DAVID LANE ASSOCIATES
ABN 36 926 003 197
Environment Health Safety

VALIDATION REPORT

Johnson Property Group
59 Lakeview Road
Morisset Park

Lot 1 DP1107753 and Lot 2 DP1107753
Formerly Lot 38 DP1076099

Version 2

Prepared for

Mr Bruce Gunn
Johnson Property Group
268 Old Northern Road
Castle Hill
NSW 2154

Prepared by

DAVID LANE ASSOCIATES

SYDNEY
Unit 2B 30 Leighton Place, Hornsby NSW 2077 • Phone: 9476 1765 • Fax: 9476 1557 • E-mail: dlassociates@bigpond.com
NEWCASTLE
778 Old North Rd, Rothbury NSW 2335 • Phone: 4938 3800 • Fax: 4938 3811 • E-mail:dolane@bigpond.com

Executive Summary

David Lane Associates (DLA) were commissioned by Mr. Bruce Gunn on behalf of Johnson Property Group to prepare a Validation Report on the site identified as Lot 1 DP1107753 and Lot 2 DP1107753 formerly identified as Lot38 DP1076099. Refer to **Figure 2** – Registered Survey Plan

The Trinity Point site, is located at 59 Lakeview Road, Morisset Park, NSW (approximately one hundred and twenty (120) kilometres north north-east of Sydney, and thirty (30) kilometres south south-west of Newcastle) and covers an area of 17.3 hectares. The site was formerly known as 22 Morisset Park Rd, Morisset Park and was occupied by a Monastery, St John of God that was partially demolished in the late 1990's. An additional new residential building was then constructed. The new building was used as a disabled and wayward children's home on weekends.

Refer to **Figure 1 –** *Site Location* and **Figure 3 –** *Site Layout* for site location and layout detail.

It is understood that Johnson Property Group intends to develop the site into a new residential estate, with the end land use remaining consistent with Table 5a, Column A - *Residential with Access to Soil,* as defined by the NEPM 1999.

The remediation/validation goals set for the 59 Lakeview Road, Morisset Park site are in accordance with NEPM 1999, Table 5a, Column A – *Residential with Access to Soils* as outlined in the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) 1999. Phytotoxicity based investigation levels were also considered as part of the remediation criteria as outlined in the NSW EPA *Guidelines for the NSW Site Auditor Scheme (2nd Edition, 2006) and the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) 1999 – Interim Urban, Ecological Investigation Levels – Table 5A.* These provisional phytotoxicity levels are intended only as a guide. Limitations are present in that phytotoxicity depends on the complex interactions between soil properties and plant species.

The validation sampling regime for 59 Lakeview Road, Morisset Park comprised of three (3) assessments (in accordance with the requirements as outlined in the NSW EPA *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, and the NSW EPA *Contaminated Sites: Sampling Design Guidelines*), comprising of the validation of the Underground Storage Tank Pit (with associated excavated material), validation of the

effluent treatment system, and a final validation across the entire site itself. A total of one hundred and thirty (130) samples (including intra and inter duplicates) were taken as part of this validation assessment in areas of high, medium and low-density sampling. High density samples were collected from the sewage effluent treatment system area, and the Underground Storage Tank Pits following removal and remediation; the medium density sampling occurred on the portion of the site that once housed the building and habitable structures on site; and the low density samples were collected from the grassed, ex cattle grazing areas.

The final validation assessment over the entire site indicated that there were no Total Petroleum Hydrocarbon (TPH), Monocyclic Aromatic Hydrocarbons (C_6 – C_9 and BTEX fractions), Polycyclic Aromatic Hydrocarbons (PAH), Benzo(a)Pyrene (BaP), Pesticides or Heavy Metal concentrations exceeding the site acceptance criteria as compliant with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*. One sample returned a positive detection of asbestos due to fragments remaining the topsoil of on grid location. This area was cleared of all fragments, retested and was subsequently deemed free from asbestos contamination.

The Tank Pit area assessment returned low or non detect levels of all analytes within the samples, David Lane Associates concludes that the remediation in the form of the UST removal was successful. No contamination was evident on the site identified as 59 Lakeview Road, Morisset Park, following the removal and disposal of the UST's and the surrounding soil, therefore, these areas are compliant with the end land use most relevant to the site, NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*.

The Stockpiled Material identified as SP1-South and SP2-North (associated with the excavation of the Tank Pit area) was identified as in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*. Therefore the stockpiled material was suitable for the proposed end land use and beneficially re-used on the 59 Lakeview Road, Morisset Park site.

The sewage effluent treatment system area (consisting of imported fill material, sludge, sludge footprint, transpiration area, and the resulting three (3) tank pits) underwent remediation prior to the validation assessment and was identified as compliant with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*. Therefore remediation on the contaminated areas was successful and all material deemed suitable for beneficial re-use on site.

Statistical analysis was conducted on PAH, BaP, PCB, TPH (C_6-C_9 and C_{10}-C_{36}), BTEX, OCP/OPP and heavy metals. Initial statistical analysis indicated the contaminant analyses conducted exhibited normal distributions for the contaminants (BaP, PCB, OCP/OPP, BTEX, TPH C_6-C_9 and C_{10}-C_{36} and Metals), where the coefficient of variance was less than 1.2.
NSW EPA Sample Design Guideline Procedure D 1995 was utilised for the statistical analysis.

The site adopted assessment criteria for 59 Lakeview Road, Morisset Park being:

- Validate in order that the arithmetic average of the contaminant(s) is less than the site acceptance criterion utilising an Upper Confidence Level of 95% (UCL95%);
- The individual contaminant concentration does not exceed the assessment criteria by more than 250%;
- The standard deviation of individual contaminants does not exceed 50% of the criteria;

It should be noted that this validation report does not guarantee that all soils at the Morisset Park site are natural. However, the chemical analysis conducted demonstrated that the residual soil in the remediated area meets the agreed clean-up criteria (NEPM 1999 Table 5A Column A – *Residential with Access to Soil*).

Consequently, it is considered that the validation program conducted on Lot 1 DP1107753 and Lot 2 DP1107753, located at 59 Lakeview Road, Morisset Park NSW has greatly reduced the risk of residual contamination being present to a level consistent with the site assessment criteria.

The completion of this report concludes that the validation objectives, according to the site acceptance criteria, have been achieved and the site is therefore suitable for an end land use consistent with NEPM 1999 Table 5a Column A – *Residential with Access to Soil*.

Summary – Site Validation Data

59 Lakeview, Morisset Park, NSW

(Column A – Residential with Access to Soil)

	Contaminant														
Parameter	**BTEX**	**TPH (C_6-C_9)**	**TPH (C_{10}-C_{36})**	**PAH**	**BaP**	**OCP/OPP**	**PCBs**	**As**	**Cd**	**Cr**	**Cu**	**Hg**	**Ni**	**Pb**	**Zn**
Number	46	46	44	79	79	44	44	79	79	79	79	79	79	79	79
Minimum	ND	ND	25	0.25	0.25	ND	ND	0.5	0.05	2	1	0.025	0.5	3	2.5
Maximum	ND	ND	530	8.6	1.1	ND	ND	7	0.3	17	59	0.15	21	72	160
Mean	-	-	81.93	0.46	0.26	-	-	1.76	0.09	7.67	6.2	0.054	1.69	13.27	41.78
Median	-	-	25	0.25	0.25	-	-	2	0.05	7	4	0.05	1	10	29
StDev	-	-	111.7	1.16	0.1	-	-	1.19	0.06	3.7	7.5	0.032	3	11.4	36.2
CV	-	-	1.363	2.53	0.38	-	-	0.68	0.69	0.481	1.21	0.59	1.78	0.86	0.87
95 % UCL	**<0.5**	**<10**	**155.3**	**1.02**	**0.3**	**<0.05**	**<0.05**	**2.3**	**0.12**	**9.5**	**9.9**	**0.069**	**3.2**	**15.2**	**49.1**
Assessment Criteria	**≈ 1.0**	**65**	**1000**	**20**	**1**	**OCP: 10 OPP: –**	**10**	**100**	**20**	**100**	**1000**	**15**	**600**	**300**	**7000**

Note: ***NSW EPA Sample Design Guideline Procedure D 1995*** **was utilised for the statistical analysis at the Morisset Park site where the CV was below 1.2 and Procedure G was utilised where the CV exceeded 1.2 to normalise the data set.**

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1.0 INTRODUCTION

David Lane Associates (DLA) were commissioned by Mr. Bruce Gunn on behalf of Johnson Property Group to prepare a Validation Report on the site identified as Lot 1 DP1107753 and Lot 2 DP1107753 formerly identified as Lot38 DP1076099.

Refer to **Figure 2** – Registered Survey Plan.

The site is located at 59 Lakeview Road (Formerly known as 22 Morisset Park Rd, Morisset Park NSW).

The site is situated in the Local Government area of the City of Lake Macquarie Council, and is currently zoned **2(a) - Residential** under the Lake Macquarie Local Environmental Plan (LEP), 1984.

The Trinity Point site (approximately one hundred and twenty (120) kilometres north north-east of Sydney, and thirty (30) kilometres south south-west of Newcastle) covers an area of 17.3 hectares. The site formerly held a Monastery, St John of God, which was partially demolished in the late 1990's with an additional new residential building constructed, which was used as a disabled and wayward children home on weekends.

Refer to **Figure 1 –** *Site Location* and **Figure 3 –** *Site Layout* for site location and layout.

The past environmental studies and investigations applicable to the site include:

- *Phase 1 Environmental Site Assessment - St John of God, Henry Street, Morisset Park NSW*, August 2001, prepared by PPK Environment & Infrastructure.
- *Phase 2 Environmental Site Assessment - St John of God, Henry Street, Morisset Park NSW,* February 2005, prepared by Parsons Brinckerhoff Aus Pty Ltd.

This Validation Report has been prepared utilising background information obtained from the above listed studies and from experience, knowledge, and current industry practice in remediation of similar sites.

David Lane Associates have conducted extensive sampling and investigation, which form the basis of the Validation report.

2.0 SCOPE OF WORK

2.1 Objectives of the Validation Report

The NSW Department of Environment and Conservation (DEC) indicates that validation reporting must:

- confirm that the remediated site complies with the clean-up criteria set for the site; and,
- confirm that all DEC (formerly the EPA) and other regulatory authorities' licence conditions and approvals have been achieved. In particular, documentary evidence confirming disposal of soil to an off-site location is done in accordance with the remedial recommendations in the Douglas Partners Contamination Assessment (September 2004).

2.2 Objectives of the Remedial Activities

The NSW Department of Environment and Conservation (DEC) indicates that Remedial Activities should:

- Remediate the site to a level enabling the proposed development to proceed.
- Remove unacceptable impacts to human health and the environmental, as defined by the relevant NSW EPA/DEC criteria.
- Validate the remedial works in accordance with the relevant EPA/DEC guidelines; and
- Document the validation process.

2.3 Remediation Goals

Based on our understanding of the NSW DEC and the City of Lake Macquarie Council requirements, the primary objectives of the remediation program at the Morisset Park Site are:

1. To make the Site acceptable for the redevelopment. It is understood that Johnson Property Group intends to develop the site into a residential estate.

The site is zoned under the Lake Macquarie Local Environmental Plan 1984 - **2(a) Residential**;

2. To prevent the potential long-term generation and release of contaminated soil impacting on the local environment and surroundings;
3. To ensure the protection of the Lake Macquarie Community.

2.4 The Contamination Assessment and Remedial Recommendations

The Validation Report contained provides a:

- Brief summary of the history of the Morisset Park site;
- Description of the existing Site and associated infrastructure, and the surrounding environment, including a summary of the site geology and hydrogeology;
- Summary of the contamination status and characteristics of the site;
- Review of the currently available remediation/management options which could achieve the remediation goals, as well as the limitations and comparison of the methods;
- Details of the preferred remediation strategy, and an outline of the methodology for the implementation for the selected strategy. Refer to **Section 2.5**;
- Brief outlines of the environmental pollution control measures that should be implemented during remedial works;
- Brief outline of the occupational health and safety measures that should be implemented during remedial works;
- Outline of regulatory approvals and licenses which may be required to adopt the preferred remedial strategy, and'
- Conclusions.

The validation long-term goals are to:

- Render the site acceptable and safe for the long-term land use consistent with a Residential development;

- Minimise environmental and health risks both on and off site; and,
- Maximise, to the extent practicable, the potential future uses of the site.

It was proposed to remediate the Morisset Park site to the above goals with the implementation of the following:

- Remediate areas of identified potential contamination including UST area, sewerage treatment areas, transpiration spray area and areas of past demolition works including appropriate assessment and disposal of materials, where necessary;

- Validate excavated areas to ensure they meet the Soil Investigation Levels for Urban Redevelopment in NSW; and,

- Ensure any excavated areas were back filled (if back filling is required) with certified clean materials, appropriate to the required remediation/validation goals set for the site, in line with Table 5a, Column A - *Residential with Access to Soils* as outlined in the *NEPM 1999 and* NSW DEC *Guidelines for the NSW Site Auditor Scheme.*

David Lane Associates has extensively reviewed the Phase 1 and Phase 2 Environmental Site Assessments prepared by PPK Environment and Infrastructure and Parsons Brinkerhoff Pty Ltd respectively dated August 2001 and February 2005;

2.5 Remedial Activities

2.5.1 Summary of Remediation Methodology.

The Remediation strategy included the following activities;

- Provision of Asbestos Clearance Assessment and Certification for the areas where asbestos removal and demolition had previously been undertaken.

Refer to **Figure 3** – *Site Layout* for an indication of former structures demolished and **Appendix 9** – *Clearance Certification*.

- Dismantling of Plant equipment and subsequent excavation of Bio-solids associated with the Sewage Treatment System;
- Removal, remediation and validation of Underground Storage Tanks (UST's);
- Staged Validation of identified areas of concern including the UST area and Sewerage Treatment Plant areas utilising high density sampling strategy;
- Final Validation including previous areas of concern and identified areas of moderate and low risk employing a medium and low density sampling strategy were conducted to confirm the Site was in compliance with the requirements of NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*. Refer to **Figure 4a** – *Chemical Sampling Design Strategy*
- Preparation of Final Validation Report.

2.5.2 Summary of Environmental Pollution Control

During the remediation process and prior to work commencing, environmental controls were put in place. These included the control surface water and air quality, in particular dust and odour.

A concerted effort was made during all excavation and surface works to provide for surface drainage in the event of rain to drain direct to the excavations. These works were successful with no water leaving the immediate areas of the excavations during any works. All stockpiles retained on site for an extended period were placed on hardstand and contained by hay bales and Geofabric.

Dust control measures included the provision of a number of water outlets on the site with hoses attached to be used as means to suppress elevated dust events. Due to the nature of materials on the site i.e: hardstand, dust levels noted during all works were minimal. Odour suppressant concentrate was available on the site during all excavation works, however this was not required.

2.5.3 Summary of OH&S Measures.

Professional Security Patrols were implemented on a nightly basis by Johnson Property Group to limit access to the site by the public. The standard Workcover requirements for a site induction prior to undertaking any works were implemented. Personal Protective Equipment (PPE) in the form of hard hats, safety boots and high visibility vests were mandatory at all times.

Safety equipment including gloves if deemed necessary by the Site Manager was provided on-site. The remedial Contractor provided evidence of equipment licences and maintenance schedules to the Project Manager prior to the commencement of the Works Contract.

All excavations that were left open overnight were secured using barrier fencing and signposted accordingly. Given the location of the site the lighting on the site was considered adequate without additional installations.

2.5.4 Summary of Regulatory Approvals and Licences.

Prior to the commencement of remediation appropriate notifications were given to Lake Macquarie Council notifying them and detailing the intended remediation works. The Project was subject to DA approval including consent conditions dealing with potential contamination issues. Workcover approval was gained prior to the commencement of all asbestos removal. The standard seven (7) days notification was adhered to and the appropriate permit obtained by the AS1 asbestos removal contractor.

2.6 Sequence of Validation Activities

Pre August 2006	Building asbestos removal and demolition. (prior to DLA involvement) including Above ground Storage Tank (AST);
18th August 2006	DLA proposal submitted;
8th September 2006	Removal of Underground Storage Tanks (UST);
8th September 2006	Validation Sampling of Tank Pit Areas, and associated excavated materials;
5th October 2006	Validation of remediated asbestos contaminated area;
22nd October 2006	Dismantling of the Sewage Effluent Treatment System;
27th October 2006	Validation Sampling of remediated Sewage Effluent Treatment System and associated areas;
18th January 2007	Preparation of Validation Grid Layout;
19th January 2007	Validation Sampling. Collection of seventy-one (71) soil samples, eight (8) intra and four (4) inter laboratory duplicates for chemical analysis, and collection of a further ten (10) bulk soil samples for asbestos analysis;
27th April 2007	Remediation and re-sampling of one (1) asbestos contaminated area;
28th May 2007	Provision of Validation Report; and,
August 2007	Finalisation of Validation Report.

3.0 SITE DESCRIPTION

3.1 Site Identification

The site lies with the City of Lake Macquarie Local Government Area. The site is currently zoned **2(a) - Residential** under the provisions of the Lake Macquarie Local Environment Plan (LEP), 1984. The property is identified in Council records as Lot 1 DP1075443, Lot 2 DP1075443, Lot 3 DP1075443, Lot 4 DP1075443, Lot 38 DP 1076099, and Lot 8 DP129377.

The site is located at 59 Lakeview Road, Trinity Point, Morisset Park, which is approximately one hundred and twenty (120) kilometres north north-east of Sydney CBD, and thirty (30) kilometres south south-west of Newcastle. The site has a maximum elevation of 12.4 metres above sea level (south western area of the site) and covers an area of approximately eighteen hectares (18ha).

The site is situated on the eastern most peninsula of Morisset Park known as Bluff Point. Protruding into Lake Macquarie, water forms the eastern and southern boundaries and most of the northern boundary of the site. To the northwest of the site is the suburb of Morisset Park and the location of recent residential development. Farther to the west is sparse residential, predominantly open space and natural bush land.

Refer to **Figure 2 –** *Site Layout* for information regarding the site configuration.

The site is located in adjacent to a residential area with a mixture of older structures and new developments.

3.2 Boundary Conditions and Surrounding Land Use

The boundaries at the site are believed to be in a stable condition with no significant cross impaction from adjoining sites. The site incorporates a headland to the east of an area occupied by sparse residential development. The surrounding immediate land use consists of:

- Directly to the north of the Western edge of the property are pre existing and newly developed residential properties;
- To the south across Lake Macquarie is Wyee Point;

- To the west is the rural centre of Morisset and sparse pre-existing residential with predominantly open space, natural bushland, and;
- Directly on the eastern, southern and half of the northern boundary, Lake Macquarie forms a natural boundary to the site.

3.3 Future Land Use

It is understood that Johnson Property Group intends to develop a majority of the site into a new residential estate, with the end land use remaining consistent with Table 5a, Column A - *Residential with Access to Soil,* as defined by the NEPM 1999.

3.4 Site History

The site history has been investigated through a Historical Title search within the City of Lake Macquarie Government Environmental databases, a review of aerial photography and anecdotal evidence from neighbours, residents, and site owners past and present.

3.4.1 Historical Title Search

Historical land title information for the site is derived from Harper Somers and a search company, and reported in PPK Environment and Infrastructure : *Phase 1 Environmental Site Assessment - St John of God, Henry Street, Morisset Park* (Aug 2001). Refer to **Appendix 2 -** *Historical Title Search,* for the original copies of the Certificates of Title and Registered Plans. A summary of the Land Title search is present in **Table 3a.**

Table 3a

Date	Property Transaction
17th July 1875	Crown Grant: William Charles Brown
5th June 1934	Transfer C252837: Reverend Michael Kelly and Nora Martin, Elizabeth O'Connor, Josephine Hazledine, Annie McMahon and Gertrude Tariant.
9th August 1948	Transfer D891963: to Henry Morrissey, James Bernard Maher and Heber Daniel Roland.
26th August 1948	Transfer D891964: to The Trustee of the Superior Council of Australia of the Society of St Vincent De Paul.
19th March 1969	Transfer L341473: to The Trustees of the Hospitaller Brothers of St John of God.

3.4.2 149 Certificate

A 149 Planning Certificate, parts two (2) and five (5) was obtained for the Trinity Point, Morisset Park site from the City of Lake Macquarie Municipal Council, stating:

- The land is affected by the State and Regional Planning Instruments;
- The erection of a dwelling-house on the land, if the land is vacant, is NOT PROHIBITED by reason of a development standard relating to the minimum area on which a dwelling house may be erected;
- Demolition of any building on the land requires development consent to be obtained;
- The land is affected by the following Development Control Plan:
  - Plan 9 - Medium Density Residential Development
  - Plan 14 - Professional Consulting Rooms
  - Plan 21 - Energy Efficient & Sustainable Housing
  - Plan 31 - Landscaping
  - Plan 33 - Exempt Development
  - Plan 34 - Complying Development
  - Plan 35 - Notification of Development Applications
- no matters apply to this property under the Contaminated Land Management Act, 1997;

- the land is not affected by the operation Sections 38 or 39 of the Coastal Protection Act, 1979;
- this site is proclaimed to be within a Mines Subsidence District under Section 15 of the Mines Subsidence Compensation Act 1961;
- The land is not affected by any road widening or road alignment proposals under resolution of the council;
- This land is not within a land slip or subsidence zone;
- This land is not within a flood zone;
- the land is not bush fire prone lands under the Environmental Planning and Assessment Act, 1979;
- this site is affected by a Tree Preservation Order. Council consent is required to cut down, ringbark or lop trees in excess of three (3) metres in height, and all mangroves irrespective of height;
- A foreshore building line applies to the coastal section of this site, which is also restricted development due to likelihood of flooding or tidal inundation.

Refer to **Appendix 1** - *149 Planning Certificates* for original 149 Certificate copies.

3.4.3 Anecdotal Evidence

Mr Laurie Gough, who was a former employee being responsible caretaking, worked on the property for seven years until July 2004 and provided PB Pty Ltd with the general overview of site activities that have been summarised below.

The Morisset Park site has a long history as a church premise. The monastery of St John of God was founded on this land, as well as the cemetery, orchards, effluent ponds, cattle grazing paddocks and cattle loading yard that the monastery managed. Mid-late 1990's the original monastery building was demolished and replaced with a new residential building, with the demolition rubble from this redevelopment work allegedly being buried in a trench excavated within the eastern paddock of the site.

Originally the eastern portion of the property contained several large brick and tile buildings including a former schoolhouse, residential building, church, gymnasium, function room, storage sheds and garages. Also located on site were a swimming pool and tennis courts.

The western portion of the site was utilised as cattle grazing land, and included a cattle-loading yard. Two excavated dams, approximately 1.5 metres depth were previously located in this area and used to water the cattle. Cattle grazing ceased on this property July 2004. Approximately 15, 000 tonnes of fly ash and fill material was brought in and used as fill material for the lower western portion of the site and the bank reclamation area, in early - mid 1990's. DLA found no evidence during site inspections and validation that the dams were filled with fly ash or fill material. Former site contour diagrams viewed suggest the dam's excavated material was used as the dam walls and subsequently pushed back to fill the voids on decommissioning.

The on-site effluent treatment system was present in the centre portion of the site, including a small pumping station, three sedimentation and evaporation tanks, an overflow pond and an irrigation system. This pond system was pumped dry in July 2004.

An area once used as a cemetery containing nine (9) graves was located on the elevated ridge on the southern portion of the site. The graves were exhumed in 2003 and the area backfilled with imported certified filling. During its use as a cemetery, the area was fenced off, however was occasionally used for cattle grazing. No documentation is available to support the anecdotal evidence of imported fill to the exhumed graves area. DLA did not observe unnatural fill material in these areas.

Originally located within the carport area, adjacent to the monastery buildings, was an Aboveground diesel Storage Tank (AST) and Underground Storage Tanks (UST). The UST's were decommissioned and partially filled with sand in approximately 1997. Two petroleum bowsers were also located near the carport of the site, but were removed early prior to the decommissioning of the tanks. It is likely that the relocation of the AST to it's recent location, adjacent to a storage shed in the paddock area, occurred at a similar time.

3.4.4 Aerial Photograph Review

Aerial photographs reviewed from 1950 to 1996 inclusive to determine the development on the site and the changes of land use over the period.

- March 1950 Run 7 — Buildings present on site. Landscaped trees are visible on the south-eastern corner (possibly an orchard). Baths present at the base of the cliff face. Three (3) fenced paddock areas are evident at the southern edge of the site.

- Sep 1961 Run 14 — Additional clearing on site has been undertaken. Landscaping (possible orchard) has been partially removed from the site. The three (3) fenced paddocks at the southern edge have been removed.
- Aug 1965 Run 14 — No visible changes are evident to the site.
- July 1969 Run 10 — A paddock at the northern end of the site is visible as a dark area. No other changes are evident to the site.
- July 1979 Run 19 — An additional Long Shed is present on the south-eastern corner of the site. No other changes are evident to the site.
- Sep 1983 Run 19 — Tennis Courts now present. No other changes are evident to the site.
- April 1987 Run 19 — The peninsula at the northern end of the site has been cleared of all vegetation. A pond is being developed in the north-eastern corner of the site. Four (4) additional residential buildings are now present on the site.
- April 1990 Run 6 — The surrounding paddocks have been allowed to grow a green grass covering. No other changes are evident to the site.
- Nov 1993 Run 6 — One (1) additional building is present on the site. Two (2) effluent sedimentation ponds are now present to the southern end of the site.
- May 1996 Run 11 — No changes are evident to the site at this point.

Refer to **Figure 2 –** Site Layout for location of Cemetery, possible Orchard, UST and AST area, Effluent ponds and Cattle Loading Yards.

3.5 Potential Contaminants resulting from Past Uses

The site history indicates some potential for land contamination given the historical land uses identified at the site through Anecdotal Evidence and a review of Aerial Photography.

Anecdotal Evidence established the presence of Underground Storage Tanks (UST's), which were decommissioned and filled with sand mid 1990's, an Aboveground Storage Tank (AST), which was removed prior to DLA being commissioned, and two (2) petroleum bowsers, which were removed early to mid 1990. An effluent treatment system remained onsite consisting of a pumping system, three (3) open sedimentation and evaporation tanks and a re-irrigation system, all of which was pumped dry during 2004.

Anecdotal evidence states that the demolition rubble from the redevelopment works was buried in a trench excavated within the eastern paddock of the site. DLA have supervised a thorough exploration and investigation in this area and can find no evidence of any material identifiable as building or demolition rubble.

The review of Aerial Photography suggests an orchard may have present during the 1950's in the area that until recently was covered by buildings on the south-eastern corner of the site, no evidence of this was found during site inspections. No evidence could be found to identify cattle dips or any other potentially contaminating activity associated with cattle handling. It can be inferred that the size of the property and associated head numbers would not warrant these facilities.

Remediation was conducted on the identified UST area and effluent treatment system, with all areas being subject to stringent sampling to ensure remediation was successful, prior to the Validation taking place.

3.6 Summary of Past Site Reports

- *Phase 1 Environmental Site Assessment - St John of God, Henry Street, Morisset Park NSW*, August 2001, prepared by PPK Environment & Infrastructure.

The report by PPK investigated the suitability of the site for its intended development purpose, being that of residential and recreational land use. It identified a number of potential sources of minor contamination from historical land uses including effluent ponds, an orchard, cattle loading yard and a cemetery. The report concluded that based on preliminary findings, the proposed development would be considered a low risk property in terms of potential contamination impacts.

- *Phase 2 Environmental Site Assessment - St John of God, Henry Street, Morisset Park NSW,* February 2005, prepared by Parsons Brinckerhoff Aus Pty Ltd.

On completion of the Phase 1 PPK recommended a Phase 2 be conducted on the Site. As a consequence a further eighteen (18) sample locations were identified including in the effluent treatment and irrigation areas, two (2) in the former orchard, three (3) in the former cattle loading yard, three (3) in the bank reclamation area, one (1) in the vicinity of the AST and six (6) in the former cattle grazing area.

Of these samples the only sample location exceeding the assessment criteria was BH09 in the vicinity of the AST and that returned elevated levels of TPH and PAH.

Recommendations of the Report to ensure compliance with the intended residential development was to remove and remediate UST and AST areas prior to being subjected to a Validation Report.

4.0 ENVIRONMENTAL SETTING

4.1 Site Topography

The site represents a small peninsular protruding into the western shoreline of Lake Macquarie and has a maximum elevation of 12.4 metres above sea level in the south western quadrant. The site slopes downwards towards to the north east to an elevation of 1.6 metres above sea level. The surroundings landscape consists of relatively low lying marshlands, broad drainage lines and rolling foothills to the west, south and north with an average relief of 30m and slope gradients <10%. The Watagan Mountain Range lies approximately 10km further to the west.

4.2 Site Geology

The underlying geology of Morisset Park consists of Triassic and Permian sediments of the Narrabeen Group – Clifton subgroup – Munmorah Conglomerate Formation occurring within the Sydney Basin geological unit.

The 1:100 000 Department of Conservation and Land Management *Soil Landscapes of Gosford – Lake Macquarie Series Sheet* 1993 indicates that the site contains two distinct soil landscapes of the Central Coast Lowlands, being Doyalson and Wyong. The first of these landscapes occupies the southern and western portions of the site and is characterised by pebbly sandstone, grey-green and grey siltstone and claystone. The Doyalson Soil Landscape is limited by its lack of fertility, erosion hazard and hard setting tendency.

The Wyong soil landscape occurs across the low lying northern areas of the site and is generally associated with a relief of <10m and slopes of <3%. The poorly drained deltaic floodplain areas and alluvial flats of the Wyong soil landscape are depositional areas of Quaternary sediments made of sand, silt, gravel and clay. Limitations of this soil type include susceptibility to waterlogging, flooding and a high acid sulphate potential.

Sandstone bedrock is evident at the surface along the foreshore and in particular the south eastern extremity of the Site and is considered indicative of the sub-surface soil profiles. Depth to sandstone bedrock would be 0 – 3.5m across the Site.

4.3 Site Hydrogeology

The sand and gravel layers within the alluvial deposits are expected to act as shallow and semi confined aquifers. Groundwater recharge into these aquifers is expected to predominantly occur through direct infiltration of surface water and rainfall.

Based on the ridgeline extending along the southern boundary of the site, the majority of surface water is expected to flow towards Lake Macquarie to the north, whilst smaller proportions would also flow overland to the eastern and southern shorelines.

Groundwater assessments have not been previously conducted at the site however the depth of the main aquifer underlying the site is estimated between 1.63 and 12.4 metres below ground level, based on the sites' elevation above Lake Macquarie. Groundwater flow is expected to follow the surface contours and predominately flow to the north toward Lake Macquarie.

There are no registered groundwater licensed groundwater bores with immediate vicinity of the property. There exists eight (8) registered bores within five (5)kms of the site being used for stock, domestic and agricultural purposes. Four (4) of these bores have available data, one of which indicates fresh water at a flow rate of 1.25 litres/sec with groundwater being encountered at the location to the west at 15 metres below ground level.

Refer to **Appendix 7** – *Groundwater Bore Information*.

The soil validation samples have indicated the presence of acceptable concentrations of metals and organics present on the site. TCLP data generated during excavation of materials have indicated that the contaminants generally noted on the site are immobile. The nature of the aquifers and the general contaminant concentrations experienced across the site suggest that the possibility of groundwater contamination is low. Also the excavation of UST's to a depth of 3.5metres found no groundwater to be present with the tank pit base being free from contamination supporting the conclusion of a low risk of groundwater contamination.

4.4 Site Meteorology

The Department of Meteorology NSW, gives the annual rainfall for the Morisset Park area at 1229mm annually, with an annual temperature range of 9.3°- 25.2°C, and an annual average day-time temperature of 21.7°C.

Refer to **Appendix 8** – *Meteorological Data*.

4.5 Acid Sulphate Soils

Acid sulphate soil is the common name given to sediment and soil containing iron sulphides (principally containing iron pyrite or iron disulfide). The exposure of pyrite in these soils to oxygen by drainage or excavation leads to the generation of sulphuric acid. Acidic leachate can dissolve clay and release toxic concentrations of aluminium, iron or other metals into water bodies. Drainage waters from areas of acid sulphate soils will affect water quality and can lead to death or disease of aquatic organisms.

The regional Acid Sulfate Soils map (Department of Land and Water Conservation, 1997, Swansea 1:25,000) describes the site as being an estuarine sand plain of 1-2m AHD. The area is considered to be high probability of Acid Sulfate Soils within one metre (1m) below ground level. The Department of Natural Resources (DNR) database (IPlan) confirmed the presence of Class 1 Acid Sulphate soils along the northern shoreline areas of the site and in association with the Wyong Soil landscape.

Refer to **Figure 5** *Acid Sulphate Soils* for detail.

The impact of Acid Sulphate Soils was recognised in the excavation of the northern sewerage evaporation pond and as such the excavation was limited to 0.5 metres, which was adequate to provide the validation surfaces required. Due this strategy no impacts from acid sulphate soils were encountered.

4.6 Flora and Fauna

The site has been largely cleared of its original vegetation since before 1950. The area that once was the cow grazing paddocks has a grass covering and a sparse scattering of individual large eucalyptus trees throughout the open spaces, which become more

concentrated around the edges of the property. The area that once housed the buildings on the site is now covered with a gravel ground cover. Large Eucalyptus trees are present throughout 50% of the area and trees surround the border of the property. The tree coverage appears to be predominantly large, old eucalyptus trees, with little or no undergrowth present. Some stress was evident on non-drought tolerant species probably due to climatic conditions. No specific indicators such as chlorosis or necrosis were apparent to suggest localised toxicity of the soils.

5.0 STATUTORY FRAMEWORK

Environmental Legislation in NSW is primarily divided into four (4) areas:

- Environmental Planning;
- Pollution Control;
- Nature and Cultural Conservation; and,
- Resource Allocation.

The applicable legislations to the site cover Environmental Planning and Pollution Control.

Some Environmental Legislation in NSW has been in force for many years but it is only from the late 1980's that the profile of environmental issues has been sufficiently high for many businesses to recognise that they may have exposures and liabilities associated with this legislation. In 1989 a benchmark piece of legislation, the *Environmental Offences and Penalties Act*, was passed which made not only companies, but their employees, in particular senior executives and managers, liable for prosecution for environmental offences.

Subsequent developments in the administration and enforcement of pollution control legislation saw the establishment of the Department of Environment and Conservation (DEC) (formerly the EPA - Environment Protection Authority), which has been given an expanded role in the scope of the legislation, which it administers. The DEC is responsible for the issue of licences, permits and approvals associated with air, water, soil and noise pollution and waste disposal. Under certain legislation the DEC has approval authority for the installation of, or modification to, pollution control equipment.

The current position adopted by the DEC is that application for approval is required irrespective of whether the new equipment or modifications will result in an increase or decrease in the type or volume of pollutants.

The *Environmental Planning and Assessment Act*, 1979 gives local authorities the power to regulate development within their areas of responsibility and to impose specific consent conditions, which cover environmental issues. In addition, the *Local Government Act* 1993 requires approval from Council for certain works / activities to be obtained.

The pollution control and environmental planning statutes in NSW, which are most likely to apply to the site, are:

- *Contaminated Land Management Act* 1997;
- *Protection of the Environment Operations Act* 1997;
- *Dangerous Goods Act* 1975;
- *Ozone Protection Act* 1989;
- *Waste Avoidance and Resource Recovery Act* 2001;
- *Water Board (Corporatisation) Act* 1994;
- *Environmental Planning and Assessment Act* 1979; and
- *Local Government Act* 1993.

In addition, regulations and planning instruments made under these Acts may also apply.

The *Protection of the Environment Operations Act* (POEO), 1997 commenced operation on 1st July 1999 and has repealed the following Acts:

- *The Clean Waters Act* 1970;
- *The Clean Air Act* 1961;
- *The Noise Control Act* 1975;
- *The Environmental Offences and Penalties Act* 1989; and
- *The Pollution Control Act* 1970

The Act also incorporates the major regulatory provisions of the repealed *Waste Minimisation and Management Act* 1995.

The repealed Acts are incorporated into the POEO Act. Thus, regulations made under the repealed Acts are now regulations under the POEO Act or until otherwise amended and licences issued under the repealed Acts are deemed to be licences under the POEO Act. The POEO Act provides a common licence to cover emissions to all environmental media. The Act lists certain "scheduled activities" which have to be licensed.

The *Contaminated Land Management Act*, 1997 specifies the legal requirements for the registration, investigation, and remediation of contaminated land, and for the registration and accreditation of site auditors. It repeals the requirements of the *Environmentally Hazardous Chemicals Act*, 1985 in relation to audits and the accreditation of site auditors.

The POEO Regulation 1997 aims at achieving more effective pollution control by implementing the principle of load-based licensing by:

- Linking licence fees to the amount of pollution emitted (as opposed to the previous legislation which linked fees to the concentration of pollutants emitted);
- Introducing higher fees for more harmful pollutants and in more sensitive environments.

In addition there are a number of Australian Standards and Codes of Practice, which either complement Legislation or which are directly referenced in Legislation. The following examples, which may apply, include:

- AS 1940, The Australian Standard for the Storage and Handling of Flammable and Combustible Liquids;
- AS 1596, The Australian LPG Gas Code;
- AS 1692, Tanks for Flammable and Combustible Liquids;
- The Australian Dangerous Goods Code;
- Worksafe Australia Guidance Notes for the Completion of Material Safety Data Sheets (MSDS);
- Worksafe Australia Code of Practice for the Safe Removal of Asbestos; and
- AS 2508, Safe Storage and Handling Information Cards for Hazardous Chemicals.

6.0 ANALYSIS AND SAMPLING METHODOLOGY

6.1 Data Quality Objectives

The Data Quality Objectives (DQO's) define the quality and quantity of data needed to support decisions relating to the environmental condition of a site. It outlines the defining criteria that a data collection design should satisfy, including when, where, how and how many samples to be collected. The DQO were developed for this assessment in accordance with the Australian standards *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds (AS4482.1 – 2005)* and *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 2: Volatile Substances (AS4482.2 – 1999).* The underlying criteria for the remedial works was as outlined in the NSW EPA *Service Station Guidelines 1994*.

The DQO process is a seven (7) step planning approach to outline the project goals, decisions, constraints and an assessment of the project uncertainties and how to address these when they arise.

The Data Quality Objectives (DQO) for the sampling and analysis investigations were to:

State the Problem.

Determine the contamination problem, why it requires new environmental data, and what resources are available to resolve the problem within the allocated deadlines of the Project. This includes researching previous site investigations, historical searches (titles, landuse of site and adjacent sites, and aerial photographs), identification of chemicals of concern, media they inhabit and possible migration pathways (to and from the site), potential exposures to human or/and environmental receptors, and concerns with the potential clean up and desired future landuse of the property. Refer to chapters: **3.0** *Site Description*; and, **4.0** *Environmental Setting*.

The problem to be addressed is whether contamination exists within the subject site and if so, to evaluate the likely human health and environmental risks associated with any contamination identified.

The following key professional personnel were identified in the Validation process:

Mr David Lane	Director
Ms Danielle Ord	Environmental Scientist
Ms Shonelle Gleeson	Environmental Scientist
Ms Nicola Rees	Environmental Scientist

Identify the Decision.

Determine the decisions that need to be made on the contamination and the new environmental data required to make them. This includes considering relevant site criteria for each medium (fill, soil and sediment), considering whether a proposed use of the 95% UCL on the mean concentrations or results for all chemicals of potential concern were less than the site criteria. Reviewing the existing conceptual model to determine whether existing data is satisfactory for the investigation or whether uncertainty exists that will reduce the number of possible actions that will solve the problem; Refer to chapters: **6.0** *Analysis and Sampling Methodology*; and, **7.0** *Assessment Criteria*.

The decisions to be made in completing the Validation are as follows:

- Is the Site suitable for the proposed development?
- Is there any groundwater contamination?
- Are there any off-site groundwater issues to be considered?
- Is there any further investigation needed to determine the end land use suitability?
- Does the Site require further remediation to ensure suitability for the proposed development?

Identify Inputs to Decision.

Identification of the information needed to allow informed, defensible decisions and specify which inputs require new environmental measurements. This includes identification of the environmental variables/characteristics that need measuring, identification of which media (fill, soil etc.) need to be collected, identification of the site criteria for each medium of concern and their analytical methods. Refer to sections: **3.5** *Potential Contaminants from Past Uses*; **6.3** *Laboratory Investigations*; and, chapter **7.0** *Assessment Criteria*.

Other inputs include:

- Systematic soil sampling at a density considered appropriate given the assessed risk of contamination
- Soil profile information obtained through the sampling phase.
- Chemical and/or physical test data on analysed samples.
- Statistical analysis of the laboratory data set.
- Assessment of validation data sets against applicable soil investigation levels in the National Environment Protection (Assessment of site Contamination) Measure 1999 (NEPM) and NSW Service Station Guidelines.

Define the Study Boundaries.

Specify the spatial and temporal aspects of the environmental media that the data must represent to support decision. To identify the boundaries (both spatial and temporal) of the investigation and to identify any restrictions that may hinder the assessment process. This includes on and off site inspections and discussions with neighbours past and present. Refer to chapters: **3.0** *Site Description*; and, **4.0** *Environmental Setting.*

Develop a Decision Rule.

To define the parameter(s) of interest, specify the action level, and provide a logical basis for choosing from alternative actions. This includes defining acceptable limits for chemicals of concern detected in field blanks, rinsate blanks, volatile-spiked trip samples, laboratory method blanks to ensure the action levels exceed the measurement detection limits. Refer to chapter **6.0** *Analysis and Sampling Methodology*.

The decision rule in validating the Site will be as follows:

- Laboratory test results for the systematic samples will be analysed statistically to ascertain the 95% upper confidence level (UCL) for each analyte or analyte group.

- The assessment criteria are the NSW DECC produced and/or endorsed criteria as specified in **Section 7.0** of this Report.
- The Site will be deemed not significantly impacted by past usage and the presence of fill materials if the following criteria are fulfilled:
- The 95% UCL of the arithmetic mean of the data set is less than the assessment criteria for the analyte group
- The standard deviation of the data set is less than 50% of the assessment criteria
- No individual sample result is greater than 250% of the assessment criteria

The subject Site will be deemed unsuccessfully validated or containing contamination "hotspots" if any of the above criteria are unfulfilled.

Laboratory test results will only be accepted and considered useable for this assessment under the following conditions:

- All laboratories used are accredited by NATA for the analysis undertaken.
- All detection limits set by the laboratories fall below the assessment criteria adopted.
- Analyte concentrations in the rinsate water samples do not vary significantly from the concentrations in the distilled water used for equipment rinsing.
- The difference between the reported concentrations of analytes in the field duplicate samples and the corresponding original samples are within the accepted limits. Refer to **Sections 6.2 and 6.3.**
- The differences between the reported concentrations of analytes in the inter-laboratory triplicate samples and the corresponding original samples are within accepted limits.
- The quality assurance / quality control (QA/QC) protocols and results reported by the laboratories comply with the requirements of the NEPM 1999 "*Guideline on laboratory Analysis of potentially Contaminated Soils"*

Specify Limits on Decision Errors.

Specify the decision-maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data.

Incorrect decisions are caused by using data that is not representative of site conditions because of sampling or analytical error, leading to a conclusion that is inappropriate for the site in question. Refer to chapters; **5.0** *Statutory Framework and Assessment Criteria*; **6.0** *Analysis and Sampling Methodology*; and, **7.0** *Assessment Criteria.*

The limits on decision errors for this assessment are as follows:

- Sample numbers have been determined to comply with the requirements generally outlined in the NSW EPA *Sampling Design Guidelines* 1994 Section 4 and Table A incorporating Procedure B.
- If any samples exceed the criteria then further remedial works will be undertaken.
- The analyte selection is based on a typical suite adopted for materials of an unknown source and identified source (Service station). Field observations during sampling detect the possibility of any other potential contaminants (through odours, staining and colouring) that may need to be included. The potential for contaminants other than those analysed is considered remote.
- The assessment criteria adopted from the guidelines stated in Section 7.0 have risk probabilities already incorporated.
- The acceptable limits for field and inter-laboratory duplicate comparisons are outlined in Section 6.3 of this report
- The acceptance limits for laboratory QA/QC parameters are based on the laboratory reported acceptance limits and those stated in the NEPM 1999 "*Guideline on Laboratory Analysis of Potentially Contaminated Soils .*

Optimise the Design for Obtaining Data.

Identification of the most resource-effective sampling and analysis design for general data that are expected to satisfy the DQO's. Including the optimal design and sampling collection regime, this is outlined in the sampling, analytical and quality plan. Refer to chapter **11.0** *Evaluation of Quality Assurance and Quality Control*.

- The procedures adopted for the location and collection of environmental samples were developed prior to implementation, in

accordance with NSW DECC guidelines and current industry practice. The sampling program was designed to ensure the integrity of data collection during the assessment, including decontamination techniques, sample labelling, storage and chain of custody protocols.

- The analytical program was developed in theory prior to undertaking the sampling. All considered potential contaminants have been covered.

- Only laboratories accredited by NATA for the analysis undertaken were used for this assessment. The laboratory performance is assessed through review of statistics calculated for QA samples such as blanks, spikes, duplicates and surrogates.

- The field QA/QC protocols adopted are outlined in Section 6.2 of this report. The QA/QC program incorporates preparation of traceable documentation of procedures used in the sampling and analytical program and in data validation procedures.

Data Quality Indicators

The performance of the Validation assessment in achieving the DQO will be assessed through the application of Data quality indicators (DQI), defined as follows:

Precision	A quantitative measure of the variability (or reproducibility) of data;
Accuracy	A quantitative measure of the closeness of reported data to the "true" value;
Representativeness	The confidence (expressed qualitatively) that data are representative of each media present on the Site.
Completeness	A measure of the amount of useable data from a data collection activity;
Comparability	The confidence (expressed qualitatively) that data can be considered equivalent for each sampling and analytical event.

An assessment of the data quality indicators is presented in **Section 6.1.1.**

David Lane Associates adopted stringent field and laboratory sampling, analytical and quality plans to ensure the Data Quality Objectives were upheld to the highest possible standard. These are detailed in the following pages.

6.1.1 Rationale for the Sampling and Analysis Plan

The sampling regime of the investigation area of 59 Lakeview Road, Morisset Park validation site was in accordance with the requirements as outlined in the NSW EPA *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, and the NSW EPA *Contaminated Sites: Sampling Design Guidelines*, taking into consideration the requirements of the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM, 1999) and the NSW EPA Service Station Guidelines 1994.

Sampling and analysis for the validation process were carried out to obtain an assessment of the following:

1. Nature, location and likely distribution of soil contaminants persisting on the Site.

2. The risk that the contaminants (if present) pose to human health or the environment under the conditions of the proposed development.

The risk of harm to human health and the environment was determined through comparison of validation results with NSW DECC produced or endorsed criteria available at the time as discussed in Section 7.0 of this report.

Site sampling was carried out between 17th September 2006 and 27th April 2007 incorporating the initial UST Pit Validations, Sewage Treatment Area Validations and Final Site Validation. All Validation processes were conducted by David Lane Associates who were responsible for visually assessing the Site, locating the sample locations, pegging the locations, recovery of soil samples, preparation of samples for delivery to NATA accredited laboratories and logging the sub-surface profile encountered at each location.

The investigation samples were collected at a depth of 0 – 0.5 metres below ground level (considered representative of soil profile conditions). Tank pit validation samples were collected from representative areas of the tank pit walls and base in accordance with NSW EPA Service station Guidelines 1994.

The sampling strategy adopted was as follows:

- The Underground Storage Tank Pit was sampled at a density of ten (10) soil samples, and two (2) intra laboratory duplicates. The associated excavated material stockpiled during these civil works were subjected to four (4) soil samples, plus one (1) intra laboratory duplicate. This area was deemed as high density sampling.
- The Sewage Effluent Treatment System area, consisting of the pumping system, three (3) sedimentation and evaporation ponds and a re-irrigation system was also deemed as a high sampling density area. Thirty (30) soil samples were collected for analysis across this area of the site.
- The investigation across the site was sampled at a density of seventy-one (71) soil samples, with eight (8) intra and four (4) inter laboratory duplicate samples to ensure the QA/QC of the data. Thirty-three (33) of these samples were collected in the low density sampling area (predominantly previously cattle grazing area), and a further fifty (50) soil samples were collected in the area deemed as medium density sampling (including the area which once included the housing structures of the site).
- In addition to the above sampling, ten (10) bulk soil samples were initially collected for asbestos analysis with one area requiring re-sampling following a positive detection.

A total of one hundred and thirty (130) samples (including intra and inter duplicates) were taken as part of the validation assessment in differentiated areas of high, medium and low density sampling to maximise sampling confidence in areas of high risk. This strategy was based on a review of previous investigations and an historical investigation that determined the most likely portions of the site to be contaminated such as house sites or tank pits. This methodology also allowed determination of the most appropriate contaminants to be selected for analyses based on the analytes that were likely to be present in those portions and at which depths they would occur.

The justification of the sampling point regime for the assessment was based on the investigator's knowledge, experience and history of the site. The sampling approach adopted also provided for samples to be collected in an unbiased manner. All historical investigations and anecdotal evidence support the above rationale.

The following table provides a list of the data quality indicators for the **Analytical Phase** of the assessment and the methods adopted in ensuring that the data quality indicators were met.

DATA QUALITY INDICATOR	METHOD(S) OF ACHIEVEMENT
Data Precision and Accuracy	Use of analytical laboratories experienced in the analyses undertaken, with appropriate NATA certification. NATA accreditation requires adequately trained and experienced testing staff. Rinsate blank water, field duplicate and inter-laboratory triplicate samples analysed Acceptable concentrations in rinsate blank water samples Acceptable RPD for duplicate comparison overall Acceptable RPD for inter-laboratory triplicate comparison overall Appropriate and validated laboratory test methods used Adequate laboratory performance based on results of the blank samples, matrix spike samples, control samples, duplicates and surrogate spike samples
Data Representativeness	Representative coverage of potential contaminants Adequate duplicate, split, rinsate and trip blank sample numbers Adequate laboratory internal quality control and quality assurance methods, complying with the NEPM.
Documentation Completeness	Preparation of chain of custody records

	Laboratory sample receipt information received confirming receipt of samples intact and appropriate chain of custody
	NATA registered laboratory results certificates provided
Data Completeness	Analysis for all potential contaminants of concern.
	Field duplicate sample numbers complying with NEPM
	Inter-laboratory triplicate numbers complying with NEPM
	Rinsate samples recovered regularly
	Trip spike samples prepared and sent with field samples regularly
Data Comparability	Use of NATA registered laboratories
	Test methods consistent for each sample
	Test methods comparable between primary and secondary laboratory Acceptable Relative Percentage Differences between original samples and field duplicates and inter-laboratory triplicate samples. Some high RPD recorded due to non-homogeneous soil matrix.

6.2 Field Investigations

6.2.1 Field Sampling, Analytical and Quality Plan

During the assessment, remediation and validation of contaminated sites the integrity of data collected is considered paramount. With the assessment of the Lakeview Road, Morisset Park Validation site a number of measures were taken to ensure the quality of the data.

These included:

Sample Containers

Soil samples collected during the investigation were placed immediately into laboratory prepared glass jars with Teflon lid inserts. Standard identification labels were adhered to each individual container and labelled according to depth, date, sampling team and media collected.

Decontamination

All equipment used in the sampling program, which includes a hand auger, spades and mixing bowl, was decontaminated prior to use and between samples to prevent cross contamination. Decontamination of equipment involved the following procedures:

- Cleaning equipment in potable water to remove gross contamination;
- Cleaning in a solution of Decon 90;
- Rinsing in clean demineralised water then wiping with clean lint free cloths; and,
- Taking a Rinsate Blank Sample for decontamination monitoring.

David Lane Associates also adopted a sampling gradient of lowest to highest potential contamination to minimise the impact of cross contamination. This gradient was determined from the historical review and the on-site inspection that was carried out at Morisset Park prior to the Validation sampling.

Sample Tracking and Identification

All samples were identified with a unique sample number and all sampling details were included on the sample label and were reproduced on the field sample log and chain of custody records.

Refer to **Appendix 4** – Field Sample Log, **Appendix 5** - Sampling Inventory for sampling and analysis details.

Sample Transport

All samples were packed in ice from the time of collection and were transported under chain of custody from the site to LabMark Australia Pty Ltd, a NATA registered laboratory located in Hornsby; SGS Environmental Services a NATA registered laboratory located in Alexandria; Envirolab, a NATA registered laboratory located in Willoughby, and ASET, a NATA registered laboratory located in Hornsby. During the Project, the laboratory

reported that all the samples arrived intact and were analysed well within their relative holding times for the respective analytes.

Trip Blank

A trip blank accompanied the sampling for the validation process. The purpose of the trip blank is to identify whether cross-contamination is occurring during the sample collection and transport process. The blank sample is not separated from the sample collection and transportation process.

The analytical results for the trip blank suggest that no cross contamination is evident amongst the sample containers as indicated below:

Table 6a
Trip Blank Analytical Results (BTEX)

Analyte	Result mg/kg
Benzene	<0.2
Toluene	<0.5
Ethyl Benzene	<0.5
Meta and para-xylene	<1
Ortho-xylene	<0.5
Total xylene	-
CDFB (Surr @ 10 mg/kg)	*94%*

Rinsate Blank

Rinsate water samples were recovered on completion of the validation field work on the 19th January 2007 in order to identify possible cross contamination between sample locations. A sample of the rinsate water is compared to clean distilled water in the laboratory thus with known concentrations of selected analytes. The concentrations of the analytes in the rinsate samples were then compared with the concentrations of distilled water.

The rinsate sample was analysed for the analytes representative of the field samples recovered on the day of sampling. The results of the rinsate blank are included in the Table below:

Table 6b
Rinsate Sample Analytical Results (PAH)

Analyte	Rinsate (EQL 1ųg/L)	NEPM 1999 ųg/l
PAH		
BaP	ND	0.01
Total PAH	ND	3

Trip Spike

Trip Spike samples are obtained from the laboratory prior to conducting field sampling where volatile substances are suspected. A trip spike represents a volatile "leakage" measure between the sample contained within the sample jar and the sample jar closure. The only site specific issue is the type of sample material contained inside of the sample container. However, laboratories tend to use acid washed, solvent rinsed sand as this would represent the worst case for any volatile leakage.

The results for the Trip Spike analysis, outlined in the table below, suggest little or no loss of volatile analytes occurred as part of the sampling and transport strategy employed by David Lane Associates:

Table 6c
Trip Spike Analytical Results (BTEX)

Analyte	Result mg/kg
Benzene	117
Toluene	110
Ethyl Benzene	108
Meta and para-xylene	107
Ortho-xylene	106
Total xylene	-
CDFB (Surr @ 10 mg/kg)	98%
TPH (C6 – C9)	107

David Lane Associates' QA/QC procedures, for the collection of environmental samples, involves the collection of trip blanks, trip spikes, rinsate blanks and duplicate samples; both intra and inter laboratory.

Field Duplicate Samples

Field duplicate samples were prepared in the field through the following process:

- A larger than normal quantity of soil is recovered from the sample location selected for duplication.
- The sample is placed in a decontaminated stainless bowl and mixed thoroughly as practicable and then the sample is quartered.
- Two portions of the sub-sample are immediately transferred using the decontaminated trowel into a labelled, laboratory supplied 250ml glass jar and sealed with an airtight, Teflon screw top lid. The fully filled jar is labelled as the duplicate and immediately placed in a chilled esky.
- The remaining portions are stored in the same way and labelled as the original sample.

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 sample frequencies computed as follows:

Validation Samples	71 samples	8 intra- laboratory duplicates	11.2%
	71 samples	4 inter laboratory duplicate	5.6%
Tank Pit Samples	10 samples	2 intra- laboratory duplicates	20%
Stockpile samples	4 samples	1 intra- laboratory duplicates	25%
Effluent System	26 samples	4 intra- laboratory duplicates	15.4%
Overall Project	111 samples	19 laboratory duplicates	17.1%

Intra-laboratory duplicates were collected at a ratio of greater than 10 % for the Project. Inter-laboratory duplicates were submitted for the final validation and met the requirement of 5%. The lack of previous interlab duplicates is not seen to jeopardise the usefulness of the remaining data.

Comparisons were made of the laboratory test results for the duplicate samples with the original samples and the %RPD were computed in order to assess the accuracy of the laboratory test procedures.

The comparisons between the duplicates and original samples indicated acceptable %RPD's which are commonly set at less than 30% for inorganics and 50% for organics. Calculations of Relative Percent Differences (% RPD) are set out below In Tables 6a, 6b, 6c, 6d, 6e and 6f

Table 6d
Calculated Percent RPDs for Metals
Intra-Laboratory Duplicates

Duplicate	%RPD							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-VL2	ND	ND	4	2	6	0.05	ND	9
TP-Dup 1	1	ND	6	2	7	0.05	ND	10
RPD %	**100%**	**0%**	**40%**	**0%**	**15%**	**0%**	**0%**	**10%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-V6	3	0.1	8	9	15	0.05	2	72
TP-Dup 2	4	0.1	10	10	15	0.06	3	79
RPD %	**28%**	**0%**	**22%**	**10%**	**0%**	**200%**	**40%**	**9%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-V29	3	ND	12	4	12	ND	1	40
TP-Dup 3	3	ND	15	5	11	0.05	1	45
RPD %	**0%**	**0%**	**22%**	**22%**	**8%**	**100%**	**0%**	**11%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-V14	2	ND	11	4	8	ND	1	46
TP-Dup 4	2	ND	13	3	7	ND	ND	23
RPD %	**0%**	**0%**	**16%**	**28%**	**13%**	**0%**	**100%**	**66%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**

Table 6d - cont.
Calculated Percent RPDs for Metals
Intra-Laboratory Duplicates

Duplicate	%RPD							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-V42	2	ND	11	3	9	ND	1	26
TP-Dup 5	3	ND	13	4	12	ND	ND	90
RPD %	**40%**	**0%**	**16%**	**28%**	**28%**	**0%**	**100%**	**110%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-VL4	ND	ND	4	ND	3	ND	ND	5
TP-Dup 6	ND	ND	4	ND	3	ND	ND	5
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-VL10	ND	ND	5	59	8	0.06	ND	25
TP-Dup 7	ND	ND	6	28	8	0.05	ND	24
RPD %	**0%**	**0%**	**18%**	**71%**	**0%**	**0%**	**0%**	**4%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-VL-18	ND	0.2	7	4	8	ND	ND	25
TP-Dup 8	ND	0.2	6	5	9	0.05	ND	29
RPD %	**0%**	**0%**	**15%**	**22%**	**11%**	**100%**	**0%**	**14%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**

Table 6d - cont.
Calculated Percent RPDs for Metals
Intra-Laboratory Duplicates

Duplicate	%RPD							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-IF-4	3	<0.1	21	<2	6	<0.05	<1	11
TP-IF-4a	3	<0.1	21	2	7	<0.05	<1	24
RPD %	**0%**	**0%**	**0%**	**100%**	**15%**	**0%**	**0%**	**74%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-TA-2	<1	<0.1	3	<2	6	<0.05	<1	9
TP-TA-2a	<1	<0.1	2	<2	6	0.05	<1	8
RPD %	**0%**	**0%**	**40%**	**0%**	**0%**	**100%**	**0%**	**12%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-S-3	6	<0.1	12	<2	4	<0.05	<1	5
TP-S-3a	4	<0.1	8	<2	3	<0.05	<1	5
RPD %	**0%**	**0%**	**40%**	**0%**	**29%**	**0%**	**0%**	**0%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-ST3-5	2	<0.1	7	2	3	<0.05	<1	9
TP-ST3-5a	1	<0.1	6	3	3	<0.05	<1	9
RPD %	**0%**	**0%**	**15%**	**40%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**

Table 6d - cont.
Calculated Percent RPDs for Metals
Intra-Laboratory Duplicates

Duplicate	%RPD							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
MP-SP1S-1	<4.0	<1	9.1	9.5	11	<0.1	6.4	35
MP-SP1a	<4.0	<1	12	9.2	9.8	<0.1	4.0	18
RPD %	**0%**	**0%**	**28%**	**3.2%**	**11.5%**	**0%**	**46.2%**	**64.2%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
MP-1E	<4.0	<1	10	4.1	4.3	<0.1	1.8	9.2
MP-1Ea	<4.0	<1	13	3.8	4.0	<0.1	1.4	6.0
RPD %	**0%**	**0%**	**26%**	**7.6%**	**7.2%**	**0%**	**25%**	**42.1%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
MP-2W	<4.0	<1	11	4	5.4	<0.1	<1	3.6
MP-2Wa	<4.0	<1	13	4.5	4.9	<0.1	<1	4.2
RPD %	**0%**	**0%**	**17%**	**12%**	**10%**	**0%**	**0%**	**15%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**

Table 6e
Calculated Percent RPDs for Metals
Inter-Laboratory Duplicates

Duplicate	%RPD							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-V6	3	0.1	8	9	15	0.05	2	72
TP-Dup 2a	4	0.2	6.9	8.3	13	<0.05	2.3	73
RPD %	**28.6%**	**66.7%**	**14.8%**	**8.1%**	**14.3%**	**-%**	**14%**	**1.4%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**

Duplicate	%RPD							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-V29	3	<0.1	12	4	12	<0.05	1	40
TP-Dup 3a	3	0.2	13	5.1	12	<0.05	1.1	63
RPD %	**0%**	**-%**	**8%**	**24.2%**	**0%**	**0%**	**9.5%**	**44.7%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-VL-4	<1	<0.1	4	<2	3	<0.05	<1	5
TP-Dup 6a	<3	<0.1	3.4	1	4	<0.05	<0.5	6.5
RPD %	**0%**	**0%**	**16.2%**	**0%**	**28.6%**	**0%**	**0%**	**26.1%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
TP-VL-18	<1	0.2	7	4	8	<0.05	<1	25
TP-Dup 8a	<3	0.3	4.7	4.9	8	<0.05	0.6	39
RPD %	**0%**	**40%**	**39.3%**	**20.2%**	**0%**	**0%**	**0%**	**43.8%**
Acceptable Criteria*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**

Table 6f
Calculated Percent RPDs for Petroleum Related Analytes
Intra-Laboratory Duplicates

Duplicate	%RPD					
	Benzene	Toluene	Ethylbenzen	Xylene	C_6-C_9	C_{10}-C_{36}
TP-V42	ND	ND	ND	ND	ND	ND
TP-Dup 5	ND	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**	**30**

Table 6f - cont.
Calculated Percent RPDs for Petroleum Related Analytes
Intra-Laboratory Duplicates

Duplicate	%RPD					
	Benzene	Toluene	Ethylbenzen	Xylene	C_6-C_9	C_{10}-C_{36}
TP-IF-4	ND	ND	ND	ND	ND	ND
TP-IF-4a	ND	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**					
	Benzene	**Toluene**	**Ethylbenzen**	**Xylene**	**C_6-C_9**	**C_{10}-C_{36}**
TP-S-3	ND	ND	ND	ND	ND	70
TP-S-3a	ND	ND	ND	ND	ND	100
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**	**35%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**					
	Benzene	**Toluene**	**Ethylbenzen**	**Xylene**	**C_6-C_9**	**C_{10}-C_{36}**
MP-SP1S-1	ND	ND	ND	ND	ND	ND
MP-SP1Sa	ND	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**					
	Benzene	**Toluene**	**Ethylbenzen**	**Xylene**	**C_6-C_9**	**C_{10}-C_{36}**
MP-1E	ND	ND	ND	ND	ND	ND
MP-1Ea	ND	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**					
	Benzene	**Toluene**	**Ethylbenzen**	**Xylene**	**C_6-C_9**	**C_{10}-C_{36}**
MP-2W	ND	ND	ND	ND	ND	ND
MP-2Wa	ND	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**	**30**

Table 6g
Calculated Percent RPDs for Remaining Analytes
Intra-Laboratory Duplicates

Duplicate	%RPD				
	BaP	PAH	PCB	OCP	OPP
TP-VL2	ND	ND	ND	ND	ND
TP-Dup 1	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-V6	ND	ND	ND	ND	ND
TP-Dup 2	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-V29	ND	ND	ND	ND	ND
TP-Dup 3	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-V14	ND	ND	ND	ND	ND
TP-Dup 4	ND	0.5	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-V42	ND	ND	ND	ND	ND
TP-Dup 5	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**

Table 6g cont'd
Calculated Percent RPDs for Remaining Analytes
Intra-Laboratory Duplicates

Duplicate	%RPD				
	BaP	PAH	PCB	OCP	OPP
TP-VL4	ND	ND	ND	ND	ND
TP-Dup 6	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-VL10	ND	ND	ND	ND	ND
TP-Dup 7	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-VL-18	ND	ND	ND	ND	ND
TP-Dup 8	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-IF-4	ND	ND	ND	ND	ND
TP-IF-4a	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-TA-2	ND	ND	ND	ND	ND
TP-TA-2a	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**

Table 6g cont'd
Calculated Percent RPDs for Remaining Analytes
Intra-Laboratory Duplicates

Duplicate	%RPD				
	BaP	PAH	PCB	OCP	OPP
TP-S-3	ND	ND	ND	ND	ND
TP-S-3a	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
TP-ST3-5	ND	ND	ND	ND	ND
TP-ST3-5a	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
MP-SP1S-1	ND	ND	ND	ND	ND
MP-SP1Sa	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
MP-1E	ND	ND	ND	ND	ND
MP-1Ea	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**
Duplicate	**%RPD**				
	BaP	**PAH**	**PCB**	**OCP**	**OPP**
MP-2W	ND	ND	ND	ND	ND
MP-2Wa	ND	ND	ND	ND	ND
RPD %	**0%**	**0%**	**0%**	**0%**	**0%**
Acceptable Criteria	**30**	**30**	**30**	**30**	**30**

6.2.2 Field Investigations

Field investigations at 59 Lakeview Road, Morisset Park comprised of the following:

- Identification of investigation locations prior to the commencement of work;

- Collection of twelve (12) soil samples, including two (2) duplicates, on 8th Sept. 2006 from the Underground Storage Tank Pit area, and the another five (5) samples were collected from the associated excavated material.

- Thirty (30) soil samples, including four (4) duplicates, were collected from the sewage effluent treatment system area on 27th Oct. 2006, immediately after remediation for validation purposes.

- Collection of a number of seventy-one (71) and twelve (12) intra and inter laboratory duplicate soil samples, from a total of seventy-one (71) sampling locations around the site, to a maximum depth of 0.5 metres.

- The Validation site was divided into three (3) separate sampling areas, Areas of High density sampling, which included: the sewage effluent system area, the Underground Storage Tank Pit, and the filled evaporation pond area on the northern peninsula. A total of forty-seven (47) soil samples, including seven (7) duplicates, were analysed from the high-density area, whilst forty-four (44) soil samples, including seven (7) duplicates, were extracted from the medium-density area that once housed the buildings and structures of the site. The low-density sampling area had twenty-seven (27) soil samples extracted for analysis, including five (5) duplicates, representing the area that was utilised as cattle grazing paddocks. Refer to **Figure 4a** – *Validation Sampling Strategy.*

- Collection of an additional eleven (11) bulk soil samples from the Morisset Park Site for asbestos analysis, as well as a thorough visual inspection across the entire site.

- Sampling was conducted on a gradient from lowest to highest suspected potential contamination to minimise cross contamination.

- Samples were collected in accordance with the NSW DEC *Sampling Design Guidelines* and *National Environmental Protection (Assessment of Site Contamination) Measure* 1999.

Field investigations on the property identified as 59 Lakeview Road, Morisset Park were collected between 13th September 2006 and 27th April, 2007, and samples transported to LabMark, Envirolab, SGS and ASET for chemical and asbestos analysis.

Sample Collection

- **Asbestos**

All samples were collected by David Lane Associates who are specifically trained in hazardous waste field investigation techniques and health and safety procedures. All techniques used are specified in David Lane Associates Field Manual for Contaminated Sites, which are based on methods specified by the United States Environment Protection Agency (US EPA) and The National Environmental Protection (Assessment of Site Contamination) Measure (NEPM), 1999.

Soil was collected for chemical analysis as well as asbestos analysis. Given that the acceptable criteria for asbestos is non-detect and that the entire sample is analysed by the laboratory it is considered that the inclusion of a large number of samples bulked to form one (1) sample for analysis is the most accurate, albeit conservative approach to asbestos characterisation within defined areas. David Lane Associates ensured equal sample size of all collected sub samples with each sample collected from the surface (0-25mm) utilising sample trowels, decontaminated between each bulk sample.

DLA acknowledge the position of Table 6.1 in the *NSW EPA Sample Design Guidelines* apart from no more than four (4) sub samples. Due to the fact that no consequence of dilution is valid, with the results for asbestos being either positive or negative an increased number of samples, within limits, increase the possibility to identify asbestos contaminated areas. David Lane Associates exercises a wealth of experience in determining the most appropriate sub sample numbers per given area to accurately reflect the asbestos contamination present.

Refer to **Figure 4e** – *Asbestos Sample Locations.*

- **Chemical**

No Photo Ionisation Detection (PID) assessments were undertaken as TPH analyses was performed on all samples collected, no odour or visible staining was encountered and above all, all contamination was removed as part of the remediation exercise.

Soil samples for chemical analyses were collected in accordance with the NSW Sample Design Guidelines, NEPM 1999 and the NSW EPA Service Station Guidelines. This involved the marking out a systematic grid to incorporate all areas and the collection of representative samples from each grid square. Tank pit validations involved the

collection of samples from the excavation pit walls and base. Stockpile samples were collected by representative sampling of the stockpile surface and inner stockpile material.

6.3 Laboratory Investigations

6.3.1 Laboratory Analytical and Quality Plan

The integrity of analytical data provides the second step in the QA/QC process for total data compliance. The data validation techniques adopted by David Lane Associates are based upon techniques published by the US EPA and in line with methods and guidelines adopted by the NSW DEC and outlined in the NEPM, 1999.

Descriptions are provided of the specific mechanisms used in the assessment of accuracy, precision and useability of analytical data within the project. Laboratory QA/QC results are summarised below, and included in **Appendix 3**- *Analytical Data with Chain of Custody*.

Table 6i
Laboratory Analysis - Quality Assurance and Quality Control

Duplicate	Frequency	Results	DQO
Duplicate - Intra Laboratory	1/10 (1/10 NEPM Guidelines)	RPD 0%-200%	<30% No
Duplicate - Inter Laboratory	1/10 (1/20 NEPM Guidelines)	RPD 0-66.7%	<30% No
Matrix Spike	1/10 (1/20 NEPM Guidelines)	Rec: 59-130%	70-130% No
Laboratory Control Sample	1 per analysis round	Rec: 80-117%	70-130%Yes
Certified Reference Material	1 per analysis round	Rec: 95-125%	70-130%Yes
Surrogate Phenol Analytes	Per target	Rec: 81-130%	50-130%Yes
Surrogate OPP	Per target	Rec: 78-104%	60-130% Yes
Method Blank	1	>95%	>95% of reported EQL
Laboratory Duplicate	1/10	RPD 0-145%	0-100% No
Laboratory Triplicate	AR	RPD 0-142%	0-100% No

AR – As Required / NA – Not Available

Rec – Recovery Time

Blanks

Blanks were used for the identification of false positive data. Laboratory blank samples were analysed.

No cross contamination of samples is said to have occurred as a result of laboratory techniques provided all blanks show concentrations below the levels of detection. No results on blank samples were above the level of reporting for any determination during the project.

Spikes and Control Samples

Control sample spikes were utilised for the organic analysis. This involves analysis of spiked control samples and their duplicates, spiked with a known concentration of organic analytes.

Accuracy was assessed by calculation of the percent recovery (%R). The duplicate sample spikes were used to assess the precision of the methods used. The percent recovery (%R) for all spike analysis were just outside the acceptance criteria 70-130% with 59-130%, which has been attributed to significant background levels of analytes in samples.

Duplicates

Laboratory Duplicates are tested to ensure the results meet the requirements of QA/QC. The samples from the Morisset Park exhibited a percent recovery for Zinc of 0-145%, exceeding the criteria of 0-100%. A Laboratory Triplicate was analysed with a similar result to the duplicate, suggesting a hot spot within the soil matrix constituted the primary sample. The percent recovery was not made available due to significant background levels of Zinc analytes detected in the samples.

Field Duplicate samples were prepared in the field by dual sampling and sending samples to the same laboratory. Approximately 10% of samples collected had duplicate analysis conducted as independent samples. Field duplicates provide an indication of the whole investigation process i.e. the sampling process, sample preparation and analysis. The relative percent differences (RPD) for the project were set at 30% between samples; which was exceeded for six (6) of the analytes analysed. This outcome does alter the viability of the results as the apparent lack of accuracy can be attributed to the increases in error margins that occur with low detection levels. Compounding the effect of low detection levels is the natural heterogeneity within the soil matrix itself.

Surrogates

To assess the performance of individual organic analysis the laboratory used surrogates. Percent recoveries were calculated for each surrogate providing an indication of analytical accuracy.

Surrogate recoveries for soil samples were all within recommended control limits, indicating that there was an acceptable degree of accuracy in analysing for organic compounds.

6.3.2 Laboratory Detection Limits

Typical methods used for analysis and their respective level of reporting for both laboratories (SGS, LabMark and Envirolab) used for analysis are outlined below:

Table 6j
Method of Soil Analysis - SGS

Analyte	**Method**	**Level of Reporting Soil mg/kg**
Polycyclic Aromatic Hydrocarbons	US EPA SW 846 Method 8270C SGS Method Code SEO-030	0.1 (Ind. Analyte)
Metals	ICP-MS SGS Method Code SEM-010 and SEM-005	**As, Cd, Cr, Cu, Pb, Ni, Zn**: 0.5, **Hg** 0.05
Pesticides	US EPA SW 846 Method 8141A SGS Method Code SEO-005	0.1
PCB	US EPA Method 8081B SGS Method Code SEO-005	0.1
BTEX	SGS Method Code SEO-017	**Benzene** 0.5 **Toluene** 0.5 **Ethylbenzene** 0.5 **Total Xylene** 1.5
TPH	SGS Method Code SEO-017 SGS Method Code SEO-020	**C_6-C_9** 20 **C_{10}-C_{14}** 20 **C_{15}-C_{28}** 50 **C_{29}-C_{36}** 50

Table 6f
Method of Soil Analysis – LabMark

Analyte	Method	Level of Reporting Soil mg/kg
Polycyclic Aromatic Hydrocarbons	USEPA SW-846 Method 8270C, December 1996 USEPA SW-846 Method 8100, January 1995 USEPA SW-846 Method 3550, January 1995	**0.5 (Ind. Analyte)**
Metals	USEPA 200.8 Rev 5.5, October 1999 USEPA 6020 Rev 0, September 1994 USEPA 3051 APHA 20th Edition – Analytical Methods PE Elan5000 Reference Manual Hg: APHA 21st Edition – Standard Methods USEPA 1631 Rev B PE FIAS Operation and Maintenance 1992	**Hg** <0.005 **As-Cd-Cr-Cu-** <0.5 **Ni-Pb-Zn** <0.5
Pesticides	USEPA SW-846 Method 8081B, January 1995 USEPA SW-846 Method 8000, January 1995 USEPA SW-846 Method 3550, January 1995 USEPA SW-846 Method 8141B, January 1995 USEPA SW-846 Method 8000B, January 1995 USEPA SW-846 Method 3550B, January 1995	**OCP** 0.05 **OPP** 0.5
TCLP	US EPA SW 846 Method 1311	Extraction Method
PCB	USEPA SW-846 Method 8081B, January 1995 USEPA SW-846 Method 8000, January 1995 USEPA SW-846 Method 3550, January 1995	**PCB** 0.5
BTEX	USEPA SW-846 Method 5032, January 1995 USEPA SW-846 Method 8020, January 1995 USEPA SW-846 Method 8021, January 1995	**Benzene** 0.2 **Toluene** 0.5 **Ethylbenzene** 0.5 **Total Xylene** 1.2
TPH	USEPA SW-846 Method 5032, January 1995 USEPA SW-846 Method 8020, January 1995	**C_6-C_9** 10 **C_{10}-C_{14}** 50 **C_{15}-C_{28}** 100 **C_{29}-C_{36}** 100

Table 6g
Method of Soil Analysis - Envirolab

Analyte	Method	Level of Reporting Soil mg/kg
Polycyclic Aromatic Hydrocarbons	USEPA SW-846 Method 8270,	**0.1 (Ind. Analyte)**
Metals	USEPA 200.7 USEPA 7471A	**Hg** <0.10 **As-Cd-Cr-Cu-** <0.10 **Ni-Pb-Zn** <0.5
Pesticides	USEPA SW-846 Method 8081 USEPA SW-846 Method 8140 USEPA SW-846 Method 8080 USEPA SW-846 Method 8870	**OCP** 0.10 **OPP** 0.10
PCB	USEPA SW-846 Method 8080 USEPA SW-846 Method 8081	**PCB** 0.10
BTEX	USEPA SW-846 Method 8260	**Benzene** 1.0 **Toluene** 1.0 **Ethylbenzene** 1.0 **Total Xylene** 3.0
TPH	USEPA SW-846 Method 8260 USEPA SW-846 Method 8000	**C_6-C_9** 25 **C_{10}-C_{14}** 50 **C_{15}-C_{28}** 100 **C_{29}-C_{36}** 100

6.3.3 Laboratory Analysis

Soil samples were analysed for a range of contaminant indicators that may be associated with past and present landuses, i.e. imported fill material. Samples were analysed by LabMark Australia Pty Ltd of Asquith, SGS Australia Pty Ltd of Alexandria, Envirolab Ltd of Willoughby, and Australian Safer Environment Technology of Hornsby Northgate for the following parameters:

Inorganic

Heavy metals: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), and zinc (Zn).

Organic

- Total Petroleum Hydrocarbons (TPH);
- Monocyclic aromatic hydrocarbons (BTEX);
- Organochlorine (OC) Pesticides;
- Organophosphorus (OP) Pesticides;
- Polycyclic Aromatic Hydrocarbons (PAH);
- Polychlorinated Biphenyls (PCB); and
- Asbestos fibres.

The Laboratory Analytical Results for soils are included as **Appendix 3**

Upper Confidence Level (UCL)

Validations are conducted in order that the arithmetic average of the contaminant(s) is less than the site acceptance criterion utilising an Upper Confidence Level of 95% (UCL95%).

The standard assessment methodology of determining the *95% UCL of the arithmetic average concentration,* ***Procedure D*** *NSW EPA Sampling Design Guidelines*, can be applied to many forms of contaminant concentration distributions including those that are not normally distributed. This is based on the Central Limit Theorem which states that sample means tend to exhibit a normal distribution even though the mother population is not normally distributed.

However, if the coefficient of variation is greater than 1.2, (the standard deviation of a distribution divided by the mean of the distribution) and the statistical tests support the hypothesis of a log-normal distribution, ***Procedure G*** *NSW EPA Sampling Design Guidelines* will be used to determine the 95% upper confidence limit of the average concentration.

Given the natural distribution of a population, individual contaminant concentrations, (be it normal or log-normal), concentration above the mean will exist. Providing that the concentration is not above the criteria by more than 250%, the existence of contamination above the criteria is acceptable, as long as the first requirement has been met. Above 250% of the criteria, or where the standard deviation is greater than 50% of the criteria,

the contamination is defined not as part of the general population of the site, but rather as a hotspot or a different population. Hotspots are defined as localised areas where contaminant concentration/s are noticeably higher than in surrounding areas.

6.4 QA/QC Comments

The results of the field and laboratory quality assurance and quality control procedures generally reflect the relative nature of the materials being analysed. While a degree of homogeneity is expected, the very nature of the material and the contaminant concentrations would create expectancy for some heterogeneity. The low concentrations present in the soil on site, relative to threshold concentrations, inherently cause some heterogeneity. Heterogeneity was experienced above the accepted RPD% criteria for a number of analytes, however the contaminant concentrations relative to the criteria does not lower the usefulness and quality of the data..

It is considered that the analytical data generated is of an acceptable degree of accuracy and precision for the purpose of assessing the soil quality on the site.

7.0 ASSESSMENT CRITERIA

7.1 Rationale for the Selection of Assessment Criteria

The criteria selected have been chosen in accordance with current Australian and NSW DEC guidelines. Australian Guidelines have been used in preference to international guidelines where available. These criteria are the most current and widely accepted guidelines in use at present in Australia, and have generally been developed using a risk-based approach. Therefore, the selected guidelines provide a satisfactory framework for the site assessment.

7.2 Soil Criteria

- Schedule B1 *Guideline on the Investigation Levels for Soil and Groundwater* from the National Environment Protection (Assessment of Site Contamination) Measure 1999 Table 5a Column A – *Residential with Access to Soil*,
- Schedule B1 *Guideline on the Investigation Levels for Soil and Groundwater* from the National Environment Protection (Assessment of Site Contamination) Measure 1999 Table 5a, *Interim Urban EIL's*;
- Health Based Investigation Levels (HBILs) for differing land uses (Imray, P. and Langley, A.) from the National Environmental Health Forum (NEHF) Monographs, Soil Science No. 1. Levels applicable to Residential with Access to Soils (Column A);
- NSW EPA *Guidelines for Assessing Service Station Sites,* 1994.
- NSW EPA *Guidelines for the NSW Site Auditor Scheme*, second edition 2006.
- National Occupational Health and Safety Commission (NOHSC) Worksafe Australia *Asbestos: Code of Practice and Guidance Notes* – August 1988.

All assessment criteria and phytotoxicity levels are presented in Tables 7a and 7b below:

Table 7a
NSW EPA Soil Investigation Levels For Urban Redevelopment in NSW
Column A Table 5a NEPM 1999 and,
NSW EPA Guidelines for Assessing Service Station sites 1994.

Analytes	NEHF A Threshold Concentrations (mg/kg dry wt)	Sources
BTEX		NSW Service Station Guidelines
Benzene	1	
Toluene	1.4[a]/130[b]	
Ethylbenzene	3.1[c]/50[d]	
Xylene (total)	14[e]/25[d]	
TPH: C6-C9	65	NSW Service Station Guidelines
TPH: C10-C40	1000	
>C16-C35 Aromatics	90	NEPM 1999, Table 5a
>C16-C35 Aliphatics	5600	
>C35 Aliphatics	56000	
Arsenic	100	NEPM 1999, Table 5a, Column A
Cadmium	20	NEPM 1999, Table 5a, Column A
Chromium	100	NEPM 1999, Table 5a, Column A
Copper	1000	NEPM 1999, Table 5a, Column A
Lead	300	NEPM 1999, Table 5a, Column A
Mercury	15	NEPM 1999, Table 5a, Column A
Nickel	600	NEPM 1999, Table 5a, Column A
Zinc	7000	NEPM 1999, Table 5a, Column A
Total PAH's	20	NEPM 1999, Table 5a, Column A
BaP	1	NEPM 1999, Table 5a, Column A
PCB	10	NEPM 1999, Table 5a, Column A
Asbestos	No visible asbestos	NSW DEC
Odours	No Odours	NSW DEC
Pesticides:		NEPM 1999, Table 5a, Column A
(Aldrin/Dieldrin)	10	
Chlordane	50	
DDT+DDE+DDD	200	

[a] The toluene threshold concentration is the Netherlands Maximum Permissible Concentration (MPC) to protect terrestrial organisms in soil. This value was obtained by applying the US EPA assessment factor to terrestrial chronic No Observed Effect Concentration (NOEC) data. The MPC is an "indicative" value (Van de Plassche *et al* 1993: Van de Plassche and Bockting 1993).

[b] Human health and ecological based protection level for toluene. The threshold concentration presented here is the Netherlands intervention value for the protection of terrestrial organisms. Other considerations such as odours and the protection of groundwater may require a lower remediation criterion.

[c] The ethylbenzene threshold concentration is the Netherlands MPC for the protection terrestrial organisms in soil. No terrestrial ecotoxicological data could be found for use in the Netherlands criteria derivation. Therefore, equilibrium partitioning has been applied to the MPC for water to obtain estimates of the MPC for soil. The MPC for water has been derived from the aquatic ecotoxicological data (Van de Plassche *et al* 1993: Van de Plassche and Bockting 1993).

[d] Human health based protection level for ethyl benzene or total xylenes as shown. The threshold concentration presented here is the Netherlands intervention value. Other considerations such as odours and the protection of groundwater may require a lower remediation criterion.

[e] The xylene threshold concentration is the Netherlands MPC for the protection terrestrial organisms in soil. No terrestrial ecotoxicological data could be found for use in the Netherlands criteria derivation. Therefore, equilibrium partitioning has been applied to the MPC for water to obtain estimates of the MPC for soil. The MPC for water has been derived from the aquatic ecotoxicological data. The concentration shown applies to the total xylenes and is based on the arithmetic average of the individual xylene MPCs (Van de Plassche *et al* 1993: Van de Plassche and Bockting 1993).

Table 7b
NSW EPA Provisional Phytotoxicity – Metals (mg/kg)

Heavy Metals	NSW EPA Provisional Phytotoxicity (mg/kg)	Heavy Metals	NSW EPA Provisional Phytotoxicity (mg/kg)
Arsenic	20	Lead	600
Cadmium	3	Mercury	1
Chromium	400	Nickel	60
Copper	100	Zinc	200

Phytotoxicity (i.e. toxicity to plants) is used as the indicative environmental effect to be dealt with in the context of land redevelopment. The provisional phytotoxicity-based investigation levels are single number criteria and are intended for use as a screen guide only. The use of single number criteria has significant limitations because phytotoxicity depends on soil properties and plant species in complex ways that require a holistic analysis of the system.

7.3 Limitations of the Assessment Criteria

All criteria have limitations. Not all chemical analytes are covered by each set of guidelines, requiring some criteria to be sourced from elsewhere. This is particularly relevant to the Dutch guidelines, which provide a guideline for assessment for some analytes not covered by the Australian guidelines.

8.0 RESULTS

The results of the 130 site investigation samples conducted at the Morisset Park site are summarised below in the following tables:

- Table 8a: BTEX (Benzene, Toluene, Ethylbenzene and Xylene)
- Table 8b: TPH (Total Petroleum Hydrocarbons)
- Table 8c: PAH (Polycyclic Aromatic Hydrocarbons)
- Table 8d: Heavy Metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)
- Table 8e: OCP, OPP and PCB (Organic Contaminants)
- Table 8f: Summary of the Site Validation Data, including 95% UCL
- Tables 8g-8j: Asbestos Visual and Laboratory Analysis.
- Tables 8k-8o Tank Pit Validation Analytical Results
- Tables 8p-8v Stockpiled material Analytical Results
- Tables 8w-8ac Effluent System Validation Analytical Results

All soils are analysed against the site criteria: NEPM, Table 5a Column A – *Residential with Access to Soils.*

8.1 Field Observations

The sample collection for the final validation involved the collection of representative samples from upper most soil profile (0-300mm) within all Lots associated with the Morisset Park Site. Exceptions to this included the UST pit walls and base that were sampled at depths of 2.4 - 2.7m and 3.0 - 3.3m respectively. Within the Sewerage Treatment System the upper 300mm of the north-eastern evaporation pond surface was removed and stockpiled for sampling whilst Effluent Treatment System tank pits and primary pond area was sampled at depths of 2.5 to 3.0 metres

Soils within the UST pits consisted of an A horizon of dark brown sandy loams to a depth of approximately 0.2 metres. Underlying this were yellow orange course grained sands used as fill for the tank pits overlying yellow/brown sandy gravely clays. A slight odour

was initially present in the lower layers however this dissipated quickly and no discolouration was evident.

The soils in the area of the Effluent Treatment System tank pits consisted of very moist dark brown, medium grained silty sand topsoil to a depth of 20mm. Underlying this were light brown, fine-grained silty sands that contain angular fine gravel to a depth of 250mm. Below 250mm were dark brown silty sandy clays with grey orange mottling. Sands were fine grained and clays had medium plasticity.

Each sample location profile where appropriate was logged to indicate differing stratigraphy. Refer to **Appendix 4** - *Sample Log* for details.

8.2 Analytical Results

8.2.1 Soil Final Validation Chemical Results

After the Underground Storage Tanks and sewage effluent treatment system area were successfully removed and remediated as per **Sections 8.3 and 8.4**, a validation soil assessment was undertaken to incorporate the entire site. A total of seventy-one (71) soil samples and eight (8) intra laboratory duplicate samples were submitted to LabMark Pty Ltd; four (4) inter laboratory duplicate samples were submitted to SGS Environmental Services, and eleven (11) bulk soil samples were sent to ASET, for a range of laboratory analysis.

Refer to **Appendix 5** - *Sample Inventory* for details.

Analytical results of the soil samples are summarised in **Tables 8a – 8g** for TPH/BTEX compounds, PAHs, Pesticide compounds (OCCs and OCPs), PCB, Heavy Metals and asbestos respectively. Results above background conditions for the site and/or above relevant criteria are highlighted.

Statistical analysis has been carried out using the final validation data consisting of seventy-nine (79) surface samples including duplicates for PAH, BaP, and heavy metals. A total 44 of these samples were analysed for PCB, TPH (C_6-C_9 and C_{10}-C_{36}), BTEX and OCP/OPP. Initial statistical analysis indicated the level of detected contaminants exhibited a normal distribution throughout the geological layer tested. Considering analytes cannot be detected down to a zero level and to allow for valid analysis, non detections were given a value of 50% of the EQL or 50% of the lowest EQL where

analyte group totals were measured. If the coefficient of variation was less than 1.2, the *NSW EPA Sample Design Guideline Procedure D 1995* was utilised for the statistical analysis. The inclusion of non detect data however tended to skew the data creating a log-normal distribution in most instances in which case Procedure G of the *NSW EPA Sample Design Guideline* was utilised.

Statistical analysis of the Validation analytical data is included in **Table 8f** below.

Table 8a – TPH in Soil (mg/kg)

Sample ID & Depth* (m)	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
TP-V1	<10	<50	<100	<100	ND
TP-V3	<10	<50	<100	180	180
TP-V5	<10	<50	<100	100	100
TP- V6 (Dup 2)	<10	70	<100	<100	70
TP-V7	<10	<50	<100	<100	ND
TP-V9	<10	60	<100	120	180
TP-V11	<10	120	160	250	530
TP-V13	<10	<50	<100	<100	ND
TP-V14 (Dup 4)	<10	<50	<100	<100	ND
TP-V16	<10	<50	<100	<100	ND
TP-V18	<10	<50	<100	<100	ND
TP-V20	<10	<50	<100	<100	ND
TP-V22	<10	<50	<100	<100	ND
TP-V24	<10	<50	200	100	300
TP-V26	<10	<50	<100	<100	ND
TP-V28	<10	<50	<100	<100	ND
TP-V29 (Dup 3)	<10	<50	<100	<100	ND
TP-V30	<10	<50	<100	<100	ND
TP-V32	<10	<50	<100	<100	ND
TP-V34	<10	<50	<100	<100	ND
TP-V36	<10	<50	<100	<100	ND
TP-V38	<10	<50	<100	<100	ND
TP-V40	<10	<50	<100	<100	ND
TP-V42	<10	<50	<100	<100	ND
TP-V44	<10	<50	<100	170	170
TP-VL1	<10	80	160	180	420
TP-VL2 (Dup 1)	<10	<50	<100	<100	ND
TP-VL3	<10	<50	<100	170	170
TP-VL4 (Dup 6)	<10	<50	<100	<100	ND
TP-VL5	<10	<50	<100	<100	ND
TP-VL7	<10	<50	<100	<100	ND
TP-VL9	<10	<50	<100	140	140

Table 8a Cont'd

Sample ID & Depth* (m)	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
TP-VL10 (Dup 7)	<10	<50	<100	<100	ND
TP-VL11	<10	<50	<100	<100	ND
TP-VL13	<10	<50	<100	220	220
TP-VL14	<10	<50	<100	<100	ND
TP-VL15	<10	<50	<100	<100	ND
TP-VL17	<10	60	<100	110	170
TP-VL18 (Dup 8)	<10	<50	<100	<100	ND
TP-VL19	<10	<50	<100	<100	ND
TP-VL21	<10	<50	<100	170	170
TP-VL23	<10	<50	<100	<100	ND
TP-VL25	<10	<50	<100	<100	ND
TP-VL27	<10	<50	<100	<100	ND
TP-Dup2a	<20	40	68	88	196
TP-Dup3a	<20	<20	<50	<50	ND
TP-Dup6a	<20	<20	<50	<50	ND
TP-Dup8a	<20	<20	<50	<50	ND
Criteria	**65**	**-**	**-**	**-**	**1000**

ND – Not Detected. * All samples are representative of soils between 0 and 300mm.

Table 8b – BTEX in Soil (mg/kg)

Sample ID & Depth* (m)	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
TP-V1	<0.2	<0.5	<0.5	<0.5
TP-V3	<0.2	<0.5	<0.5	<0.5
TP-V5	<0.2	<0.5	<0.5	<0.5
TP-V7	<0.2	<0.5	<0.5	<0.5
TP-V9	<0.2	<0.5	<0.5	<0.5
TP-V11	<0.2	<0.5	<0.5	<0.5
TP-V13	<0.2	<0.5	<0.5	<0.5
TP-V16	<0.2	<0.5	<0.5	<0.5
TP-V18	<0.2	<0.5	<0.5	<0.5
TP-V20	<0.2	<0.5	<0.5	<0.5
TP-V22	<0.2	<0.5	<0.5	<0.5
TP-V24	<0.2	<0.5	<0.5	<0.5
TP-V26	<0.2	<0.5	<0.5	<0.5
TP-V28	<0.2	<0.5	<0.5	<0.5
TP-V30	<0.2	<0.5	<0.5	<0.5
TP-V32	<0.2	<0.5	<0.5	<0.5
TP-V34	<0.2	<0.5	<0.5	<0.5
TP-V36	<0.2	<0.5	<0.5	<0.5
TP-V38	<0.2	<0.5	<0.5	<0.5
TP-V40	<0.2	<0.5	<0.5	<0.5
TP-V42	<0.2	<0.5	<0.5	<0.5
TP-V44	<0.2	<0.5	<0.5	<0.5
TP-VL1	<0.2	<0.5	<0.5	<0.5
TP-VL3	<0.2	<0.5	<0.5	<0.5
TP-VL5	<0.2	<0.5	<0.5	<0.5
TP-VL7	<0.2	<0.5	<0.5	<0.5
TP-VL9	<0.2	<0.5	<0.5	<0.5

Table 8b Cont'd

Sample ID & Depth* (m)	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
TP-VL11	<0.2	<0.5	<0.5	<0.5
TP-VL13	<0.2	<0.5	<0.5	<0.5
TP-VL15	<0.2	<0.5	<0.5	<0.5
TP-VL17	<0.2	<0.5	<0.5	<0.5
TP-VL19	<0.2	<0.5	<0.5	<0.5
TP-VL21	<0.2	<0.5	<0.5	<0.5
TP-VL23	<0.2	<0.5	<0.5	<0.5
TP-VL25	<0.2	<0.5	<0.5	<0.5
TP-VL27	<0.2	<0.5	<0.5	<0.5
TP-Dup1	<0.2	<0.5	<0.5	<0.5
TP-Dup2	<0.2	<0.5	<0.5	<0.5
TP-Dup2a	<0.5	<0.5	<0.5	<1.5
TP-Dup3	<0.2	<0.5	<0.5	<0.5
TP-Dup3a	<0.5	<0.5	<0.5	<1.5
TP-Dup4	<0.2	<0.5	<0.5	<0.5
TP-Dup5	<0.2	<0.5	<0.5	<0.5
TP-Dup6	<0.2	<0.5	<0.5	<0.5
TP-Dup6a	<0.5	<0.5	<0.5	<1.5
TP-Dup7	<0.2	<0.5	<0.5	<0.5
TP-Dup8	<0.2	<0.5	<0.5	<0.5
TP-Dup8a	<0.5	<0.5	<0.5	<1.5
Criteria	**1**	**1.4[a]/130[b]**	**3.1[c]/50[d]**	**14[e]/25[d]**

[a b c d e] * – As outlined in Table 8a.

Table 8c – PAH in Soil (mg/kg)

Sample ID and Depth* (m)	Contaminant	
	BaP	Total PAH
TP-V1	<0.05	ND
TP-V2	<0.05	ND
TP-V3	<0.05	ND
TP-V4	<0.05	ND
TP-V5	<0.05	ND
TP-V6	<0.05	ND
TP-V7	<0.05	ND
TP-V8	<0.05	ND
TP-V9	<0.05	6.1
TP-V10	<0.05	ND
TP-V11	<0.05	ND
TP-V12	<0.05	ND
TP-V13	<0.05	ND
TP-V14	<0.05	ND
TP-V15	<0.05	ND
TP-V16	<0.05	ND
TP-V17	<0.05	ND
TP-V18	<0.05	ND
TP-V19	<0.05	ND
TP-V20	<0.05	ND
TP-V21	<0.05	ND
TP-V22	<0.05	ND
TP-V23	<0.05	ND
TP-V24	<0.05	ND
TP-V25	<0.05	ND
TP-V26	<0.05	ND
TP-V27	<0.05	ND
TP-V28	<0.05	ND
TP-V29	<0.05	ND

Table 8c Cont'd

Sample ID and Depth* (m)	Contaminant	
	BaP	Total PAH
TP-V30	<0.05	ND
TP-V31	<0.05	ND
TP-V32	<0.05	ND
TP-V33	<0.05	ND
TP-V34	<0.05	ND
TP-V35	<0.05	ND
TP-V36	<0.05	ND
TP-V37	<0.05	ND
TP-V38	<0.05	ND
TP-V39	<0.05	ND
TP-V40	<0.05	ND
TP-V41	<0.05	ND
TP-V42	<0.05	ND
TP-V43	<0.05	ND
TP-V44	<0.05	ND
TP-VL1	<0.05	ND
TP-VL2	<0.05	ND
TP-VL3	<0.05	ND
TP-VL4	<0.05	ND
TP-VL5	<0.05	ND
TP-VL6	<0.05	ND
TP-VL7	<0.05	ND
TP-VL8	<0.05	ND
TP-VL9	<0.05	ND
TP-VL10	<0.05	ND
TP-VL11	<0.05	ND
TP-VL12	<0.05	ND
TP-VL13	0.9	8.6
TP-VL14	<0.05	ND

Table 8c Cont'd

Sample ID and Depth* (m)	Contaminant	
	BaP	Total PAH
TP-VL15	<0.05	ND
TP-VL16	<0.05	ND
TP-VL17	<0.05	ND
TP-VL18	<0.05	ND
TP-VL19	<0.05	2.1
TP-VL20	<0.05	ND
TP-VL21	<0.05	ND
TP-VL22	<0.05	ND
TP-VL23	<0.05	ND
TP-VL24	<0.05	ND
TP-VL25	<0.05	ND
TP-VL26	<0.05	ND
TP-VL27	<0.05	ND
TP-Dup1	<0.05	ND
TP-Dup2	<0.05	ND
TP-Dup2a	<0.05	ND
TP-Dup3	<0.05	ND
TP-Dup3a	<0.05	ND
TP-Dup4	<0.05	0.5
TP-Dup5	<0.05	ND
TP-Dup6	<0.05	ND
TP-Dup6a	<0.05	ND
TP-Dup7	<0.05	ND
TP-Dup8	<0.05	ND
TP-Dup8a	<0.05	ND
Acceptance Criteria	**1**	**20**

ND – Not Detected * All samples are representative of soils between 0 and 300mm.

Table 8d – Organics in Soil (mg/kg)

Sample ID and Depth* (m)	Contaminant		
	OCP	OPP	PCB
TP-V1	<0.05	<0.05	<0.05
TP-V3	<0.05	<0.05	<0.05
TP-V5	<0.05	<0.05	<0.05
TP- V6 (Dup 2)	<0.05	<0.05	<0.05
TP-V7	<0.05	<0.05	<0.05
TP-V9	<0.05	<0.05	<0.05
TP-V11	<0.05	<0.05	<0.05
TP-V13	<0.05	<0.05	<0.05
TP-V14 (Dup 4)	<0.05	<0.05	<0.05
TP-V16	<0.05	<0.05	<0.05
TP-V18	<0.05	<0.05	<0.05
TP-V20	<0.05	<0.05	<0.05
TP-V22	<0.05	<0.05	<0.05
TP-V24	<0.05	<0.05	<0.05
TP-V26	<0.05	<0.05	<0.05
TP-V28	<0.05	<0.05	<0.05
TP-V29 (Dup 3)	<0.05	<0.05	<0.05
TP-V30	<0.05	<0.05	<0.05
TP-V32	<0.05	<0.05	<0.05
TP-V34	<0.05	<0.05	<0.05
TP-V36	<0.05	<0.05	<0.05
TP-V38	<0.05	<0.05	<0.05
TP-V40	<0.05	<0.05	<0.05
TP-V42	<0.05	<0.05	<0.05
TP-V44	<0.05	<0.05	<0.05
TP-VL1	<0.05	<0.05	<0.05
TP-VL2 (Dup 1)	<0.05	<0.05	<0.05
TP-VL3	<0.05	<0.05	<0.05
TP-VL4 (Dup 6)	<0.05	<0.05	<0.05
TP-VL5	<0.05	<0.05	<0.05

Table 8d Cont'd

Sample ID and Depth* (m)	Contaminant		
	OCP	OPP	PCB
TP-VL7	<0.05	<0.05	<0.05
TP-VL9	<0.05	<0.05	<0.05
TP-VL10 (Dup 7)	<0.05	<0.05	<0.05
TP-VL11	<0.05	<0.05	<0.05
TP-VL13	<0.05	<0.05	<0.05
TP-VL15	<0.05	<0.05	<0.05
TP-VL17	<0.05	<0.05	<0.05
TP-VL18 (Dup 8)	<0.05	<0.05	<0.05
TP-VL19	<0.05	<0.05	<0.05
TP-VL21	<0.05	<0.05	<0.05
TP-VL23	<0.05	<0.05	<0.05
TP-VL25	<0.05	<0.05	<0.05
TP-VL27	<0.05	<0.05	<0.05
TP-Dup2a	<0.1	<0.1	<0.1
TP-Dup3a	<0.1	<0.1	<0.1
TP-Dup6a	<0.1	<0.1	<0.1
TP-Dup8a	<0.1	<0.1	<0.1
Acceptance Criteria	**10**	**-**	**10**

ND – Not Detected. * All samples are representative of soils between 0 and 300mm.

Table 8e - Metals in Soil (mg/kg)

Sample ID and Depth* (m)	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-V1	2	<0.1	14	9	7	<0.05	11	34
TP-V2	3	<0.1	12	22	21	0.06	21	100
TP-V3	2	0.2	11	8	72	0.15	2	140
TP-V4	1	0.2	8	8	22	0.07	2	160
TP-V5	1	0.1	4	5	14	0.05	1	96
TP-V6	3	0.1	8	9	15	0.05	2	72
TP-V7	<1	0.1	4	3	15	0.05	<1	51
TP-V8	<1	<0.1	4	<2	3	<0.05	<1	<5
TP-V9	2	0.2	6	15	40	0.13	2	87
TP-V10	2	<0.1	13	7	7	<0.05	12	31
TP-V11	1	<0.1	6	7	16	0.06	3	50
TP-V12	2	<0.1	14	3	12	<0.05	<1	84
TP-V13	3	<0.1	13	5	24	<0.05	2	53
TP-V14	2	<0.1	11	4	8	<0.05	1	46
TP-V15	2	0.2	7	10	39	0.11	2	140
TP-V16	1	<0.1	4	<2	3	<0.05	<1	5
TP-V17	1	0.3	6	4	11	0.05	1	53
TP-V18	2	<0.1	9	11	23	0.11	1	47
TP-V19	2	<0.1	11	3	10	0.08	<1	20
TP-V20	<1	<0.1	5	<2	3	<0.05	<1	9
TP-V21	<1	<0.1	5	<2	5	<0.05	<1	8
TP-V22	2	<0.1	9	7	22	0.05	2	56
TP-V23	3	<0.1	11	6	11	0.07	2	21
TP-V24	3	0.2	8	8	18	0.09	2	30
TP-V25	7	0.2	10	10	44	0.1	1	62
TP-V26	3	<0.1	14	3	9	<0.05	<1	28
TP-V27	2	<0.1	12	2	8	<0.05	<1	20
TP-V28	3	<0.1	12	7	15	<0.05	3	90
TP-V29	3	<0.1	12	4	12	<0.05	1	40
TP-V30	3	<0.1	15	6	13	0.05	<1	95

Table 8e Cont'd

Sample ID and Depth* (m)	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-V31	3	<0.1	17	2	7	<0.05	<1	29
TP-V32	1	0.1	5	6	19	0.05	1	47
TP-V33	1	<0.1	11	<2	4	<0.05	<1	6
TP-V34	1	<0.1	6	4	9	0.05	<1	18
TP-V35	4	<0.1	8	2	8	0.06	3	10
TP-V36	4	<0.1	6	5	10	0.11	1	50
TP-V37	2	<0.1	11	6	11	0.09	<1	33
TP-V38	4	0.2	5	4	10	0.06	5	25
TP-V39	1	0.2	5	6	13	0.06	1	45
TP-V40	1	<0.1	4	6	8	<0.05	1	27
TP-V41	3	<0.1	10	7	24	<0.05	1	160
TP-V42	2	<0.1	11	3	9	<0.05	1	26
TP-V43	2	0.1	5	11	20	0.13	2	63
TP-V44	2	0.1	4	5	13	0.12	1	30
TP-VL1	<1	<0.1	3	3	7	0.12	<1	17
TP-VL2	<1	<0.1	4	2	6	0.05	<1	9
TP-VL3	1	0.2	7	6	18	0.09	1	27
TP-VL4	<1	<0.1	4	<2	3	<0.05	<1	5
TP-VL5	2	<0.1	3	2	5	0.05	<1	10
TP-VL6	<1	<0.1	4	<2	4	<0.05	<1	6
TP-VL7	1	<0.1	4	2	5	<0.05	<1	8
TP-VL8	1	<0.1	7	3	8	0.05	<1	19
TP-VL9	1	<0.1	8	3	7	0.05	<1	19
TP-VL10	<1	<0.1	5	59	8	0.06	<1	25
TP-VL11	<1	<0.1	4	2	5	0.05	<1	11
TP-VL12	2	<0.1	11	6	11	0.05	2	61
TP-VL13	2	0.2	9	13	15	0.05	9	79
TP-VL14	2	0.1	7	13	20	0.06	1	81
TP-VL15	<1	0.1	5	4	19	0.06	<1	26

Table 8e Cont'd

Sample ID and Depth* (m)	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-VL16	1	<0.1	7	9	12	0.05	<1	16
TP-VL17	1	<0.1	7	2	9	0.1	<1	23
TP-VL18	<1	0.2	7	4	8	<0.05	<1	25
TP-VL19	2	0.1	6	5	51	0.11	<1	51
TP-VL20	1	0.1	4	9	26	0.06	<1	64
TP-VL21	3	<0.1	12	8	10	0.06	2	31
TP-VL22	1	0.1	3	3	6	0.06	1	17
TP-VL23	<1	0.1	2	3	6	<0.05	<1	12
TP-VL24	<1	0.2	3	3	5	<0.05	<1	13
TP-VL25	<1	0.2	4	3	6	<0.05	<1	18
TP-VL26	2	<0.1	4	3	4	<0.05	2	11
TP-VL27	2	0.1	3	3	5	<0.05	1	12
TP-Dup1	1	<0.1	6	2	7	0.05	<1	10
TP-Dup2	4	0.1	10	10	15	0.06	3	79
TP-Dup2a	4	0.2	6.9	8.3	13	<0.05	2.3	73
TP-Dup3	3	<0.1	15	5	11	0.05	1	45
TP-Dup3a	3	0.2	13	5.1	12	<0.05	1.1	63
TP-Dup4	2	<0.1	13	3	7	<0.05	<1	23
TP-Dup5	3	<0.1	13	4	12	<0.05	<1	90
TP-Dup6	<1	<0.1	4	<2	3	<0.05	<1	5
TP-Dup6a	<3	<0.1	3.4	1.0	4	<0.05	<0.5	6.5
TP-Dup7	<1	<0.1	6	28	8	0.05	<1	24
TP-Dup8	<1	0.2	6	5	9	0.05	<1	29
TP-Dup8a	<3	0.3	4.7	4.9	8	<0.05	0.6	39
Acceptance Criteria	**100[1]**	**20[1]**	**100[1]**	**1000[1]**	**300[1]**	**15[1]**	**600[1]**	**7000[1]**
	20[2]	**3[2]**	**400[2]**	**100[2]**	**600[2]**	**1[2]**	**60[2]**	**200[2]**

[1] NEHF A Criteria [2] NSW EPA Phytotoxicity Criteria

* All samples are representative of soils between 0 and 300mm.

Table 8f

Summary – Site Validation Data

59 Lakeview Drive, Morisset Park, NSW

(Column A – Residential with Access to Soils)

	Contaminant														
Parameter	**BTEX**	**TPH (C_6-C_9)**	**TPH (C_{10}-C_{36})**	**PAH**	**BaP**	**OCP/OPP**	**PCBs**	**As**	**Cd**	**Cr**	**Cu**	**Hg**	**Ni**	**Pb**	**Zn**
Number	46	46	44	79	79	44	44	79	79	79	79	79	79	79	79
Minimum	ND	ND	25	0.25	0.25	ND	ND	0.5	0.05	2	1	0.025	0.5	3	2.5
Maximum	ND	ND	530	8.6	1.1	ND	ND	7	0.3	17	59	0.15	21	72	160
Mean	-	-	81.93	0.46	0.26	-	-	1.76	0.09	7.67	6.2	0.054	1.69	13.27	41.78
Median	-	-	25	0.25	0.25	-	-	2	0.05	7	4	0.05	1	10	29
StDev	-	-	111.7	1.16	0.1	-	-	1.19	0.06	3.7	7.5	0.032	3	11.4	36.2
CV	-	-	1.363	2.53	0.38	-	-	0.68	0.69	0.481	1.21	0.59	1.78	0.86	0.87
95 % UCL	**<0.5**	**<10**	**155.3**	**1.02**	**0.3**	**<0.05**	**<0.05**	**2.3**	**0.12**	**9.5**	**9.9**	**0.069**	**3.2**	**15.2**	**49.1**
Assessment Criteria	**≈ 1.0**	**65**	**1000**	**20**	**1**	**OCP: 10 OPP: –**	**10**	**100**	**20**	**100**	**1000**	**15**	**600**	**300**	**7000**

Note: ***NSW EPA Sample Design Guideline Procedure D 1995*** **was utilised for the statistical analysis at the Morisset Park site where the CV was below 1.2 and Procedure G was utilised where the CV exceeded 1.2 to normalise the data set.**

8.2.2 Soil Final Validation Asbestos Results.

Prior to the validation assessment being assumed by David Lane Associates, an area of the Trinity Point, Morisset Park site was identified to have asbestos contamination, and remediated. David Lane Associates conducted an inspection on this area and produced an Asbestos Clearance Certificate on October 2006, stating '*the inspections indicate the previously conducted asbestos contamination removal from the property has been successfully undertaken and created a safe environment for both access and future planned works*.'

For the validation of the entire site, a thorough visual inspection was conducted on the 59 Lakeview Road, Morisset Park site. At the time of inspection the area of the former demolition and asbestos removal was scraped back to bare soils and clays with all demolition debris removed. The results are summarised below in **Table 8g**. A total of eleven (11) bulk soil samples were collected from the Morisset Park site and sent to ASET for analysis, the results are summarised in **Table 8h**.

Refer to **Appendix 9** *Clearance Certification*.

Table 8g – Visual Inspection Details

Visual Inspection		
Date	**Location**	**Result**
19th Jan 2007	Low Density Sample Area	**No visible asbestos was present at the time of the site inspection**
19th Jan 2007	Medium Density Sample Area	**No visible asbestos was present at the time of the site inspection**

Table 8h - Asbestos in Soil

Asbestos Analysis		
Sample	**Description**	**Result**
TP-A1	The sample consisted of a mixture of sandy clayish soil, stones, plant matter, fragments of plaster and brick.	**Chrysotile Asbestos Detected**
TP-A2	The sample consisted of a mixture of sandy soil, stones, plant matter and fragments of plaster.	**No Asbestos Detected**
TP-A3	The sample consisted of a mixture of sandy clayish soil, stones and plant matter.	**No Asbestos Detected**
TP-A4	The sample consisted of a mixture of clayish sandy soil, stones and plant matter.	**No Asbestos Detected**
TP-A5	The sample consisted of a mixture of soil, stones and plant matter.	**No Asbestos Detected**
TP-A6	The sample consisted of a mixture of sandy clayish soil, stones and plant matter.	**No Asbestos Detected**
TP-A7	The sample consisted of a mixture of sandy clayish soil, stones, organic fibre like fibres, plant matter and fragments of plaster.	**No Asbestos Detected**
TP-A8	The sample consisted of a mixture of soil, stones, plant matter and fragments of plaster.	**No Asbestos Detected**
TP-A9	The sample consisted of a mixture of soil, stones, plant matter and fragments of plaster.	**No Asbestos Detected**
TP-A10	The sample consisted of a mixture of sandy clayish soil, stones, plant matter, organic fibre like fibres and fragments of plaster.	**No Asbestos Detected**

One (1) location failed the soil samples for asbestos analysis, with Chrysotile asbestos being present.

Refer to **Figure 4e** *Asbestos Sample Locations.*

Upon investigation of this area and review of the analytical sample description and verified by discussion with the laboratory, TP-A1 was considered to contain an isolated fragment of asbestos containing fibro plaster material. As such further remediation was recommended in the form of hen picking in order to eliminate the possibility of further fragments contaminating a soil sample. Remediation involved the removal of approximately ten (10) fragments and two (2) shovel volumes of soil containing smaller fragments. Following the remediation, a clearance and validation was undertaken in the form of a further bulk soil sample collection to ensure all contaminated materials had been removed.

Airborne asbestos monitoring was not conducted during the remedial works due the minor nature of the materials and the time frame involved (less than 20 minutes) in conducting the works, this prevented compliance sampling requirements. Results for asbestos analysis are summarised below in **Table 8i-8j.**

Table 8i – Visual Inspection Details

Visual Inspection		
Date	**Location**	**Result**
1st May 2007	TP-A1	**No visible asbestos was present at the time of the site inspection**

Table 8j – Asbestos in Soil

Asbestos Analysis		
Sample	**Description**	**Result**
Sample #1	The sample consisted of a mixture of clayish sandy soil, stones, plant matter and fragments of plaster.	**No Asbestos Detected**

Refer to **Figure 4e** - *Asbestos Sample Locations* for sample locations.

8.2.3 Soil Analytical Comments

Total Petroleum Hydrocarbon:

Concentrations of Total Petroleum Hydrocarbon (TPH) compounds above the Service Station Guidelines (most sensitive) of 1000 mg/kg were not detected in any of the samples taken on site.

Monocyclic Aromatic Hydrocarbons (C_6 – C_9 and BTEX fractions), associated with petrol contamination, were not detected above the associated guidelines in any of the samples collected on site.

It should be noted that the duplicate results have been utilised where indicated for instances where the original was not tested for TPH analytes.

Polycyclic Aromatic Hydrocarbons (PAH):

A total of eighty-three (83) soil samples and including twelve (12) duplicates (inter and intra laboratory) were submitted for analysis of PAH compounds. PAHs are generally associated with ash material used as fill. Four (4) samples collected from the Morisset Park site (TP-V9, TP-VL13, TP-VL19, TP-Dup4 [TP-V14]) returned detectable limits of PAHs, the highest exhibited a concentration of 8.6mg/kg, well within the acceptance criteria of 20mg/kg.

One sample returned a positive Benzo(a)Pyrene (BaP) concentration of 0.9mg/kg, in compliance with acceptance criteria of 1mg/kg. All other Benzo(a)Pyrene concentrations were non detect for all eighty-three (83) samples collected from the Morisset Park site.

Heavy Metals:

A total of eighty-three (83) soil samples including duplicates (inter and intra laboratory were submitted for analysis of all eight (8) heavy metals as recommended by the NSW DEC (formerly the EPA). No exceedances for any of the eight (8) heavy metals analysed for were recorded above the site acceptance criteria.
No Provisional Phytotoxicity based investigation threshold levels were not exceeded for any of the eight (8) heavy metals.

Pesticides:

Forty eight (48) samples including twelve (12) duplicates were submitted for pesticide and herbicide analysis (OCP, OPP and PCB) as part of the final validation. No concentrations

of Organochlorine or Organophosphorus pesticides were detected on any samples collected and analysed from this site.

Asbestos:

A visual inspection was undertaken as part of the validation process with the entire area passing the visual inspection. Ten (10) bulk soil samples of less than 500g were collected during the validation process and submitted to ASET for the entire sample to be analysed for asbestos and identified using PLM with dispersion staining.

Refer to **Figure 4e** - *Asbestos Sample Locations* for sample locations.

One (1) sample (TP-A1) returned a positive identification for Chrysotile asbestos. This area was subject to immediate remediation, which involved removal of the contaminated material. A bulk soil sample was collected from the area and further validation assessment was carried out on the footprint of this remediated area. All analysis was conducted in accordance with **NATA** standards and the National Occupational Health and Safety Commission (**NOHSC**) Worksafe Australia 'Asbestos Code of Practice and Guidance Notes – August 1998'.

The final inspections and analysis of a bulk soil sample found that there were no asbestos fibres or visible fragments on the 59 Lakeview Road, Morisset Park site.

NATA certified analytical data is included as **Appendix 3 –** *Laboratory Analytical Data*.

8.3 Tank Pit Validation Results

Parsons Brinckerhoff conducted Phase 1 and Phase 2 Environmental Site Assessments on the 59 Lakeview Road, Morisset Park (August 2001, February 2005). During these investigations they located and identified: one (1) UST for removal and remediation, and detailed possible contamination resulting from these USTs and associated service trenches; and, one (1) above ground diesel storage tank for removal, and detailed visible staining on the immediate surrounding area for remediation.

During the remediation of the 59 Lakeview Rd, Morisset Park Site, David Lane Associates located an additional Underground Storage Tank. This UST was located adjacent to the previously identified UST and was also removed during on site excavations, and underwent remediation in the form of removal and disposal. To ensure

the USTs removal was conducted according to the appropriate guidelines and no contamination resulted, validation samples were collected from the tank pit areas immediately following excavation. Statistical analysis was limited due the high number of non detections and the low number of samples collected, however, it can be determined that the standard deviation is well below 50% of the assessment criteria threshold value and no sample exceed 250% of the assessment criteria threshold value.

Table 8k – TPH in Soil (mg/kg)

Sample ID & Depth	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
MP-1S - 2.5m	<25	<50	<100	<100	ND
MP-1E- 2.5m	<25	<50	<100	<100	ND
MP-1Ea- 2.5m	<25	<50	<100	<100	ND
MP-B1 – 3m	<25	<50	<100	<100	ND
MP-2N- 2.5m	<25	<50	<100	<100	ND
MP-2W- 2.5m	<25	<50	<100	<100	ND
MP2Wa- 2.5m	<25	<50	<100	<100	ND
Criteria	**65**	**-**	**-**	**-**	**1000**

Table 8l – BTEX in Soil (mg/kg)

Sample ID	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
MP-1S - 2.5m	<1.0	<1.0	<0.1	ND
MP-1E- 2.5m	<1.0	<1.0	<0.1	ND
MP-1Ea- 2.5m	<1.0	<1.0	<0.1	ND
MP-B1 – 3m	<1.0	<1.0	<0.1	ND
MP-2N- 2.5m	<1.0	<1.0	<0.1	ND
MP-2W- 2.5m	<1.0	<1.0	<0.1	ND
MP2Wa- 2.5m	<1.0	<1.0	<0.1	ND
Criteria	**1**	**1.4[a]/130[b]**	**3.1[c]/50[d]**	**14[e]/25[d]**

[a b c d e] – As outlined in Table 7a.

Table 8m – PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
MP-1S – 2.5m	<0.05	ND
MP-2S– 2.5m	<0.05	ND
MP-1E– 2.5m	<0.05	ND
MP-1Ea– 2.5m	<0.05	ND
MP-2E– 2.5m	<0.05	ND
MP-B1 – 3m	<0.05	ND
MP-B2 – 3m	<0.05	ND
MP-1N– 2.5m	<0.05	ND
MP-2N– 2.5m	<0.05	ND
MP-1W– 2.5m	<0.05	ND
MP-2W– 2.5m	<0.05	ND
MP-2Wa– 2.5m	<0.05	ND
Acceptance Criteria	**1**	**20**

Table 8n – Organics in Soil (mg/kg)

Sample ID	Contaminant		
	OCP	OPP	PCB
MP-1S - 2.5m	<0.1	<0.1	<0.1
MP-1E- 2.5m	<0.1	<0.1	<0.1
MP-1Ea- 2.5m	<0.1	<0.1	<0.1
MP-B1 – 3m	<0.1	<0.1	<0.1
MP-2N- 2.5m	<0.1	<0.1	<0.1
MP-2W- 2.5m	<0.1	<0.1	<0.1
MP2Wa- 2.5m	<0.1	<0.1	<0.1
Acceptance Criteria	**10**	**-**	**10**

Table 8o - Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
MP-1S – 2.5m	<4.0	<1.0	17	5.9	6.1	<0.10	2.2	8.7
MP-2S– 2.5m	6.3	<1.0	11	8.0	15	<0.10	2.3	22
MP-1E– 2.5m	<4.0	<1.0	10	7.2	4.3	<0.10	1.8	9.2
MP-1Ea– 2.5m	<4.0	<1.0	10	4.1	4.0	<0.10	1.4	6.0
MP-2E– 2.5m	<4.0	<1.0	13	3.8	4.8	<0.10	1.8	7.4
MP-B1 – 3m	<4.0	<1.0	1.7	1.8	1.8	<0.10	<1.0	7.9
MP-B2 – 3m	<4.0	<1.0	6.9	6.8	6.8	<0.10	1.6	16
MP-1N– 2.5m	<4.0	<1.0	10	7.1	7.1	<0.10	2.3	11
MP-2N– 2.5m	<4.0	<1.0	7.7	3.0	3.0	<0.10	<1.0	3.4
MP-1W– 2.5m	<4.0	<1.0	16	4.8	4.8	<0.10	1.2	8.8
MP-2W– 2.5m	<4.0	<1.0	11	4.0	5.4	<0.10	<1.0	3.6
MP-2Wa– 2.5m	<4.0	<1.0	13	4.5	4.9	<0.10	<1.0	4.2
Acceptance Criteria	**100[1]**	**20[1]**	**100[1]**	**1000[1]**	**300[1]**	**15[1]**	**600[1]**	**7000[1]**
	20[2]	**3[2]**	**400[2]**	**100[2]**	**600[2]**	**1[2]**	**60[2]**	**200[2]**

[1] NEHF A Criteria [2] NSW EPA Phytotoxicity Criteria

Total Petroleum Hydrocarbons:

Concentrations of Total Petroleum Hydrocarbon (TPH) compounds above the Service Station Guidelines (most sensitive) of 1000 mg/kg were not detected in any of the samples taken from the tank pit located on the 59 Lakeview Road, Morisset Park Site.

Monocyclic aromatic hydrocarbons (C_6 – C_9 and BTEX fractions), associated with petrol contamination, were not detected above the associated guidelines in any of the samples collected.

Polycyclic Aromatic Hydrocarbons (PAH):

A total of twelve (12) Tank Pit soil samples were submitted for analysis of PAH compounds. PAHs are generally associated with ash material used as fill. No samples collected from the Morisset Park site returned detectable limits of PAHs. Benzo(a)Pyrene (BaP) concentrations were non-detect for all twelve (12) samples collected.

Heavy Metals:

A total of twelve (12) Tank Pit soil samples were submitted for analysis of all eight (8) heavy metals as recommended by the NSW DEC (formerly the EPA). No exceedances for any of the eight (8) heavy metals analysed for, or their related Provisional Phytotoxicity based investigation threshold levels were recorded above the site acceptance criteria for any sample taken from the tank pit area.

Pesticides:

No concentrations of Organochlorine or Organophosphorus pesticides were detected on any samples collected and analysed from the Tank Pit Areas

Due to the low or non detect levels of all analytes within the samples tested from the Tank Pit areas, David Lane Associates concludes that the remediation in the form of the UST removal was successful. No contamination was evident on the site identified as 59 Lakeview Road, Morisset Park, following the removal and disposal of the UST's and the surrounding soil, therefore, these areas are compliant with the end land use most relevant to the site, NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*.

Stockpiled Materials Resulting from Tank Pit Excavation

The excavation of the USTs from the above mentioned tank pit produced two (2) stockpiles, SP1-South, and SP2 -North. A total of five (5) samples were collected from the stockpiled materials.

The results of these stockpiled materials assessments are given below in **Tables 8p-8v,** with assessment criteria in accordance with: NEPM 1999, Table 5a, Column A - *Residential with Access to Soils* and the DEC **Table A4** - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8p – Organics in Soil (mg/kg)

Sample ID	Contaminant		
	OCP	OPP	PCB
MP-SP1S-1	<0.1	<0.1	<0.1
MP-SP1S-2	<0.1	<0.1	<0.1
MP-SP1Sa	<0.1	<0.1	<0.1
MP-SP2N-2	<0.1	<0.1	<0.1
Acceptance Criteria	**10[1]**	**-**	**10[1]**
			2[2]

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8q – TPH in Soil (mg/kg)

Sample ID	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
MP-SP1S-1	<25	<50	<100	<100	ND
MP-SP1S-2	<25	<50	<100	<100	ND
MP-SP1Sa	<25	<50	<100	<100	ND
MP-SP2N-2	<25	<50	<100	<100	ND
Acceptance Criteria	**65[1]**				**1000[1]**
	650[2]				**5000[2]**

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8r – BTEX in Soil (mg/kg)

Sample ID	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
MP-SP1S-1	<1.0	<1.0	<1.0	<3.0
MP-SP1S-2	<1.0	<1.0	<1.0	<3.0
MP-SP1Sa	<1.0	<1.0	<1.0	<3.0
MP-SP2N-2	<1.0	<1.0	<1.0	<3.0
Acceptance Criteria	**1**	**1.4[a]/130[b]**	**3.1[c]/50[d]**	**14[e]/25[d]**
	18[2]	**518[2]**	**1080[2]**	**1800[2]**

[a b c d e] – As outlined in Table 7a.
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8s – PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
MP-SP1S-1	<0.05	ND
MP-SP1S-2	<0.05	ND
MP-SP1Sa	<0.05	ND
MP-SP2N-1	<0.05	ND
MP-SP2N-2	<0.05	ND
Acceptance Criteria	**1**	**20[1]**
	1[2]	**200[2]**

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8t – TCLP PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
MP-SP1S-1	<0.001	ND
MP-SP1S-2	<0.001	ND
MP-SP1Sa	<0.001	ND
MP-SP2N-1	<0.001	ND
MP-SP2N-2	<0.001	ND
Acceptance Criteria	**0.004**	**N/A**

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8u - Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
MP-SP1S-1	<4.0	<1.0	9.1	9.5	11	<0.10	6.4	35
MP-SP1S-2	<4.0	<1.0	11	13	30	<0.10	3.8	56
MP-SP1Sa	<4.0	<1.0	12	9.2	9.8	<0.10	4.0	18
MP-SP2N-1	<4.0	<1.0	7.5	4.5	4.7	<0.10	1.3	7.9
MP-SP2N-2	<4.0	<1.0	19	12	120	<0.10	4.5	96
Acceptance Criteria	**100[1]**	**20[1]**	**100[1]**	**1000[1]**	**300[1]**	**15[1]**	**600[1]**	**7000[1]**
	500[2]	**100[2]**	**1900[2]**		**1500[2]**	**50[2]**	**1050[2]**	

NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8v - TCLP Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
MP-SP1S-1	<0.05	<0.01	<0.01	<0.01	<0.03	<0.0005	<0.02	0.14
MP-SP1S-2	<0.05	<0.01	<0.01	<0.01	<0.03	<0.0005	<0.02	0.14
MP-SP1Sa	<0.05	<0.01	<0.01	<0.01	<0.03	<0.0005	<0.02	0.11
MP-SP2N-1	<0.05	<0.01	<0.01	0.01	<0.03	<0.0005	<0.02	0.13
MP-SP2N-2	<0.05	<0.01	<0.01	<0.01	<0.03	<0.0005	<0.02	0.38
Criteria	**0.5**	**0.1**	**0.5**	**NA**	**0.5**	**0.02**	**0.2**	**NA**

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Stockpiled Material SP1-South, and SP2-North

Stockpiled materials identified as Stockpile SP1-South, and Stockpile SP2-North contained approximately 80m^3 and 70m^3 of material respectively. This material was subjected to a total of five (5) samples being collected and sent to NATA registered laboratories for a range of analysis.

Stockpiled Material identified as SP1-South and SP2-North was identified as in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*. Therefore the stockpiled material was suitable for the proposed end land use and beneficially re-used on the 59 Lakeview Road, Morisset Park site.

8.4 Sewage Effluent Treatment System Results

Parsons Brinckerhoff conducted Phase 1 and Phase 2 Environmental Site Assessments on the 59 Lakeview Road, Morisset Park (August 2001, February 2005). During these investigations they noted the sewage effluent treatment system and described a pumping system with three (3) treatment tanks being used for primary and secondary treatment processes and two (2) evaporation ponds providing overload support to an onsite irrigation system. Anecdotal evidence from a former employee suggests the tanks were pumped dry in 2004.

Remediation of the 59 Lakeview Road, Morisset Park Site included the removal of the above mentioned sewage effluent treatment system, remediation of the surrounding area and a validation investigation to ensure remedial works were completely successful. Statistical analysis was limited due the high number of non detections and the low number of samples collected, however, it can be determined that the standard deviation is well below 50% of the assessment criteria threshold value and no sample exceed 250% of the assessment criteria threshold value.

David Lane Associates undertook this investigation on 27th October, 2006, which consisted of:

- Imported Fill Materials imported on to site to fill in trenches left during remedial works (IF);
- Sludge removed from the ponds (S);
- An area on the north eastern peninsula that had effluent sludge laid out on it (SP3);
- The transpiration area which had been sprayed with the re-irrigation water produced from the effluent treatment system (TA); and,
- Three (3) effluent pits resulted from the removal and remediation of the sewage effluent treatment system area (ST1, ST2, and ST3).

The results of these investigations are given below in **Tables 8w – 8ac**.

The standard guidelines used in the case of a sewage effluent treatment plant are the NSW EPA *Environmental Guidelines Use and Disposal of Biosolids Products*, however chapter seven (7) states that these guidelines are only required when the sewage treatment system caters for a minimum of one hundred (100) people, therefore these guidelines are not applicable to 59 Lakeview Road, Morisset Park. The samples were assessed using NEPM 1999, Table 5a, Column A - *Residential with Access to Soils,* and

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria) where applicable.

Table 8w – TPH in Soil (mg/kg)

Sample ID	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
TP-IF-4 0-0.1m	<10	<50	<100	<100	ND
TP-IF-4a 0-0.1m	<10	<50	<100	<100	ND
TP-S-3 0-0.1m	<10	70	<100	<100	70
TP-S-3a 0-0.1m	<10	<50	<100	100	100
TP-SP3-1 0-0.1m	<10	<50	<100	150	150
TP-SP3-2 0-0.1m	<10	<50	<100	310	310
Acceptance Criteria	**65**[1]				**1000**[1]
	650[2]				**5000**[2]

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8x – BTEX in Soil (mg/kg)

Sample ID	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
TP-IF-4 0-0.1m	<0.2	<0.5	<0.5	ND
TP-IF-4a 0-0.1m	<0.2	<0.5	<0.5	ND
TP-S-3 0-0.1m	<0.2	<0.5	<0.5	ND
TP-S-3a 0-0.1m	<0.2	<0.5	<0.5	ND
TP-SP3-1 0-0.1m	<0.2	<0.5	<0.5	ND
TP-SP3-2 0-0.1m	<0.2	<0.5	<0.5	ND
Acceptance Criteria	**1**	**1.4**[a]**/130**[b]	**3.1**[c]**/50**[d]	**14**[e]**/25**[d]
	18[2]	**518**[2]	**1080**[2]	**1800**[2]

[a b c d e] – As outlined in Table 7a.
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8y – PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
TP-IF-1 0-0.1m	<0.5	ND
TP-IF-2 0-0.1m	<0.5	ND
TP-IF-3 0-0.1m	<0.5	ND
TP-IF-4 0-0.1m	<0.5	ND
TP-IF-4a 0-0.1m	<0.5	ND
TP-TA-1 0-0.3m	<0.5	ND
TP-TA-2 0-0.3m	<0.5	ND
TP-TA-2a 0-0.3m	<0.5	ND
TP-S-1 0-0.1m	<0.5	ND
TP-S-2 0-0.1m	<0.5	ND
TP-S-3 0-0.1m	<0.5	ND
TP-S-3a 0-0.1m	<0.5	ND
TP-SP3-1 0-0.1m	<0.5	ND
TP-SP3-2 0-0.1m	<0.5	ND
TP-ST1-4	<0.5	ND
TP-ST1-5	<0.5	ND
TP-ST1-6	<0.5	ND
TP-ST1-7	<0.5	ND
TP-ST1-8	<0.5	ND
TP-ST2-9	<0.5	ND
TP-ST2-10	<0.5	ND
TP-ST2-11	<0.5	ND
TP-ST2-12	<0.5	ND
TP-ST2-13	<0.5	ND
TP-ST3-1	<0.5	ND
TP-ST3-2	<0.5	ND
TP-ST3-3	<0.5	ND
TP-ST3-4	<0.5	ND
TP-ST3-5	<0.5	ND
TP-ST3-5a	<0.5	ND
Acceptance Criteria	**1**	**20[1]**
	1[2]	**200[2]**

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8z - TCLP PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
TP-S-1	<1	ND
TP-S-2	<1	ND
TP-S-3	<1	ND
TP-S-3a	<1	ND
TP-SP3-1	<1	ND
TP-SP3-2	<1	ND
Acceptance Criteria	**0.004**	**N/A**

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8aa – Organics in Soil (mg/kg)

Sample ID	Contaminant		
	OCP	OPP	PCB
TP-IF-4	<0.05	<0.05	<0.05
TP-IF-4a	<0.05	<0.05	<0.05
TP-TA-1	<0.05	<0.05	<0.05
TP-TA-2	<0.05	<0.05	<0.05
TP-TA-2a	<0.05	<0.05	<0.05
TP-S-3	<0.05	<0.05	<0.05
TP-S-3a	<0.05	<0.05	<0.05
TP-SP3-1	<0.05	<0.05	<0.05
TP-SP3-2	<0.05	<0.05	<0.05
TP-ST1-7	<0.05	<0.05	<0.05
TP-ST1-8	<0.05	<0.05	<0.05
TP-ST3-5	<0.05	<0.05	<0.05
TP-ST3-5a	<0.05	<0.05	<0.05
Acceptance Criteria	**10[1]**	**-**	**10[1]**
			2[2]

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8ab - Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-IF-1	3	<0.1	18	10	20	<0.05	<1	170
TP-IF-2	4	<0.1	20	<2	5	<0.05	<1	6
TP-IF-3	3	<0.1	12	7	21	<0.05	<1	180
TP-IF-4	3	<0.1	21	<2	6	<0.05	<1	11
TP-IF-4a	3	<0.1	21	2	7	<0.05	<1	24
TP-TA-1	<1	<0.1	3	<2	6	<0.05	<1	9
TP-TA-2	<1	<0.1	3	<2	6	0.05	<1	9
TP-TA-2a	<1	<0.1	2	<2	5	<0.05	<1	8
TP-S-1	12	0.1	30	32	10	0.12	2	59
TP-S-2	7	<0.1	15	13	7	0.22	<1	20
TP-S-3	6	<0.1	12	<2	4	<0.05	<1	5
TP-S-3a	4	<0.1	8	<2	3	<0.05	<1	5
TP-SP3-1	3	<0.1	9	9	6	0.06	<1	22
TP-SP3-2	3	<0.1	9	10	7	0.08	<1	32
TP-ST1-4	18	<0.1	17	<2	4	<0.05	<1	<5
TP-ST1-5	5	<0.1	11	2	4	<0.05	<1	<5
TP-ST1-6	10	<0.1	13	<2	3	<0.05	<1	<5
TP-ST1-7	12	<0.1	28	<2	5	<0.05	<1	<5
TP-ST1-8	<1	<0.1	4	<2	2	<0.05	<1	<5
TP-ST2-9	8	<0.1	12	<2	4	<0.05	<1	<5
TP-ST2-10	4	<0.1	11	<2	4	<0.05	<1	<5
TP-ST2-11	4	<0.1	10	<2	4	<0.05	<1	<5
TP-ST2-12	13	<0.1	17	<2	7	<0.05	<1	6
TP-ST2-13	2	<0.1	9	<2	2	<0.05	<1	<5
TP-ST3-1	2	<0.1	9	3	5	<0.05	<1	6
TP-ST3-2	2	<0.1	8	2	3	<0.05	<1	6
TP-ST3-3	3	<0.1	22	2	75	<0.05	<1	10
TP-ST3-4	2	<0.1	2	<2	3	<0.05	<1	<5
TP-ST3-5	2	<0.1	7	2	3	<0.05	<1	9
TP-ST3-5a	1	<0.1	6	3	3	<0.05	<1	9
Acceptance Criteria	**100[1]**	**20[1]**	**100[1]**	**1000[1]**	**300[1]**	**15[1]**	**600[1]**	**7000[1]**
	500[2]	**100[2]**	**1900[2]**		**1500[2]**	**50[2]**	**1050[2]**	

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8ac - TCLP Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-S-1	<10	1	<50	<50	<10	<1	<50	720
TP-S-2	<10	1	<50	<50	<10	<1	<50	680
TP-S-3	<10	<1	<50	<50	<10	<1	<50	<50
TP-S-3a	<10	<1	<50	<50	<10	<1	<50	<50
TP-SP3-1	<10	<1	<50	<50	<10	<1	<50	390
TP-SP3-2	<10	<1	<50	<50	<10	<1	<50	450
Criteria	**0.5**	**0.1**	**0.5**	**NA**	**0.5**	**0.02**	**0.2**	**NA**

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Imported Fill (IF):

Imported fill material consisted of approximately 500m^3 of material imported on site to fill in the trenches left by the removal and remediation of the sewage effluent treatment system area. This material was subjected to a total of five (5) samples being collected and sent to LabMark, a NATA registered laboratory for a range of analysis.

The Imported Fill material imported on site to 59 Lakeview Road, Morisset was identified as in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*, and therefore deemed suitable for use on site.

Sludge (S):

Sludge removed during the remediation of the ponds associated with the sewage effluent treatment system, contained approximately 75m^3. Four (4) soil samples collected from this material were sent to LabMark for a range of analysis.

The Sludge removed from the sewage effluent treatment system ponds during remediation was found to be in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*, and therefore deemed suitable for beneficial re-use on site.

North Eastern Peninsula (SP3):

The excavated material and sludge originating from the evaporation pond located on the north eastern peninsula of the site was stockpiled adjacent to the pond and consisted of approximately 100m^3. This material was subjected to a total of two (2) samples being collected and sent to LabMark, a NATA registered laboratory for a range of analysis.

The stockpiled material, located on the north eastern peninsula was identified as in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*, and therefore deemed suitable for beneficial reuse on the site.

Transpiration Area (TA):

The Transpiration Area consisted of land that had previously been sprayed or immersed in re-irrigation water produced from the sewage effluent treatment system. This area was subjected to three (3) soil samples being collected and sent to LabMark for a range of chemical analysis.

The Transpiration Area which had previously been sprayed with re-irrigation water produced from the sewage effluent treatment system was found to be in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*, and therefore requiring no further remediation works to be undertaken.

Tank Pits (ST1, ST2, and ST3):

The Effluent Pits ST1, ST2, and ST3 were subjected to a total of five (5), five (5) and six (6) soil samples respectively, being collected and sent to LabMark, a NATA registered laboratory for a range of analysis.

The residual soils associated with the three (3) former treatment ponds following removal and remediation of the sewage effluent treatment system area were identified as being in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*, and therefore required no further remediation.

Due to the low or non-detect concentrations of all analytes within the samples tested from the sewage effluent treatment system area, David Lane Associates concludes that the remediation involved in the removal of the effluent system was successful. No contamination was identified or evident in regards to the remediated areas on the site identified as 59 Lakeview Road, Morisset Park. Therefore, the areas and material

associated with the past use as a sewage effluent treatment system are compliant with the end land use most relevant to the site, NEPM 1999, Table 5a, Column A - *Residential with Access to Soils.*

9.0 EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

From a review and evaluation of the QA/QC data provided by David Lane Associates and the intended objectives of the sampling and analysis it is considered the data presented is generally of sufficient precision, accuracy, representative-ness, comparability and completeness for its intended purpose.

Laboratory QA/QC on all samples analysed included calculation of %RPD, matrix spike recovery and blank determinations. Comment on the acceptability of data was given with each analytical report generated.

As the objectives of the David Lane Associates were to provide an indication of contamination across the Morisset Park site, assessments for all potential contaminants of concern and qualification of any data is not considered to materially affect usefulness of the data.

9.1 Rationale for the Sampling and Analysis Plan

The justification of the sampling point regime for the assessment was based on the investigator's knowledge, experience and history of the site. The sampling approach adopted also provided for samples to be collected in an unbiased manner.

A total of one hundred and twelve (112) soil samples, fifteen (14) intra and four (4) inter laboratory duplicate samples were collected for the validation of 59 Lakeview Road, Morisset Park.

9.2 Limitation of Report

The conclusions presented in this report are relevant to the condition of the site and the state of legislation currently enacted as at the date of this report. We do not make any representation or warranty that the conclusions in this report will be applicable in the future as there may be changes in the condition of the site, applicable legislation or other factors that would affect the conclusions contained in this report.

David Lane Associates has used a degree of skill and care ordinarily exercised by reputable members of our profession practicing in the same or similar locality.

Conclusions are based on representative samples on the site, the intensity of those samples being in accordance with the usual levels of testing carried out for this type of investigation. Due to the inherent variability in natural soils we cannot warrant that the whole overall condition of the site is identical or substantially similar to the representative samples.

This report and the information contained in it, is the intellectual property of David Lane Associates and Johnson Property Group.

This Validation has been conducted for the purpose stated in this report.

10.0 CONCLUSIONS

A well-defined scope of work has resulted in an efficient remediation/validation operation. No problems were encountered during the remediation/validation and excavation works.

The identified areas of contamination were remediated. The validation results indicate **59 Lakeview Road, Morisset Park as outlined in the Site Layout attached as Figure 2 has been satisfactorily remediated. This is in accordance with the most suitable end landuse criteria Column A, Table 5a – *Residential with Access to Soils* in accordance with the NEPM 1999 and the NSW DEC Guidelines for the NSW Site Auditors Scheme (2nd Edition, 2006).**

It should be noted that this validation report does not guarantee that all soils at the Morisset Park site are natural and identifies the presence of fill materials in the northern peninsula area to reclaim the northern shoreline. However, the chemical analysis conducted demonstrated that the residual soil in the remediated area meets the agreed clean-up criteria (NEPM 1999 Table 5A Column A – *Residential with Access to Soil*).

Consequently, it is considered that the validation program conducted on Lot 1 DP1107753 and Lot 2 DP1107753, and located at 59 Lakeview Road, Morisset Park NSW has greatly reduced the risk of residual contamination being present to a level consistent with the site assessment criteria.

The completion of this report concludes that the validation objectives, according to the site acceptance criteria, have been achieved and the site is therefore suitable for an end land use consistent with NEPM 1999 Table 5a Column A – *Residential with Access to Soil*.

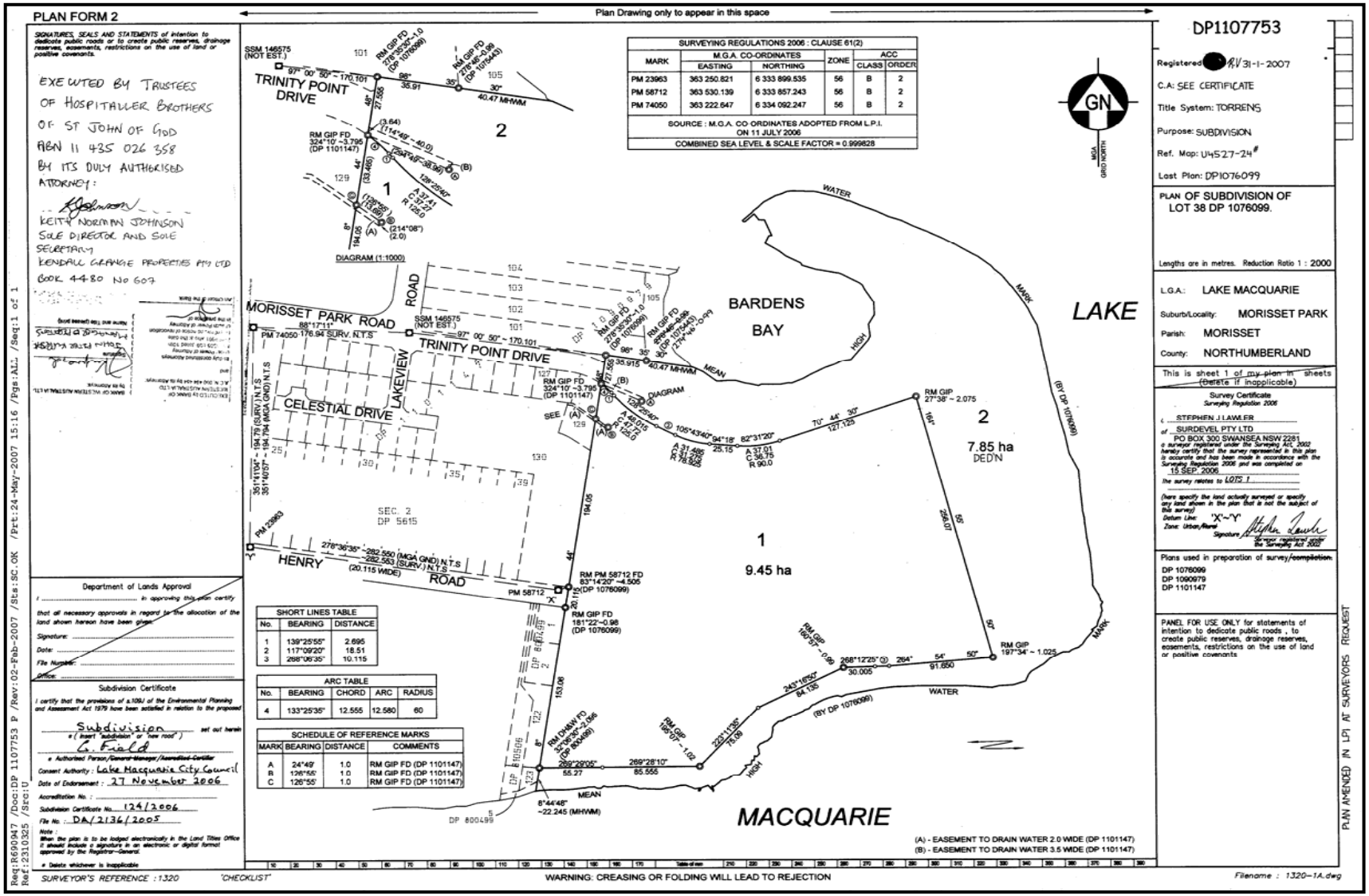
Figure 1

Site Location

DAVID LANE ASSOCIATES Environment Health Safety "Ayrfield" Lot 18 Old North Road - Rothbury	**DESIGNED:** DLA	SITE LOCATION	
	COMPILED: DUO	**CLIENT:** Johnson Property Group	**DRAWING:** 21/03/07
	PROJ. No.	**LOCATION:** Site Validation, 59 Lakeview Road, Trinity Pt, Morisset Park	**FIGURE:** 1

Figure 2

Registered Site Survey



DAVID LANE ASSOCIATES Environment Health Safety 2b / 30 Leighton Place Hornsby, NSW	**DESIGNED:** DLA	**Title**	Registered Site Survey
	Ver: 1	**CLIENT:**	Johnson Property Group Pty Ltd — **Date:** 30/07/2007
	PROJ. No. 1779	**LOCATION:**	Morisset Park - Trinity Point — **FIGURE:** 2

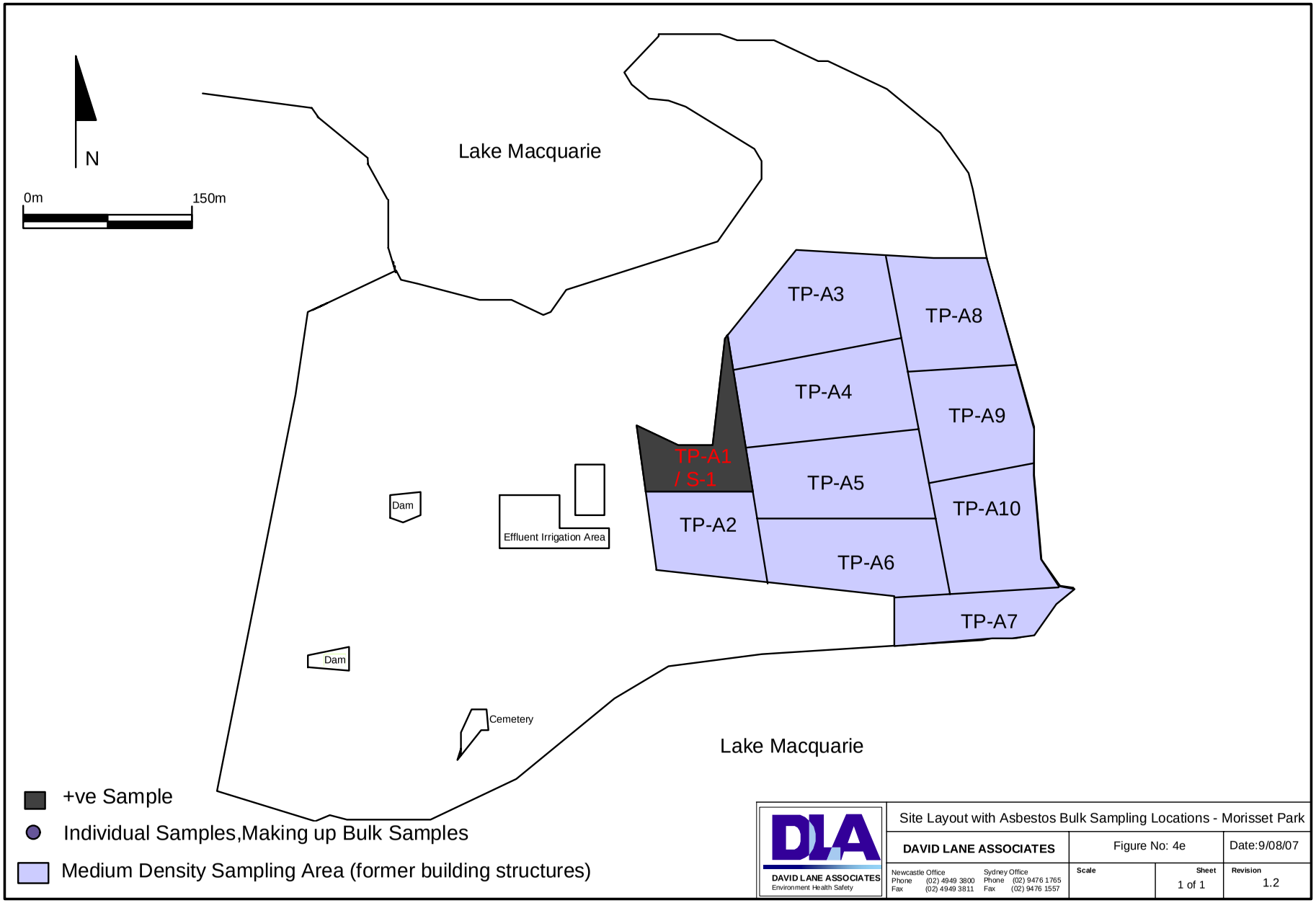
Figure 3

Site Layout

DAVID LANE ASSOCIATES Environment Health Safety 2b / 30 Leighton Place Hornsby, NSW	**DESIGNED:** DLA	**Title**	Site Layout - 59 Lakeview Road Morisset Park
	Ver: 1	**CLIENT:**	Johnson Property Group Pty Ltd — **Date:** 18/08/2007
	PROJ. No. 1779	**LOCATION:**	Morisset Park - Trinity Point — **FIGURE:** 3

Figure 4

Sampling Grid Layouts



Site Layout with Asbestos Bulk Sampling Locations - Morisset Park

DAVID LANE ASSOCIATES

Figure No: 4e

Date:9/08/07

DAVID LANE ASSOCIATES
Environment Health Safety

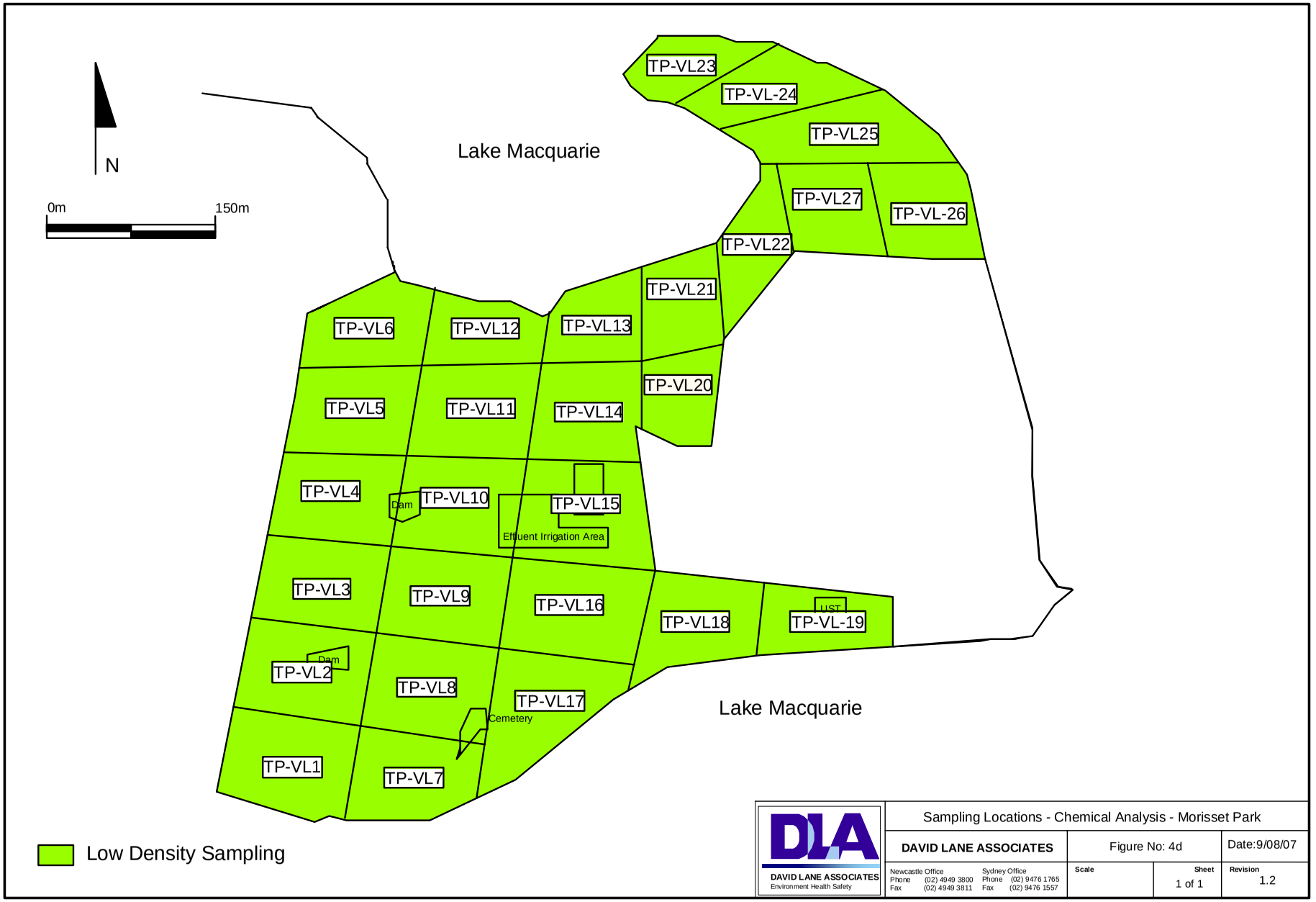
Newcastle Office
Phone (02) 4949 3800
Fax (02) 4949 3811

Sydney Office
Phone (02) 9476 1765
Fax (02) 9476 1557

Scale

Sheet
1 of 1

Revision
1.2

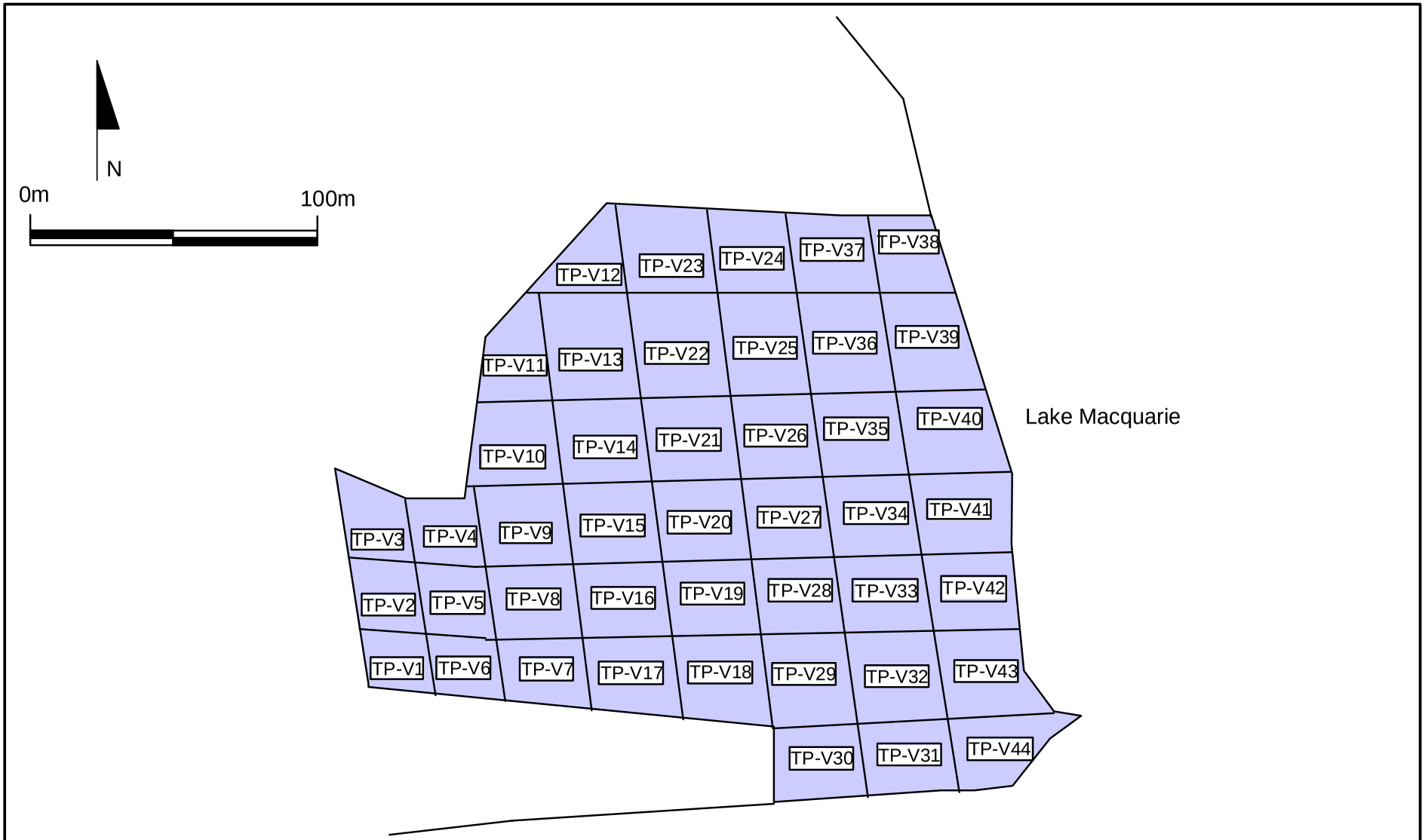


Sampling Locations - Chemical Analysis - Morisset Park

DAVID LANE ASSOCIATES
Environment Health Safety
Newcastle Office Phone (02) 4949 3800 Fax (02) 4949 3811
Sydney Office Phone (02) 9476 1765 Fax (02) 9476 1557

DAVID LANE ASSOCIATES | Figure No: 4d | Date:9/08/07

Scale | Sheet: 1 of 1 | Revision: 1.2



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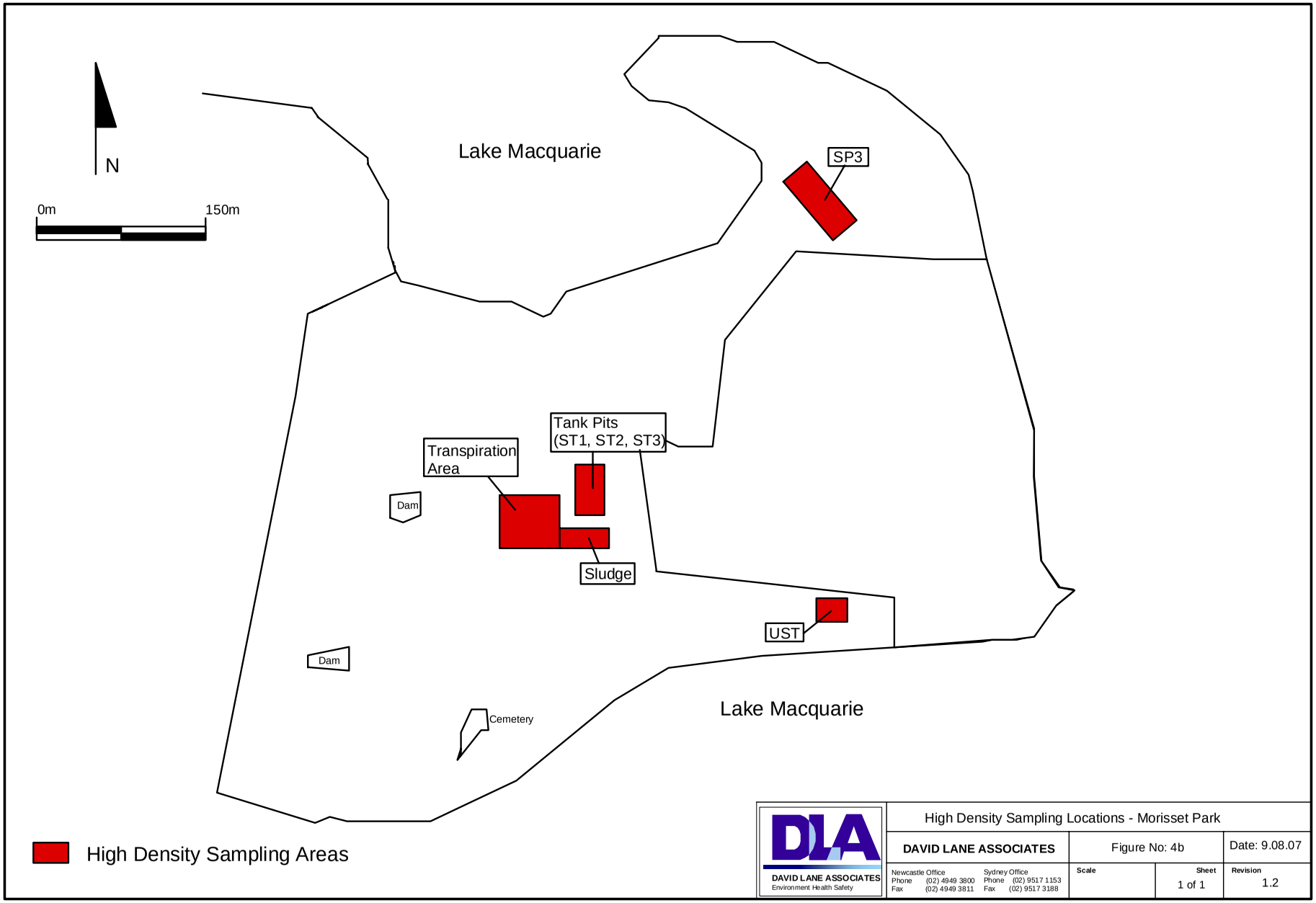
Environment Health Safety

Sampling Locations - Chemical Analysis - Morisset Park

DAVID LANE ASSOCIATES	Figure No: 4c		Date: 9/08/07
Newcastle Office Phone (02) 4949 3800 Fax (02) 4949 3811 / Sydney Office Phone (02) 9476 1765 Fax (02) 9476 1557	Scale	Sheet 1 of 1	Revision 1.2



High Density Sampling Locations - Morisset Park

DAVID LANE ASSOCIATES

Figure No: 4b

Date: 9.08.07

DAVID LANE ASSOCIATES
Environment Health Safety

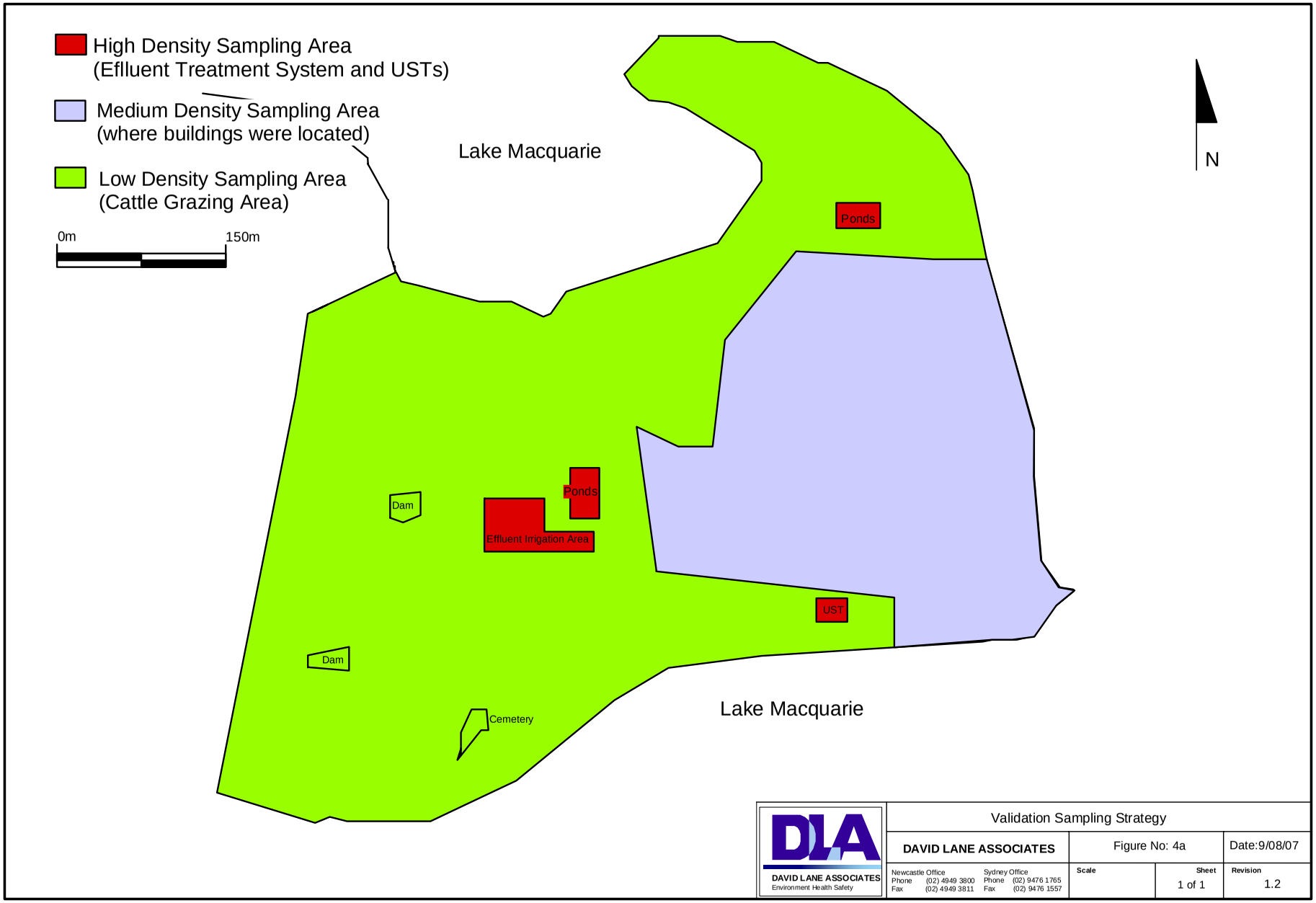
Newcastle Office
Phone (02) 4949 3800
Fax (02) 4949 3811

Sydney Office
Phone (02) 9517 1153
Fax (02) 9517 3188

Scale

Sheet
1 of 1

Revision
1.2



DAVID LANE ASSOCIATES
Environment Health Safety

Newcastle Office
Phone (02) 4949 3800
Fax (02) 4949 3811

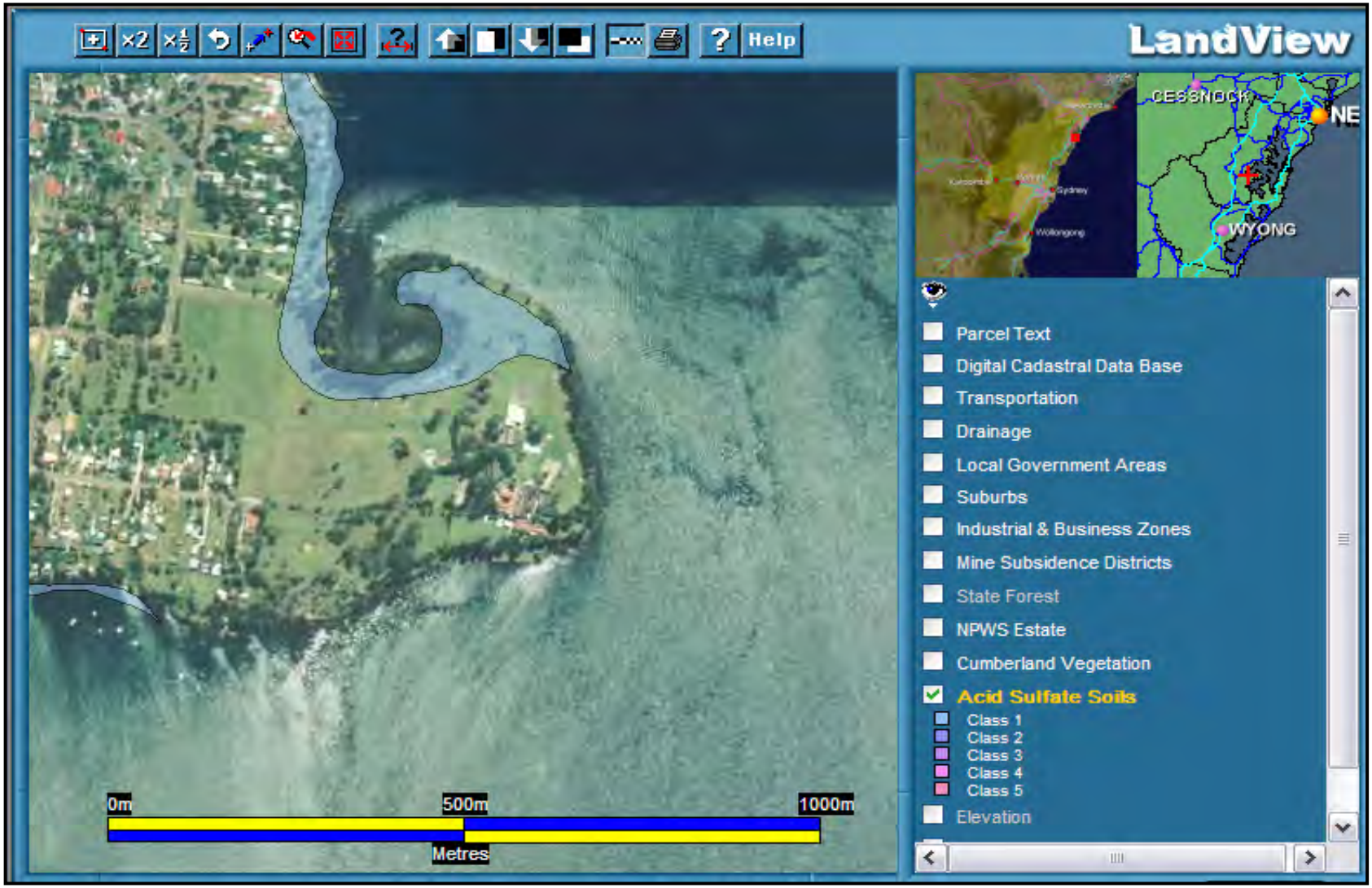
Sydney Office
Phone (02) 9476 1765
Fax (02) 9476 1557

Validation Sampling Strategy

DAVID LANE ASSOCIATES	Figure No: 4a	Date:9/08/07
Scale	Sheet: 1 of 1	Revision: 1.2

Figure 5

Acid Sulphate Soils



DAVID LANE ASSOCIATES Environment Health Safety 2b / 30 Leighton Place Hornsby, NSW	**DESIGNED:** DLA	**Title**	Acid Sulphate Soils
	Ver: 1	**CLIENT:**	Johnson Property Group Pty Ltd — **Date:** 30/07/2007
	PROJ. No. 1779	**LOCATION:**	Morisset Park - Trinity Point — **FIGURE:** 5

Appendix 1

149 Planning Certificate (parts 2 and 5)

Certificate No. **2002/1139**
Page 1 of 7

CITY OF
Lake Macquarie

HARPER SOMERS PTY LTD
C/-JASON WASIAK
49616500

Applicant's Ref:

SECTION 149 PLANNING CERTIFICATE, ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Fee Paid..... 100.00
Receipt No... 1111111
Issue Date ..... 09/08/2001 Receipt Date 09/08/2001

DESCRIPTION OF LAND

Address: 22 Morisset Park Road
MORISSET PARK NSW 2264

Lot Details: LOT 4 Sec 2 DP 5615,LOT 5 Sec 2 DP 5615,LOT 6 Sec 2 DP 5615L
Parish: Morisset
County: Northumberland

Owner: THE TRUST OF THE HOSPITALLER

for KEN HOLT
GENERAL MANAGER

Telephone: 02
126-138 Main Road Speers Point NSW 2284
Box 1906, Hunter Region Mail Centre NSW 2310
Facsimile: 02 4958 7257 Email: enquiries@lakemac.nsw.gov.au

ADVICE PROVIDED IN ACCORDANCE WITH SECTION 149(2)

A. Local Environmental Plans

The Lake Macquarie Local Environmental Plan,1984("the Plan") applies to the land and identifies the land as being zoned-

Residential 2a

Purposes for which development may be carried out on the land, either with or without Council consent, and the purposes for which development is prohibited, are specified opposite the relevant zone(s) in the table to Clause 10 of the Plan. An extract from the Table is appended to this Certificate as Attachment A.

Additional purposes specified under certain Clauses of the Plan for which development may be carried out on the land with Council consent:

NONE

In addition, the Plan imposes certain other restrictions on development, including development standards, which may affect the land. Attention is drawn to the Environmental Planning and Assessment Model Provisions, 1980 which are adopted by the Plan. Copies of these instruments may be obtained at the State Government Information Service, Sydney, or viewed at either Council's Administration Centre or the Speers Point Branch Library during normal business hours.

B. Draft Local Environmental Plans

The land IS NOT AFFECTED by a Draft Local Environmental Plan exhibited pursuant to Section 66(1)(b) of the Act.

C. State Environmental Planning Policies and Regional Environmental Plans

The land is affected by the State and Regional Planning Instruments.

State Environmental Planning Policy No.10 - Retention of Low-Cost Rental Accomodation.
State Environmental Planning Policy No. 1 - Development Standards.
State Environmental Planning Policy No. 4 - Development without Consent.
State Environmental Planning Policy No. 6 - Number of Storeys in a Building.
State Environmental Planning Policy No. 8 - Surplus Public Lands.
State Environmental Planning Policy No. 9 - Group Homes.
State Environmental Planning Policy No.11 - Traffic Generating Development.
State Environmental Planning Policy No.21 - Caravan Parks.
State Environmental Planning Policy No.32 - Urban Consolidation (Redevelopment of Urban Land)
State Environmental Planning Policy No.33 - Hazardous and Offensive Development.
State Environmental Planning Policy No.35 - Maintenance and Dredging of Tidal Waterways.
State Environmental Planning Policy No.36 - Manufactured Homes Estates.
State Environmental Planning Policy No. 5 - Housing for Older People with a Disability.
State Environmental Planning Policy No.19 - Bushland in Urban Areas.
State Environmental Planning Policy No.16 - Tertiary Institutions.
State Environmental Planning Policy No.44 - Koala Habitat Protection.
State Environmental Planning Policy No.45 - Permissibility of Mining.
State Environmental Planning Policy No.48 - Major Putrescible Landfill Sites.
State Environmental Planning Policy No.50 - Canal Estate Development.
State Environmental Planning Policy No.55 - Remediation of Land.
State Environmental Planning Policy No.64 - Advertising Signs.
State Environmental Planning Policy No.37 - Continued Mines and Extractive Industries.

D. Erection of a dwelling-house on vacant land

The erection of a dwelling-house on the land, if the land is vacant, IS NOT PROHIBITED by reason of a development standard relating to the minimum area on which a dwelling-house may be erected.

E. Demolition of buildings

Demolition of any building on the land requires development consent to be obtained.

F. Development Control Plans

The land IS AFFECTED by the following Development Control Plan/s.
Development Control Plan No. 9 - Medium Density Residential Development.
Development Control Plan No. 14 - Professional Consulting Rooms.
Development Control Plan No.21 - Energy Efficient & Sustainable Housing.
Development Control Plan No. 31 - Landscaping.
Development Control Plan No. 33 - Exempt Development.
Development Control Plan No. 34 - Complying Development.
Development Control Plan No. 35 - Notification of Development Applications.

F1. Contributions Plan
Lake Macquarie City Council has adopted the following Section 94 Contribution Plan/s which effects this land:-

Lake Macquarie Section 94 Contributions Plan No.1 - City Wide

Further advice on contribution rates can be obtained from the Council Administrative Office.

G. State Significant Development

WHETHER ANY APPLICATION TO CARRY OUT DEVELOPMENT ON THE LAND WAS, AT THE TIME THE APPLICATION FOR THE CERTIFICATE WAS LODGED, THE SUBJECT OF A NOTICE BY THE MINISTER UNDER SECTION (76) (B) OF THE ACT DECLARING THE DEVELOPMENT TO BE STATE SIGNIFICANT DEVELOPMENT.

Yes. Development to which State Environmental Planning Policy No.34 - Major Employment Generating Industrial Development and State Environmental Planning Policy No.48 - Major Putrescible Landfill Sites apply is State Significant development.

Under Clause 17(1) of the Environmental Planning and Assessment (Savings and Transitional) Regulation 1998, all s.101 directions in existence before 1 July 1998 are taken to be State Significant development. Attachment G specifies these purposes.

H. Coastal Protection Act, 1979

Council HAS NOT received any notification from the Department of Public Works that the land is affected by the operation of Section 38 or 39 of the Coastal Protection Act, 1979.

I. Mines Subsidence Compensation Act, 1961

The land IS WITHIN a Mines Subsidence District proclaimed under Section 15 of the Mines Subsidence Compensation Act 1961. Contact the Mines Subsidence Board regarding permissible surface development.

J. Road Acquisition proposals by Council

The land IS NOT AFFECTED by any road widening or road realignment under Part 3, Division 2 of the Roads Act, 1993.

If the land is affected by any road widening or road alignment under any environmental planning instrument, reference to this is made under items A or B above.

The land IS NOT AFFECTED by road widening or road alignment under resolution of Council.

NOTE: THE INFORMATION ABOVE RELATES TO COUNCIL'S ROAD PROPOSALS ONLY. OTHER AUTHORITIES, INCLUDING THE ROADS AND TRAFFIC AUTHORITY, MAY HAVE PROPOSALS NOT SET OUT ABOVE.

K. Restrictions on Development Due to Natural Hazards

K.1 Landslip/Subsidence:

Council HAS NOT by resolution adopted a policy to restrict the development of the land by reason of the likelihood of land slip or subsidence.

K.2 Flooding/Tidal Inundation:

Council HAS NOT by resolution adopted a policy to restrict the development of the land by reason of the likelihood of flooding or tidal inundation.

K.3 Bush Fire:

Council HAS NOT by resolution adopted a policy to restrict the development of the land by reason of the likelihood of bush fire.

NOTE: THE ABSENCE OF A COUNCIL POLICY RESTRICTING DEVELOPMENT OF THE LAND BY REASON OF A PARTICULAR NATURAL HAZARD DOES NOT MEAN THAT THE RISK FROM THAT HAZARD IS NON-EXISTENT.

SPECIAL NOTE

The Environmental Planning and Assessment Amendment Act 1997 commenced operation on the 1 July 1998. As a consequence of this Act the information contained in this certificate needs to be read in conjunction with the provisions of the Environmental Planning and Assessment (Amendment) Regulation 1998, Environmental Planning and Assessment (Further Amendment) Regulation 1998 and Environmental Planning and Assessment (Savings and Transitional) Regulation 1998.

ADVICE PROVIDED IN ACCORDANCE WITH SECTION 149(5)

NOTE: SECTION 149(6) OF THE ACT STATES THAT A COUNCIL SHALL NOT INCUR ANY LIABILITY IN RESPECT OF ANY ADVICE PROVIDED IN GOOD FAITH PURSUANT TO SECTION 149(5).

L. Clearing and lopping of trees

The land IS AFFECTED by a Tree Preservation Order. Council consent is required to cut down, ringbark or lop trees in excess of 3 metres in height, and all mangroves irrespective of height.

N. Easements

The land is NOT affected by a proposed easement in favour of Lake Macquarie City Council.

As to affectation by existing easements, a search of the relevant Title of the land should be undertaken.

O. Section 5 of Unhealthy Building Land Act, 1990

The land IS NOT WITHIN an area affected by a notice under Section 5 of the Unhealthy Building Land Act, 1990.

P. Outstanding Notices

The land IS NOT AFFECTED by an outstanding building notice.
The land IS NOT AFFECTED by an outstanding health notice.
The land IS NOT AFFECTED by an outstanding notice issued under Section 66 of the Rural Fires Act, 1997.

Q. Other Matters

Council has prepared a draft strategy to provide direction for future land use planning, urban design and development of the City until the year 2020. A copy of "Lifestyle 2020 - A Strategy for Our Future" is available from Council.

An earthquake was experienced throughout most of the city area on 28/12/89. Prospective purchasers should make their own enquiries as to whether buildings/structures on the land sustained any structural damage.

New South Wales Coastal Government Policy, 1997.
The NSW Coastal Policy 1997 applies to the coast eastwards from the high water mark in Lake Macquarie City. Coastal land MAY BE AFFECTED by the provisions of the Policy, where changes in landuse or development affects ocean waters. The Environmental Planning and Assessment Act requires Council to take the Coastal Policy into consideration when determining Development Applications for affected land.

ATTACHMENT A

LAND IN RESIDENTIAL ZONES

Specified below for each nominated zone are:

(1) the intentions of that zone;

(2) the purpose for which development may be carried out without consent;

(3) the purposes for which development may be carried out only with consent; and

(4) the purposes for which development is prohibited.

This information is subject to further provisions in the Lake Macquarie Local Environmental Plan, 1984. Provisions most likely to be relevant are printed overleaf, but perusal of the full instrument is advised.

ZONE : RESIDENTIAL 2(a)

1. ***Intention of Zone***
   To set aside land predominantly for neighbourhoods of dwelling-houses.

2. ***Without Development Consent***
   See DCP 33- Exempt Development and DCP 34- Complying Development.

3. ***Only with Development Consent***
   Any purpose other than those included in Item 2 or 4.

4. ***Prohibited***
   Advertising structures; advertisements; aerodromes; automotive uses, bulk stores; cemeteries and crematoria; commercial premises (other than home offices); funeral parlours; generating works; hotels; industries (other than home industries); junk yards; liquid fuel depots; mines, quarries; roadside stalls; sawmills; shops (other than general stores having a gross floor area not exceeding 250 square metres); service stations; stock and sale yards; timber yards;brothels; tourist facilities; transport terminals; warehouses.

ZONE : RESIDENTIAL 2(b)

1. ***Intention to Zone***
   To set aside land predominantly for low-density residential flat building development up to a density of 60 bedrooms per hectare.

2. ***Without Development Consent***
   See DCP 33- Exempt Development and DCP 34- Complying Development.

3. ***Only with Development Consent***
   Any purpose other than those included in Item 2 or 4.

4. ***Prohibited***
   Advertising structures; advertisements; aerodromes; automotive uses; bulk stores; cemeteries and crematoria; commercial premises (other than home offices); funeral parlours; generating works; industries (other than home industries); junk yards; liquid fuel depots; mines; quarries; roadside stalls;brothels; stock and sale yards; timber yards; tourist facilities (other than motels); transport terminals; warehouses.

ZONE : RESIDENTIAL 2(c)

1. ***Intention of Zone***
   To set aside land predominantly for medium-density residential flat building development up to a density of 120 bedrooms per hectare.

2. ***Without Development Consent***
   See DCP 33- Exempt Development and DCP 34- Complying Development.

3. ***Only with Development Consent***
   Any purpose other than those included in Item 2 or 4.

4. ***Prohibited***
   Advertising structures; advertisements; aerodromes; automotive uses; bulk store; cemeteries and crematoria; funeral parlours; generating works; industries (other than or home industries); junk yards; liquid fuel depots; mines; quarries; roadside stalls; sawmills; stock and sale yards; timber yards; brothels; tourist facilities (other than motels); transport terminals; warehouses.

SELECTED SPECIAL PROVISIONS FROM THE LAKE MACQUARIE LEP 1984 (as amended)

Subdivision of land, generally

11. (1) A person shall not subdivide any land without the consent of the Council.

(2) In respect of any application for the subdivision of land, the Council may as a condition of consent require the provision of an electricity reticulation system satisfying the requirements of energyAustralia, including the provision of sites for electricity substations and easements for access and electricity mains in favour of and without cost to energyAustralia.

Height of buildings

14. A person shall not erect a building which exceeds 9 metres in height without the consent of Council.

Floor space ratios

15. (1) Except as provided by subclause (2), a person shall not erect any building on land within a zone specified in Column 1 of the Table to this Clause unless the ratio of the gross floor area of the