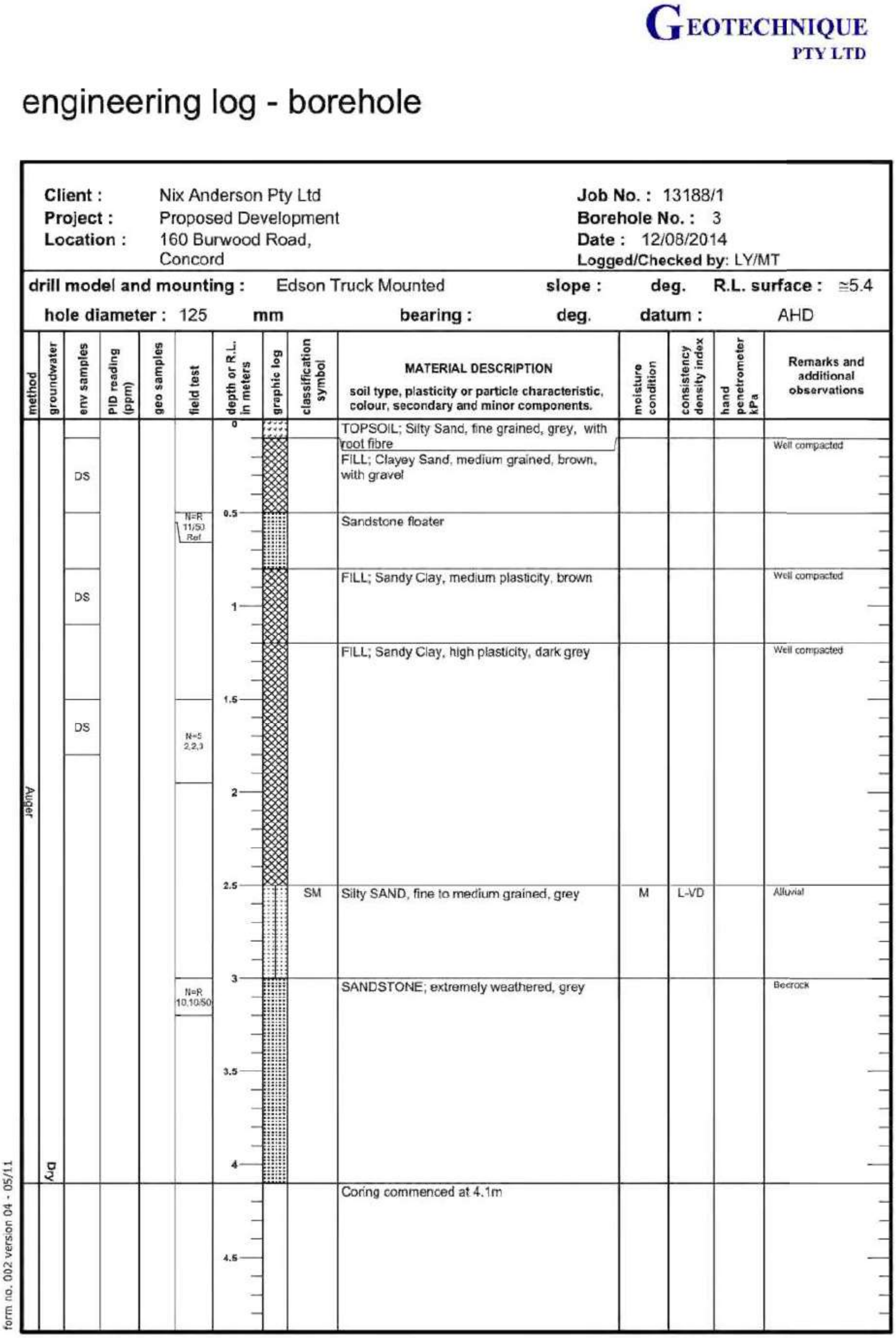
Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 2
Date : 11/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.4
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	Dry					10	▨						
						10.5			Borehole 2 terminated at 10.5m				
						11							
						11.5							
						12							
						12.5							
						13							
						13.5							
						14							
						14.5							

form no. 002 version 04 - 05/11



GEOTECHNIQUE PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 3
Date : 12/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted **slope :** **deg.** **R.L. surface :** ≃5.4
hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger	Dry					0			TOPSOIL; Silty Sand, fine grained, grey, with root fibre				
		DS							FILL; Clayey Sand, medium grained, brown, with gravel				Well compacted
					N=R 11/50 Ref	0.5			Sandstone floater				
		DS				1			FILL; Sandy Clay, medium plasticity, brown				Well compacted
		DS			N=5 2,2,3	1.5 2			FILL; Sandy Clay, high plasticity, dark grey				Well compacted
						2.5		SM	Silty SAND, fine to medium grained, grey	M	L-VD		Alluvial
					N=R 10,10/50	3 3.5 4			SANDSTONE; extremely weathered, grey				Bedrock
						4.5			Coring commenced at 4.1m				

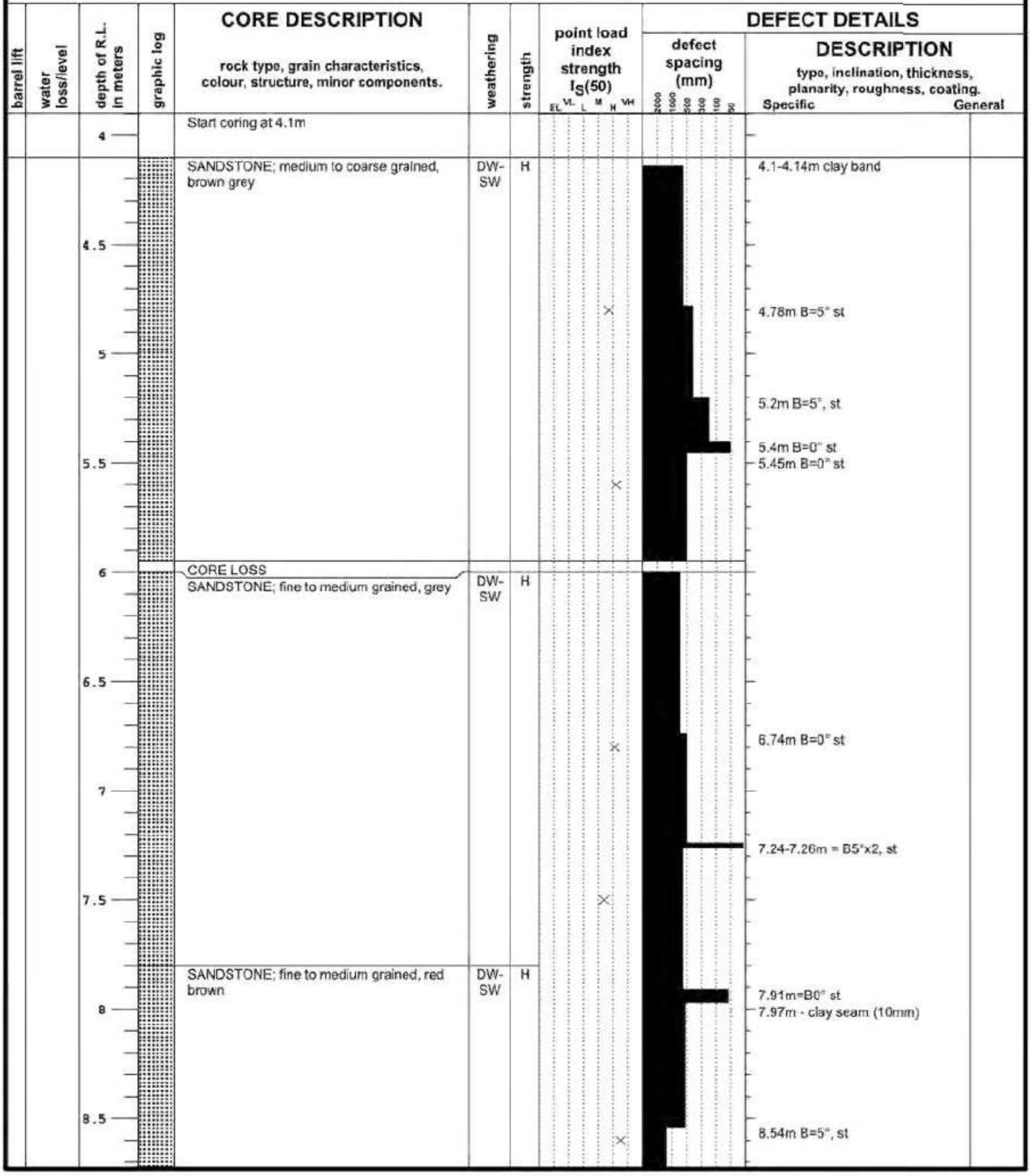
form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/1
Borehole No. : 3
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.4
core size: NMLC
bearing : **deg.**
datum : AHD



CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
Start coring at 4.1m				
SANDSTONE; medium to coarse grained, brown grey	DW-SW	H	4.1-4.14m clay band 4.78m B=5° st 5.2m B=5°, st 5.4m B=0° st 5.45m B=0° st	
CORE LOSS				
SANDSTONE; fine to medium grained, grey	DW-SW	H	6.74m B=0° st 7.24-7.26m = B5°x2, st	
SANDSTONE; fine to medium grained, red brown	DW-SW	H	7.91m=B0° st 7.97m - clay seam (10mm) 8.54m B=5°, st	

form no. 003 version 03 - 09/10

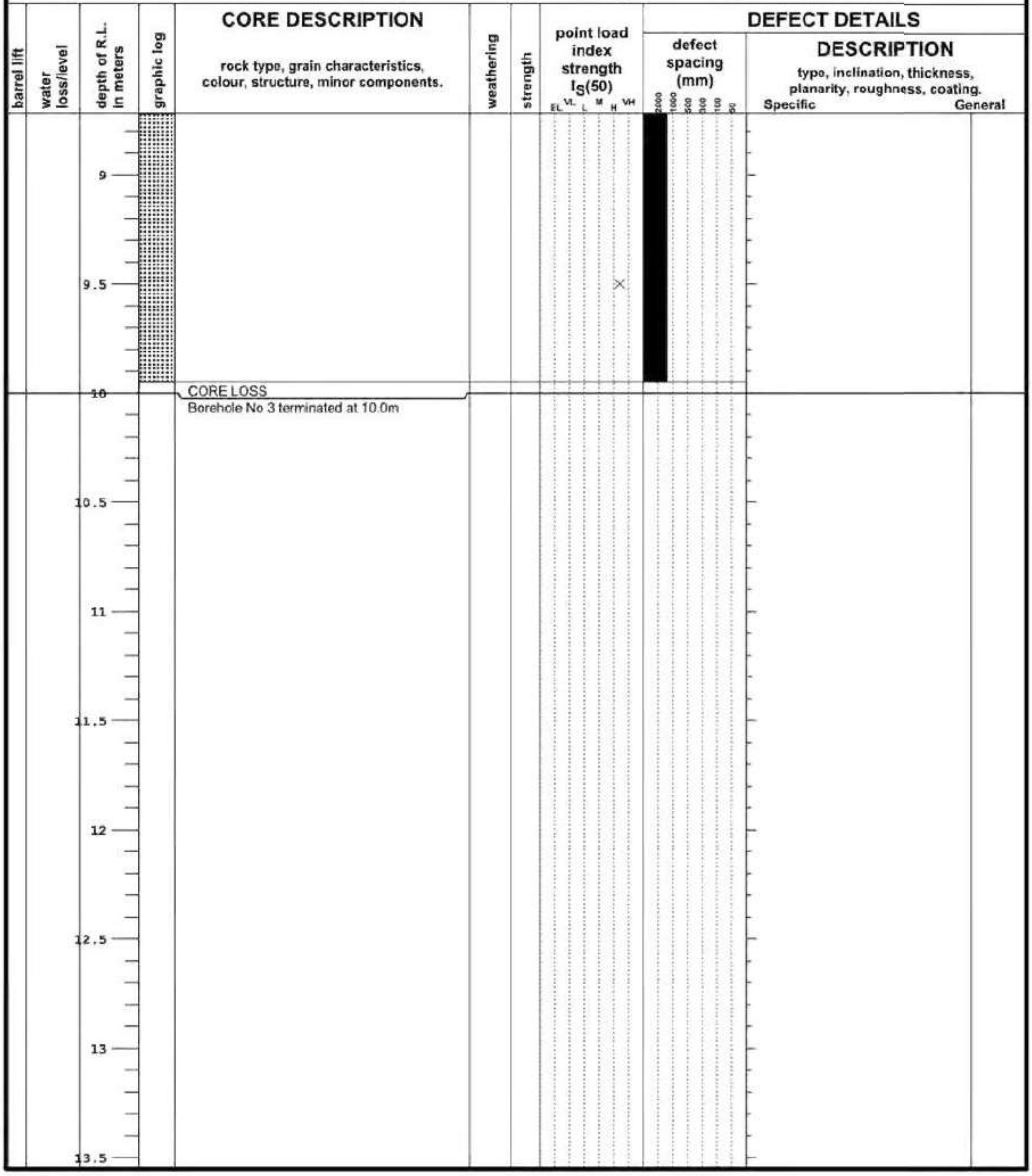
GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 3
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.4
core size: NMLC
bearing : **deg.**
datum : AHD



CORE LOSS
Borehole No 3 terminated at 10.0m

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

Job No 13188/1 BH3 Started Coring at 4.1m

BH3 terminated at 10.0m

MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 4
Date : 12/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃5.8
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0			TOPSOIL; Silty Sand, medium grained, grey, with root fibre				
		DS							FILL; Gravelly Sand, medium grained, brown				Well compacted
					N=R 15/150 Ref	0.5			SANDSTONE; floater				
								SM	Silty SAND, fine to medium grained, brown grey	M	VD		Alluvial
						1			SANDSTONE; extremely weathered. extremely low strength. brown and grey				Bedrock
						1.5							
						2							
	Dry												
						2.5			Commenced Coring at 2.5m				
						3							
						3.5							
						4							
						4.5							

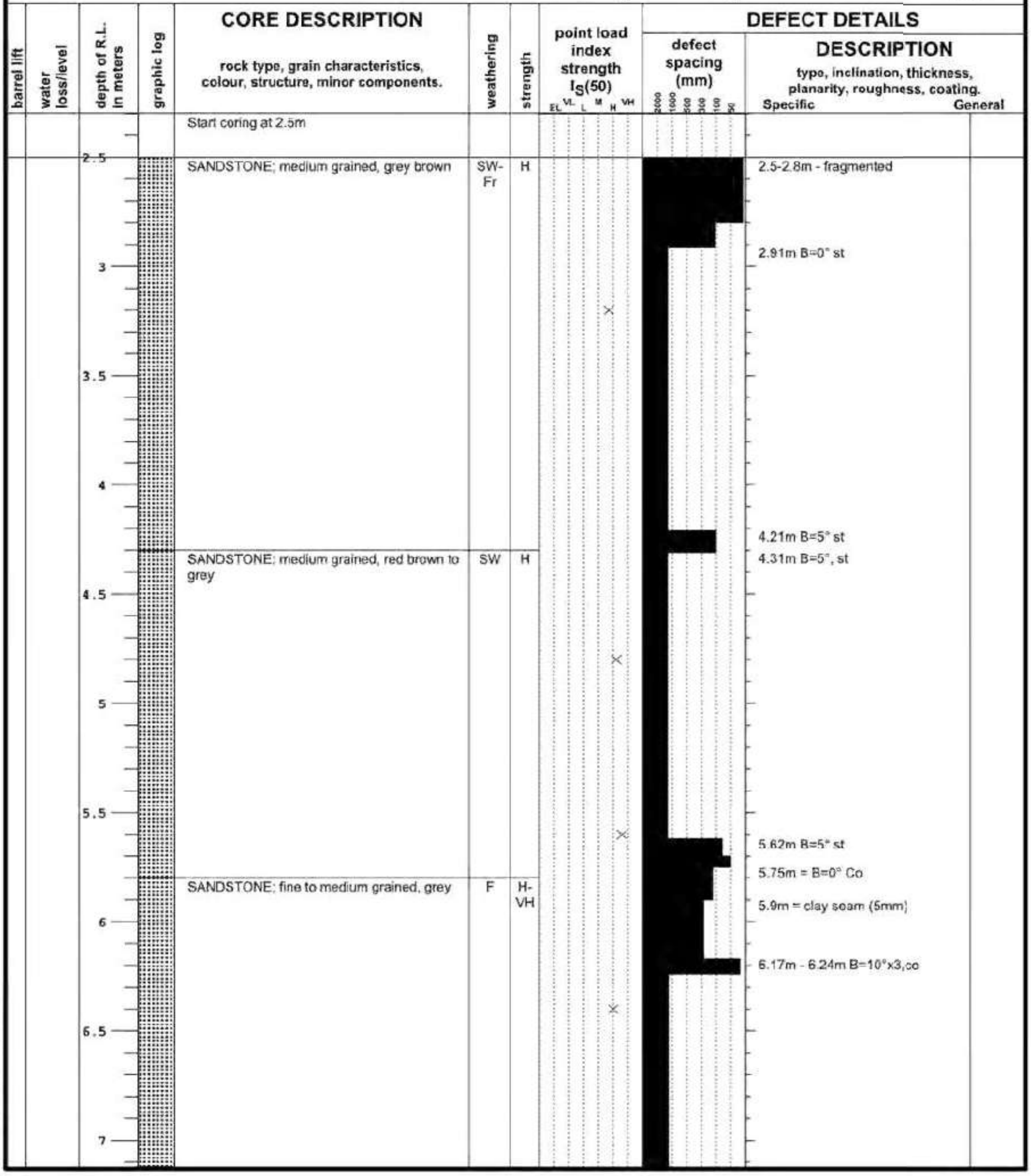
form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/1
Borehole No. : 4
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.8
core size: NMLC
bearing : **deg.**
datum : AHD



CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
Start coring at 2.5m				
SANDSTONE; medium grained, grey brown	SW-Fr	H	2.5-2.8m - fragmented 2.91m B=0° st 4.21m B=5° st	
SANDSTONE; medium grained, red brown to grey	SW	H	4.31m B=5°, st 5.62m B=5° st 5.75m = B=0° Co	
SANDSTONE; fine to medium grained, grey	F	H-VH	5.9m = clay seam (5mm) 6.17m - 6.24m B=10°x3,co	

form no. 003 version 03 - 09/10

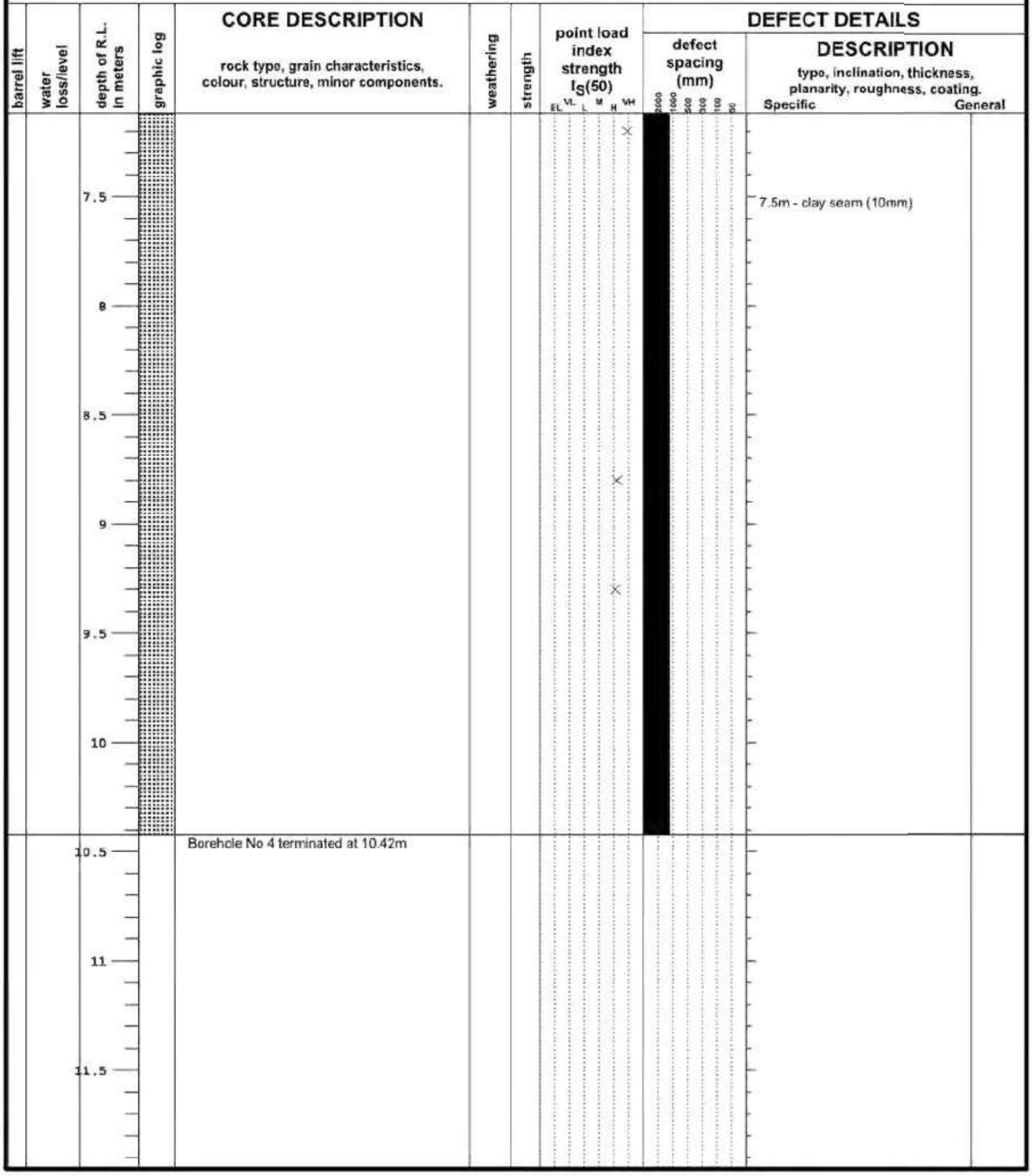
GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 4
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.8
core size: NMLC
bearing : **deg.**
datum : AHD



7.5m - clay seam (10mm)

Borehole No 4 terminated at 10.42m

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 5
Date : 13/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃6.7
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger	Dry					0	░		TOPSOIL; Silty Clay, medium plasticity, grey, with root fibre				
		DS					▩		FILL; Sandy Gravelly Clay, medium plasticity, grey, with inclusion of sandstone fragments				Well compacted
					N=4 4,2,2	0.5 1	▨	CH	Silty CLAY, high plasticity, grey	M>PL	S		Residual
						1.5	▦		SANDSTONE; extremely weathered, extremely low strength, brown				Bedrock
						2 2.5 3 3.5 4 4.5			Commenced Coring at 1.6m				

form no. 002 version 04 - 05/11

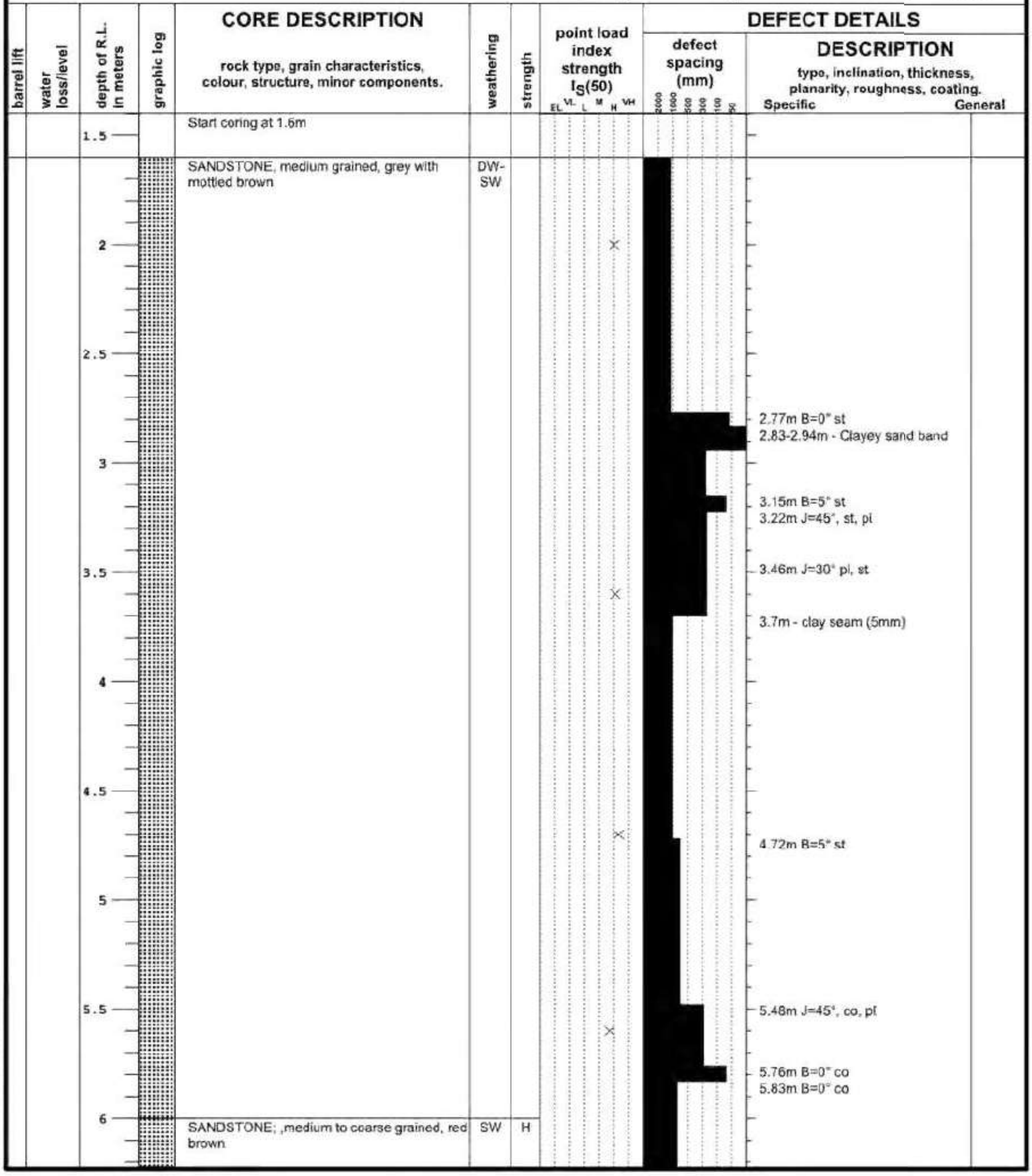
GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 5
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅6.7
core size: NMLC
bearing : **deg.**
datum : AHD



barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
		1.5		Start coring at 1.6m				
				SANDSTONE, medium grained, grey with mottled brown	DW-SW			
		2						
		2.5						
							2.77m B=0° st 2.83-2.94m - Clayey sand band	
		3						
							3.15m B=5° st 3.22m J=45°, st, pl	
							3.46m J=30° pl, st	
		3.5						
							3.7m - clay seam (5mm)	
		4						
		4.5						
							4.72m B=5° st	
		5						
		5.5					5.48m J=45°, co, pl	
							5.76m B=0° co 5.83m B=0° co	
		6		SANDSTONE; ,medium to coarse grained, red brown	SW	H		

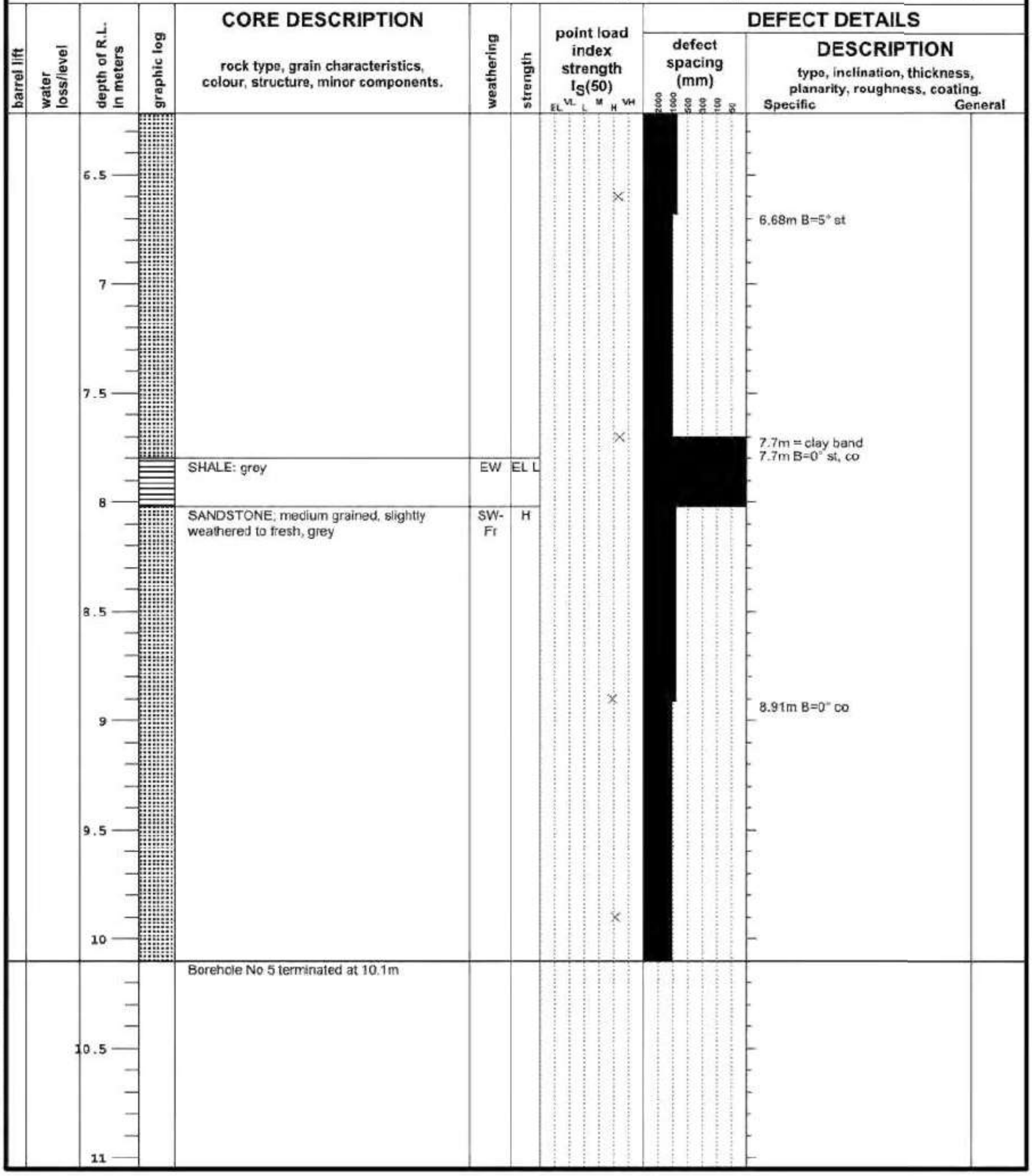
form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/1
Borehole No. : 5
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅6.7
core size: NMLC
bearing : **deg.**
datum : AHD



CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS – DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
			6.68m B=5° st	
			7.7m = clay band 7.7m B=0° st, co	
SHALE: grey	EW	EL L		
SANDSTONE; medium grained, slightly weathered to fresh, grey	SW-Fr	H		
			8.91m B=0° co	
Borehole No 5 terminated at 10.1m				

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 6
Date : 13/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted
slope : deg.
R.L. surface : ≃6.3
hole diameter : 125 mm
bearing : deg.
datum : AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0	■		CONCRETE				
									ROADBASE, gravel				
		DS					▩		FILL; Gravelly Clay, medium plasticity, grey				Well compacted
		DS			N=R 7,20/100, Ref	0.5	▨	CI	Sandy CLAY, medium plasticity, brown, with inclusion of ironstone	M>PL	H		Residual
	Dry					1	░		SANDSTONE; extremely weathered, extremely low strength, brown, with some ironstone				Bedrock
									Commenced Coring at 1.2m				
						1.5							
						2							
						2.5							
						3							
						3.5							
						4							
						4.5							

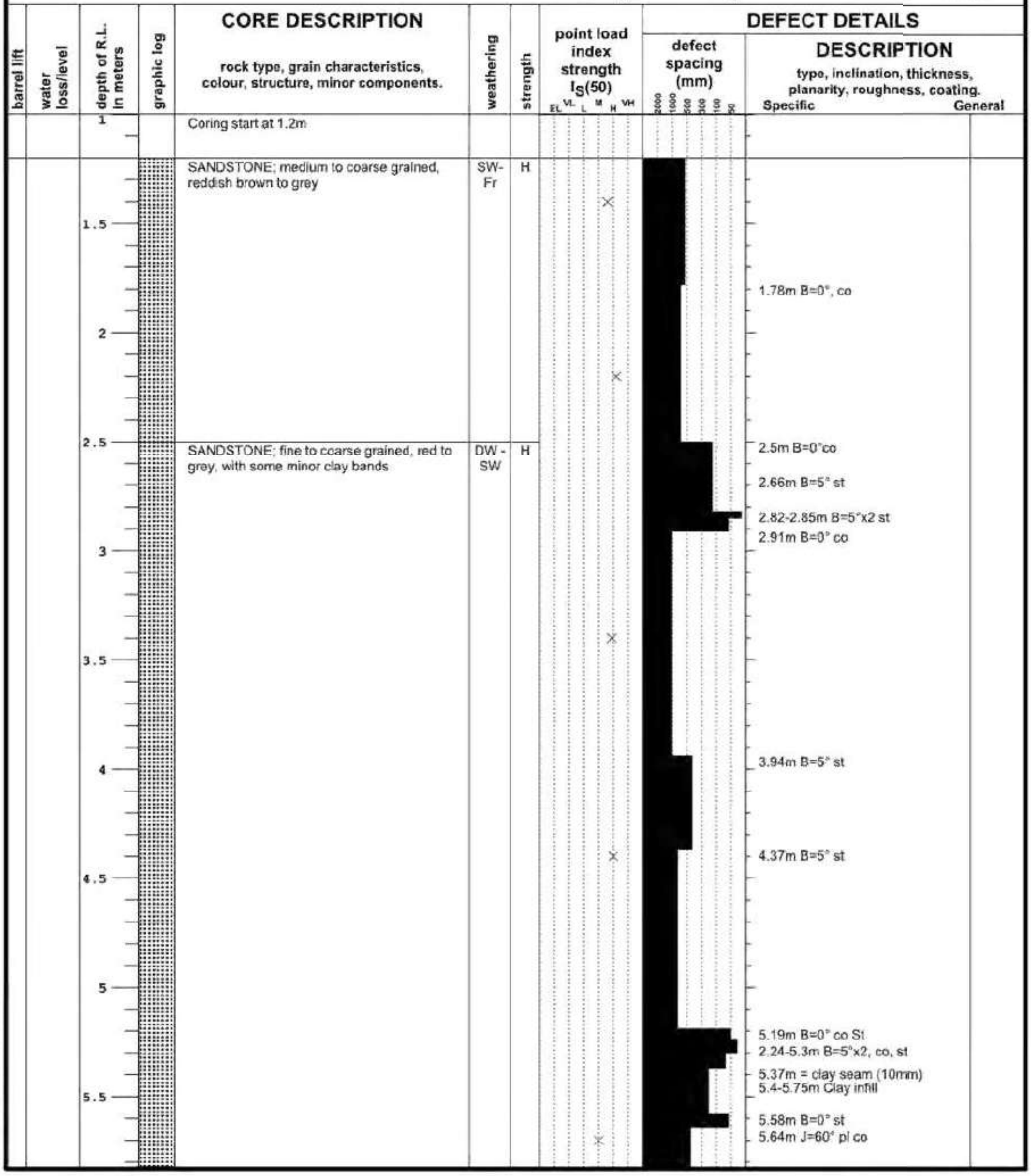
form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client :	Nix Anderson Pty Ltd	**Job No. :**	13188/1
Project :	Proposed Development	**Borehole No. :**	6
Location :	160 Burwood Road, Concord	**Date :**	11/08/2014
		Logged/Checked by :	LY/MT

drill model and mounting : Edson Truck Mounted **slope :** 90 **deg.** **R.L. surface :** ≅6.3
core size: NMLC **bearing :** **deg.** **datum :** AHD



depth	core description	weathering	strength
1	Coring start at 1.2m		
	SANDSTONE; medium to coarse grained, reddish brown to grey	SW-Fr	H
2.5	SANDSTONE; fine to coarse grained, red to grey, with some minor clay bands	DW - SW	H

Defect details – Specific:
1.78m B=0°, co
2.5m B=0°co
2.66m B=5° st
2.82-2.85m B=5°x2 st
2.91m B=0° co
3.94m B=5° st
4.37m B=5° st
5.19m B=0° co St
2.24-5.3m B=5°x2, co, st
5.37m = clay seam (10mm)
5.4-5.75m Clay infill
5.58m B=0° st
5.64m J=60° pl co

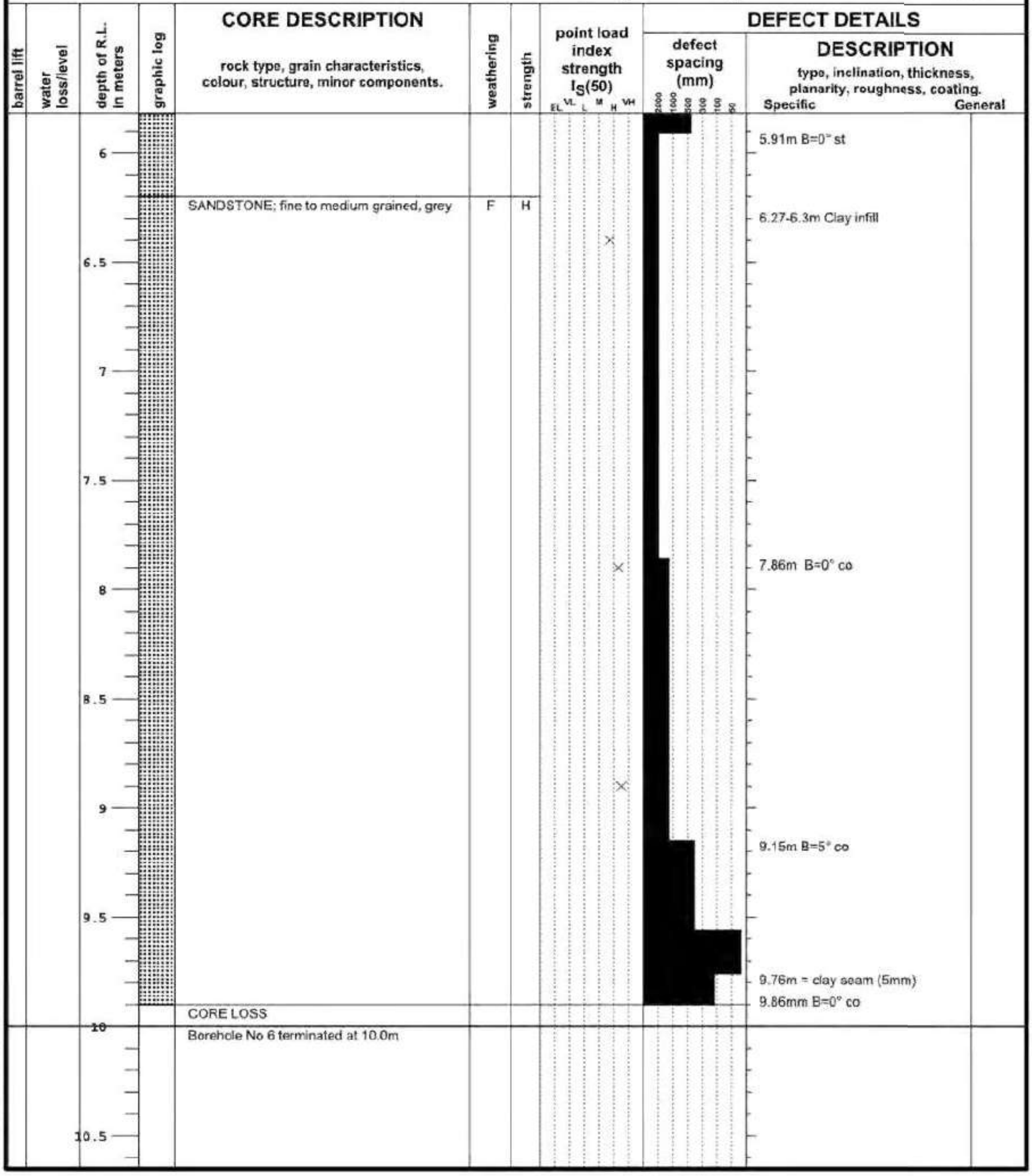
form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord
Job No. : 13188/1
Borehole No. : 6
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅6.3
core size: NMLC
bearing : **deg.**
datum : AHD



CORE DESCRIPTION
rock type, grain characteristics, colour, structure, minor components.

CORE DESCRIPTION	weathering	strength
SANDSTONE; fine to medium grained, grey	F	H
CORE LOSS		
Borehole No 6 terminated at 10.0m		

DEFECT DETAILS
DESCRIPTION
type, inclination, thickness, planarity, roughness, coating.
Specific General

5.91m B=0° st
6.27-6.3m Clay infill
7.86m B=0° co
9.15m B=5° co
9.76m = clay seam (5mm)
9.86mm B=0° co

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 7
Date : 11/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≈5.6
hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger	Dry					0			ASPHALTIC CONCRETE				
									ROADBASE; sandy gravel, fine to medium grained, grey				Well compacted
		DS			N=14 9,10,4	0.5			FILL; Silty Sand, fine grained, brown, with inclusion of gravel				
						1			FILL; Sandy Clay, high plasticity, dark grey				Well compacted
		DS			N=5 5,3,2	1.5 2			FILL; Sandy Clay, medium plasticity, brown, with inclusion of gravel				Well compacted
		DS							FILL; Silty Clay, high plasticity, grey				Well compacted
						2.5		SM	Silty SAND, fine to medium grained, grey brown	M	D-VD		Alluvial
					N=R 2,2,10/ 100	3 3.5			SANDSTONE; fine to medium grained, grey brown				Bedrock
						4 4.5			Commenced Coring at 3.8m				

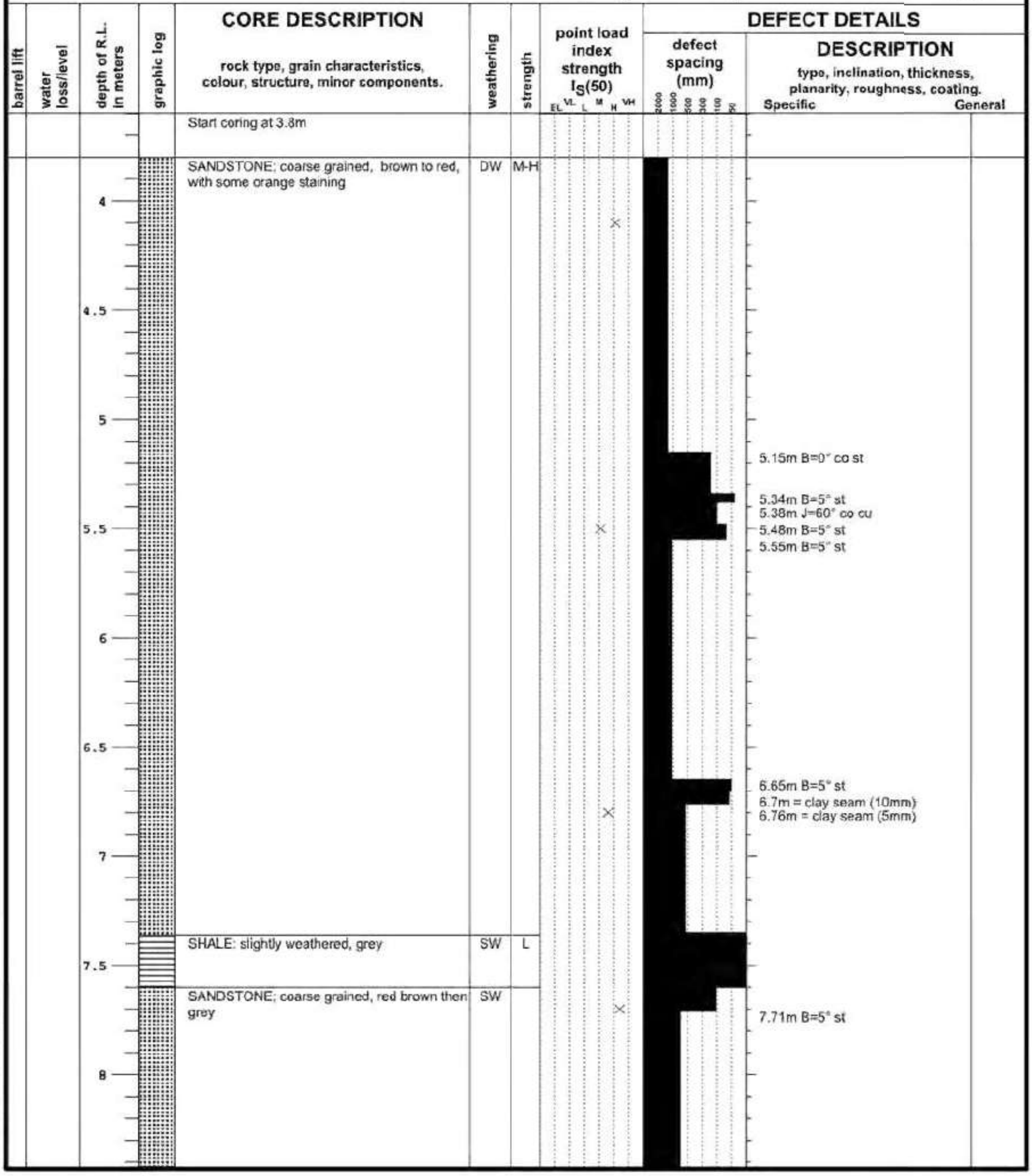
form no. 002 version 04 - 05/11

GEOTECHNIQUE PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/1
Borehole No. : 7
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≃5.6
core size: NMLC
bearing : **deg.**
datum : AHD



depth of R.L. in meters	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS – DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
	Start coring at 3.8m				
3.8	SANDSTONE; coarse grained, brown to red, with some orange staining	DW	M-H	5.15m B=0° co st 5.34m B=5° st 5.38m J=60° co cu 5.48m B=5° st 5.55m B=5° st 6.65m B=5° st 6.7m = clay seam (10mm) 6.76m = clay seam (5mm)	
7.35	SHALE; slightly weathered, grey	SW	L		
7.6	SANDSTONE; coarse grained, red brown then grey	SW		7.71m B=5° st	

form no. 003 version 03 - 09/10

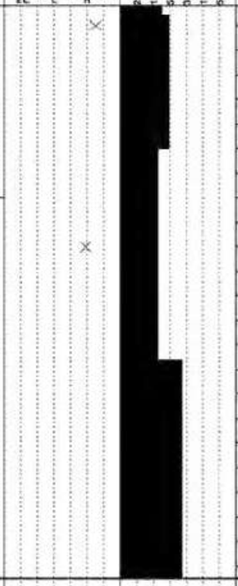
GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/1
Borehole No. : 7
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≃5.6
core size: NMLC
bearing : **deg.**
datum : AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_S(50)$ EL VL L M H VH	defect spacing (mm) 2000 1000 500 300 100 50	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
		8.5							8.46m B=0° st	
		9							9.0M J=30° PL ST	
				SANDSTONE; fine to medium grained, grey	SW- F	H				
		9.5								
									9.86m B=5° co	
		10							10.22m B=0° co st	
		10.5								
				Borehole No 7 terminated at 10.75m						
		11								
		11.5								
		12								
		12.5								
		13								



form no. 003 version 03 - 09/10

MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client :	Nix Anderson Pty Ltd	**Job No. :**	13188/1
Project :	Proposed Development	**Borehole No. :**	8
Location :	160 Burwood Road, Concord	**Date :**	14/08/2014
		Logged/Checked by:	LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≃5.7

hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	Dry					0	■		Concrete Pavement 200mm				
		DS					▩		FILL; Silty Sand, fine to medium grained, brown, with some gravel				
					N=19 5,10,9	0.5	░	SM	Silty SAND, fine to medium grained, brown, with some ironstone	M	MD		
						1	▒	SM	SANDSTONE; fine to medium grained, brown, extremely weathered				Bedrock
						1.5			Commenced Coring at 1.4m				
						2							
						2.5							
						3							
						3.5							
						4							
						4.5							

form no. 002 version 04 - 05/11

GEOTECHNIQUE PTY LTD

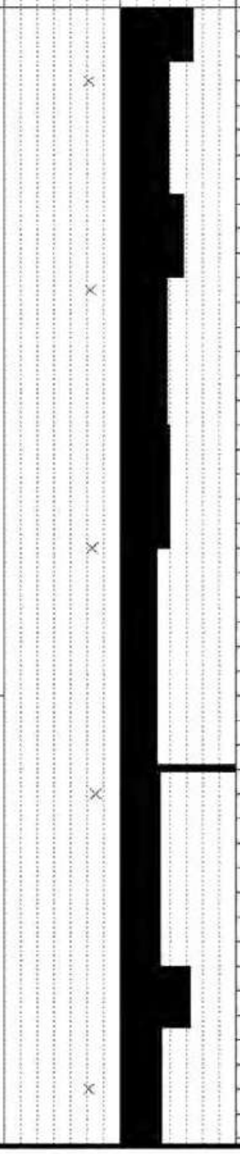
engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 8
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≃5.7
core size: NMLC
bearing : **deg.**
datum : AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_s(50)$ EL VL L M H VH	defect spacing (mm) 2000 1000 500 300 100 50	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
				Started coring at 1.4m						
		1.5		SANDSTONE: medium to coarse grained, grey yellow to red	DW	H			1.6m B=0° stepped	
		2							2.17m B=5° planar	
		2.5							2.6m B=10° stepped	
		3							3.1m B=0° planar	
		3.5							3.6m B=2° planar	
		4		SANDSTONE: fine to medium grained, grey red, with some clay bands	DW-SW	H				
		4.5							4.48-4.51m clay seam (30mm)	
		5							5.25-5.3m (EW zone) 5.3-5.45m (EW zone)	
		5.5								
		6								



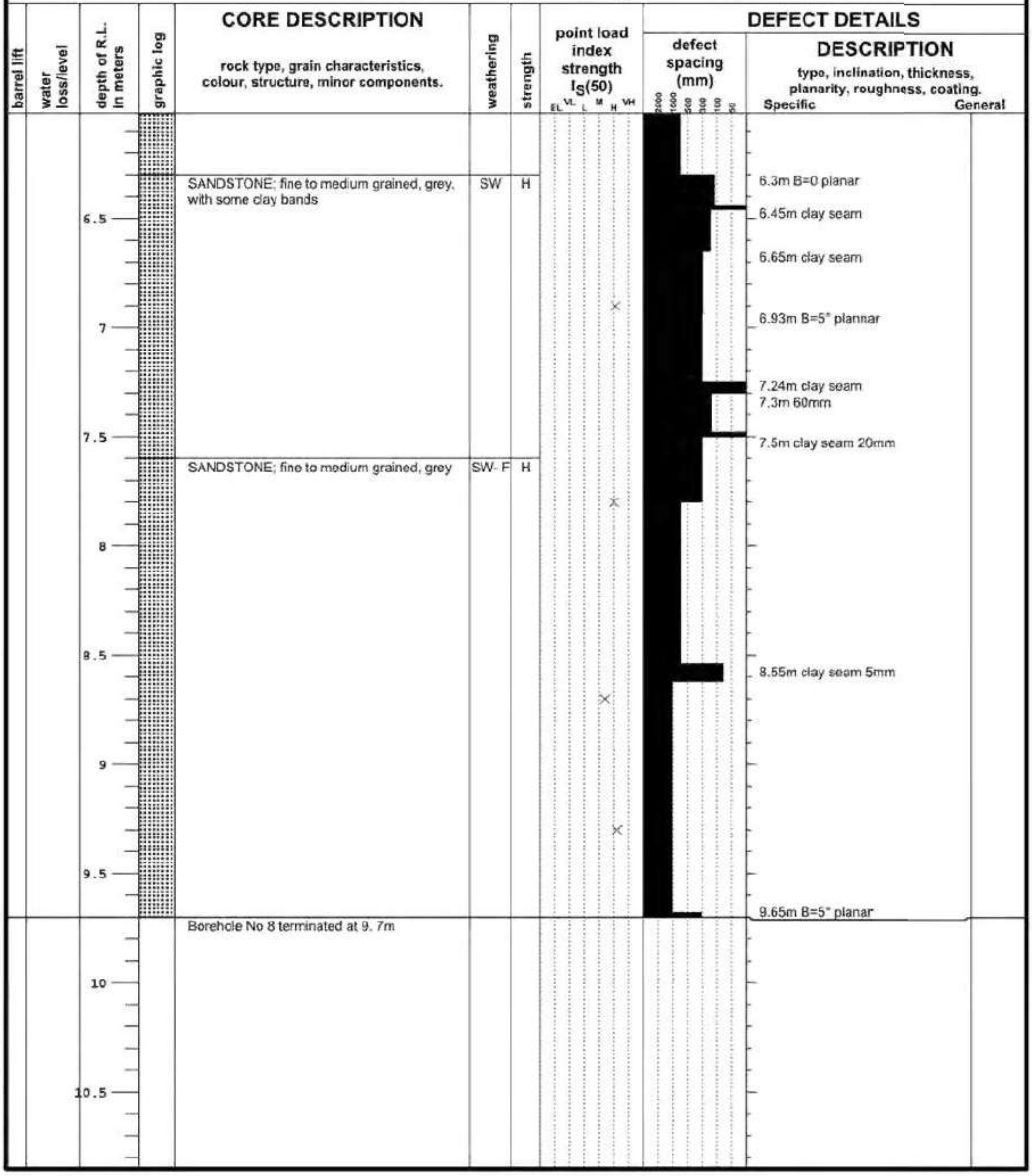
form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord
Job No. : 13188/1
Borehole No. : 8
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.7
core size: NMLC
bearing : **deg.**
datum : AHD



CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength
SANDSTONE: fine to medium grained, grey, with some clay bands	SW	H
SANDSTONE; fine to medium grained, grey	SW- F	H
Borehole No 8 terminated at 9. 7m		

DEFECT DETAILS
DESCRIPTION
type, inclination, thickness, planarity, roughness, coating.
Specific General

6.3m B=0 planar
6.45m clay seam
6.65m clay seam
6.93m B=5° plannar
7.24m clay seam
7.3m 60mm
7.5m clay seam 20mm
8.55m clay seam 5mm
9.65m B=5° planar

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

GEOTECHNIQUE
PTY LTD

Job No 13188/1 BH8 Started Coring at 1.4m

BH8 terminated at 10.0m

MT.mh/04.09.2014

GEOTECHNIQUE PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 9
Date : 14/08/2014
Logged/Checked by: LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≃7.16
hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0			Bitumen Pavement				
		DS							FILL; Silty Gravelly Clay, medium plasticity, grey, with some gravel	M<PL			
					N=13 5,3,10	0.5			FILL; Silty Gravelly Clay, medium to high plasticity, grey brown to dark brown, with gravel	M<PL			
		DS			N=5 2,2,3	1 1.5			FILL; Silty Gravelly Clay, medium to high plasticity, grey brown to dark brown with ironstone	M<PL			
		DS				2			FILL; Silty Clay, medium to high plasticity, dark brown	M<PL	F		
					N=8 2,3,5	2.5 3 3.5		CI-CH	Silty CLAY, medium to high plasticity, orange to grey, with some ironstone	M>PL	St		Residual
	Dry					4			SANDSTONE; fine to medium grained, grey red				Bedrock
						4.5			Commenced Coring at 4.5m				

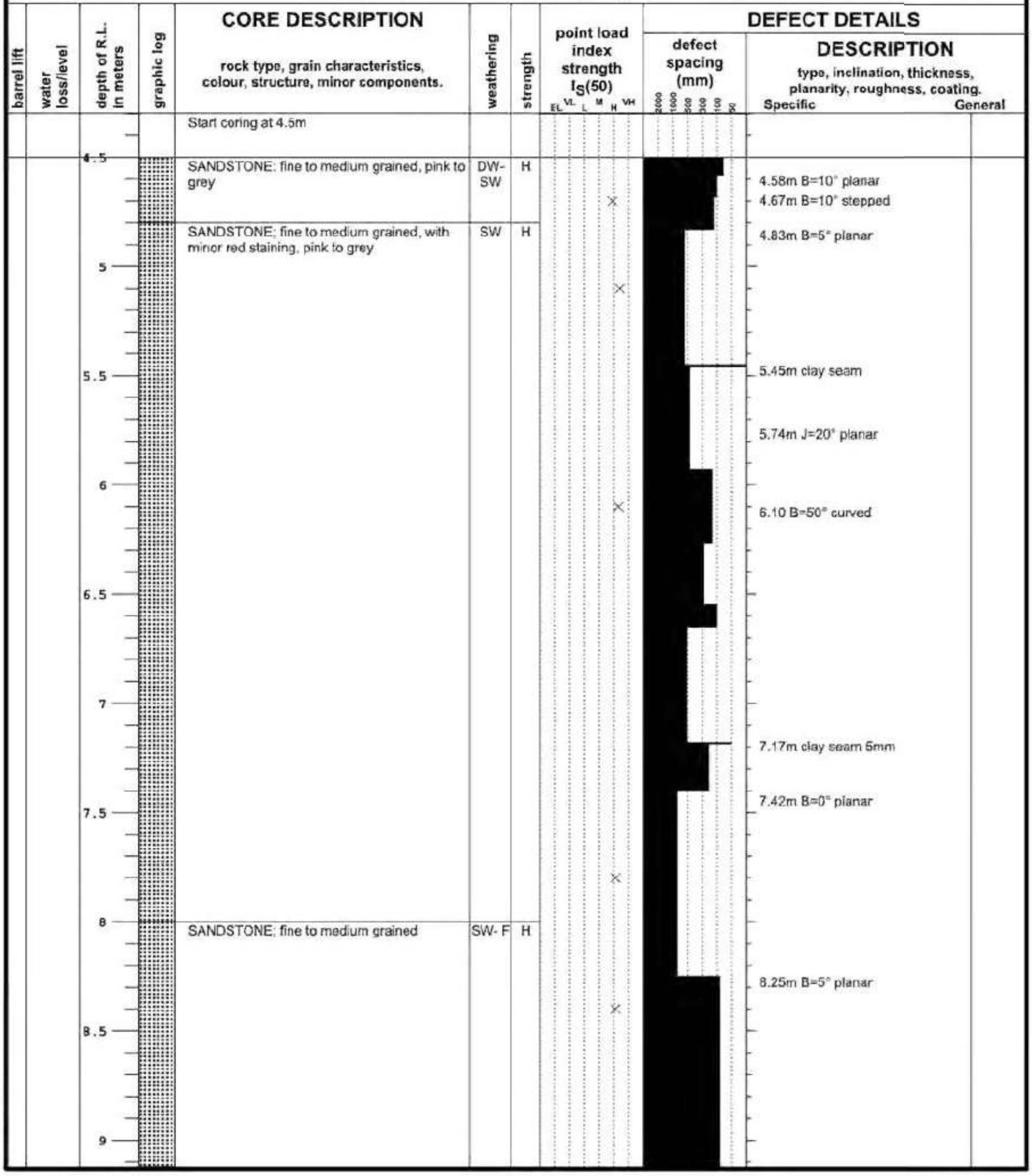
form no. 002 version 04 - 05/11

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord
Job No. : 13188/1
Borehole No. : 9
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅7.16
core size: NMLC
bearing : **deg.**
datum : AHD



CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength
Start coring at 4.5m		
SANDSTONE: fine to medium grained, pink to grey	DW-SW	H
SANDSTONE; fine to medium grained, with minor red staining, pink to grey	SW	H
SANDSTONE; fine to medium grained	SW- F	H

DEFECT DETAILS
DESCRIPTION type, inclination, thickness, planarity, roughness, coating.
Specific General

4.58m B=10° planar
4.67m B=10° stepped
4.83m B=5° planar
5.45m clay seam
5.74m J=20° planar
6.10 B=50° curved
7.17m clay seam 5mm
7.42m B=0° planar
8.25m B=5° planar

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/1
Borehole No. : 9
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≃7.16
core size: NMLC
bearing : **deg.**
datum : AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	**CORE DESCRIPTION** rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_{S}(50)$ EL VL L M H VH	defect spacing (mm) 2000 1000 500 300 100 50	**DEFECT DETAILS** **DESCRIPTION** type, inclination, thickness, planarity, roughness, coating. Specific	General
			▩					■	9.15m B=10 planar	
				Borehole No 9 terminated at 9. 3m						
		9.5								
		10								
		10.5								
		11								
		11.5								
		12								
		12.5								
		13								
		13.5								

form no. 003 version 03 - 09/10

MT.mh/04.09.2014

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client :	Nix Anderson Pty Ltd	**Job No. :**	13188/1
Project :	Proposed Development	**Borehole No. :**	10
Location :	160 Burwood Road, Concord	**Date :**	14/08/2014
		Logged/Checked by:	LY/MT

drill model and mounting : Edson Truck Mounted **slope :** deg. **R.L. surface :** ≃5.9

hole diameter : 125 mm **bearing :** deg. **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Auger	Dry					0	■		Concrete				
									Road base/gravel				Well compacted
		DS					▩		FILL; Gravelly Clay, medium plasticity, grey with inclusion of sand				
		DS			N=16 7,7,8	0.5 1	▨	CH	Shaley CLAY, high plasticity, grey and red brown	M>PL	VSt-H		Residual
					N=R 30/150, Ref	1.5 2	░		SANDSTONE; extremely weathered, extremely low strength, brown with ironstone bands				Bedrock
						2.5 3 3.5 4 4.5			Commenced coring at 2.4m				

form no. 002 version 04 - 05/11

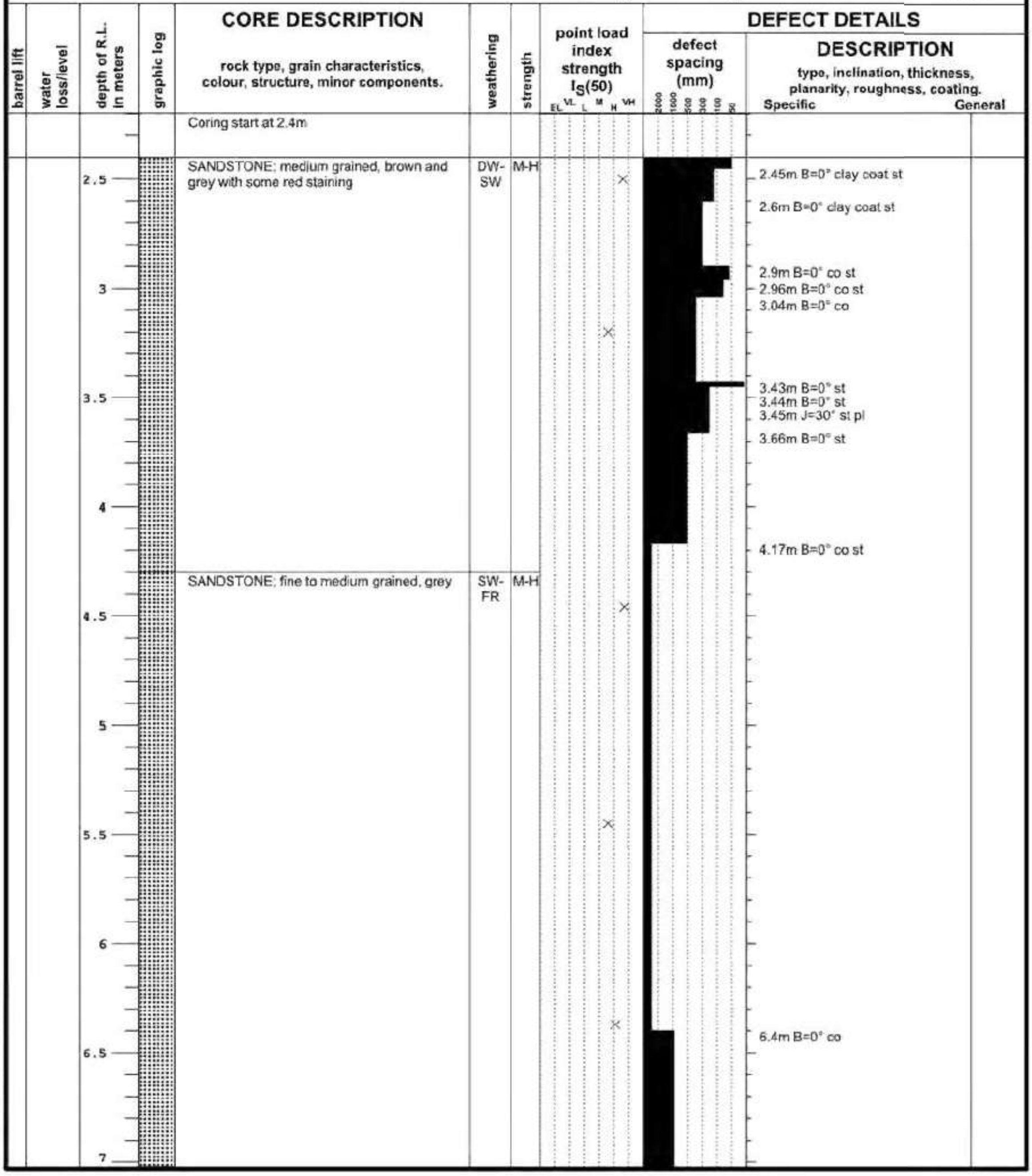
GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 10
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.9
core size: NMLC
bearing : **deg.**
datum : AHD



CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific	General
Coring start at 2.4m				
SANDSTONE: medium grained, brown and grey with some red staining	DW-SW	M-H	2.45m B=0° clay coat st 2.6m B=0° clay coat st 2.9m B=0° co st 2.96m B=0° co st 3.04m B=0° co 3.43m B=0° st 3.44m B=0° st 3.45m J=30° st pl 3.66m B=0° st 4.17m B=0° co st	
SANDSTONE: fine to medium grained, grey	SW-FR	M-H	6.4m B=0° co	

form no. 003 version 03 - 09/10

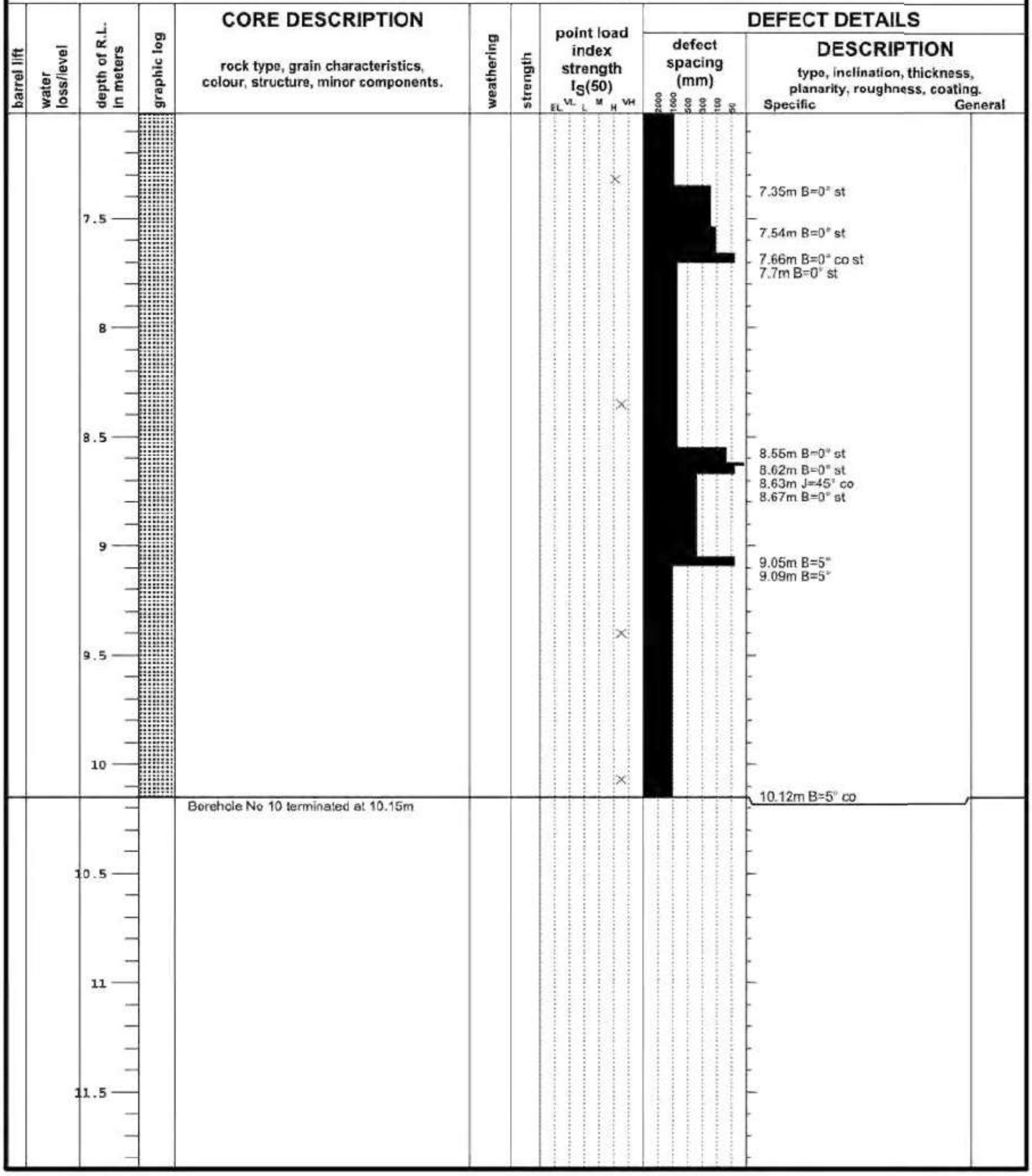
GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road,
Concord

Job No. : 13188/1
Borehole No. : 10
Date : 11/08/2014
Logged/Checked by : LY/MT

drill model and mounting : Edson Truck Mounted
slope : 90 **deg.**
R.L. surface : ≅5.9
core size: NMLC
bearing : **deg.**
datum : AHD

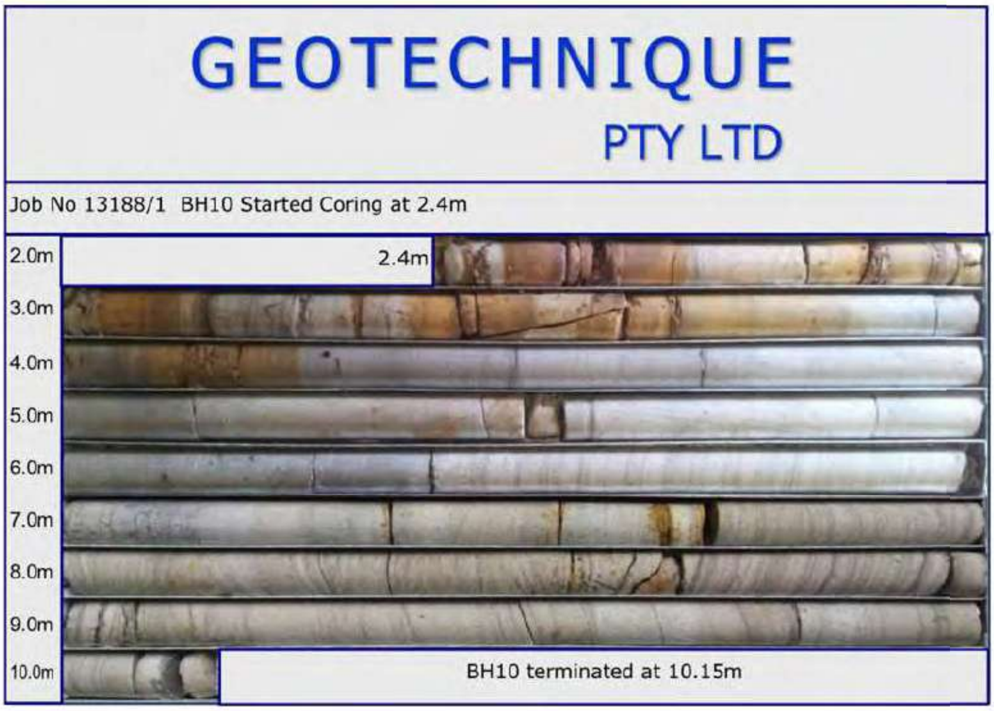


Borehole No 10 terminated at 10.15m

7.35m B=0° st
7.54m B=0° st
7.66m B=0° co st
7.7m B=0° st
8.55m B=0° st
8.62m B=0° st
8.63m J=45° co
8.67m B=0° st
9.05m B=5°
9.09m B=5°
10.12m B=5° co

form no. 003 version 03 - 09/10

GEOTECHNIQUE
PTY LTD



GEOTECHNIQUE
PTY LTD

Job No 13188/1 BH10 Started Coring at 2.4m

MT.mh/04.09.2014

EXPLANATORY NOTES

Introduction

These notes have been provided to simplify the geotechnical report with regard to investigation procedures, classification methods and certain matters relating to the Discussion and Comments section. Not all notes are necessarily relevant to all reports.

Geotechnical reports are based on information gained from finite sub-surface probing, excavation, boring, sampling or other means of investigation, supplemented by experience and knowledge of local geology. For this reason they must be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on AS1726 - 1993 "Geotechnical Site Investigations". In general, descriptions cover the following properties; strength or density, colour, structure, soil or rock type, and inclusions. Identification and classification of soil and rock involves, to a large extent, judgement within the acceptable level commonly adopted by current geotechnical practices.

Soil types are described according to the predominating particle size, qualified by the grading or other particles present (e.g. sandy clay) on the following basis:

Soil Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2.00mm
Gravel	2.00mm to 60.00mm

Cohesive soils are classified on the basis of strength, either by laboratory testing or engineering examination. The strength terms are defined as follows:

Classification	Undrained Shear Strength kPa
Very Soft	Less than 12
Soft	12 – 25
Firm	25 – 50
Stiff	50 – 100
Very Stiff	100 – 200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT), as below:

Relative Density	SPT 'N' Value (blows/300mm)	CPT Cone Value (q_c-MPQ)
Very Loose	Less than 5	Less than 2
Loose	5 – 10	2 – 5
Medium Dense	10 – 30	5 – 15
Dense	30 – 50	15 – 25
Very Dense	>50	>25

Rock types are classified by their geological names, together with descriptive terms on degrees of weathering, strength, defects and other minor components. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, type, moisture content, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin walled sample tube (normally known as U_{50}) into the soil and withdrawing a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils. Details of the type and method of sampling are given in the report.

Field Investigation Methods

The following is a brief summary of investigation methods currently carried out by this Company and comments on their use and application.

Hand Auger Drilling

The borehole is advanced by manually operated equipment. The diameter of the borehole ranges from 50mm to 100mm. Penetration depth of hand augered boreholes may be limited by premature refusal on a variety of materials, such as hard clay, gravels or ironstone.

Test Pits

These are excavated with a tractor-mounted backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3.0m for a backhoe and up to 6.0m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Care must be taken if construction is to be carried out near, or within the test pit locations, to either adequately recompact the backfill during construction, or to design the structure to accommodate the poorly compacted backfill.

Large Diameter Auger (e.g. Pengo)

The hole is advanced by a rotating plate or short spiral auger, generally 300mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5m) and are disturbed, but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers and is usually supplemented by occasional undisturbed tube sampling.

Continuous Spiral Flight Augers

The hole is advanced by using 90mm-115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be highly mixed with soil of other stratum.

Information from the drilling (as distinct from specific sampling by SPT or undisturbed samples) is of relatively lower reliability due to remoulding, mixing or softening of samples by groundwater, resulting in uncertainties of the original sample depth.

The spiral augers are usually advanced by using a V-bit through the soil profile to refusal, followed by Tungsten Carbide (TC) bit, to penetrate into bedrock. The quality and continuity of the bedrock may be assessed by examination of recovered rock fragments and through observation of the drilling penetration resistance.

Non-core Rotary Drilling (Wash Boring)

The hole is advanced by a rotary bit, with water being pumped down the drill rod and returned up the annulus carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the feel and rate of penetration.

Rotary Mud Stabilised Drilling

This is similar to rotary drilling, but uses drilling mud as a circulating fluid, which may consist of a range of products from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (e.g. SPT and U_{50}) samples).

Continuous Core Drilling
A continuous core sample is obtained using a diamond tipped core barrel. Providing full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush.

Portable Proline Drilling
This is manually operated equipment and is only used in sites which require bedrock core sampling and there is restricted site access to truck mounted drill rigs. The boreholes are usually advanced initially using a tricone roller bit and water circulation to penetrate the upper soil profile. In some instances, a hand auger may be used to penetrate the soil profile. Subsequent drilling into bedrock involves the use of NMLC triple tube equipment, using water as a lubricant.

Standard Penetration Tests
Standard penetration tests are used mainly in non-cohesive soils, but occasionally also in cohesive soils, as a means of determining density or strength and of obtaining a relatively undisturbed sample. The test procedure is described in AS1289 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube under the impact of a 63kg hammer with a free fall of 769mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In a case where full penetration is obtained with successive blow counts for each 150mm of, say 4, 6 and 7 blows as;

  N = 13
  4,6,7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm as;

  15, 30/40mm

The results of the tests can be related empirically to the engineering properties of the soil. Occasionally the test method is used to obtain samples in 50mm diameter thin walled sample tubes in clays. In these circumstances, the test results are shown on the bore logs in brackets.

Cone Penetrometer Testing and Interpretation
Cone penetrometer testing (sometimes referred to as Dutch Cone-CPT) described in this report, has been carried out using an electrical friction cone penetrometer and the test is described in AS1289 6.5.1.

In the test, a 35mm diameter rod with cone tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig, which is fitted with a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output on continuous chart recorders. The plotted results given in this report have been traced from the original records. The information provided on the charts comprises:

- Cone resistance - the actual end bearing force divided by the cross sectional area of the cone, expressed in MPa *
- Sleeve friction - the frictional force on the sleeve divided by the surface area, expressed in kPa

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and very soft clays, rising to 4% to 10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:

$$q_c \text{ (MPa)} = (0.4 \text{ to } 0.6) \text{ N (blows per 300mm)}$$

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:

$$q_c = (12 \text{ to } 18)C_u$$

Interpretation of CPT values can also be made to allow estimate of modulus or compressibility values, to allow calculation of foundation settlements. Inferred stratification, as shown on the attached report, is assessed from the cone and friction traces, from experience and information from nearby boreholes etc.

This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties and where precise information or soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometer (DCP)
Portable Dynamic Cone Penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows per successive 100mm increment of penetration.

There are two similar tests, Cone Penetrometer (commonly known as Scala Penetrometer) AS1289 6.3.2 and the Perth Sand Penetrometer AS1289 6.3.3. Scala Penetrometer is commonly adopted by this company and consists of a 16mm rod with a 20mm diameter cone end, driven with a 9kg hammer, dropping 510mm (AS1289 Test P3.2).

Laboratory Testing
Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedures are given on the individual report forms.

Engineering Logs
The engineering logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, however, this is not always practicable or possible to justify economically. As it is, the boreholes represent only a small sample of the total sub-surface profile. Interpretation of the information and its application to design and construction should take into account the spacing of boreholes, frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Groundwater
Where groundwater levels are measured in boreholes, there are several potential problems:

- in low permeability soils groundwater, although present, may enter the hole slowly or perhaps not at all during the investigation period
- a localised perched water table may lead to an erroneous indication of the true water table
- water table levels will vary from time to time due to the seasons or recent weather changes. They may not be the same at the time of construction as indicated in the report
- the use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole if water observations are to be made

More reliable measurements can be achieved by installing standpipes that are read at intervals over several days, or weeks for low permeability soils. Piezometers sealed in a particular stratum may be advisable in low permeability soils, or where there may be interference from a perched water table or surface water.

Engineering Reports
Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, perhaps a three-storey building, the information and interpretation may not be relevant if the design proposal is changed, say to a twenty-storey building. If this occurs, the Company will be pleased to review the report and sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of sub-surface conditions, discussions of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on bore spacing and sampling frequency.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of contractors responding to commercial pressures.

If these occur, the Company will be pleased to assist with investigation or advice to resolve the matter.

Site Anomalies
In the event that conditions encountered on-site during construction appear to vary from those that were expected from the information contained in the report, the Company requests immediate notification. Most problems are much more easily resolved when conditions are exposed rather than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes
Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institute of Engineers Australia. Where information obtained from this investigation is provided for tendering purposes; it is recommended that all information, including the written report and discussion, be made available.

In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or make additional copies of the report available for contract purposes, at a nominal charge.

Site Inspection
The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that the conditions exposed are as expected, to full time engineering presence on site.

Review of Design
Where major civil or structural developments are proposed, or where only a limited investigation has been completed, or where the geotechnical conditions are complex, it is prudent to have the design reviewed by a Senior Geotechnical Engineer.

SGS

ANALYTICAL REPORT

NATA
WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Emged Rizkalla	Manager	Jon Dicker
Client	Geotechnique	Laboratory	SGS Cairns Environmental
Address	P.O. Box 880 PENRITH NSW 2751	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	02 8594 0400	Telephone	+61 07 4035 5111
Facsimile	02 8594 0499	Facsimile	+61 07 4035 5122
Email	edward.ibrahim@sgs.com	Email	AU.Environmental.Cairns@sgs.com
Project	**SE130657 13188-1 - Concord**	SGS Reference	**CE111357 R0**
Order Number	(Not specified)	Report Number	0000019640
Samples	5	Date Reported	25 Aug 2014
Date Started	21 Aug 2014	Date Received	20 Aug 2014

COMMENTS

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

SIGNATORIES

Anthony Nilsson
Operations Manager

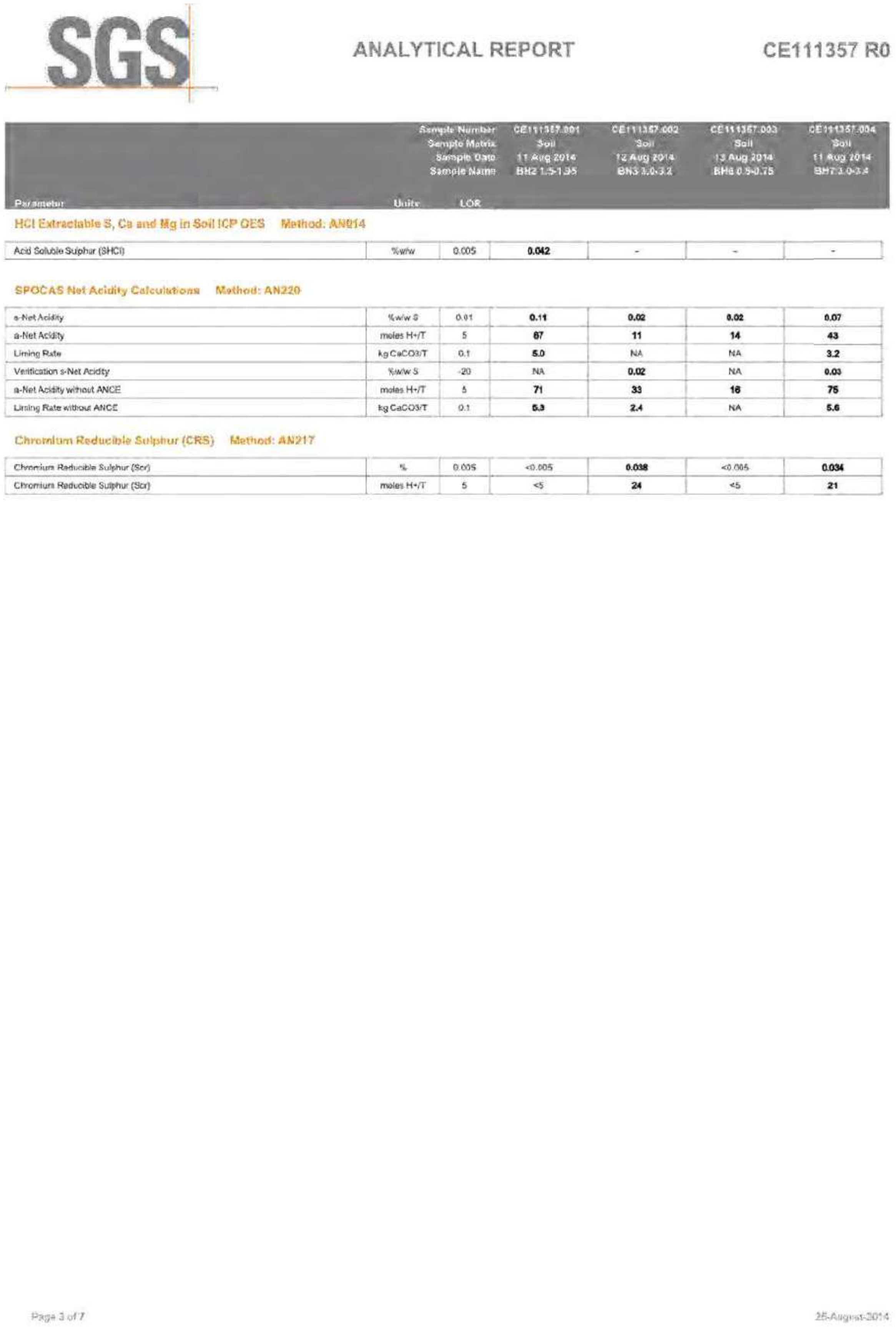
Jon Dicker
Manager Northern QLD

SGS

ANALYTICAL REPORT

CE111357 R0

		Sample Number	CE111357.001	CE111357.002	CE111357.003	CE111357.004
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	11 Aug 2014	12 Aug 2014	13 Aug 2014	11 Aug 2014
		Sample Name	BH2 1.5-1.95	BH3 3.0-3.2	BH6 0.5-0.75	BH7 3.0-3.4
Parameter	Units	LOR				
Moisture Content Method: AN002						
% Moisture	%	0.5	**15**	**22**	**19**	**30**
TAA (Titratable Actual Acidity) Method: AN219						
pH KCl	pH Units	-	**4.2**	**6.6**	**5.5**	**5.4**
Titratable Actual Acidity	kg H2SO4/T	0.25	**2.9**	<0.25	**0.61**	**1.3**
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	**60**	<5	**12**	**27**
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	**0.10**	<0.01	**0.02**	**0.04**
Sulphur (SKCl)	%w/w	0.005	**0.031**	<0.005	<0.005	<0.005
Calcium (CaKCl)	%w/w	0.005	**0.032**	**0.17**	**0.11**	**0.005**
Magnesium (MgKCl)	%w/w	0.005	**0.039**	**0.016**	**0.012**	**0.024**
TPA (Titratable Peroxide Acidity) Method: AN218						
Peroxide pH (pH Ox)	pH Units	-	**4.3**	**5.2**	**6.2**	**4.7**
TPA as kg H_2SO_4/tonne	kg H2SO4/T	0.25	**2.8**	<0.25	<0.25	**4.3**
TPA as moles H+/tonne	moles H+/T	5	**58**	<5	<5	**89**
TPA as S % W/W	%w/w S	0.01	**0.09**	<0.01	<0.01	**0.14**
Titratable Sulfidic Acidity as moles H+/tonne	moles H+/T	5	<5	<5	<5	**61**
Titratable Sulfidic Acidity as kg H_2SO_4/tonne	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	**3.0**
Titratable Sulfidic Acidity as S % W/W	%w/w S	0.01	<0.01	<0.01	<0.01	**0.10**
ANCE as % $CaCO_3$	% CaCO3	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
ANCE as S % W/W	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Peroxide Oxidisable Sulphur (Spos)	%w/w	0.005	**0.010**	**0.052**	**0.006**	**0.076**
Peroxide Oxidisable Sulphur as moles H+/tonne	moles H+/T	5	**6**	**33**	<5	**47**
Sulphur (Sp)	%w/w	0.005	**0.041**	**0.064**	**0.006**	**0.078**
Calcium (Cap)	%w/w	0.005	**0.032**	**0.20**	**0.12**	**0.11**
Reacted Calcium (CaA)	%w/w	0.005	<0.005	**0.027**	**0.005**	**0.017**
Reacted Calcium (CaA)	moles H+/T	5	<5	**13**	<5	**9**
Magnesium (Mgp)	%w/w	0.005	**0.040**	**0.016**	**0.013**	**0.029**
Reacted Magnesium (MgA)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Reacted Magnesium (MgA)	moles H+/T	5	<5	<5	<5	<5
Net Acid Soluble Sulphur as % w/w	%w/w	0.005	**0.011**	-	-	-
Net Acid Soluble Sulphur as moles H+/tonne	moles H+/T	5	**7**	-	-	-



SGS

ANALYTICAL REPORT

CE111357 R0

			Sample Number	CE111357.001	CE111357.002	CE111357.003	CE111357.004
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	11 Aug 2014	12 Aug 2014	13 Aug 2014	11 Aug 2014
			Sample Name	BH2 1.5-1.95	BH3 3.0-3.2	BH6 0.5-0.75	BH7 3.0-3.4
Parameter	Units	LOR					
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014							
Acid Soluble Sulphur (SHCl)	%w/w	0.005		**0.042**	-	-	-
SPOCAS Net Acidity Calculations Method: AN220							
s-Net Acidity	%w/w S	0.01		**0.11**	**0.02**	**0.02**	**0.07**
a-Net Acidity	moles H+/T	5		**67**	**11**	**14**	**43**
Liming Rate	kg CaCO3/T	0.1		**5.0**	NA	NA	**3.2**
Verification s-Net Acidity	%w/w S	-20		NA	**0.02**	NA	**0.03**
a-Net Acidity without ANCE	moles H+/T	5		**71**	**33**	**16**	**75**
Liming Rate without ANCE	kg CaCO3/T	0.1		**5.3**	**2.4**	NA	**5.6**
Chromium Reducible Sulphur (CRS) Method: AN217							
Chromium Reducible Sulphur (Scr)	%	0.005		<0.005	**0.038**	<0.005	**0.034**
Chromium Reducible Sulphur (Scr)	moles H+/T	5		<5	**24**	<5	**21**

Page 3 of 7

25-August-2014

SGS

ANALYTICAL REPORT

CE111357 R0

		Sample Number	CE111357.006
		Sample Matrix	Soil
		Sample Date	12 Aug 2014
		Sample Name	BH10 1.5-1.65
Parameter	**Units**	**LOR**	

Moisture Content Method: AN002

% Moisture	%	0.5	**17**

TAA (Titratable Actual Acidity) Method: AN219

pH KCl	pH Units	-	**4.4**
Titratable Actual Acidity	kg H2SO4/T	0.25	**2.8**
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	**54**
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	**0.09**
Sulphur (SKCl)	%w/w	0.005	**0.007**
Calcium (CaKCl)	%w/w	0.005	**0.010**
Magnesium (MgKCl)	%w/w	0.005	**0.025**

TPA (Titratable Peroxide Acidity) Method: AN218

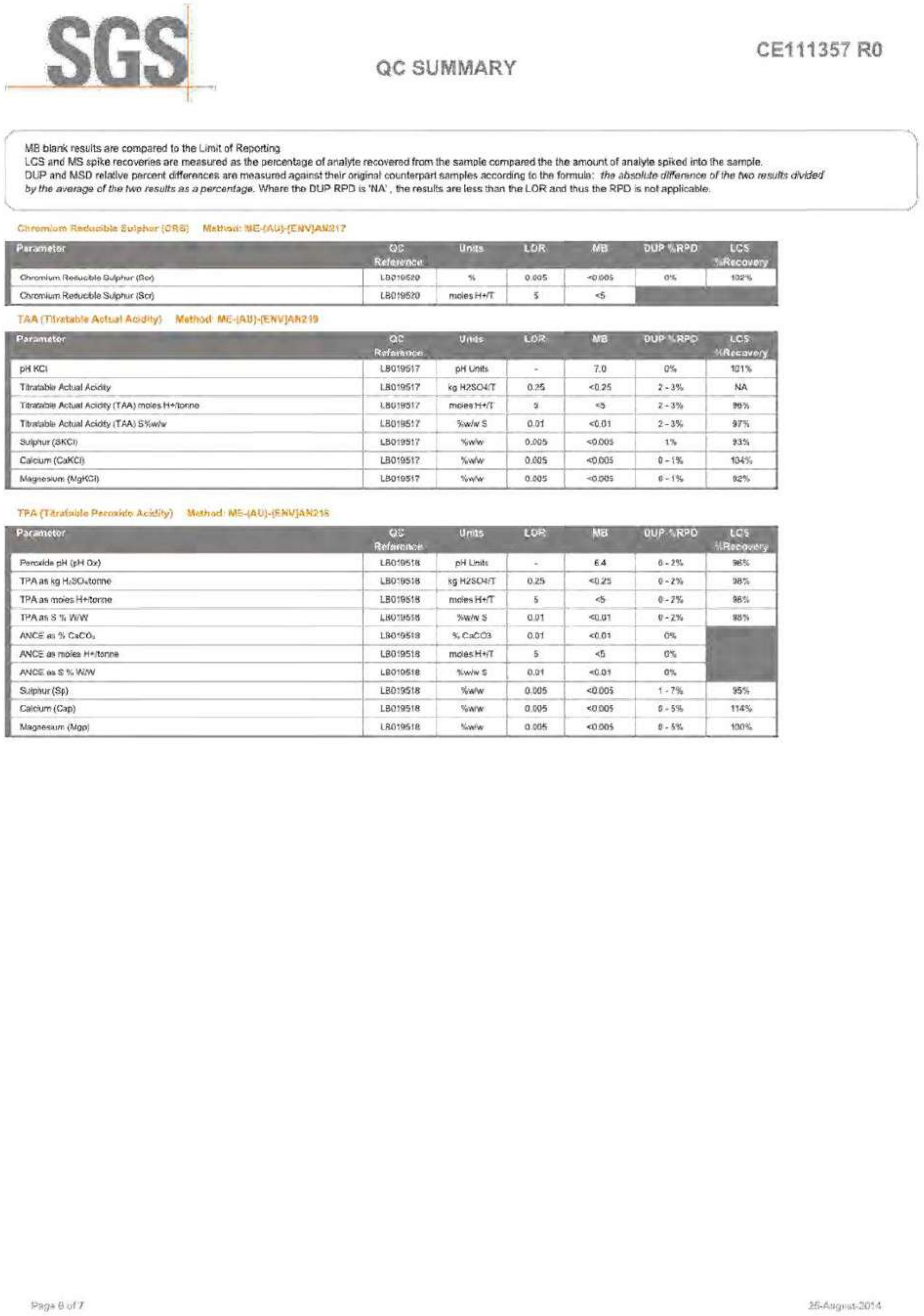
Peroxide pH (pH Ox)	pH Units	-	**4.9**
TPA as kg H_2SO_4/tonne	kg H2SO4/T	0.25	**2.7**
TPA as moles H+/tonne	moles H+/T	5	**55**
TPA as S % W/W	%w/w S	0.01	**0.09**
Titratable Sulfidic Acidity as moles H+/tonne	moles H+/T	5	<5
Titratable Sulfidic Acidity as kg H_2SO_4/tonne	kg H2SO4/T	0.25	<0.25
Titratable Sulfidic Acidity as S % W/W	%w/w S	0.01	<0.01
ANCE as % $CaCO_3$	% CaCO3	0.01	<0.01
ANCE as moles H+/tonne	moles H+/T	5	<5
ANCE as S % W/W	%w/w S	0.01	<0.01
Peroxide Oxidisable Sulphur (Spos)	%w/w	0.005	**0.008**
Peroxide Oxidisable Sulphur as moles H+/tonne	moles H+/T	5	**5**
Sulphur (Sp)	%w/w	0.005	**0.015**
Calcium (Cap)	%w/w	0.005	**0.012**
Reacted Calcium (CaA)	%w/w	0.005	<0.005
Reacted Calcium (CaA)	moles H+/T	5	<5
Magnesium (Mgp)	%w/w	0.005	**0.026**
Reacted Magnesium (MgA)	%w/w	0.005	<0.005
Reacted Magnesium (MgA)	moles H+/T	5	<5
Net Acid Soluble Sulphur as % w/w	%w/w	0.005	**0.012**
Net Acid Soluble Sulphur as moles H+/tonne	moles H+/T	5	**8**

SGS

ANALYTICAL REPORT

CE111357 R0

Parameter	Units	LOR	Sample Number CE111357.006 Sample Matrix Soil Sample Date 12 Aug 2014 Sample Name BH10 1.5-1.65
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014			
Acid Soluble Sulphur (SHCl)	%w/w	0.005	**0.019**
SPOCAS Net Acidity Calculations Method: AN220			
s-Net Acidity	%w/w S	0.01	**0.10**
a-Net Acidity	moles H+/T	5	**61**
Liming Rate	kg CaCO3/T	0.1	**4.6**
Verification s-Net Acidity	%w/w S	-20	NA
a-Net Acidity without ANCE	moles H+/T	5	**65**
Liming Rate without ANCE	kg CaCO3/T	0.1	**4.8**
Chromium Reducible Sulphur (CRS) Method: AN217			
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5



SGS

QC SUMMARY

CE111357 R0

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

Chromium Reducible Sulphur (CRS) **Method: ME-(AU)-[ENV]AN217**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chromium Reducible Sulphur (Scr)	LB019520	%	0.005	<0.005	0%	102%
Chromium Reducible Sulphur (Scr)	LB019520	moles H+/T	5	<5		

TAA (Titratable Actual Acidity) **Method: ME-(AU)-[ENV]AN219**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH KCl	LB019517	pH Units	-	7.0	0%	101%
Titratable Actual Acidity	LB019517	kg H2SO4/T	0.25	<0.25	2 - 3%	NA
Titratable Actual Acidity (TAA) moles H+/tonne	LB019517	moles H+/T	5	<5	2 - 3%	96%
Titratable Actual Acidity (TAA) S%w/w	LB019517	%w/w S	0.01	<0.01	2 - 3%	97%
Sulphur (SKCl)	LB019517	%w/w	0.005	<0.005	1%	93%
Calcium (CaKCl)	LB019517	%w/w	0.005	<0.005	0 - 1%	104%
Magnesium (MgKCl)	LB019517	%w/w	0.005	<0.005	0 - 1%	92%

TPA (Titratable Peroxide Acidity) **Method: ME-(AU)-[ENV]AN218**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Peroxide pH (pH Ox)	LB019518	pH Units	-	6.4	0 - 2%	98%
TPA as kg H_2SO_4/tonne	LB019518	kg H2SO4/T	0.25	<0.25	0 - 2%	98%
TPA as moles H+/tonne	LB019518	moles H+/T	5	<5	0 - 2%	98%
TPA as S % W/W	LB019518	%w/w S	0.01	<0.01	0 - 2%	98%
ANCE as % $CaCO_3$	LB019518	% CaCO3	0.01	<0.01	0%	
ANCE as moles H+/tonne	LB019518	moles H+/T	5	<5	0%	
ANCE as S % W/W	LB019518	%w/w S	0.01	<0.01	0%	
Sulphur (Sp)	LB019518	%w/w	0.005	<0.005	1 - 7%	95%
Calcium (Cap)	LB019518	%w/w	0.005	<0.005	0 - 5%	114%
Magnesium (Mgp)	LB019518	%w/w	0.005	<0.005	0 - 5%	100%

SGS

METHOD SUMMARY

CE111357 R0

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN004	Soils, sediments and sludges are pulverised using an LM2 ringmill. The dry sample is pulverised to a particle size of >90% passing through a -75µm sieve.
AN014	This method is for the determination of soluble sulphate (SO4-S) by extraction with hydrochloric acid. Sulphides should not react and would normally be expelled. Sulphur is determined by ICP.
AN217	Dried pulped sample is mixed with acid and chromium metal in a rapid distillation unit to produce hydrogen sulphide (H2S) which is collected and titrated with iodine (I2(aq)) to measure SCR.
AN218	Soil samples are subjected to extreme oxidising conditions using hydrogen peroxide. Continuous application of heat and peroxide ensure all sulphide is converted to sulphuric acid. Excess peroxide is broken down by a copper catalyst prior to titration for acidity. Calcium, magnesium, and sulphur are determined by ICP-OES. Also included is a carbonate modification step which, depending on pH after the initial oxidation, gives a measure of ANC.
AN219	Dried pulped sample is extracted for 4 hours in a 1 M KCl solution. The ratio of sample to solution is 1:40. The extract is titrated for acidity. Calcium, magnesium, and sulphur are determined by ICP-AES.
AN220	SPOCAS Suite: Scheme for the calculation of net acidities and liming rates using a Fineness Factor of 1.5.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
^	Performed by outside laboratory.	-	The sample was not analysed for this analyte
		NVL	Not Validated

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

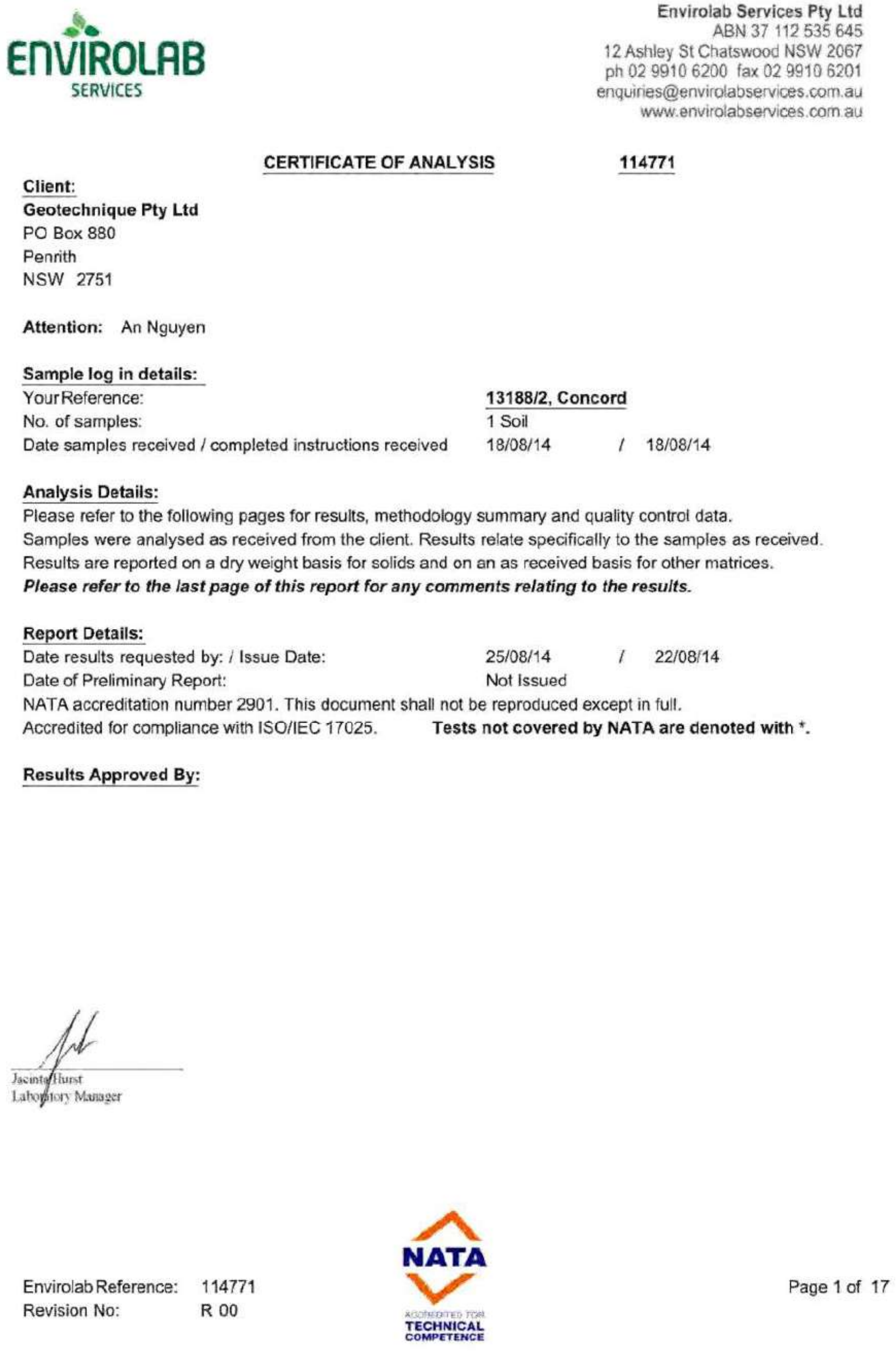
Some totals may not appear to add up because the total is rounded after adding up the raw values.

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

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions/General-Conditions-of-Services-English.aspx . The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This report must not be reproduced, except in full.



Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 114771

Client:
Geotechnique Pty Ltd
PO Box 880
Penrith
NSW 2751

Attention: An Nguyen

Sample log in details:

Your Reference:	**13188/2, Concord**	
No. of samples:	1 Soil	
Date samples received / completed instructions received	18/08/14 /	18/08/14

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

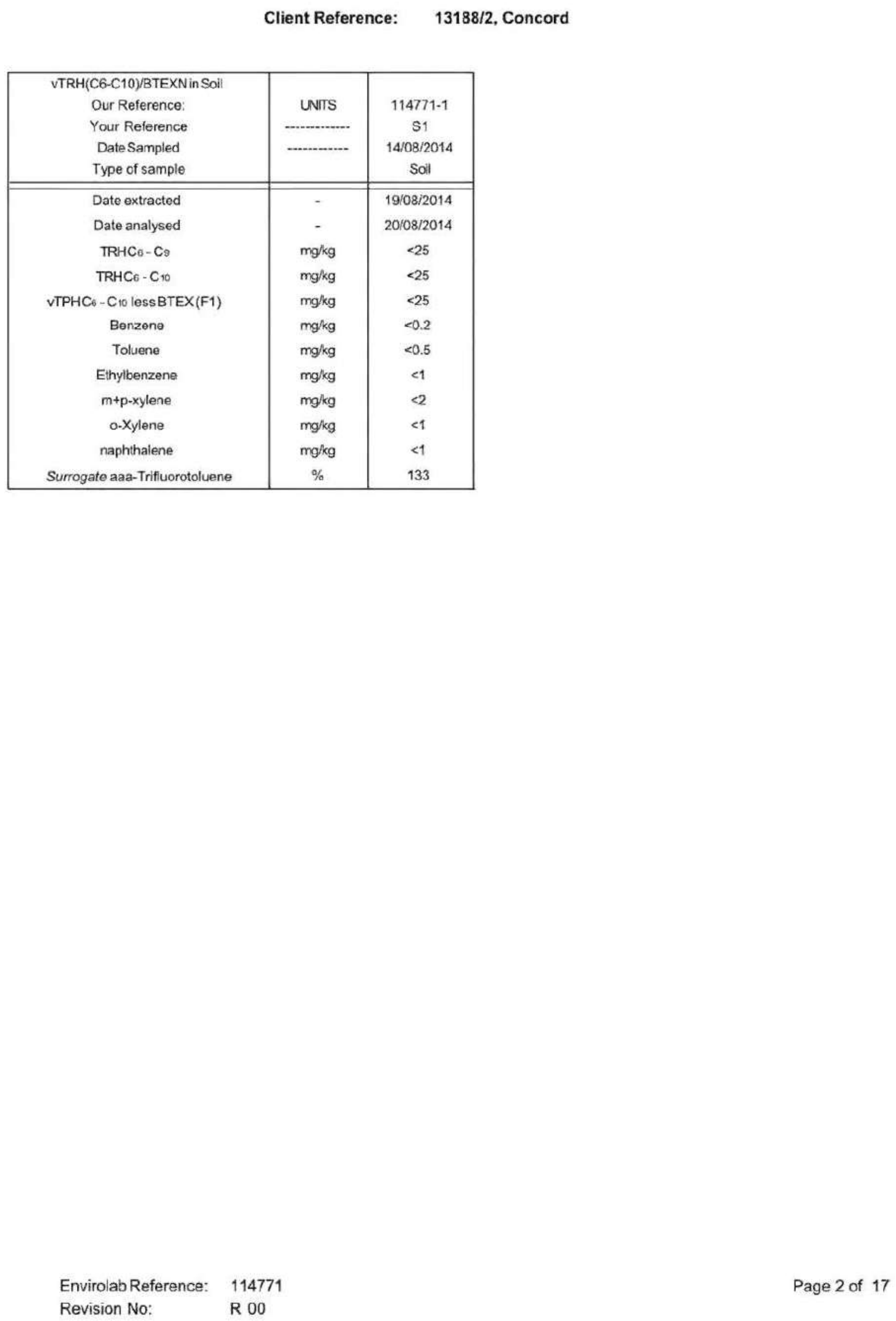
Date results requested by: / Issue Date:	25/08/14 /	22/08/14
Date of Preliminary Report:	Not Issued	

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

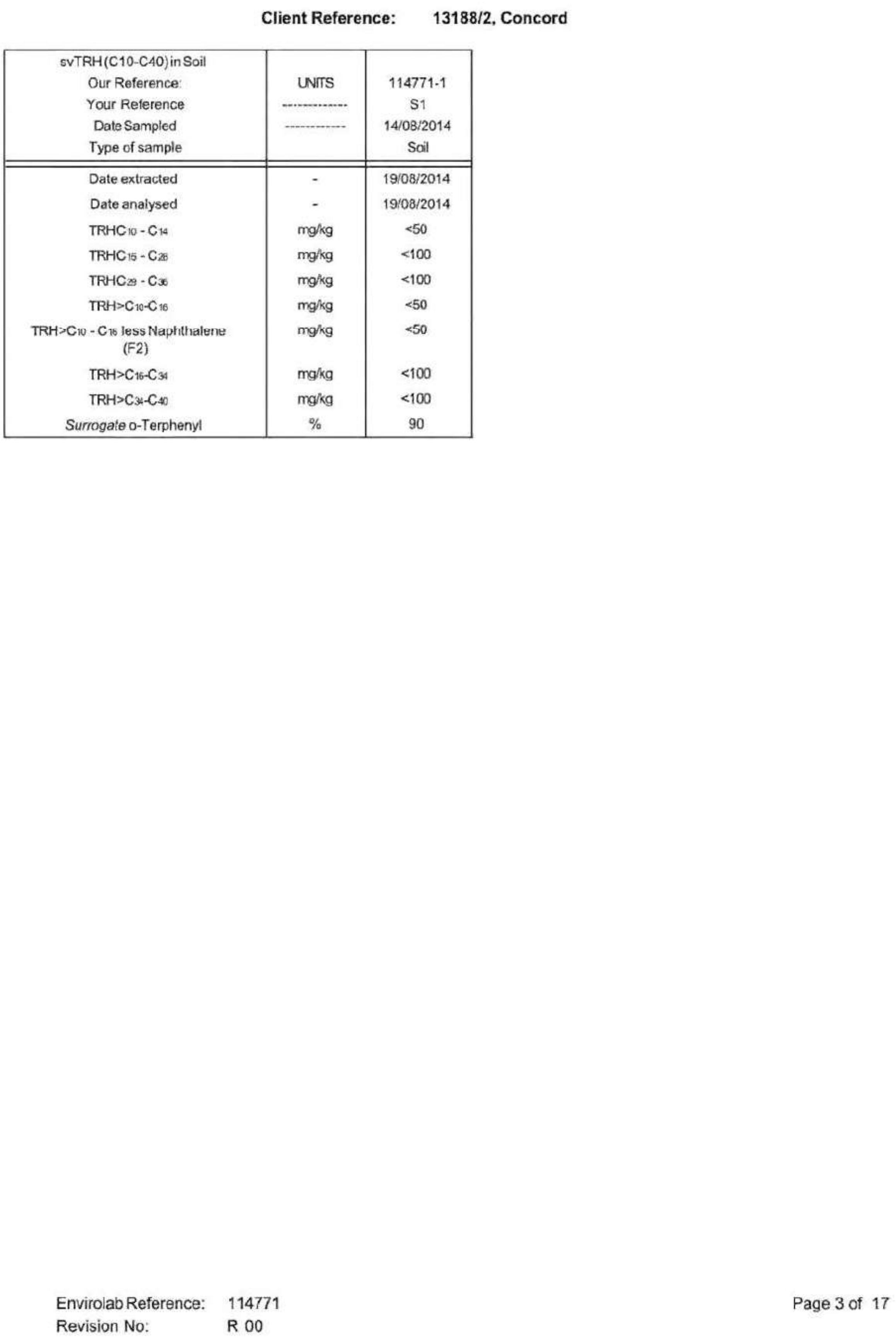
Jacinta Hurst
Laboratory Manager

NATA
ACCREDITED FOR TECHNICAL COMPETENCE



Client Reference: **13188/2, Concord**

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	114771-1 S1 14/08/2014 Soil
Date extracted	-	19/08/2014
Date analysed	-	20/08/2014
TRHC_6 - C_9	mg/kg	<25
TRHC_6 - C_{10}	mg/kg	<25
vTPHC_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	133

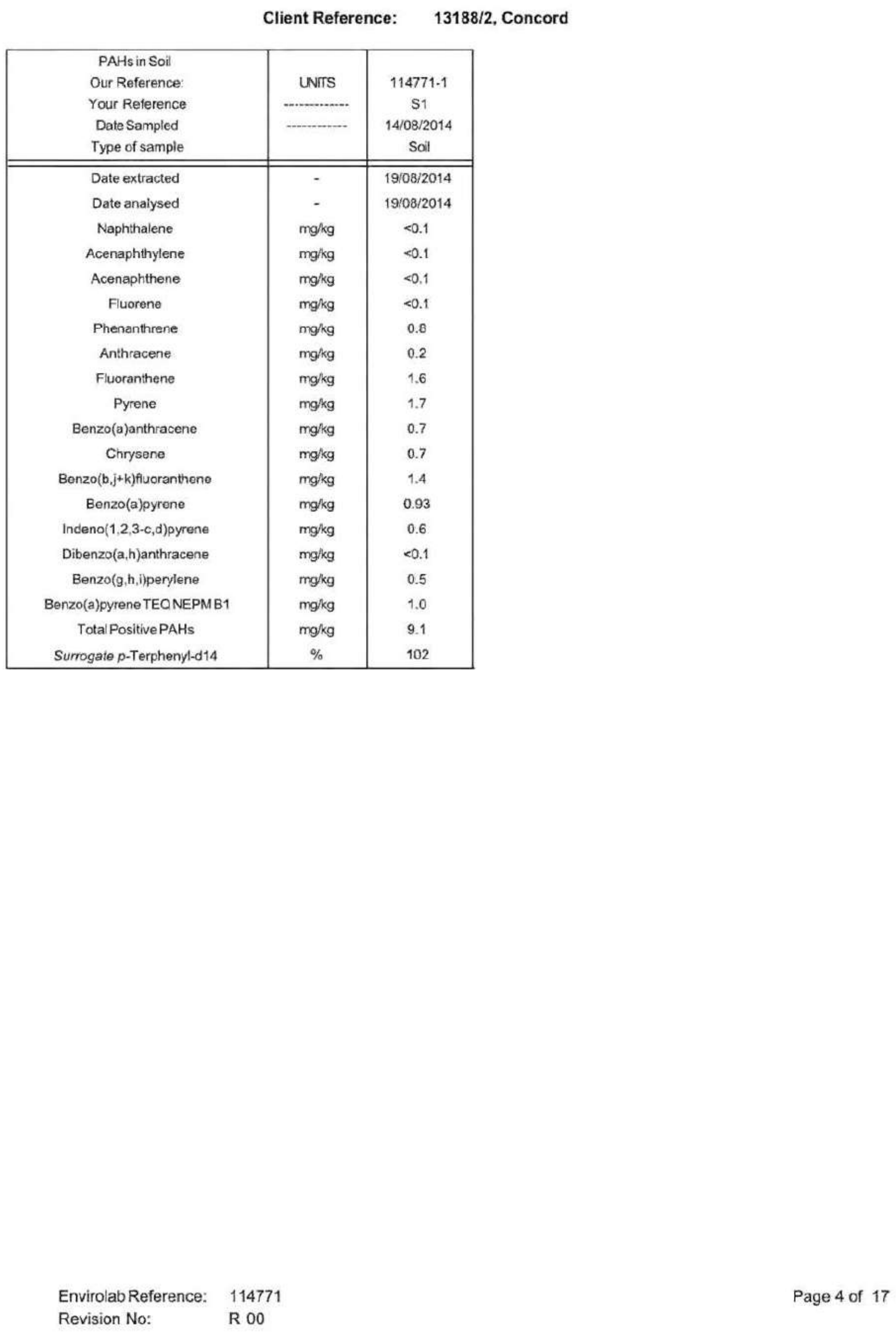


Client Reference: 13188/2, Concord

svTRH (C10-C40) in Soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	114771-1 S1 14/08/2014 Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
TRHC$_{10}$ - C$_{14}$	mg/kg	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100
Surrogate o-Terphenyl	%	90

Envirolab Reference: 114771
Revision No: R 00

Page 3 of 17



Client Reference: 13188/2, Concord

PAHs in Soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.8
Anthracene	mg/kg	0.2
Fluoranthene	mg/kg	1.6
Pyrene	mg/kg	1.7
Benzo(a)anthracene	mg/kg	0.7
Chrysene	mg/kg	0.7
Benzo(b,j+k)fluoranthene	mg/kg	1.4
Benzo(a)pyrene	mg/kg	0.93
Indeno(1,2,3-c,d)pyrene	mg/kg	0.6
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	0.5
Benzo(a)pyrene TEQ NEPM B1	mg/kg	1.0
Total Positive PAHs	mg/kg	9.1
Surrogate p-Terphenyl-d14	%	102

Client Reference: 13188/2, Concord

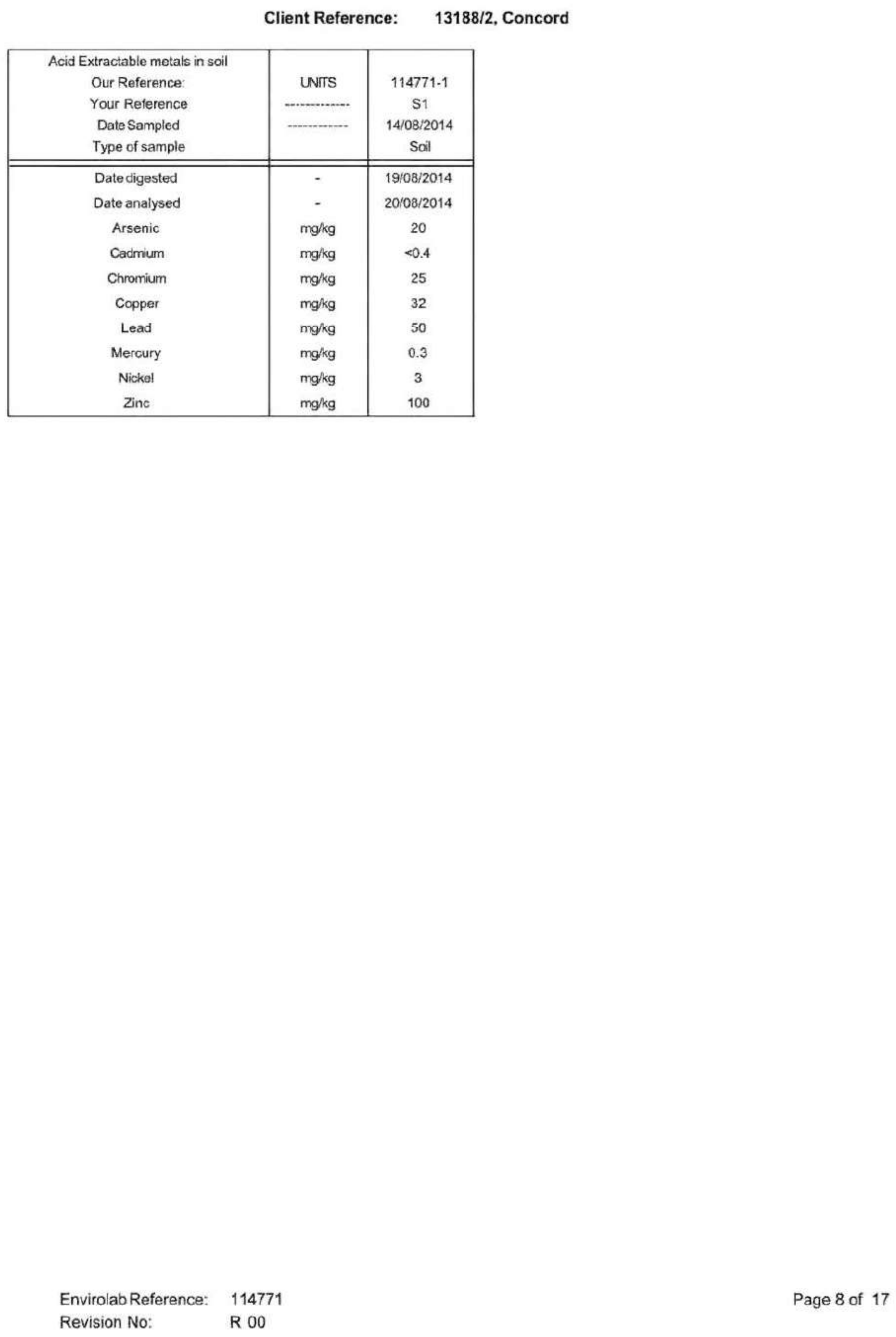
Organochlorine Pesticides in soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
HCB	mg/kg	<0.1
alpha-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Surrogate TCMX	%	85

Client Reference: 13188/2, Concord

PCBs in Soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	114771-1 S1 14/08/2014 Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
Arochlor 1016	mg/kg	<0.1
Arochlor 1221	mg/kg	<0.1
Arochlor 1232	mg/kg	<0.1
Arochlor 1242	mg/kg	<0.1
Arochlor 1248	mg/kg	<0.1
Arochlor 1254	mg/kg	<0.1
Arochlor 1260	mg/kg	<0.1
Surrogate TCLMX	%	85

Client Reference: 13188/2, Concord

Total Phenolics in Soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date extracted	-	19/08/2014
Date analysed	-	19/08/2014
Total Phenolics (as Phenol)	mg/kg	<5



Client Reference: 13188/2, Concord

Acid Extractable metals in soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	114771-1 S1 14/08/2014 Soil
Date digested	-	19/08/2014
Date analysed	-	20/08/2014
Arsenic	mg/kg	20
Cadmium	mg/kg	<0.4
Chromium	mg/kg	25
Copper	mg/kg	32
Lead	mg/kg	50
Mercury	mg/kg	0.3
Nickel	mg/kg	3
Zinc	mg/kg	100

Envirolab Reference: 114771
Revision No: R 00

Page 8 of 17

Client Reference: 13188/2, Concord

Miscellaneous Inorg - soil		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date prepared	-	19/08/2014
Date analysed	-	19/08/2014
pH 1:5 soil:water	pH Units	7.2
Total Cyanide	mg/kg	<0.5

Client Reference: **13188/2, Concord**

Moisture		
Our Reference:	UNITS	114771-1
Your Reference	-------------	S1
Date Sampled	------------	14/08/2014
Type of sample		Soil
Date prepared	-	19/08/2014
Date analysed	-	20/08/2014
Moisture	%	22

Client Reference: 13188/2, Concord

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.

Client Reference: 13188/2, Concord

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			20/08/2014	[NT]	[NT]	LCS-1	20/08/2014
TRHC_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-1	120%
TRHC_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-1	120%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-1	115%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-1	121%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-1	120%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-1	122%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-1	130%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	139	[NT]	[NT]	LCS-1	133%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
TRHC_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-1	85%
TRHC_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-1	100%
TRHC_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-1	86%
TRH>C_{10}-C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-1	85%
TRH>C_{16}-C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-1	100%
TRH>C_{34}-C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-1	86%
Surrogate o-Terphenyl	%		Org-003	85	[NT]	[NT]	LCS-1	93%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	101%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	97%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	97%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	100%

Client Reference: 13188/2, Concord

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	100%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-1	94%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	[NT]	[NT]	LCS-1	104%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	99	[NT]	[NT]	LCS-1	98%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	89%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	86%
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	86%
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	92%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	92%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	95%
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	82%
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	94%
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	96%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	90%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%		Org-005	85	[NT]	[NT]	LCS-1	81%

Client Reference: 13188/2, Concord

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	LCS-1	106%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	85	[NT]	[NT]	LCS-1	76%

QUALITY CONTROL Total Phenolics in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	LCS-1	101%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			19/08/2014	[NT]	[NT]	LCS-2	19/08/2014
Date analysed	-			20/08/2014	[NT]	[NT]	LCS-2	20/08/2014
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-2	103%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-2	110%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	108%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	106%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	104%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-2	89%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	107%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	106%

Client Reference: 13188/2, Concord

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
Date analysed	-			19/08/2014	[NT]	[NT]	LCS-1	19/08/2014
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-1	101%
Total Cyanide	mg/kg	0.5	Inorg-014	<0.5	[NT]	[NT]	LCS-1	87%

Client Reference: **13188/2, Concord**

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Client Reference: **13188/2, Concord**

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

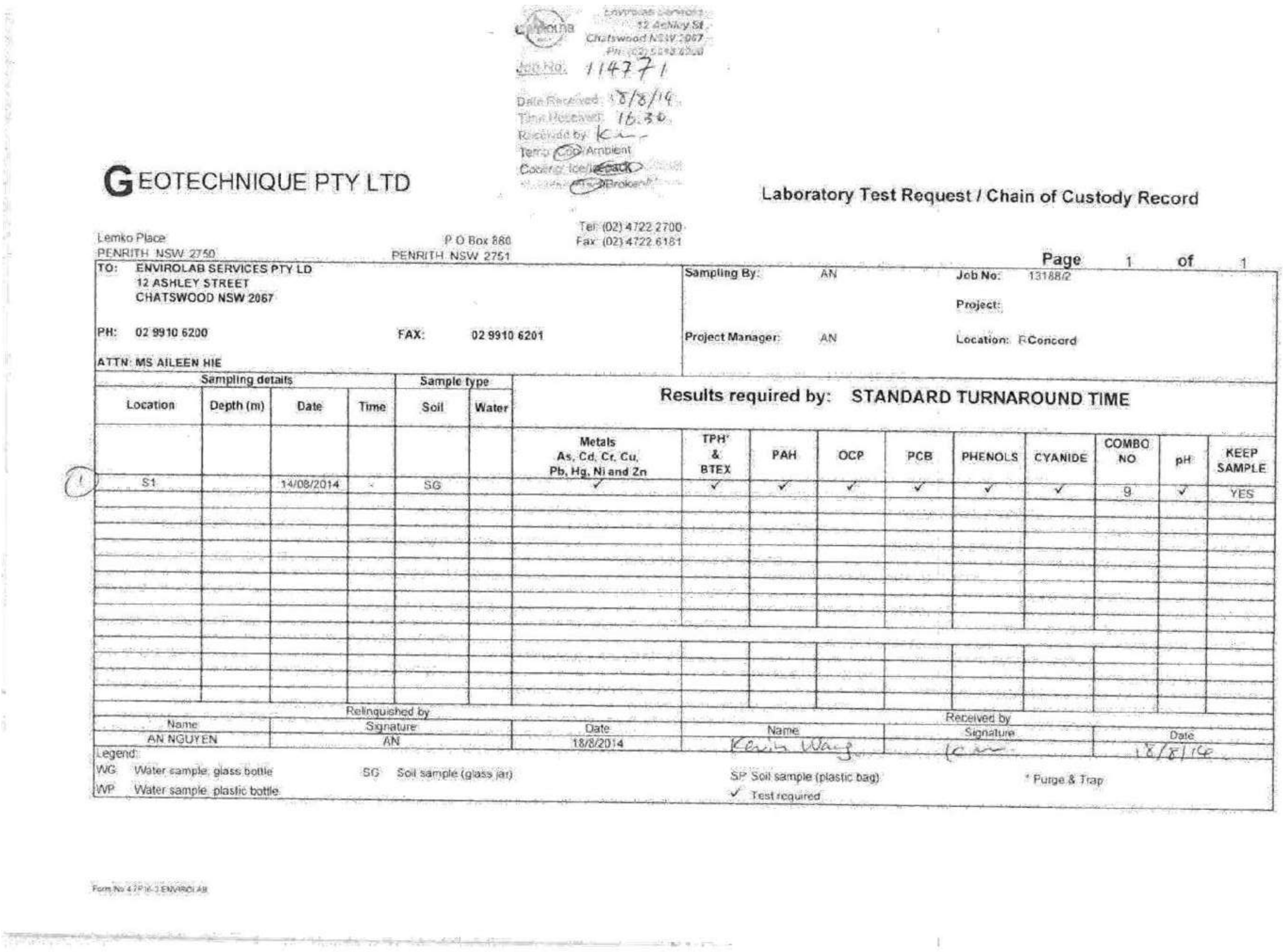
Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.



Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) [illegible]
Job No: 114771
Date Received: 18/8/14
Time Received: 16.30
Received by: Ke
Temp: [✓ Cool]/Ambient
Cooling: Ice/[✓ Icepack]
Security: [✓ Intact]/Broken

GEOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

Lemko Place
PENRITH NSW 2750

P O Box 880
PENRITH NSW 2751

Tel: (02) 4722 2700
Fax: (02) 4722 6161

Page 1 of 1

TO: ENVIROLAB SERVICES PTY LD
12 ASHLEY STREET
CHATSWOOD NSW 2067

PH: 02 9910 6200 FAX: 02 9910 6201

ATTN: MS AILEEN HIE

Sampling By: AN
Job No: 13188/2
Project:
Project Manager: AN
Location: F Concord

Results required by: STANDARD TURNAROUND TIME

Sampling details				Sample type												
Location	Depth (m)	Date	Time	Soil	Water	Metals As, Cd, Cr, Cu, Pb, Hg, Ni and Zn	TPH* & BTEX	PAH	OCP	PCB	PHENOLS	CYANIDE	COMBO NO	pH	KEEP SAMPLE
① S1		14/08/2014	-	SG		✓	✓	✓	✓	✓	✓	✓	9	✓	YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
AN NGUYEN	AN	18/8/2014	Kevin Wang	Ke	18/8/14

Legend:
WG Water sample: glass bottle
WP Water sample: plastic bottle
SG Soil sample (glass jar)
SP Soil sample (plastic bag)
✓ Test required
* Purge & Trap

Form No 4.7P16-3 ENVIROLAB