idealgeotech
a division of idealcorp

Report on

Preliminary Contamination Assessment

Prepared for: SGCH

Address: 88-92 Elizabeth Drive, Liverpool

Job No: 26191

Date: March 2017

Accredited for compliance
With ISO/IEC 17025
NATA Accreditation No. 19226

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EXECUTIVE SUMMARY

This executive summary presents a synopsis of the Stage 1 Preliminary Contamination Report for 88-92 Elizabeth Drive, Liverpool.

The object of the Stage 1 Preliminary Contamination Report was to ascertain whether the site presents a risk to human health and/or the environment arising from any past/present activities at the site or neighbouring properties. The scope of work included a documentary review of historical records, a site walkover, preliminary laboratory testing and the preparation of this report.

The only obvious potential sources of contamination arise from the following;

- Existing houses, garages and granny flats that may contain asbestos or were used to store chemicals.

No history of dangerous manufacturing on site utilizing heavy chemicals was documented. No history of heavy chemicals storage was documented.

A search of the NSW EPA Contaminated Land Management record of notices yielded no previous record of contamination.

Search of Protection of the Environment Operations Public Register (POEO) revealed no licensed and delicensed premises in the vicinity (200m) of the subject site.

The results of the chemical analyses indicate that the site does not present a risk to human health or the environment in a 'resiendential with garden/accessible soil' ('A') setting and is considered suitable for the proposed development. Validation of the site will be required once the demolition of the structures has been undertaken.

1.0 INTRODUCTION

Ideal Geotech have undertaken a Stage 1 Preliminary Contamination Report with limited testing and analysis as requested by Saint George Community Housing at 88-92 Elizabeth Drive, Liverpool. It is understood the existing residential dwellings will be demolished and a multi storey apartment complex will be constructed.

2.0 SCOPE OF WORK

The following scope of work was conducted:

- Desktop Study of the following to assist in identification of potential contamination issues:
  - Data from Environment Protection Authority
  - Data from the Protection of the Environment Operations Public Register (POEO)
  - Council records/ development and building applications
  - Council property files
  - Current and past zoning of the land
- Review of soils and geological maps
- Site walkover
- Chemical analysis of soil samples by a NATA accredited laboratory
- Preparation of a Stage 1 Preliminary Contamination Report.

3.0 SITE DESCRIPTION

The subject site is rectangular in shape and approximately 2,350m^2 in area and covers three residential blocks, 88-92 Elizabeth Drive, Liverpool. The site is bound by Elizabeth Drive to the north and neighbouring residential properties on all other sides.

The site is currently occupied by three houses and associated garages and granny flats at 88 and 90 Elizabeth Drive. The site is located on slightly sloping terrain with gradients of approximately 1-2^o falling towards the east. Vegetation consists of grass cover and some small to large trees.

4.0 SITE HISTORY

The properties of 88-92 Elizabeth Drive are situated in a residential area as aerial photographs and titles indicate.

4.1 Geology

Reference to the Penrith 1:100,000 geological map (Geological series sheet 9030) indicates that the site is underlain by Bringelly Shale of the Wianamatta Group consisting of shale, claystone, laminite, lithic sandstone and rare coal along with soils derived from the weathering of these rocks.

4.2 Aerial Photographs

Aerial Photographs from 1951, 1971, 1986 and 1998 were obtained from the NSW Department of Lands office and Google Earth used to view the site from 2004 to 2016. The aerial photographs were reviewed to assess the likely past uses of the site. The findings are summarised below and a copy of historical photographs can be found in Appendix B.

1951 –The site is situated within a residential area with a cemetery located to the west.

1971 – The site is largely unchanged with the surroundaing area having been slightly more developed with residential dwellings.

1986 – The site has undergone very little change as visible from the previous aerial photograph in1971.

1998 – Little change present since the previous aerial photograph in 1986.

2004-2016 – The site has been unchanged since the photograph taken in 1998.

In summary, the aerial photographs reveal that the site was initially situated within a residential area evident from the photograph in 1961. The site has remained largly unchanged from the photograph in 1951 to the date of the site inspection in 2017.

4.3 Historic Land Titles

Historic title deed searched were undertaken on the site, the results of the searches are summarised in the tables below and a copy of search results are included in Appendix A.

Table 1 – Lot 1 DP26047, Lot B DP391258 and Lot 3 DP414352

Date of acquisition and held term	Registed proprietor(s) & occupations where available	Reference of title at acquisition
19 June 2015	Forlife Development (Lot 1 DP26047)	T AJ579313
21 January 2016	Forlife Development (Lot B DP391258)	T AK156561
21 January 2016	Forlife Development (Lot 3 DP414352)	T AK156549

4.4 Search of Contaminated Land Management Register (NSW EPA)

A search of the NSW EPA Contaminated Land Management record of notices for the Miller area indicated that the site has had no previous contamination reported.

4.5 Search of Protection of the Environment Operations Public Register (POEO) of Licensed and Delicensed Premises

A search of the POEO public register of licensed and delicensed premises (DECC) indicated that no licensed or delicensed premises were located within the immediate surrounding area of the site (within 200m).

5.0 SITE WALKOVER AND SURROUNDING ENVIRONMENT

A site investigation was conducted on 17th February 2016. The field observations are summarised in Table 2 below.

Table 2 – Summary of Field Observations

Parameter	Observation
Visible observations on soil contamination	No visible evidence of contamination was observed. No staining of the soils or odours was documented.
Signs of plant stress	None observed.
Presence of drums or waste materials	None observed. No visible indicators of underground fuel tanks (bowsers or venting pipes).
Presence of fill	Minimal fill was observed within the site.
Quality of surface waters	No visible evidence of contamination was observed nor were any odours detected.
Flood potential	Not evident.
Relevant sensitive environments	None observed.

6.0 SUMMARY OF POTENTIAL SOURCES OF CONTAMINATION

The potential for the site to be contaminated from on-site sources and off site sources was considered by Ideal Geotech. Based on the findings of our site inspection and site history review the following actual or potential contamination sources were identified.

1. Fuel, oil, asbestos sheeting, lead based paints and pesticides may have been stored within the garages at some point.

2. The house construction may include asbestos and lead based paints.

No history of dangerous manufacturing utilizing heavy chemicals was documented.

No history of heavy chemicals storage was documented.

Properties bordering the site are residential and not considered to have posed a risk for potential contamination to the site.

7.0 SAMPLING METHODOLOGY

Limited sampling and analysis was undertaken in order to assess the nature, location and likely distribution of any contamination present at the subject site, and also any potential risk posed to human health or the environment. Test results were compared to the relevant New South Wales Environment Protection Authority (NSW EPA) criteria.

Each sample location (refer to Figure 1) was excavated utilizing hand tools to a depth of 0.2m below ground surface. The sample was collected from the hole using a stainless steel trowel, which had been decontaminated prior to use to prevent cross contamination occurring.

The samples were placed in 250g laboratory prepared glass jars which were capped using Teflon-sealed screw caps and then placed in a chilled container. The sample jars were transported to our Smithfield office and placed in a refrigerator.

The following day the samples were forwarded to SGS environmental for analysis along with a Chain of Custody which was subsequently returned to confirm the receipt of all samples.

8.0 LABORATORY CHEMICAL TESTING RESULTS

It should be appreciated that the assessment was preliminary in nature and was very limited in scope. Chemical testing was carried out on soil samples using SGS laboratory services. SGS holds accreditation with the National Association of Testing Authorities, Australia (NATA). The initial testing of the soil was undertaken as a broad scale preliminary assessment.

All testing was undertaken within the terms of their accreditation. Copies of the testing laboratory reports are shown in Appendix C. The results of laboratory testing are summarised in the following tables.

Table 3 - Heavy Metal Test Results

		Heavy Metals (mg/kg)							
Sample No.	Depth (m)	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury
E1	0.0 - 0.2	12	0.6	28	15	46	8.5	87	<0.5
E2	0.0 - 0.2	9	<0.3	16	14	20	5.1	33	<0.5
E3	0.0 - 0.2	11	0.5	21	16	60	5.3	69	<0.5
E4	0.0 - 0.2	6	0.5	26	21	62	25	240	<0.5
LOR		*3*	*0.3*	*0.3*	*0.5*	*1*	*0.5*	*0.5*	*0.05*
NEPM Health Investigation Level HILs (A)		**100**	**20**	**100**	**6000**	**300**	**400**	**7400**	**40**

LOR Limit of Reporting

Table 4 - Organochlorine Pesticides (OCP) & Organophosphate Pesticides (OPP) Test Results

		OCP (mg/kg)						OPP (mg/kg)		
Sample No.	Depth (m)	Aldrin+ Dieldrin	Endrin	Heptachl-or	DDD+ DDE+ DDT	DDT	Chlord-ane	Diazinon	Ethion	Chlorp-yrifos
E1	0.0 - 0.2	<0.3	<0.2	<0.1	<0.3	<0.1	<0.2	<0.5	<0.2	<0.2
E2	0.0 - 0.2	<0.3	<0.2	<0.1	<0.3	<0.1	<0.2	<0.5	<0.2	<0.2
E3	0.0 - 0.2	<0.3	<0.2	<0.1	<0.3	<0.1	<0.2	<0.5	<0.2	<0.2
E4	0.0 - 0.2	<0.3	<0.2	<0.1	<0.3	<0.1	<0.2	<0.5	<0.2	<0.2
LOR		*0.3*	*0.2*	*0.1*	*0.3*	*0.1*	*0.2*	*0.5*	*0.2*	*0.2*
NEPM HILs A for low density residential areas		**6**	**10**	**6**	**240**	**NC**	**50**	**NC**	**NC**	**160**

NC No Criteria
LOR Limit of Reporting

Table 5 - Polynuclear Aromatic Hydrocarbons (PAH) and PCB Test Results

Sample No.	Depth (m)	PAH (mg/kg)			PCB
		Total	B(a)P	B(a)P TEQ (Upper)	Total
E1	0.0 - 0.2	<0.8	<0.1	<0.3	<1
E2	0.0 - 0.2	<0.8	<0.1	<0.3	<1
E3	0.0 - 0.2	<0.8	<0.1	<0.3	<1
E4	0.0 - 0.2	<0.8	<0.1	<0.3	<1
LOR		*0.8*	*0.1*	*0.3*	*1*
NEPM HILs A for low density residential areas		**300**	**NC**	**3**	**1**

NC No Criteria
LOR Limit of Reporting

Table 6 - Total Petroleum Hydrocarbon (TPH) and BTEX Test Results

Sample No.	Depth (m)	TRH (mg/kg)				BTEX (mg/kg)			
		C10-C14	C15-C28	C29-C36	Total	Benzene	Toluene	Ethyl Benzene	Total Xylenes
E1	0.0 - 0.2	<20	<45	<45	<210	<0.1	<0.1	<0.1	<0.3
E2	0.0 - 0.2	<20	<45	<45	<210	<0.1	<0.1	<0.1	<0.3
E3	0.0 - 0.2	<20	<45	<45	<210	<0.1	<0.1	<0.1	<0.3
E4	0.0 - 0.2	<20	<45	<45	<210	<0.1	<0.1	<0.1	<0.3
LOR		*20*	*45*	*45*	*210*	*0.1*	*0.1*	*0.1*	*0.3*
NSW EPA (DECC) Threshold Concentrations 2009 ('Guidelines for Assessing Service Station Sites')		**NC**	**NC**	**NC**	**10000**	**10**	**135**	**185**	**95**

NC No Criteria
LOR Limit of Reporting

Table 7 - Asbestos Test Results

Sample No.	Depth (m)	Asbestos Detected	Type of Asbestos
E1	0.0 - 0.2	Asbestos Found	Amosite and Chrysotile
E2	0.0 - 0.2	No Asbestos Found	NA
E3	0.0 - 0.2	No Asbestos Found	NA
E4	0.0 - 0.2	No Asbestos Found	NA

9.0 DISCUSSION OF CONTAMINATION RESULTS

9.1 Heavy Metals

The heavy metal concentrations, presented in Table 3, were less than the relecvent assessment criteria adopted, and therefore the chemical analyses indicate that areas tested are not contaminated with heavy metals.

9.2 Organochlorine Pesticides (OCP) and Organophosphorus Pesticides (OPP)

The OCP and OPP concentrations, presented in Table 4, were less than the relevant assessment criteria adopted, and therefore the chemical analyses indicate that the areas tested are not contaminated with OCP or OPP.

9.3 Polycyclic Aromatic Hydrocarbons (PAH) and Polychlorinated Biphenyl (PCB)

The PAH and PCB concentrations, presented in Table 5, were less than the relevant assessment criteria adopted, and therefore the chemical analyses indicate that the site is not contaminated with PAH or PCB.

9.4 Total Petrolium Hydrocarbons (TPH) and BTEX

The TPH and BTEX concentrations, presented in Table 6, were less than the relecvent assessment criteria adopted, and therefore the chemical analysis indicate that areas tested are not contaminated with TPH or BTEX.

9.1 Asbestos

The presence of asbestos, presented in Table 7, was identified within soil sample E1.

10.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions of this Contamination Report are as follows:

The only obvious potential sources of contamination arise from the following;

1. Fuel, oil, asbestos sheeting, lead based paints and pesticides may have been stored within the garages at some point.

2. The house construction may include asbestos and lead based paints.

No history of dangerous manufacturing on site utilizing heavy chemicals was documented. No history of heavy chemicals storage was documented.

A search of the NSW EPA Contaminated Land Management record of notices indicates that the site has had no previous contamination reported.

Search of Protection of the Environment Operations Public Register (POEO) revealed no licensed and delicensed premises in the vicinity (200m) of the subject site.

The results of the chemical analyses indicate that the site does not present a risk to human health or the environment in a 'resiendential with garden/accessible soil' ('A') setting and is considered suitable for the sites proposed development.

This report is a Stage 1 Preliminary Contamination Assessment with laboratory testing undertaken. Whilst the study indicated the site to be free of contamination, it is possible that contaminated soils may be present between sampling locations. Asbestos was identified within sample E1, taken from near the existing granny flat. Further sampling and chemical testing should be undertaken once demolition of the existing dwellings and garages has been undertaken.

For and on behalf of
Ideal Geotech

Murali Pami
Geotechnical Engineer

D. Dwyer
Geotechnical Engineer

REFERENCES:

Contaminated Sites – Guidelines for Assessing Service Stations. NSW Environment Protection Authority (EPA) 1994

Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites. NSW Environment Protection Authority (EPA) 2000.

Contaminated Sites – Sampling Design Guidelines. NSW Environment Protection Authority (EPA) 1995

Managing Land Contamination: Planning Guidelines SEPP55 – Remediation of Land - Department of Urban Affairs and Planning and Environment Protection Authority (DUAP and EPA) 1998.

National Environment Protection (Assessment of Site Contamination) Measure – National Environmental Protection Council 2013.

APPENDIX A

HISTORIC LAND TITLES

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 1/26047

SEARCH DATE	TIME	EDITION NO	DATE
23/3/2017	3:44 PM	3	19/6/2015

LAND

LOT 1 IN DEPOSITED PLAN 26047
LOCAL GOVERNMENT AREA LIVERPOOL
PARISH OF ST LUKE COUNTY OF CUMBERLAND
TITLE DIAGRAM DP26047

FIRST SCHEDULE

FORLIFE DEVELOPMENT PTY LTD (T AJ579313)

SECOND SCHEDULE (3 NOTIFICATIONS)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
2 LAND EXCLUDES THE ROAD(S) BEING LOT 16 IN DP248384
3 AJ579314 MORTGAGE TO BANK OF SYDNEY LTD

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

PRINTED ON 23/3/2017

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 3/414352

SEARCH DATE	TIME	EDITION NO	DATE
23/3/2017	3:44 PM	2	21/1/2016

LAND

LOT 3 IN DEPOSITED PLAN 414352
LOCAL GOVERNMENT AREA LIVERPOOL
PARISH OF ST LUKE COUNTY OF CUMBERLAND
TITLE DIAGRAM DP414352

FIRST SCHEDULE

FORLIFE DEVELOPMENT PTY LTD (T AK156549)

SECOND SCHEDULE (3 NOTIFICATIONS)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
2 T31249 LAND ABOVE DESCRIBED IS PUBLIC ROAD PART BEING LOT 18 IN DP248384
3 AK156562 MORTGAGE TO BANK OF SYDNEY LTD

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

PRINTED ON 23/3/2017

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: B/391258

SEARCH DATE	TIME	EDITION NO	DATE
23/3/2017	3:44 PM	1	21/1/2016

LAND

LOT B IN DEPOSITED PLAN 391258
LOCAL GOVERNMENT AREA LIVERPOOL
PARISH OF ST LUKE COUNTY OF CUMBERLAND
TITLE DIAGRAM DP391258

FIRST SCHEDULE

FORLIFE DEVELOPMENT PTY LTD (T AK156561)

SECOND SCHEDULE (3 NOTIFICATIONS)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
2 T31249 LAND EXCLUDES THE ROAD(S) BEING LOT 17 IN DP248384
3 AK156562 MORTGAGE TO BANK OF SYDNEY LTD

NOTATIONS

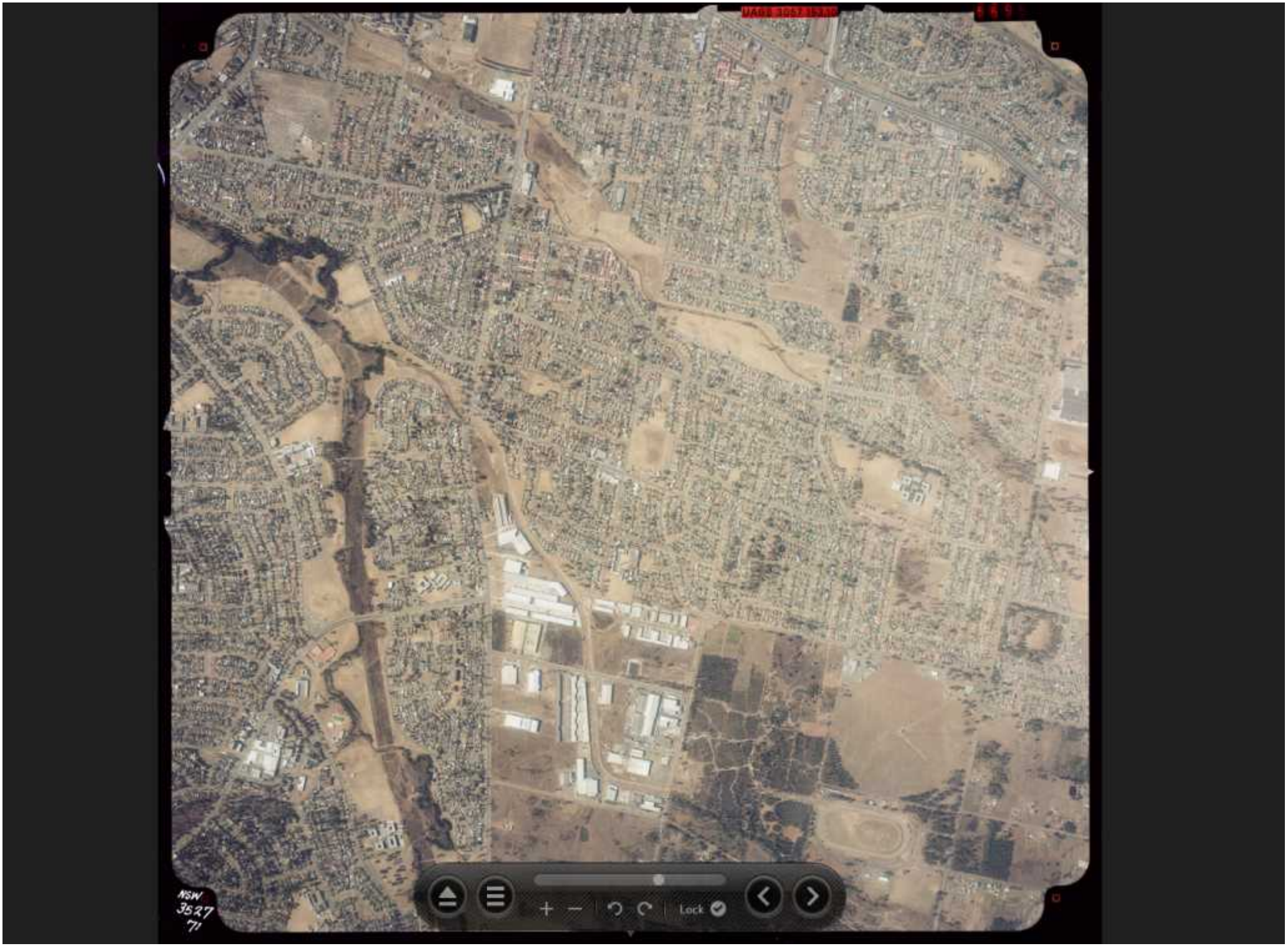
UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

PRINTED ON 23/3/2017

APPENDIX B

AERIAL PHOTOGRAPHS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NSW
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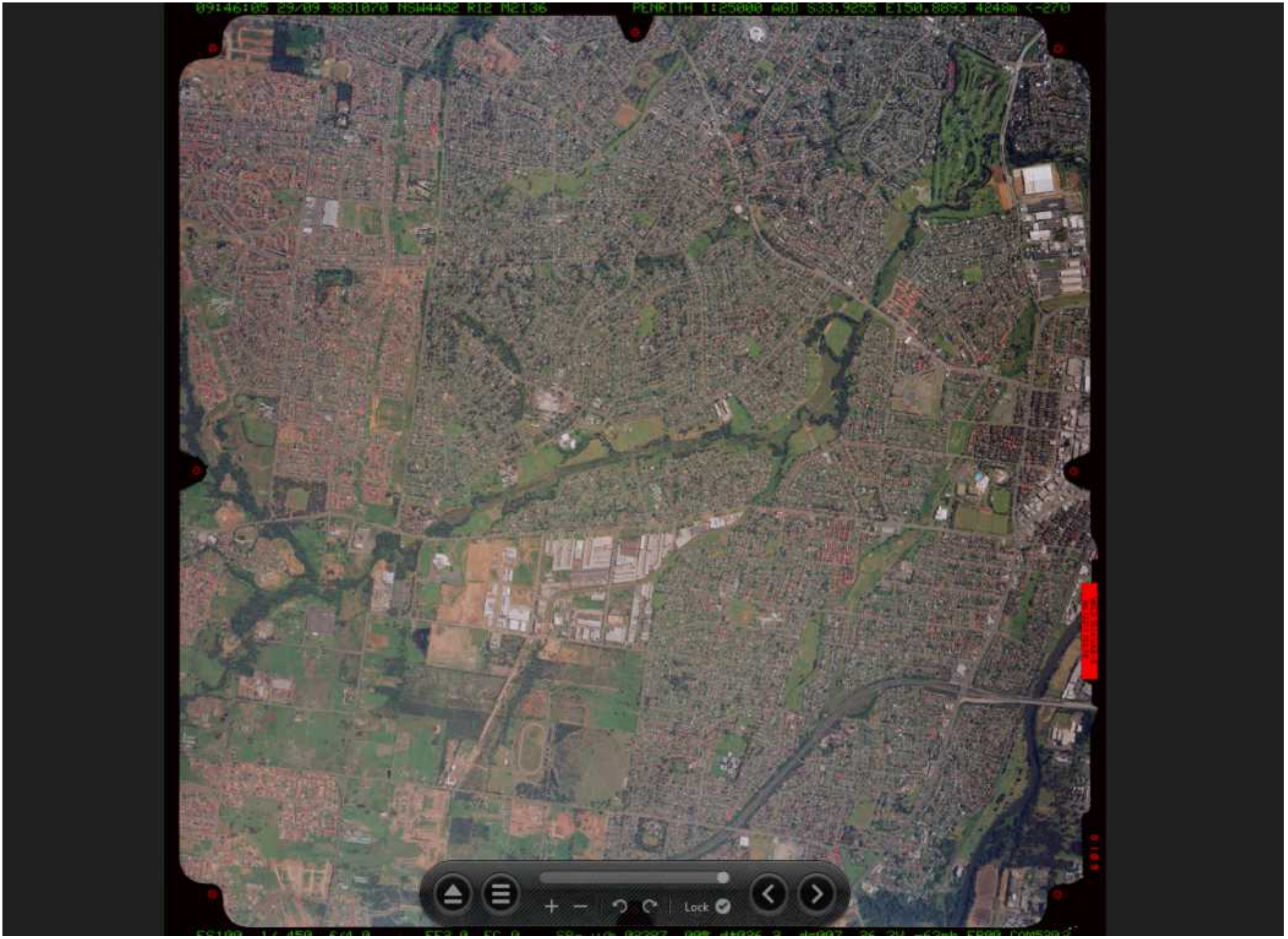
51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APPENDIX C

LABORATORY TEST RESULTS

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Dane Dwyer
Client	IDEALCORP PTY LTD
Address	PO BOX 2270 SMITHFIELD NSW 2164
Telephone	61 2 97255522
Facsimile	61 2 87866300
Email	orders@idealfoundations.com.au
Project	**26191**
Order Number	(Not specified)
Samples	4

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	**SE163072 R0**
Date Received	15/3/2017
Date Reported	22/3/2017

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

No respirable fibres detected in all soil samples using trace analysis technique.

Sample # 1: 2-4mm length fibre bundles found in 4x2mm cement sheet fragments.

Asbestos analysed by Approved Identifier Yusuf Kuthpudin.

SIGNATORIES

Bennet Lo
Senior Organic Chemist/Metals Chemist

Kamrul Ahsan
Senior Chemist

Ly Kim Ha
Organic Section Head

Ravee Sivasubramaniam
Hygiene Team Leader

VOC's in Soil [AN433] Tested: 16/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
Benzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes*	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX	mg/kg	0.6	<0.6	<0.6	<0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil [AN433] Tested: 16/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
TRH C6-C9	mg/kg	20	<20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25	<25

TRH (Total Recoverable Hydrocarbons) in Soil [AN403] Tested: 16/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
TRH C10-C14	mg/kg	20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	<45	<45	<45	<45
TRH C29-C36	mg/kg	45	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25	<25	<25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110	<110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210	<210

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 16/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	**0.2**	<0.1	<0.1
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	**0.1**	**0.2**	<0.1	<0.1
Pyrene	mg/kg	0.1	**0.2**	**0.3**	<0.1	**0.1**
Benzo(a)anthracene	mg/kg	0.1	<0.1	**0.1**	<0.1	<0.1
Chrysene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	**0.1**	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	<0.2	<0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	<0.3	<0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	<0.2	<0.2	<0.2
Total PAH (18)	mg/kg	0.8	<0.8	<0.8	<0.8	<0.8
Total PAH (NEPM/WHO 16)	mg/kg	0.8	<0.8	<0.8	<0.8	<0.8

OC Pesticides in Soil [AN420] Tested: 16/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Lindane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Endrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1

OP Pesticides in Soil [AN420] Tested: 16/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
Dichlorvos	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Dimethoate	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Diazinon (Dimpylate)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Fenitrothion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Malathion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Bromophos Ethyl	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Methidathion	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Ethion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2

PCBs in Soil [AN420] Tested: 16/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
Arochlor 1016	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1	<1	<1	<1	<1

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 20/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
Arsenic, As	mg/kg	3	12	9	11	6
Cadmium, Cd	mg/kg	0.3	0.6	<0.3	0.5	0.5
Chromium, Cr	mg/kg	0.3	28	16	21	26
Copper, Cu	mg/kg	0.5	15	14	16	21
Lead, Pb	mg/kg	1	46	20	60	62
Nickel, Ni	mg/kg	0.5	8.5	5.1	5.3	25
Zinc, Zn	mg/kg	0.5	87	33	69	240

Mercury in Soil [AN312] Tested: 21/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Moisture Content [AN002] Tested: 20/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
% Moisture	%w/w	0.5	**16**	**17**	**20**	**15**

Fibre Identification in soil [AN602] Tested: 21/3/2017

PARAMETER	UOM	LOR	E1 SOIL - 14/3/2017 SE163072.001	E2 SOIL - 14/3/2017 SE163072.002	E3 SOIL - 14/3/2017 SE163072.003	E4 SOIL - 14/3/2017 SE163072.004
Asbestos Detected	No unit	-	Yes	No	No	No
Estimated Fibres*	%w/w	0.01	**>0.01**	<0.01	<0.01	<0.01

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.
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.
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 analysis by ASS or ICP as per USEPA Method 200.8.
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
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.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
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).
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN433	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.
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."
AN602	The sample can be reported “no asbestos found at the reporting limit of 0.1 g/kg” (<0.01%w/w) where AN602 section 4.5 of this method has been followed, and if- (a) no trace asbestos fibres have been detected (i.e. no ‘respirable’ fibres): (b) the estimated weight of non-respirable asbestos fibre bundles and/or the estimated weight of asbestos in asbestos-containing materials are found to be less than 0.1g/kg: and (c) these non-respirable asbestos fibre bundles and/or the asbestos containing materials are only visible under stereo-microscope viewing conditions.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	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.

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

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

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

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

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

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

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

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Dane Dwyer
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Project	**26191**
Order Number	(Not specified)
Samples	4

LABORATORY DETAILS

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SGS Reference	**SE163072 R0**
Date Received	15 Mar 2017
Date Reported	22 Mar 2017

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

No respirable fibres detected in all soil samples using trace analysis technique.

Sample # 1: 2-4mm length fibre bundles found in 4x2mm cement sheet fragments.

Asbestos analysed by Approved Identifier Yusuf Kuthpudin.

SIGNATORIES

Bennet Lo
Senior Organic Chemist/Metals Chemis

Kamrul Ahsan
Senior Chemist

Ly Kim Ha
Organic Section Head

Ravee Sivasubramaniam
Hygiene Team Leader

ANALYTICAL REPORT

RESULTS

Fibre Identification in soil — Method AN602

Laboratory Reference	Client Reference	Matrix	Sample Description	Date Sampled	Fibre Identification	
SE163072.001	E1	Soil	29 g clay, sand, soil, rocks	14 Mar 2017	Amosite & Chrysotile Asbestos Found	>0.01
SE163072.002	E2	Soil	33 g clay, soil, rocks	14 Mar 2017	No Asbestos Found	<0.01
SE163072.003	E3	Soil	41 g clay, soil, rocks	14 Mar 2017	No Asbestos Found	<0.01
SE163072.004	E4	Soil	22 g sand, soil rocks	14 Mar 2017	No Asbestos Found	<0.01

METHOD SUMMARY

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."
AN602	The sample can be reported “no asbestos found at the reporting limit of 0.1 g/kg” (<0.01%w/w) where AN602 section 4.5 of this method has been followed, and if- (a) no trace asbestos fibres have been detected (i.e. no ‘respirable’ fibres): (b) the estimated weight of non-respirable asbestos fibre bundles and/or the estimated weight of asbestos in asbestos-containing materials are found to be less than 0.1g/kg: and (c) these non-respirable asbestos fibre bundles and/or the asbestos containing materials are only visible under stereo-microscope viewing conditions.

FOOTNOTES

Amosite	-	Brown Asbestos	NA	-	Not Analysed
Chrysotile	-	White Asbestos	LNR	-	Listed, Not Required
Crocidolite	-	Blue Asbestos	*	-	NATA accreditation does not cover the performance of this service .
Amphiboles	-	Amosite and/or Crocidolite	**	-	Indicative data, theoretical holding time exceeded.

(In reference to soil samples only) 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 polarised light microscopy, including dispersion staining.
Where reported: 'No Asbestos Found': No Asbestos Found by polarised light microscopy, including dispersion staining.
Where reported: 'UMF Detected': Mineral fibres of unknown type detected by polarised 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

APPENDIX D

SAMPLING LOCATIONS

Figure 1 – Sampling Location Plan

88-92 Elizabeth Drive, Liverpool