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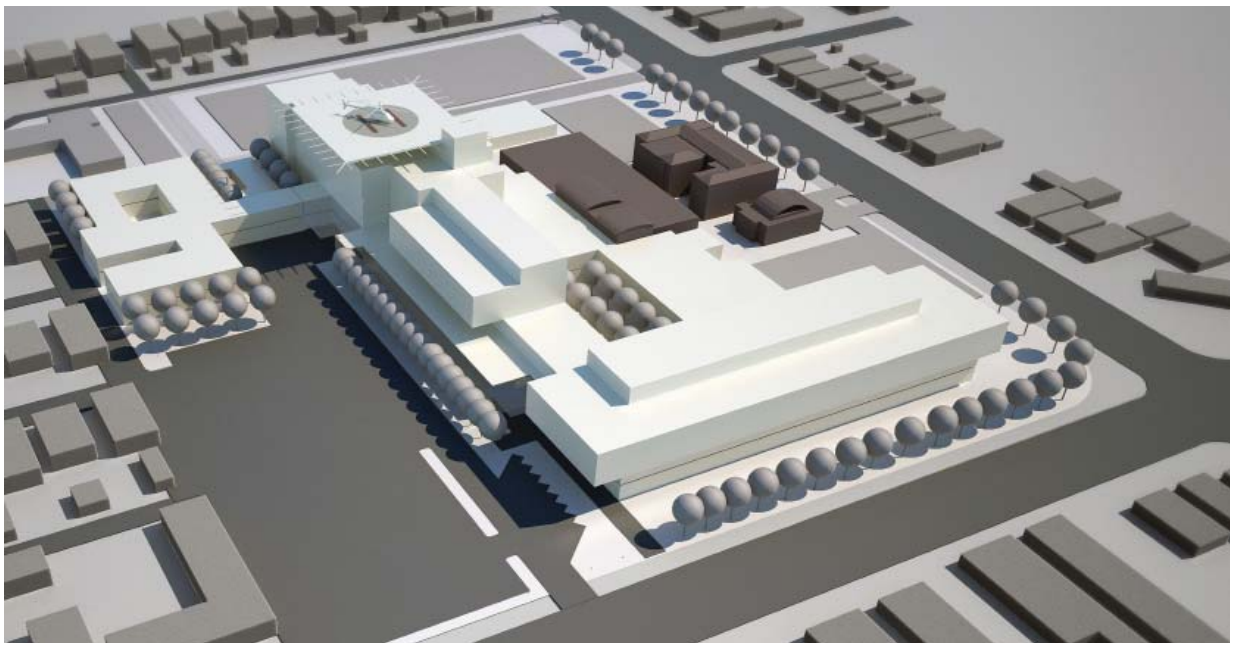
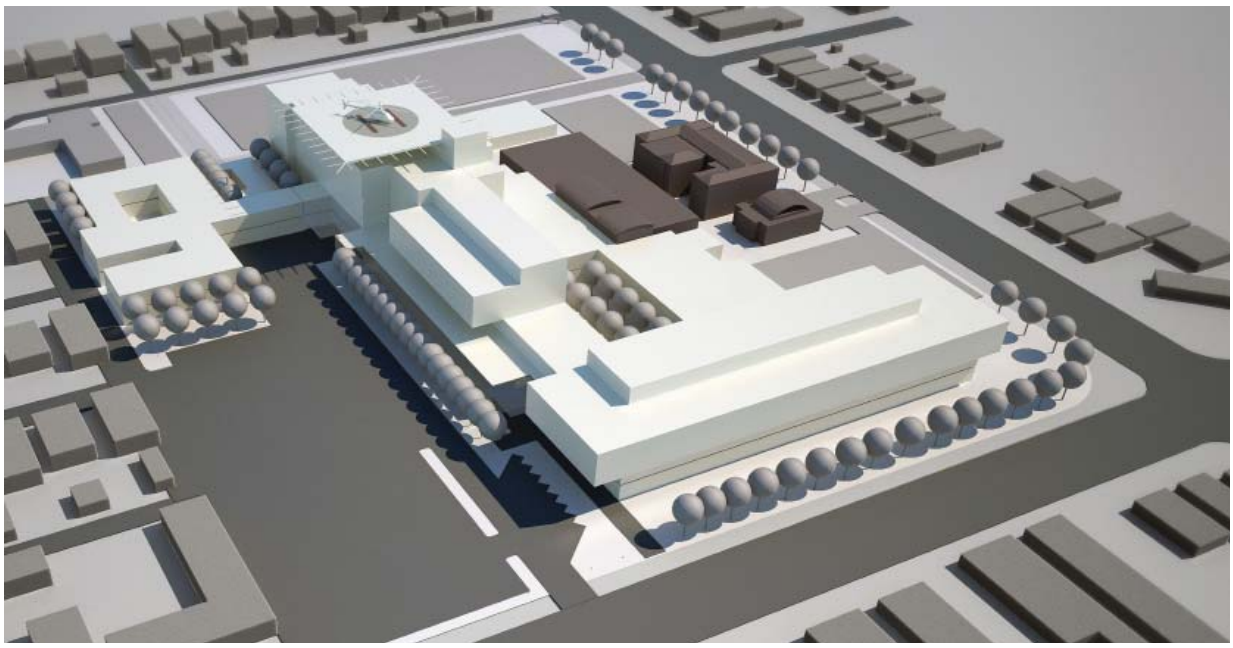


APPENDIX J

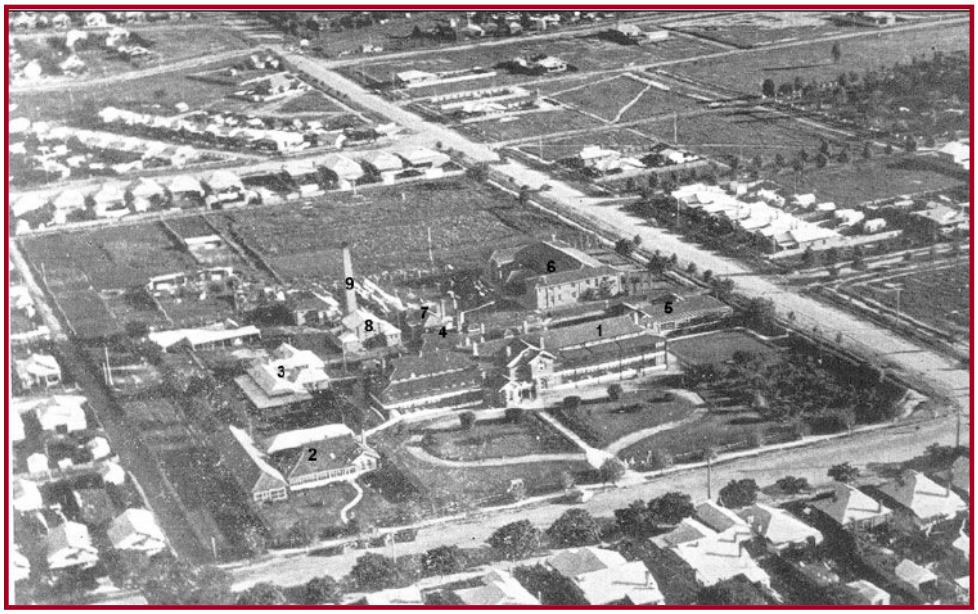
Archaeological Assessment



WAGGA WAGGA BASE HOSPITAL

BASELINE ARCHAEOLOGICAL ASSESSMENT

FOR WEIR PHILLIPS



Aerial Photograph of Wagga Wagga Base Hospital, 1943

January 2011

AHMS

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CONTENTS

EXECUTIVE SUMMARY

- In August 2009, Weir Phillips Architects engaged Archaeological and Heritage Management Solutions Pty Ltd (AHMS) on behalf of NSW Health Infrastructure to undertake a baseline Aboriginal and Historical Archaeological Assessment of the Wagga Wagga Base Hospital;
- The report was completed in December 2009, and has now been updated to address revisions to the development proposal;
- NSW Health Infrastructure is proposing to upgrade the Wagga Wagga Base Hospital requiring a combination of the construction of new buildings, upgrade of some existing structures, new landscaping and car parking and the installation of services.

Aboriginal Archaeology:

- A review of previous archaeological investigations of the Wagga area and the geographic context of the site indicate it is likely that the site contains low to moderate potential to retain intact evidence of past Aboriginal occupation. Where present, this evidence is most likely to be seen in the form of stone artefacts, found either singly (as isolated finds) or as scatters across the landscape (e.g. open camp sites);
- No Aboriginal sites or places are known to be present within the study area;
- The results of an inspection of the study area revealed the entire hospital landscape has been disturbed by previous activities associated with the hospital. This was evident in the lack of original vegetation present; and the homogenized nature and general disturbance of topsoils expected to a depth of approximately 150 mm across the Study Area. This is relevant as topsoil is most likely to retain evidence of past human occupation and disturbance to its integrity will affect the archaeological research values of any stone artefact deposits present;
- This assessment was not a full Aboriginal archaeological Assessment and did not include consideration of cultural heritage values of the site for the local Aboriginal community. Prior to development it is recommended that the local Aboriginal community be consulted to determine whether the subject land has any Aboriginal cultural significance.

Historical Archaeology:

- The study area does not appear to have been used for Non-Indigenous (pre-hospital) purposes prior to its acquisition in 1907 for the establishment of

the new Wagga Wagga Base Hospital. It is likely to have been used for intermittent grazing prior to its acquisition for the hospital;

- From its opening in 1910, the hospital was almost constantly in need of modifications, improvements and additional buildings in order to satisfy the demands of the local and regional population;
- Historical archaeological resources relating to previous hospital structures and features are likely to survive at Wagga Wagga hospital site. There is no likelihood of historical archaeological features prior to the hospital occupation;
- The historical archaeological resources across the Study area have been significantly disturbed by successive phases of hospital modification, demolition, landscaping and building. This has comprised the integrity and archaeological research value of this resource. In addition, the resource is considered on the whole to be 'marginal' because in most instances, detailed records of the hospital's development exist;
- There is some potential for the remains associated with Rawson House to provide detailed information not currently known or available, and which would add to the corpus of information and understanding about the hospital; and
- While the proposed new development will impact the historical archaeological resource, investigating and recording it archaeologically would appear on the whole to be redundant and unwarranted on archaeological research grounds. This is because (with the exception of Rawson House) the resource has limited potential to provide additional information to that already available for the hospital.

Recommendations:

- On the basis of this report, no further formal archaeological investigation prior to development is warranted for Aboriginal archaeological constraints for the site prior to the proposed hospital upgrades because the study area has been heavily disturbed by continual construction and development of the site over time;
- Because this study only considered Aboriginal archaeological values, it is recommended that, prior to development, the local Aboriginal community is consulted to determine whether the subject land has any Aboriginal cultural significance;
- On the basis of this report, no further formal historical archaeological investigation is required prior to development. While the proposed development would eventuate in direct historical archaeological impacts, the historical archaeological resource (with the exception of Rawson House)

is of little research value and its investigation and recording prior to disturbance does not appear warranted; and

- There are some grounds, however, to photographically record any remains associated with Rawson House (shown in **Figure 14** of this report) during site works should they indicate the internal configuration of the building.

1. INTRODUCTION

1.1 Background

In August 2009, Archaeological and Management Solutions Pty Ltd (AHMS) was engaged to undertake a baseline Aboriginal and historical archaeological assessment of the Wagga Wagga Base Hospital at Docker and Edward Streets, Wagga Wagga, NSW (**Figures 1 and 2**). The report was completed in December 2009, and has now been updated to address revisions to the development proposal.

NSW Health Infrastructure proposes to redevelop the hospital. This will include a series of new buildings, demolition of most of the existing structures and services and upgrade of retained structures. New car parking areas and new landscaping are also proposed.

The archaeological assessment has been prepared to inform a broader heritage impact assessment of the proposal by Weir Phillips Architects. In turn, the broader assessment will form part of the Environmental Assessment (EA) for the hospital redevelopment project which is subject to Part 3A of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

This report presents the results of the baseline archaeological assessment. It does not include a formal Aboriginal Heritage Impact Assessment (AHIA) in accordance with NSW Department of Environment, Climate Change and Water (DECCW) guidelines, or Aboriginal community consultation in accordance with DECCW guidelines.[1] Nor does the report include a formal Historical Archaeological Assessment prepared in accordance with the Heritage Branch, Department of Planning (DOP), guidelines.

1.2 Aims and Objectives

Specific aims of the baseline archaeological assessment were to:

1. Identify known Aboriginal and historical archaeological elements and resources by searching relevant heritage registers and databases;
2. Undertake desktop research and initial site inspection to identify areas of potential archaeological heritage sensitivity and produce overlays to determine whether any previous occupation and use of the study area (including now non-extant previous hospital occupation and use) is indicated;

[1] DECCW, April 2010.

3. Identify potential archaeological constraints and opportunities, including whether or not detailed significance assessment is required to inform any future environmental assessment reporting.

As the project is subject to Part 3A of the EP&A Act, which 'turns off' the Aboriginal archaeological provisions of the *National Parks and Wildlife Act 1974* and the relics provisions of the *Heritage Act 1977*, the report it does not include a section explaining statutory constraints and requirements.

Previous reports, surveys and other pertinent studies, undertaken in the locality, were reviewed to determine the potential for Aboriginal/historical archaeological sites to exist within the Study Area. Some secondary sources were reviewed to identify any historical item/sites that may not be heritage listed (e.g. on the NSW State Heritage Inventory (SHI) or the NSW State Heritage Register (SHR) or on non-statutory registers like the National Trust of Australia (NTA) Register).

1.3 Report Outline

The report follows the following structure:

Section 1 – Introduction and Background

Section 2 - Aboriginal Archaeology Baseline Assessment

Section 3 - Historical Archaeology Baseline Assessment

References

Appendix 1 – AHIMS Search Results

1.4 Authorship and Acknowledgements

The baseline assessment was drafted by Lisa Newell, Associate Director, AHMS with the assistance of Laura Matarese, Consultant, AHMS. The historical information was provided by Alice Fuller, Heritage Consultant, Weir Phillips Architects and Heritage Consultants.

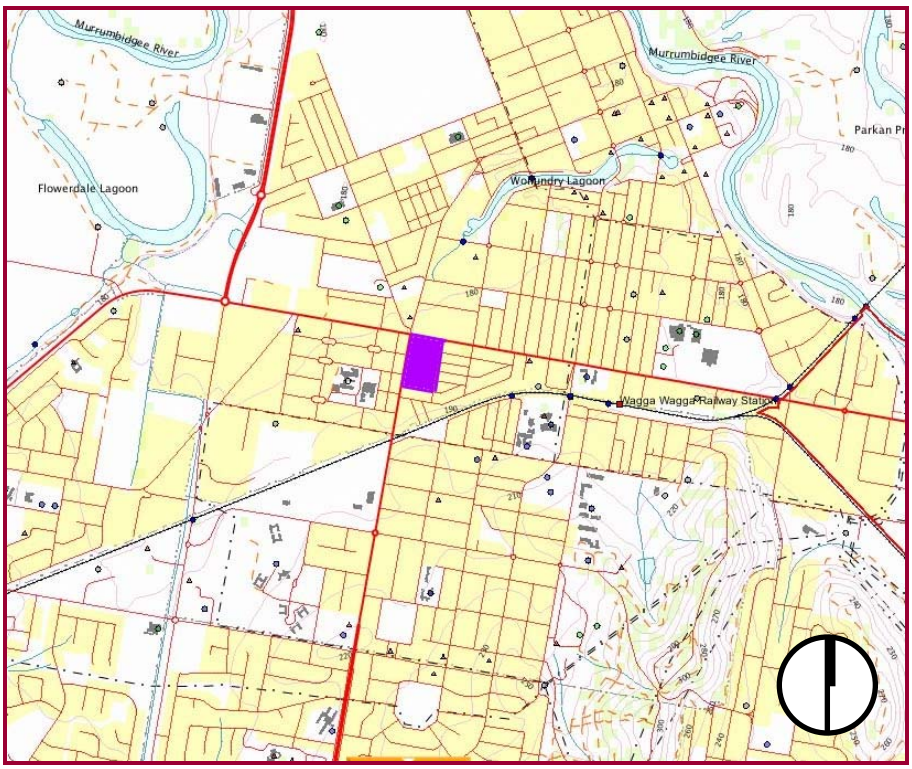

Figure 1: General Location of Study Area within Wagga Wagga (study area coloured purple).

Figure 2: Location of Study Area (outlined in red).

2. ABORIGINAL ARCHAEOLOGY

2.1 Regional Archaeological Context

The study area is located on the Murrumbidgee River Plain. The archaeology of this area has been recorded irregularly, with most studies relating to housing developments or small infrastructure developments/upgrades.

There is general consistency in the types and distribution of archaeological sites identified in this region with those found throughout eastern Australia. The distribution, density and size of sites are largely dependent on environmental context. For instance, middens are found in close proximity to marine, estuarine and less often, freshwater bodies. Rock shelters are only found in areas of exposed sandstone escarpments, and grinding grooves are found in areas of exposed flat beds of sandstone.

During a series of surveys on the Murrumbidgee River Plain, Witter[2] formulated a site distribution pattern which suggested that:

- Artefact scatters, mounds, scarred eucalypt trees and cypress pines with torch bark scars tend to occur near major flood channels;
- Scarred eucalypt trees, fired clay hearths and artefact scatters may occur near minor flood channels and temporary swamps, especially when sand features are present; and
- Isolated artefacts of flaked or abraded stone and scarred eucalypt trees may be found scattered across the plains.

Investigations carried out since Witter's study have tended to confirm the patterns described above. Environmental and topographic context is an important determinant of the size and nature of archaeological sites in the Wagga region and across the Murrumbidgee Plain. The most commonly reported pattern in the region is scatters of stone artefacts (either isolated finds or open camp sites) found near watercourses. Surveys and excavations carried out within the Wagga region[3] have revealed that quartz is the dominant raw material found amongst the stone assemblages. However quartzite, chert and silcrete are also occasionally represented.

[2] Witter, 1982a, 1982b.
[3] Kelly, 1980; Silcox, 1986; Navin Officer, 1998; Navin Officer, 2002; as cited in AHMS 2008.

2.2 Local Archaeological Context

Most previous archaeological investigations in the Wagga area have been carried out to satisfy impact assessment requirements for development. Archaeological excavations and surveys have been carried out in Gumly Gumly[4]; along the Wagga Wagga to Darlington Point transmission line[5] and along the Wagga Wagga to Wodonga natural gas pipeline[6]. These investigations were carried out on a variety of landforms on the margins of wetlands or Murrumbidgee River floodplain and tributaries. In short, the majority of investigation sites were located near water sources. Artefacts were recovered on most landforms and predominantly consisted of low density stone artefact scatter sites exposed by erosion or soil disturbance.

The results of the previous archaeological excavations and surveys have been used to develop a model that explains and also predicts the location and distribution of Aboriginal occupation across the landscape. The most common patterns reported in the Wagga area include:

- Sites are located adjacent to watercourses, particularly within 100 metres of permanent streams; and
- Sites are located on flat elevated locations, particularly on ridges and crests.

Each of the patterns described above is supported by the results of test excavation on at least one or more sites in the Wagga area. Therefore any of these patterns may also apply to landforms within the current study area. The local excavations also generally report silcrete and tuff as the dominant local stone types used for making artefacts.

2.3 Known Aboriginal Sites

For the purposes of Aboriginal heritage background research, searches of the following databases were undertaken: Local Environmental Plans (LEP), the State Heritage Register, the Native Title Tribunal website, and the DECCW Aboriginal Heritage Information Management System (AHIMS).

The DECCW AHIMS search was carried out (on 1 September 2009) for sites within a 5km radius of the study area to ascertain the types of sites that could be expected in the area. No sites were listed in this area (**Appendix 1**).

The study area falls within the municipality of the Wagga Wagga City Council, which has no Aboriginal heritage items listed on its Local Environmental Plan or

[4] Silcox, 1987.
[5] Hiscock, 1983, as cited in AHMS 2008.
[6] Navin Officer, 1998.

Development Control Plan. Nor were any items listed in the area on the NSW State Heritage Register. The search of the Native Tribunal website (on 28 July 2009) established that there are currently no Native Title claims active in the Study Area.

2.4 Predictive Model

The topography and distribution of natural resources near the study area generally indicates a potential for:

- Stone artefact deposits within intact topsoils below current ground;
- Surface scatters of stone artefacts in areas of soil exposure caused by erosion;
- Isolated finds anywhere across the landscape; and
- Cultural scarring on old growth trees.

In particular, it is predicted that in-situ open artefact scatters may be found buried below current ground surfaces in areas where intact topsoil (i.e. A-horizon soils) remains.[7] In areas where A-horizon soils have been removed or substantially disturbed by erosion or land uses (as at the hospital site) it is unlikely that in-situ sub-surface deposits remain. Isolated finds may be found anywhere across the landscape, a pattern that holds true throughout NSW. There is also no potential for rockshelter sites, axe grinding grooves or rock engravings because the study area does not contain outcropping bedrock.

Previous investigations throughout the Wagga region indicate a high density of sites in association with fresh water drainage lines, particularly along larger (higher order) creeks and rivers. Reports also indicate high densities of sites are found on the fringes of wetlands and on flat elevated landforms.

In summary, the results of previous archaeological investigations in the Wagga area and the geographical context of the site indicate the study area falls within an area of low-moderate archaeological potential.

2.5 Site Inspection

An inspection of the study area was carried out on the 10th of September 2009 by Lisa Newell, Associate Director, AHMS (see **Figures 3 and 4**).

The study area is in a relatively elevated location within an entirely urban landscape and appears to have been 100% disturbed through previous hospital uses. No Aboriginal sites or objects were found during the inspection. There was no

[7] This is because topsoil has the potential to contain stone artefacts.

evidence of original vegetation and no evidence of endemic old growth trees. There were no areas where natural soil profiles were exposed or visible.

Hospital uses including sequences of major building construction, services and landscaping over the past 100 years, have most likely resulted in the upper soil horizon (A-horizon) across the site being thoroughly disturbed. Hospital use and major construction activities are likely to have disturbed and homogenised the remnant A-horizon profile to a depth of at least 150 mm below current ground. Any Aboriginal artefacts within the homogenised soils would have been vertically and probably horizontally displaced, compromising the stratigraphic integrity and scientific research value of any such deposits.

The landscape disturbances described above have most likely removed or disturbed portions of original topsoil across the study area. Original topsoil is of interest within erosional soil landscapes because Aboriginal cultural deposits are found within topsoil but are not usually found within the (lower) sub-soils. The precise extent of disturbance caused to original topsoils could not be determined during the survey, primarily because soil exposures were limited.

The following conclusions regarding site disturbance have been made based on survey observations:

- Across the entire site, the majority of original vegetation has been removed. The process of vegetation clearing (especially removal of tree roots) and resultant construction activities has significantly disturbed original topsoils. Aboriginal objects within the affected soils would have been upturned; and
- Previous land uses would have disturbed remnant original topsoils to a depth of approximately 150 mm. The stratigraphic integrity of any of the Aboriginal objects located within this 'disturbance zone' would have been compromised.

Figure 3. View facing South across the Edward Street lawn, showing lack of original vegetation and homogenized nature of the landscape.

Figure 4: Approximate location of the former Rawson House facing Edward Street.

2.6 Conclusions and Recommendations

No Aboriginal sites or objects were identified during the survey, therefore there are currently no direct constraints on development of the site with regard to Aboriginal heritage.

In the event that no Aboriginal sites or objects are found during a site inspection (as in the case for the current study area), an assessment of archaeological potential, based on our understanding of local archaeological patterns and our assessment of landscape and soil disturbance occurs.

Conclusions

In regards to archaeological potential, the following conclusions can apply:

- Archaeological patterning in the Wagga area and across the Murrumbidgee Plains indicates the subject land (prior to hospital uses) would have had low to moderate archaeological potential. This assessment is based on its relatively flat, elevated landform. Previous archaeological investigations in the Wagga area have shown that landscapes similar to this have low to moderate archaeological potential;
- The original topsoil across the study area has been significantly disturbed by past land uses, compromising the integrity and archaeological research values of any stone artefact deposits present within affected soils. In-situ artefact deposits are unlikely to occur, however, there remains some likelihood of isolated artefacts surviving in disturbed contexts.

Recommendations

- No further formal archaeological investigation is required prior to development based on the results of this survey. In our opinion there are no direct Aboriginal *archaeological* constraints on the proposed hospital upgrade because the development will not involve physical disturbance of any known Aboriginal sites or potential archaeological deposits (PADs);
- Our current investigation was limited to an assessment of archaeological potential and did not consider Aboriginal cultural values. Prior to development it is recommended that the local Aboriginal communities be consulted to determine whether the subject land has any Aboriginal cultural significance;
- Given that there remains some likelihood that isolated artefacts may be exposed, disturbed, discovered or excavated during development works, local Aboriginal communities should be consulted to determine how they may wish the artefacts to be retrieved, recorded and collected.

3. HISTORICAL ARCHAEOLOGY

3.1 Summary History

The historical summary provided in this report is based on a detailed history of the site and its historical and geographical context completed by Weir Phillips Architects and Heritage Consultants.

The Weir Phillips history (paraphrased) notes that:

The history of the subject site during the late nineteenth century is difficult to determine without a full title search. Parish maps indicate that the subject site was part of a 40 acre parcel of land owned by T. Byrnes, who also owned the adjoining 40 acres (**Figure 5**). Parish maps of this period do not show structures. In July 1885, 5 acres of Byrnes 40 acre lot was resumed for a gaol site (14 July, 1885). The land would never be used for this purpose.

In 1906 the Department of Justice agreed to surrender the 5 acre lot previously part of Byrne's parcel. The lot was by then located in Edward Street and was dedicated as a Hospital Site on 3 January, 1907. The first improvements to the new Edward Street site were made in August 1907, when trees were planted around the site and a substantial fence was erected. On the main Albury Road (later Bourke Street), a windbreak was planted to protect the site from the strong westerly winds and from dust.

By 1910, the site included the main hospital (the eastern wing of the current building), the original Nurses Quarters (separate building to the front and east of the main building), a mortuary and several outbuildings (**Figure 6**). The need for additional buildings was met in early 1916 with the construction of an additional brick building consisting of additional wards, day, duty and nurse's rooms. A western wing with a dedicated Children's Ward on the upper floor, was also completed by September 1922 (**Figure 7**).

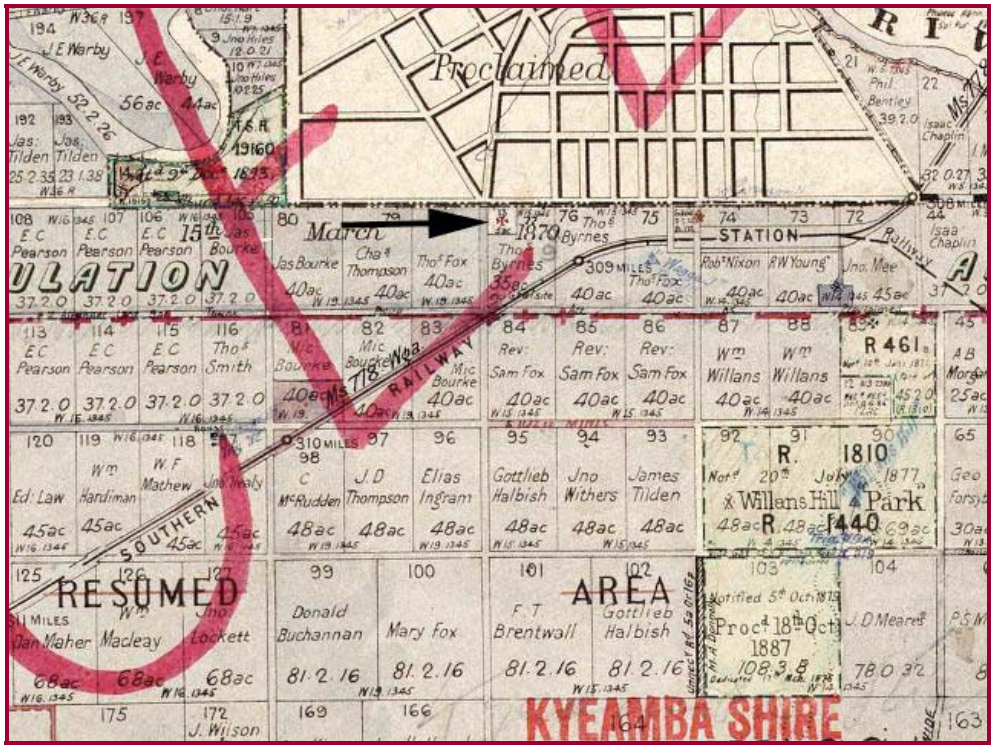

Figure 5: Detail from a Plan of Wagga Wagga, Parish of Wynyard. (NSW Department of Lands, 1889) (The site is indicated by the black arrow).

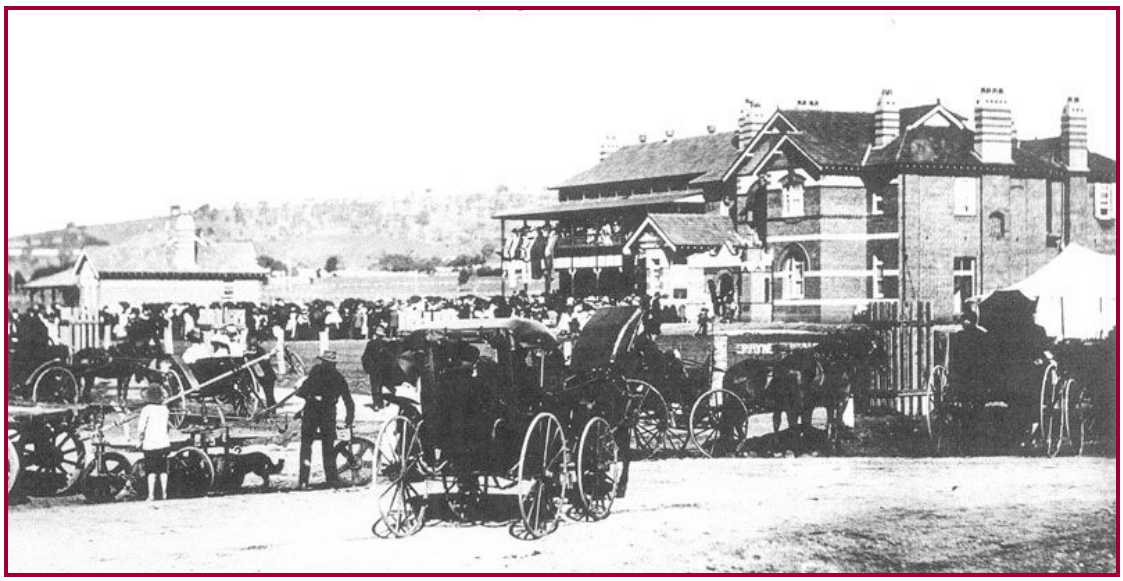

Figure 6: Official Opening. The building to the front of the Hospital is the Nurses Quarters (Morris, 1988).

Figure 7: The Hospital after the addition of the second wing (Morris, 1988)

Further works included extensions to the original nurse's home known as Rawson House (1918 and 1924), and a new nurse's home in 1936 facing Albury Road, later Docker Street (now the UNSW Building). Following completion of the new nurse's home, the old nurse's home was converted into wards and a new pathology building opened to the rear of the main building, attached to the original morgue.

Sewerage, hot running water and electricity were gradually added from the 1920s onwards within the hospital buildings.

By 1943 the hospital had grown into a complex of buildings, services, and landscapes including a kitchen garden to the south of the site (**Figure 8**).

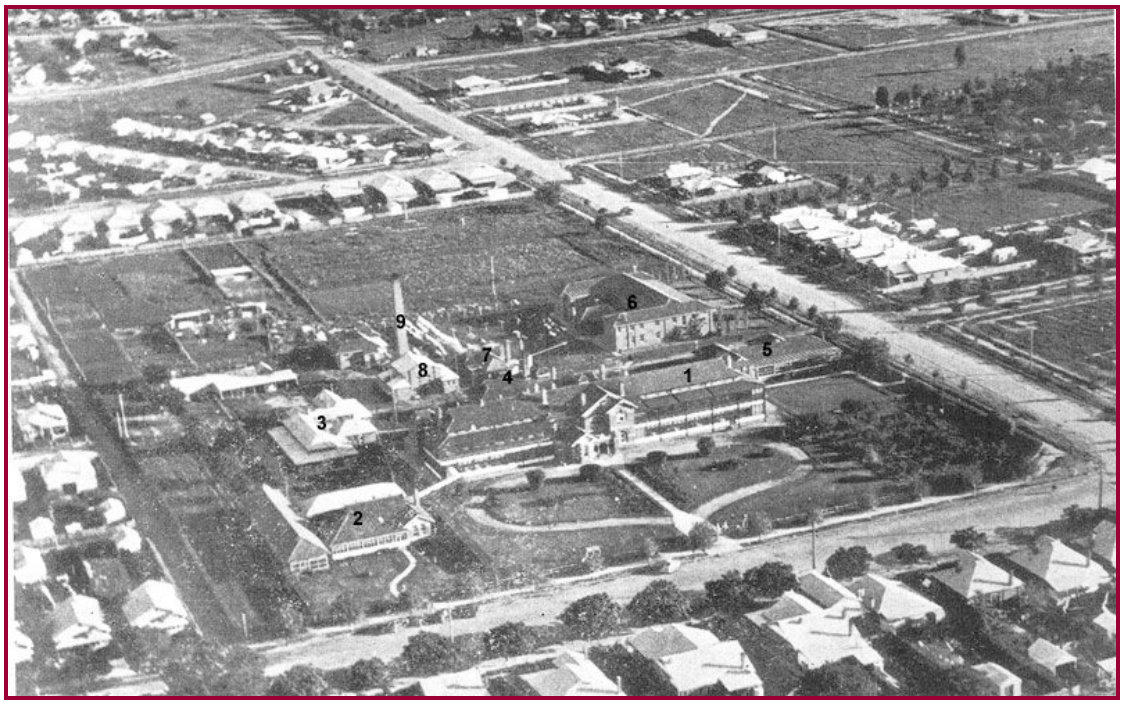

Figure 8: Aerial photograph of Wagga Wagga Hospital, 1943.
Key:
1. Main Building (now the Old Hospital Building)
2. Rawson House (private and intermediate wards)
3. Isolation Block
4. Kitchen and Staff Dining
5. Maternity Unit (later Robinson House)
6. Nurses Home (later Harvey House)
7. Laundry
8. Boiler House
9. Chimney Stack

Various further improvements occurred from 1943 including a new multi storey block to the south-east of the main hospital eastern wing (1963), a new nurse's home (1961) and training centre. In 1967 Rawson House was demolished to provide room for a car park.

Gardening and landscaping, seen in changing garden beds, trees, hedges and pathways were a part of the hospital from its commencement on the study site. The patterns of gardening seen in **Figures 7, 8 and 9** demonstrate changes over time within the hospital layout. These changes also indicate how the landscaping and gardens reflected the continual growth of the hospital where over time there was less need for gardens, more for buildings, and post war, for car parking.

Site Plans 1956 and 1988 below (Figure 9) indicate the extent of post war change, demolition of older buildings and improvement.

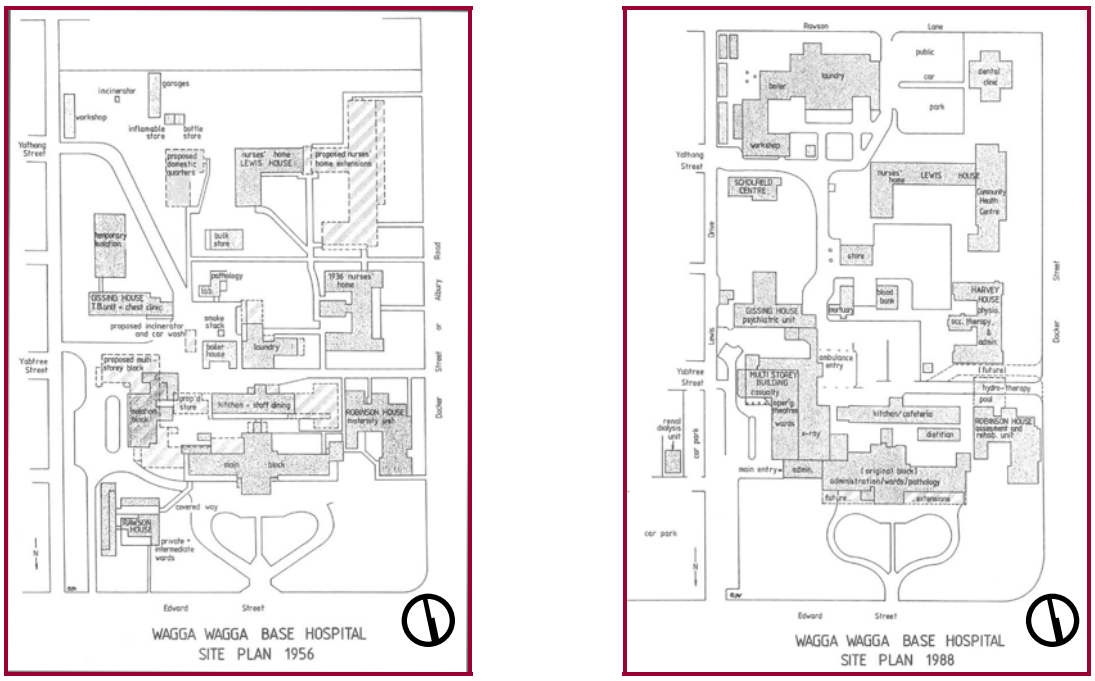

Figure 9: Hospital Site Plans dating from 1956 (left) and 1988 (right) (Morris, 1988).

3.2 Historical Archaeological Potential

The history of the site indicates that there is no potential for pre-hospital use historical archaeological resources to survive at the site. The site was unoccupied prior to hospital construction and is unlikely to have been used for specific land uses other than intermittent grazing. There is no record of any pre-hospital building on the site.

The history and the site inspection, however, indicate that there is considerable potential for historical archaeological resources related to the previous, now demolished hospital structures, services, landscaping and features to survive at the site. Most notable of these is Rawson House, the remains of which are likely to be retained fairly well intact to the front of the eastern wing of the main hospital building. Other areas of historical archaeological potential include the site of the previous boiler house and laundry (to the rear of the kitchen/cafeteria), previous road and garden arrangements throughout the site and disused services such as pipes, sewer, etc.

It is noted that successive phases of modification and construction at the site would have disturbed, truncated and/or destroyed most of the integrity of the potential archaeological resources and that the site is well documented. This indicates that while there is a high potential for retained historical archaeological

resources related to hospital use, the archaeological resource has been disturbed and would be unlikely to contribute to a greater understanding of the hospital's growth, development and change over time.

The one area of exception is Rawson House, the archaeological remains of which may have been retained largely intact (**Figure 4**). This structure appears not to have been recorded in any detail and information about it and its use do not seem to have been retained in public records. This information may be retained in the archaeological record.

Figure 10 below indicates the location of the Rawson House archaeological remains (light blue) relative to current structures and features at the site.

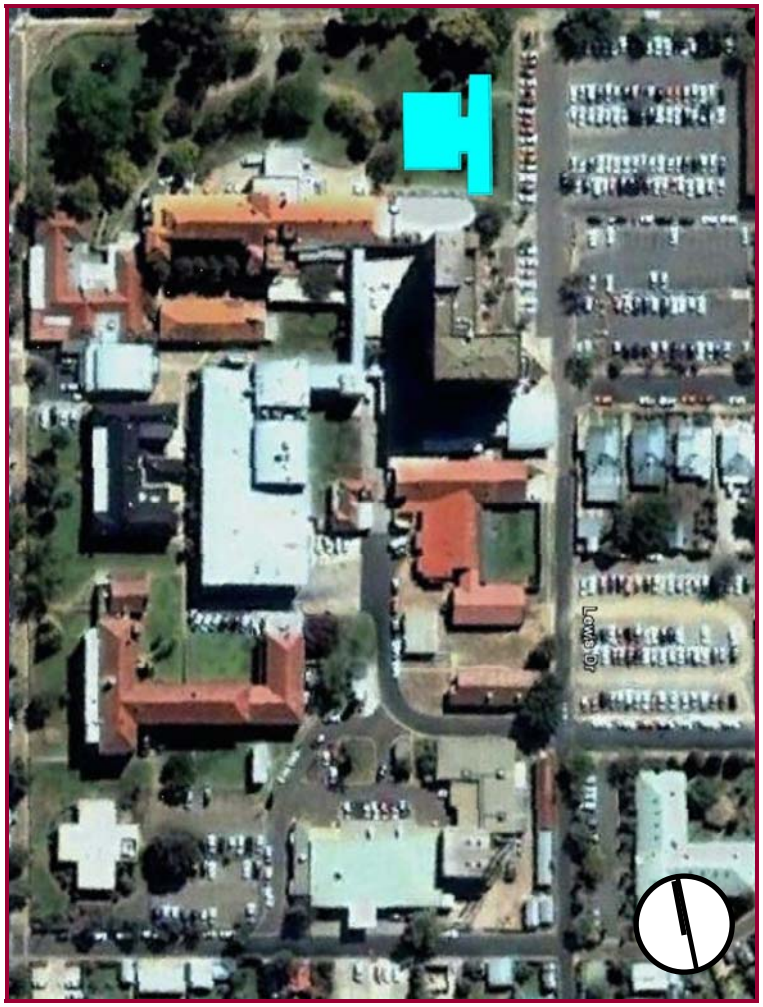

Figure 10: Image in Blue indicates the location of the former Rawson House (light blue) within the Wagga Wagga Base Hospital site.

3.3 Impacts

Overlays of the 1956 plan of the Wagga Wagga Base Hospital with the footprint of the proposed new works (**Figures 11 and 12**), indicate that nearly all current buildings and historical archaeological resources will be impacted by the proposed new works. This includes the remains of Rawson House which would be disturbed to make way for the proposed new Ambulatory Care and Health Information buildings.

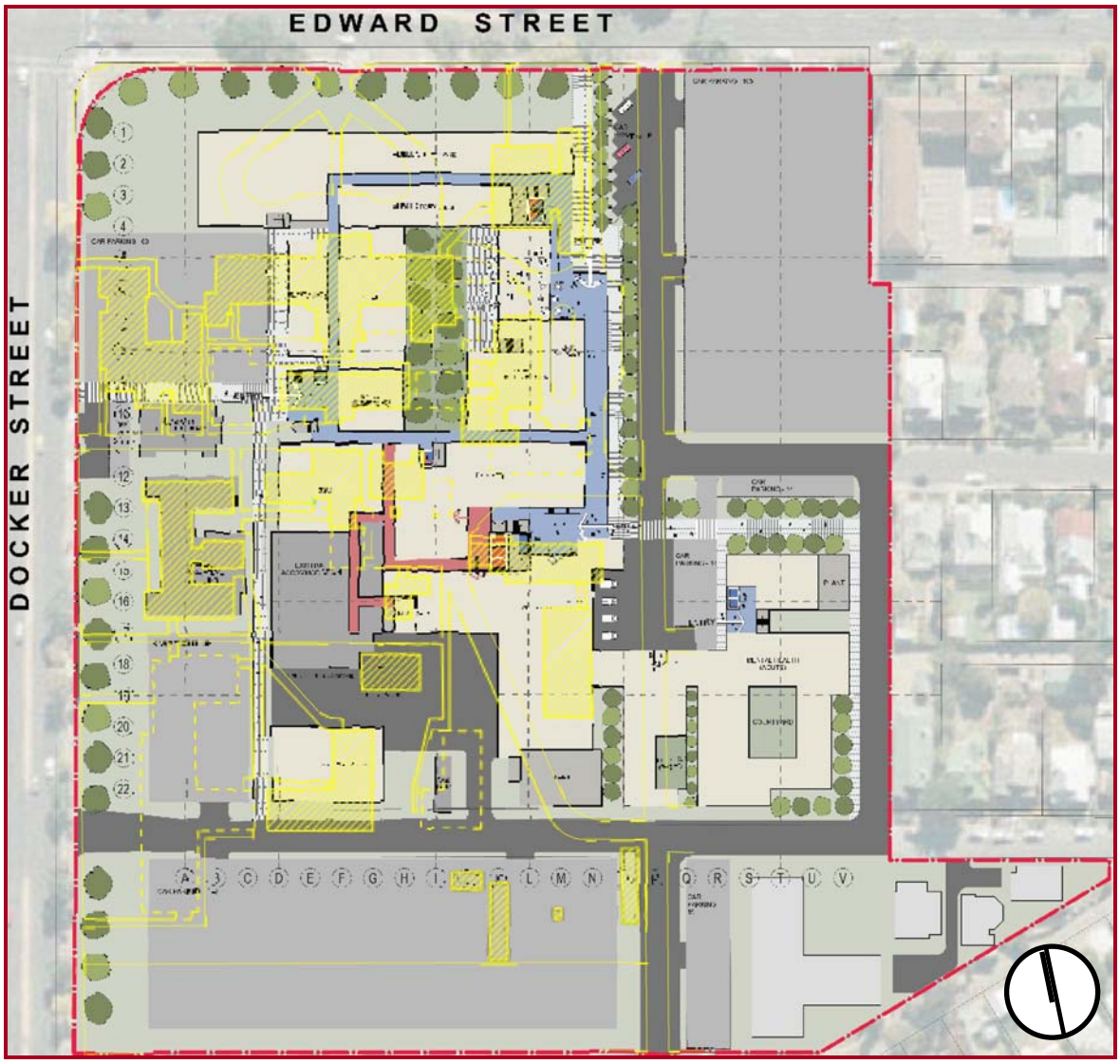

Figure 11: Overlay of the 1956 Wagga Wagga Base Hospital (yellow) over proposed development plan.

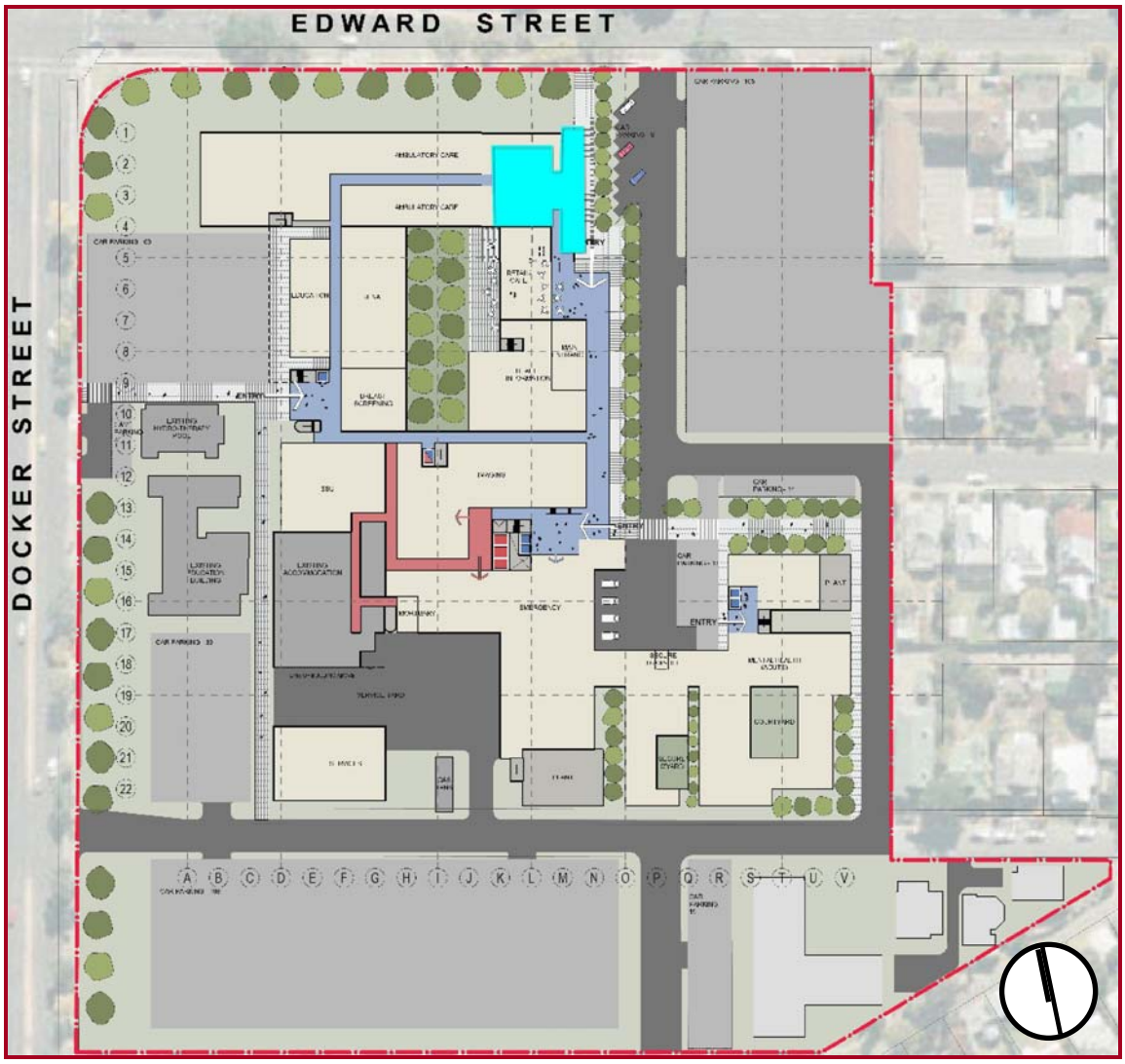

Figure 12: Location of Rawson House site (light blue) in relation to proposed development plans.

In particular, remediation and broad site preparation works such as grading, drainage and services, are likely to disturb most historical archaeological remains.

Notwithstanding that most historical archaeological features and resources would be impacted and most probably destroyed by the proposed works, it is not considered a sufficiently adverse impact in heritage terms to warrant re-design or mitigative action such as archaeological recording, investigation or excavation. This is because there are detailed records relating to the site, most of the historical archaeological resources (with the exception of Rawson House) have been previously impacted and its retention or investigation would not offer any further information to that already known and recorded.

3.4 Conclusions and Recommendations

Conclusions

In regards to historical archaeological potential, the following conclusions can apply:

- Historical archaeological resources relating to previous hospital structures and features are likely to survive at the Wagga Wagga hospital site. There is no likelihood of historical archaeological features prior to hospital occupation;
- The historical archaeological resources across the study area have been significantly disturbed by successive phases of hospital modification, demolition, landscaping and building. This has compromised the integrity and archaeological research value of the resource. In addition, the resource is considered on the whole to be 'marginal' because records exist about the history of the development of the hospital site;
- While the proposed new development will impact the historical archaeological resource, investigating and recording it archaeologically, because of its limited potential to provide additional information to that already available in historical material, would appear redundant and unwarranted on archaeological research grounds; and
- There is some potential for the remains associated with Rawson House to provide detailed information not currently known or available, and which would add to the corpus of information and understanding about the hospital.

Recommendations

- No further formal historical archaeological investigation is required prior to development based on the results of this survey. While the proposed development would eventuate in direct historical archaeological impacts, the historical archaeological resource is of little research value and its investigation and recording prior to disturbance does not appear warranted;
- There are some grounds, however, to photographically record any remains associated with Rawson House during site works should they indicate the internal configuration of the building as this information does not appear to be available through other resources or records.

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APPENDIX 1: AHIMS SEARCH RESULTS

Department of
Environment and Climate Change (NSW)

Your reference : Wagga Wagga / Lake Albert
Our reference : AHIMS #27119

Archaeological & Heritage Management Solutions Pty Ltd
349 Annandale Street
Annandale NSW 2038

Tuesday, 01 September 2009

Attention: Kris Gallen

Dear Sir or Madam:

Re: AHIMS Search for the following area at Wagga Wagga / Lake Albert;Zone: 55;E: 529940 - 536940;N: 6111278 - 6111935

I am writing in response to your recent inquiry in respect to Aboriginal objects and Aboriginal places registered with the NSW Department of Environment and Climate Change (DECC) at the above location.

A search of the DECC Aboriginal Heritage Information Management System (AHIMS) has shown that *0* Aboriginal objects and Aboriginal places are recorded in or near the above location. Please refer to the attached report for details.

The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.

The following qualifications apply to an AHIMS search:

- AHIMS only includes information on Aboriginal objects and Aboriginal places that have been provided to DECC;
- Large areas of New South Wales have not been the subject of systematic survey or recording of Aboriginal history. These areas may contain Aboriginal objects and other heritage values which are not recorded on AHIMS;
- Recordings are provided from a variety of sources and may be variable in their accuracy. When an AHIMS search identifies Aboriginal objects in or near the area it is recommended that the exact location of the Aboriginal object be determined by re-location on the ground; and
- The criteria used to search AHIMS are derived from the information provided by the client and DECC assumes that this information is accurate.

All Aboriginal places and Aboriginal objects are protected under the *National Parks and Wildlife Act 1974* (NPW Act) and it is an offence to destroy, damage or deface them without the prior consent of the DECC Director-General. An Aboriginal object is considered to be known if:

- It is registered on AHIMS;
- It is known to the Aboriginal community; or

PO Box 1967 Hurstville NSW 2220
43 Bridge Street Hurstville NSW 2220
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Facsimile (02) 9585 6094
ABN 30 841 387 271
ahims@environment.nsw.gov.au
www.environment.nsw.gov.au

- It is located during an investigation of the area conducted for a development application.

If you considering undertaking a development activity in the area subject to the AHIMS search, DECC would recommend that an Aboriginal Heritage Assessment be undertaken. You should consult with the relevant consent authority to determine the necessary assessment to accompany your development application.

Yours Sincerely

Gordon, David
Administrator
Information Systems & Assessment Section
Culture & Heritage Division
Phone: 02 9585 6513
Fax: 02 9585 6094

AHIMS

List of Sites (List - Short)

Lake Albert

Grid Reference Type = AGD (Australian Geodetic Datum), Zone = 55, Easting From = 529940, Easting to = 536940, Northing From = 6111278, Northing to = 6111935, Requestor Ilke 5210%, Service ID = 27119, Feature Search Type = AHIMS Features

Site ID	Site Name	Datum	Zone	Easting	Northing	Context	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)	State Arch. Box No (for office use only)

No Site Recorded

Number of Sites : 0

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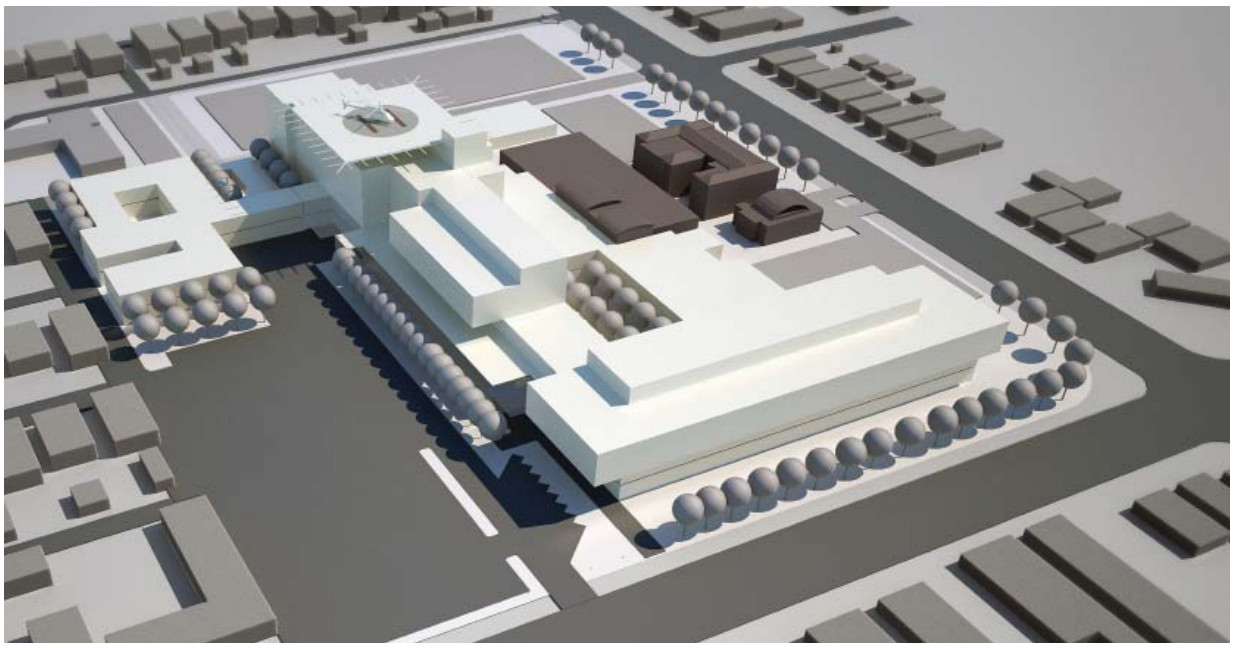
APPENDIX K

Helicopter Noise Assessment



ACOUSTICS AND AIR

WWBH MASTERPLAN DEVELOPMENT

HELICOPTER NOISE ASSESSMENT

REPORT NO. 09257-A
VERSION A

WILKINSON MURRAY

WWBH MASTERPLAN DEVELOPMENT

HELICOPTER NOISE ASSESSMENT

REPORT NO. 09257-A
VERSION A

MARCH 2011

PREPARED FOR

HEALTH INFRASTRUCTURE
C/O RICE DAUBNEY
77 PACIFIC HIGHWAY
NORTH SYDNEY NSW 2060

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Level 2, 123 Willoughby Road, Crows Nest NSW 2065, Australia • **Offices in SE Qld & Hong Kong**
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TABLE OF CONTENTS

GLOSSARY OF TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph overleaf, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

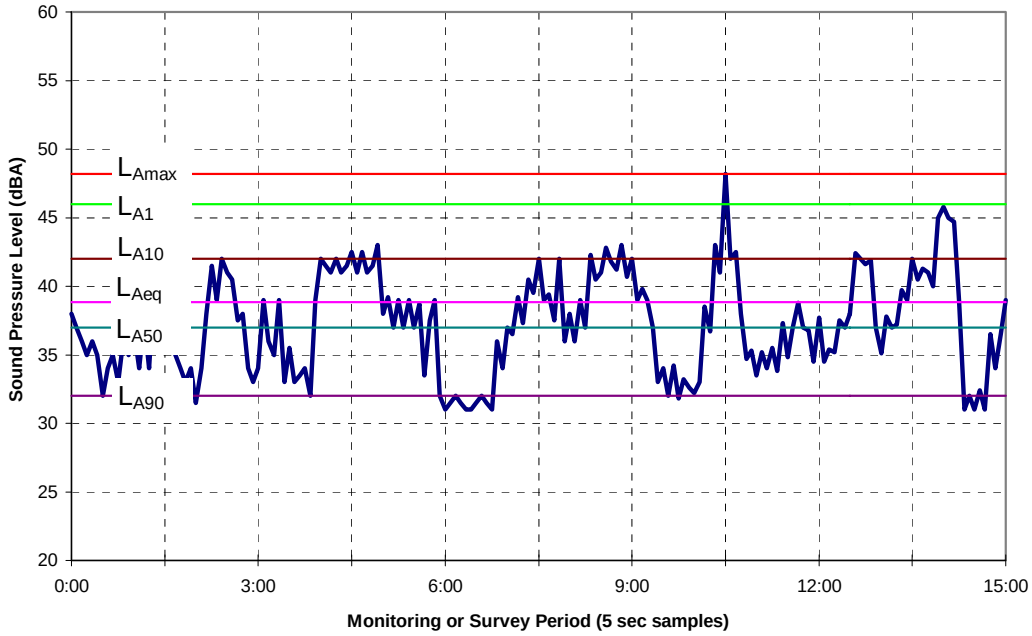
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period **–** daytime, evening and night time.


60
55
50
45
40
35
30
25
20
Sound Pressure Level (dBA)
LAmax
LA1
LA10
LAeq
LA50
LA90
0:00
3:00
6:00
9:00
12:00
15:00
Monitoring or Survey Period (5 sec samples)

EXECUTIVE SUMMARY

A new helipad is proposed as part of the Wagga Wagga Base Hospital Masterplan. The helipad would be located on the roof of the redevelopment. Currently helicopters transferring passengers to or from Wagga Wagga hospital use the Duke of Kent Park in South Parade, northwest of the hospital. There are also a number of fixed wing aircraft flights using Wagga Wagga airport for hospital patient transfers.

A variety of helicopters would use the helipad. The number of flights to the hospital would increase from 47 to 78 per year if the helipad were relocated to the hospital. This results from a forecast increase of 11 in helicopter flights to the hospital, plus an expected 20 fixed wing aircraft flights that are expected to convert to helicopter flights if the heliport were moved to the hospital.

Noise from the helipad and flight paths potentially affects residences surrounding the hospital and the hospital buildings themselves.

On-ground noise - that is noise from the helicopters standing on the helipad - is assessed according to the NSW DECCW *Industrial Noise Policy*. The daytime and evening goals are predicted to be met at all locations for noise from the proposed helipad. Exceedances of the night time goal would be predicted within approximately 200m of either the proposed or the existing helipad, with exceedances up to 15dBA at the closest residences to the helipads. Night time operations would not be frequent, and the noise nuisance would be of short duration.

There are no assessment criteria for noise from helicopters in flight. To assess the long-term noise levels of the helipads, the operating principles of Air Services Australia were considered. The principles indicate that noise levels less than $L_{Aeq,24hour}$ 40dBA would not be considered significant for planning flight paths, while levels of more than $L_{Aeq,24hour}$ 60dBA mean the area would be unacceptable for new residential development.

Noise was predicted using the US FAA's noise prediction software (INM). The predicted levels for long term noise indicate that:

- for the existing helipad the $L_{Aeq,24hour}$ would exceed 40dBA at approximately 7 houses;
- for the proposed helipad the $L_{Aeq,24hour}$ would exceed 40dBA at approximately 40 houses; and
- the noise would not exceed the $L_{Aeq,24hour}$ 60dBA at any house for either helipad.

Note that this long-term $L_{Aeq,24hour}$ is due to very few noise events.

Flyover noise from helicopters at night has the potential to cause sleep disturbance. Night flights however would not be frequent and are only expected in an emergency with a possible frequency of 2 per month. While the new helipad is elevated, the maximum flyover noise levels at the ground are not significantly less than flights from the existing helipad. Flight paths to the east would cause similar noise impact (in terms of sleep disturbance events) for both helipads. Flight paths to the west from the existing helipad would cause fewer awakening events than from the proposed helipad, as the flight path is over industrial and recreational land.

At the proposed helipad, the flight path to the west would cause less noise impact in the event of an emergency night time flight.

Noise into the hospital itself can be controlled by suitable building elements and architectural design. A range of glazing options is proposed for various hospital areas.

In summary, flights to and from the proposed helipad would cause slightly greater noise impact than the existing helipad due to increased flight numbers and overflying more residents on flight paths to the west of the hospital.

1 INTRODUCTION

A new helipad is proposed as part of the Wagga Wagga Base Hospital Masterplan. Patients are transferred to and from the hospital by either helicopter or fixed wing aircraft. The majority of these movements are “scheduled” and occur during daytime hours, however a small proportion (approximately 15%) are emergency movements which occur at nigh time. Currently, helicopters use the Duke of Kent Park in South Parade, approximately 1km northwest of the hospital. Under the proposal, the helicopters would land on the roof of a four storey building at the hospital. As the proposed helipad is closer to the hospital with much easier transfer of patients, there would be an increase in the number of helicopter flights.

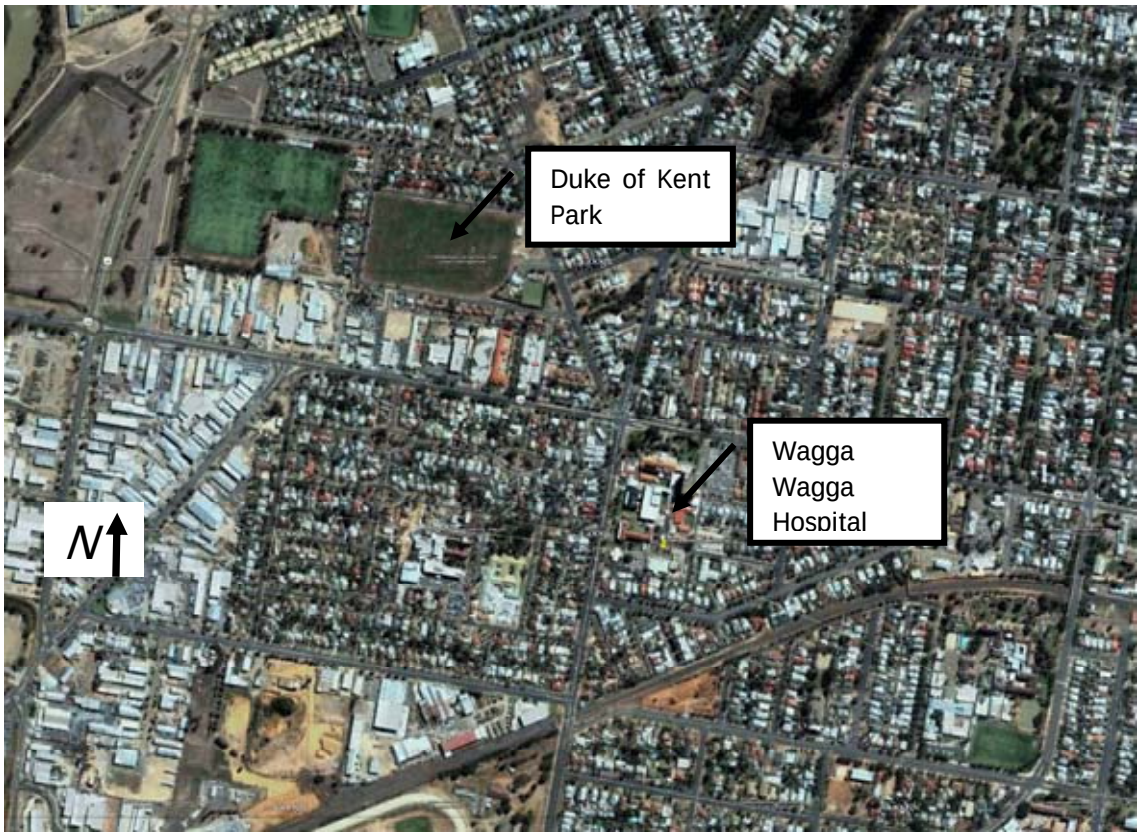
This report assesses noise from the helicopters, comparing the existing and proposed helipads and flight paths. Noise is assessed to residential neighbours, and into the hospital buildings.

2 DESCRIPTION OF THE PROPOSAL

2.1 Location

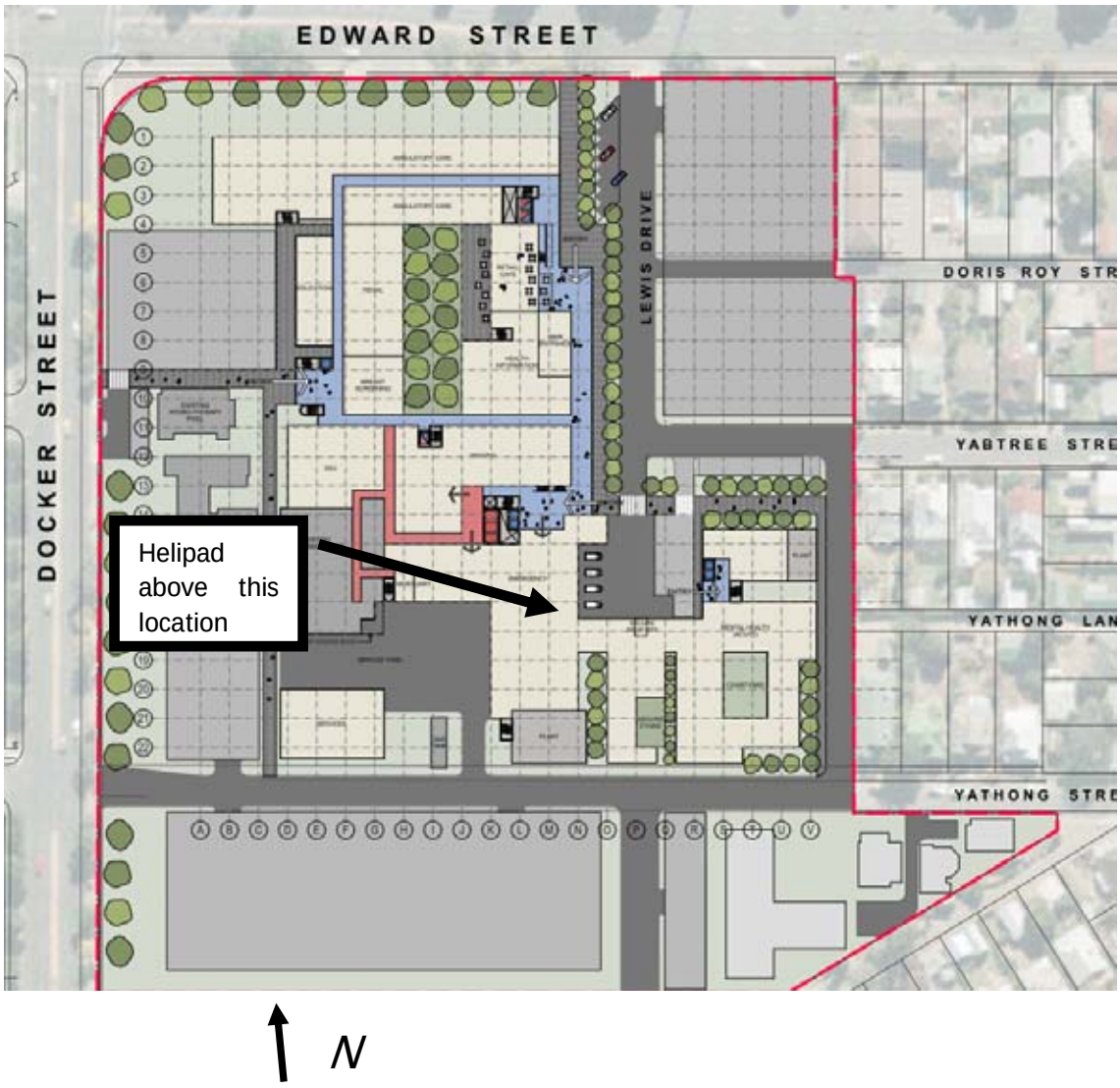
The location of the hospital and the existing heliport is shown on Figure 2-1.

Figure 2-1 Location of Hospital and Existing Heliport



A plan of the ground floor of the hospital is shown on Figure 2-2 showing also the location of the helipad.

Figure 2-2 Ground Floor of Proposal



2.2 Sensitive Receivers

There are residential receivers surrounding Wagga Wagga Base Hospital. As well as these residences, noise from the proposal has the potential to impact on the hospital itself, and other commercial premises in the neighbourhood.

Duke of Kent Park has residences on the north, east and south sides. To the west are industrial estates and recreational land.

Noise will be discussed at the following locations representative of the residential areas. The locations are described in Table 2-1 and shown on Figure 2-3.

Table 2-1 Sensitive Receiver Locations

Location	Closest Helipad
1.Yathong Street	Proposed
2. Yabtree Street	Proposed
3. Norman Street	Proposed
4. Cnr Brookong Avenue and Sturt Highway	Proposed
5. Hardy Avenue	Proposed
6. Gormly Avenue	Proposed
7. Dwyer Avenue	Proposed
8. Bolton Street	Existing
9. North Parade	Existing
10. Turana Lane	Existing
11. Cnr South Pde and Shaw Street	Existing

Figure 2-3 Location of Sensitive Receivers

2.3 Helicopter Services

The following aircraft types currently use the existing helipad, and would use the proposed helipad. The helicopters are described in Table 2-2.

- Bell 412;
- Augusta Westland 139;
- EC145;
- BK117;
- AS365 N-N Dauphin;

Table 2-2 Helicopters

Aircraft	Description	Image[1]
Bell 412	Rotor diameter 14m 2 x 671 kW	
Augusta Westland 139	Rotor diameter 13.8m, 2 x 671 kW	
Eurocopter EC 145	Rotor diameter 11m, 2 x 550 kW	
MBB/Kawasaki BK117	Rotor diameter 11m, 2 x 410 kW	
Aerospatiale AS 365 N-N Dauphin	Rotor diameter 11.94m, 2 x 625 kW	

Note: 1. All images from Wikimedia Commons

The number of aircraft transfers to and from Wagga Wagga Hospital for 2008/2009 is given in Table 2-3 (data from Aeromedical and Medical Retrieval Services).

Table 2-3 Air transfer services to and from Wagga Wagga, 2008/2009

Direction	Helicopter	Fixed Wing
To Wagga Wagga Hospital	11	Nil relevant
From Wagga Wagga Hospital	36	39

If the landing site remains at the oval then these numbers are unlikely to change significantly – i.e. 47 helicopter transfers per year. If the landing site moves to the hospital then potentially up to 50% of the fixed wing activity (20) will become helicopter activity and the use of Wagga Wagga hospital as a destination would potentially double (11) - giving a total of 78 helicopter transfers per year. Overall the frequency would increase from approximately one flight per week to one and a half per week.

Most flight transfers are scheduled and would take place between midday and midnight. Aeromedical and Medical Retrieval Services have provided the following based on historical data.

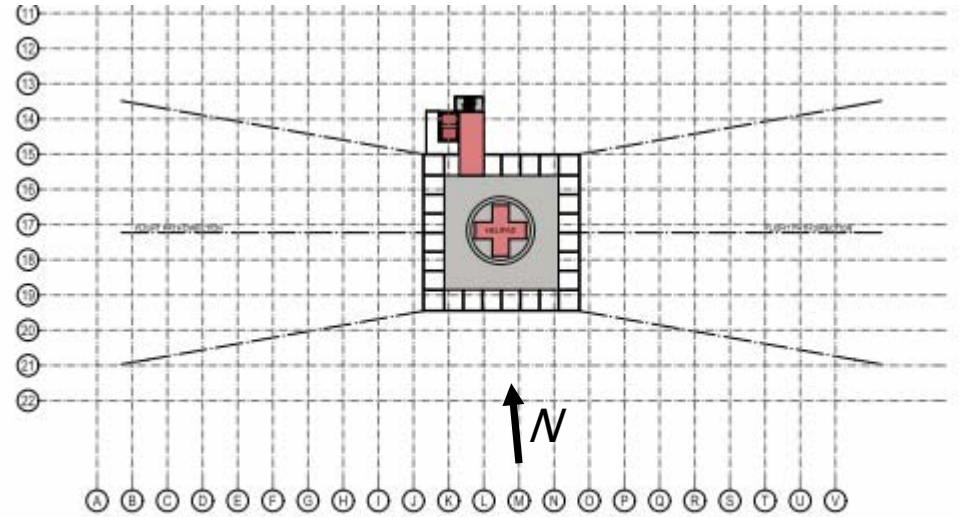
- 45% of helicopters arrive at Wagga between 0800 and 1800
- 25% arrive between 1800 and Midnight
- 30% arrive between Midnight and 0800

The number or emergency night flights would be approximately two per month.

2.4 Flight Paths and Sensitive Receivers

Figure 2-4 shows the proposed flight paths for the new helipad. They are WNW and ESE. For the purposes of comparison, the flight paths at the existing helipad were assumed to be parallel to these. The calculation of noise from helicopters in flight assumes that the aircraft continue straight along these flight paths at 1000ft above ground level before landing or after taking off.

Figure 2-4 Helipad on Level 7



3 ENVIRONMENTAL NOISE CRITERIA

3.1 Ground-Based Noise

3.1.1 Intrusive Noise Criteria

In assessing noise from the proposed helicopter operations, it is important to distinguish between noise generated while the helicopter is on the roof top helipad and noise generated while it is in the air. When the helicopter is on the helipad its noise should be assessed under guidelines promulgated by the NSW Department of Environment, Climate Change and Water (DECCW) in their *Industrial Noise Policy (INP)*. In this case, the most stringent of these criteria would be the "intrusiveness" criterion, namely that the $L_{Aeq,15min}$ noise level emanating from the premises should not exceed the Rating Background Level (RBL) by more than 5dBA.

Helicopter noise would generally require a 5dBA modifying factor to account for the characteristics of the noise, though this would depend on the aircraft. Also, because the aircraft would be on the helipad for a short period once in any one day, the criterion is adjusted to account for the duration of the noise. If it is assumed the helicopter is operating on the pad for between 1.5 minutes and 6 minutes, the criterion is increased by 15dBA for daytime and evening, and 5dBA for night time.

The background noise level has not been measured at the hospital. Estimates of the background noise were obtained from the Appendix of Australian Standard 1055 *Acoustics – Description and Measurement of Environmental Noise*. The estimated background levels for "areas with low density transportation", and derived noise criteria, are given in Table 3-1.

Table 3-1 Site Specific Noise Criteria for Ground Based Noise, $L_{Aeq,15min}$ dBA

Monitoring Location	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
Estimated Rating Background Noise Level	45	40	35
Duration Adjusment	15	15	5
Tonality Adjustment	-5	-5	-5
Intrusive Criterion Adjustment	5	5	5
Intrusive Noise Criterion – $L_{Aeq(15minite)}$	60	55	40

3.1.2 Sleep Disturbance Criterion

For movements occurring during night time hours, the possibility of sleep disturbance should be assessed. Sleep disturbance occurs when there are events with short duration but high noise level.

Sleep disturbance is typically assessed against guidelines from the DECCW's *Noise Guide for Local Government*, which recommends a criterion of L_{Amax} less than background plus 15dBA.

In this case, as helicopter flights start or finish at the helipad, the calculation of maximum noise levels from the helipad will be included in the calculation of maximum noise levels from flight. The assessment of sleep disturbance is therefore covered in Section 3.2.2.

3.2 Noise Generated in the Air

3.2.1 Long Term Noise Exposure

Noise produced while a helicopter is in the air is not regulated by the DECCW. There are no specific noise criteria relating to helicopter movements.

Air Services Australia has produced the document "*Environmental Principles and procedures for minimising the impact of aircraft noise*" (Revised 21 November 2002) which provides guidance on noise exposure of aircraft as follows.

"Upper and Lower Limits of Noise Exposure

Principle 5: *Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 $L_{eq\ 24}$ and there are less than 50 overflights per day.*

Principle 6: *No residential area should receive more than 60 $L_{eq\ 24}$, i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021."*

For the purposes of this review the impact of helicopter flyover noise has been assessed with respect to these noise goals.

3.2.2 Sleep Disturbance

No specific noise criterion applies to sleep disturbance associated with helicopters operating in the night period between 10.00pm – 7.00am. However, the DECCW's *Environmental Criteria for Road Traffic Noise (ECRTN)* provides the following guidance with respect to transportation noise and sleep disturbance.

- Maximum internal noise levels below 50 – 55dBA are unlikely to cause sleep awakening reactions.
- One or two noise events per night, with maximum internal noise levels of 65 – 70dBA, are not likely to affect health and wellbeing significantly.

These are internal levels, but the noise prediction techniques predict only external noise levels. Typically noise is reduced by approximately 10dBA by a façade with open windows. This gives the following noise goals for helicopters:

- Maximum external noise levels below 60 – 65dBA are unlikely to cause sleep awakening reactions.
- One or two noise events per night, with maximum external noise levels of 75 – 80dBA, are not likely to affect health and wellbeing significantly.

4 NOISE ASSESSMENT

4.1 Impacts from "Ground-Based" Noise

Noise data for ground-based noise emission from the helicopters that would use the proposal are not available. Noise measurements of Eurocopter AS355 F1 and AS350 B3 helicopters conducted by Wilkinson Murray on previous assessments are shown in Table 4-1.

Table 4-1 Measured Helicopter Noise Levels from a Helicopter on the Helipad – dBA

Helicopter Type	Combined Takeoff and Landing SEL at 30m	L_{Amax} at 30m
AS 335 F1	105	93-95
AS 350 B3	103	92-93

The helicopters in Table 4-1 are smaller than those that would use the proposal, and in the air, the noise levels of these helicopters are typically 3-5dBA quieter than those that would be used. Based on this, an SEL of 110dB at 30m was used to predict the noise impact. The predictions were performed using CadnaA noise prediction software to determine likely noise levels at the identified surrounding residences. Table 4-2 shows calculated noise levels at the surrounding receiver locations, where calculations assume that one take-off and landing may occur in any 15-minute period.

The daytime goal is predicted to be met at all locations. Some minor exceedances of the evening goal are predicted. Exceedances of the night time goal would be predicted within approximately 200m of either Helipad, with exceedances up to 15dBA at the closest residences to the helipads. Night time operations would be infrequent, being of the order of two per month.

Table 4-2 $L_{Aeq,\ 15min}$ Noise Levels from a Helicopter on the Helipad

Receiver	Existing Site - Predicted Noise Level $L_{Aeq,15min}$ dBA	Proposed Site - Predicted Noise Level $L_{Aeq,15min}$ dBA	Noise Criteria, Day/Evening/Night dBA
1.Yathong Street	35	55	60/55/40
2. Yabtree Street	35	55	60/55/40
3. Noonan Street	35	46	60/55/40
4. Cnr Brookong Avenue and Sturt Highway	35	46	60/55/40
5. Hardy Avenue	40	53	60/55/40
6. Gormly Avenue	40	53	60/55/40
7. Dwyer Avenue	40	53	60/55/40
8. Bolton Street	45	43	60/55/40
9. North Parade	56	40	60/55/40
10. Turana Lane	55	40	60/55/40
11. Cnr South Parade and Shaw Street	53	40	60/55/40

4.2 Noise Impacts from Helicopters in the Air

4.2.1 Calculation Procedure

Flyover noise levels from helicopters were predicted using the USA FAA's Integrated Noise Model (INM). This model allows for the different throttle settings (which relate to noise) during take off and landing. While this model is capable of predicting noise from approach and departure, it includes noise source data for only one of the helicopters expected to use the proposal: the Aerospatiale AS 365 N-N Dauphin. Wilkinson Murray data on the other helicopters, while not in INM format, shows that noise levels of the AS 365 are typical of the helicopters to use the helipad. Some of the helicopters are slightly more powerful, and some slightly less powerful, as described in Table 2-2. Hence it was considered that noise levels of the AS 365 would be suitable for prediction of long-term noise levels, which would include flights from all helicopters. The maximum noise levels may be slightly higher for the more powerful craft (say 1-2dBA).

4.2.2 $L_{Aeq,24\ hr}$ Noise Levels

$L_{Aeq,24\ hr}$ helicopter noise levels have been predicted at residences based on a flight paths as shown on Figure 2-4 and an approach height of 1000 ft (305m).

$L_{Aeq,24\ hour}$ noise level contours are plotted in Figure 4-1. The calculation assumed that half of the flights at each heliport would use the eastern flight path, and half would use the western flight path. The figure shows contours for both existing and proposed helipads – the existing helipad is at the top left of the figure. In both cases the helipad is located at the centre of the red 60dBA contour.

The outer green contour shows the predicted $L_{Aeq,24hr}$ 40dBA noise level. Outside this noise contour the noise is not considered significant for planning purposes according to the Air Services Australia operating principles. These principles consider $L_{Aeq,24hr}$ 60 to be an unacceptable level of noise for residential housing. Note that in this case the long term $L_{Aeq,24hour}$ is due to very few noise events.

Table 4-3 shows the approximate number of residences inside the $L_{Aeq,24hr}$ 40dBA, 50dBA and 60dBA noise contours. While there are residences inside the 40dBA contour at both helipads, no residence is inside the 60dBA contour.

Table 4-3 Houses Inside Noise Contours

Heliport	Number of Houses Inside $L_{Aeq,24hr}$ 40 Contour	Number of Houses Inside $L_{Aeq,24hr}$ 50 Contour	Number of Houses Inside $L_{Aeq,24hr}$ 60 Contour
Existing	7	0	0
New	40	0	0

Figure 4-1 L_{Aeq} 24hour Noise Contours

4.2.3 Maximum Noise Levels

The maximum noise levels from helicopter flights are considered for assessing the possibility of sleep disturbance.

The noise contours in Figure 4-2 to Figure 4-9 illustrate the maximum noise level predicted for a helicopter fly over. Each page shows the same event at both existing and proposed helipads for comparison. In each case the contours for the existing helipad are at the top of the page, and the proposed helipad at the bottom of the page.

Figure 4-2 and Figure 4-3 show predicted maximum noise levels for an approach flight from the east.

Figure 4-4 and Figure 4-5 show predicted maximum noise levels for a departure flight to the east.

Figure 4-6 and Figure 4-7 show predicted maximum noise levels for an approach flight from the west.

Figure 4-8 and Figure 4-9 show predicted maximum noise levels for a departure flight to the west.

While there are no criteria for these noise events, a reasonable external goal for avoidance of sleep disturbance would be 65dBA (the lime green contour). Events that cause noise levels exceeding 65dBA would not necessarily cause awakening. Night flights would not be frequent, and such events are only expected in an emergency, with a possible frequency of two flights per month as noted above. The contours show that large numbers of houses lie within the 65dBA contour for all departures and approaches to either helipad. Assuming equal use of the east and west flight paths, these houses would experience these noise levels approximately once per fortnight.

At the existing helipad, an approach or landing to the west of the helipad would affect the fewest people as the flight path is over industrial or recreational land. At the proposed helipad, the flight path to the west would also cause less noise impact in the event of an emergency night time flight.

Figure 4-2 L_{Amax} dBA- Existing Approach from the East

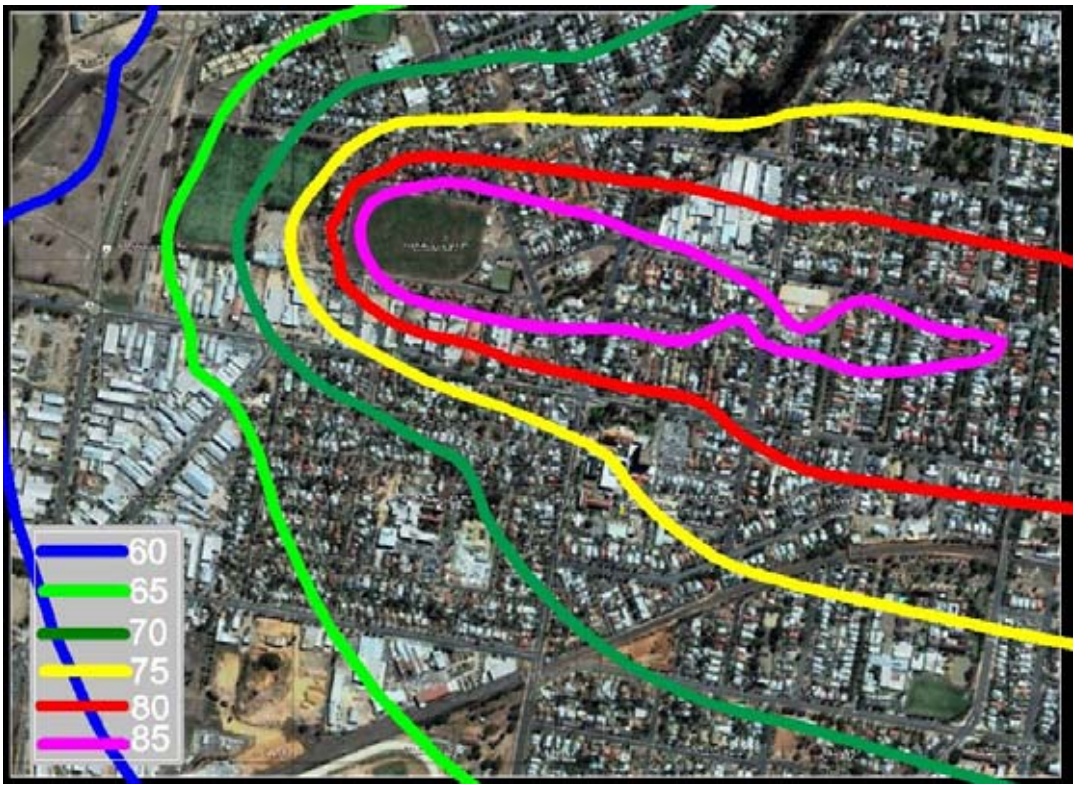


Figure 4-3 L_{Amax} dBA Proposed Approach from the East

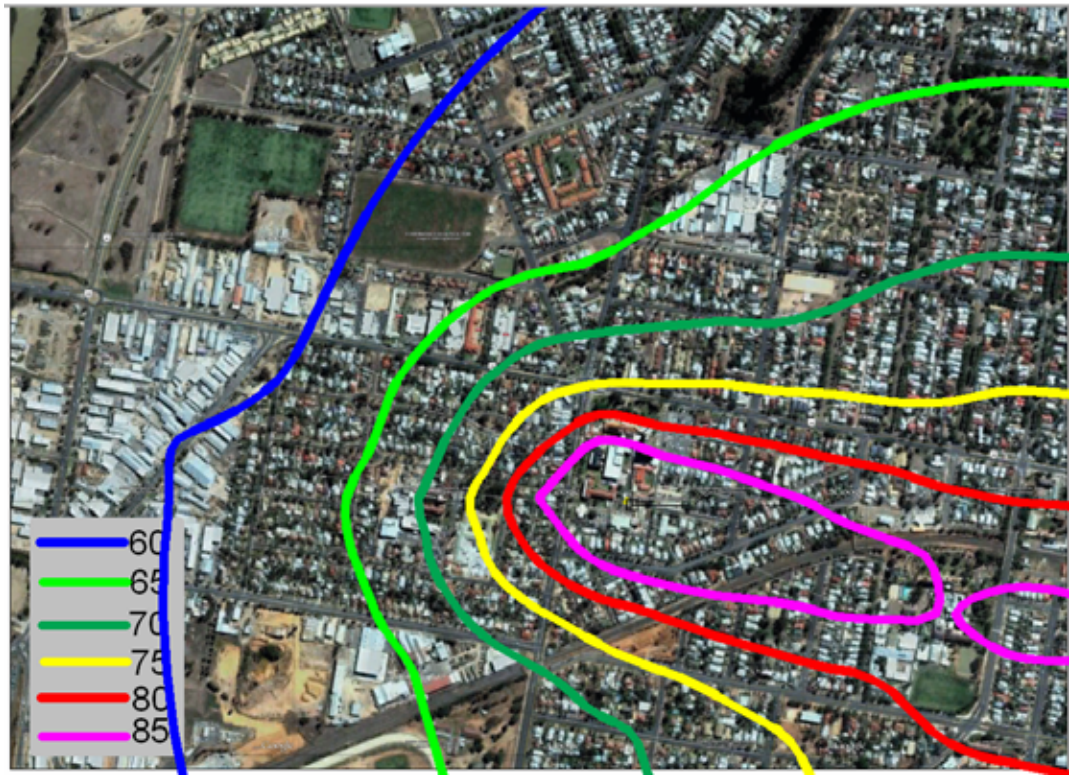


Figure 4-4 L_{Amax} dBA- Existing Departure to the East

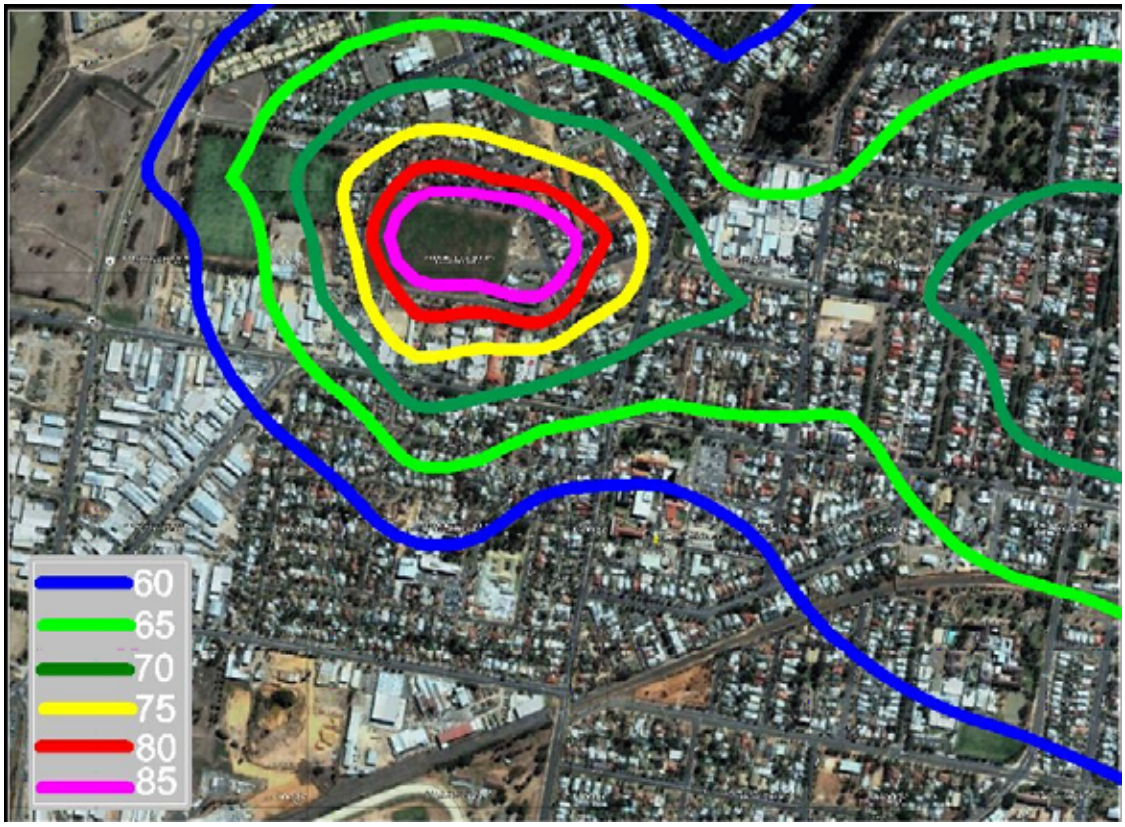


Figure 4-5 L_{Amax} dBA Proposed Departure to the East

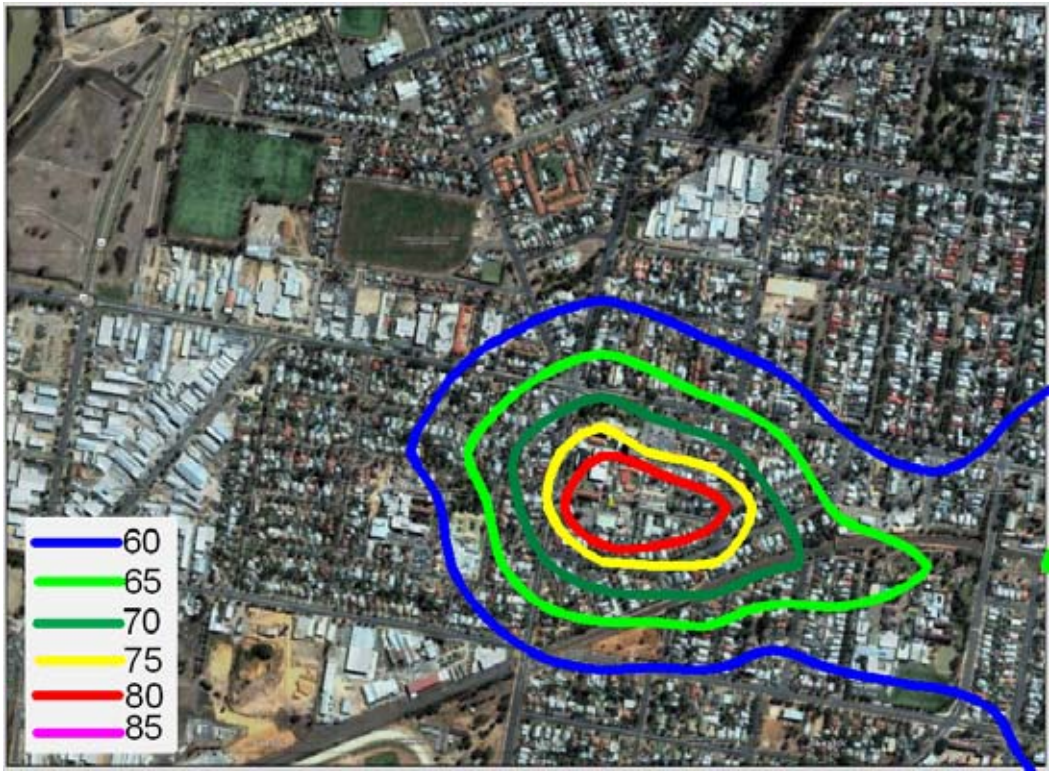


Figure 4-6 L_{Amax} dBA- Existing Approach from the West

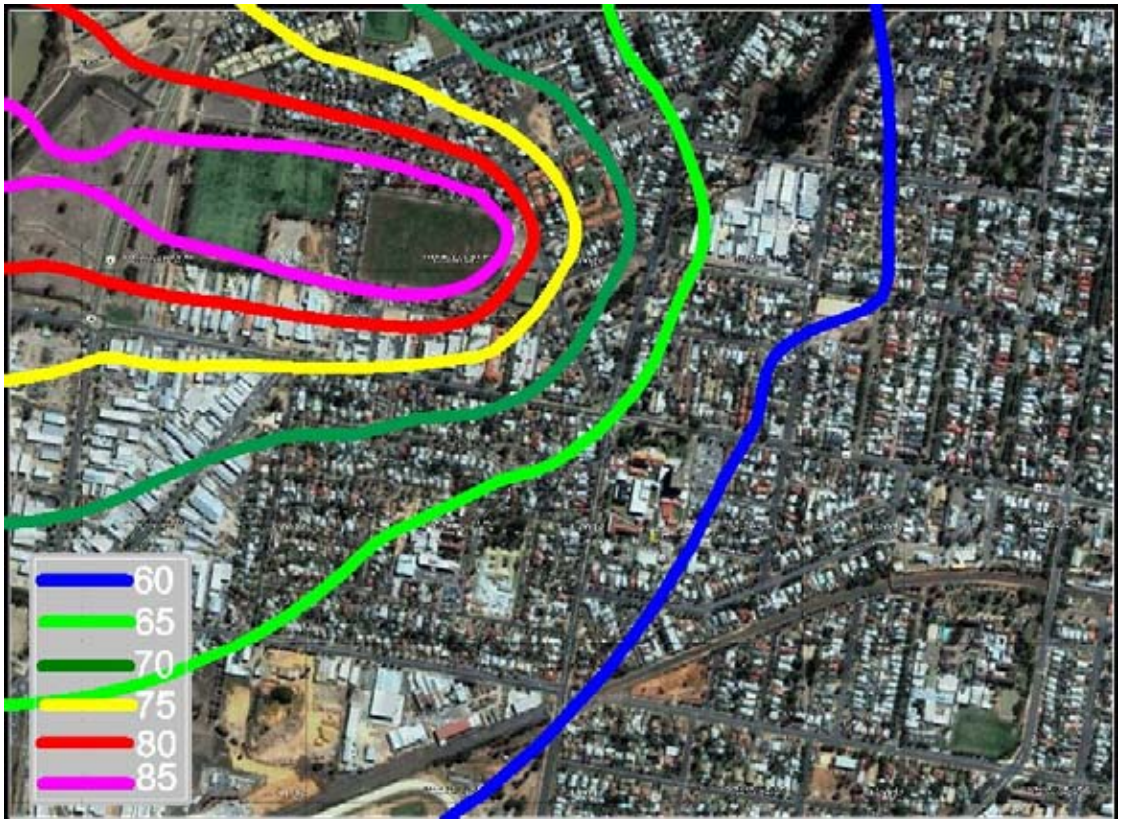


Figure 4-7 L_{Amax} dBA Proposed Approach from the West

Figure 4-8 L_{Amax} dBA- Existing Departure to the West

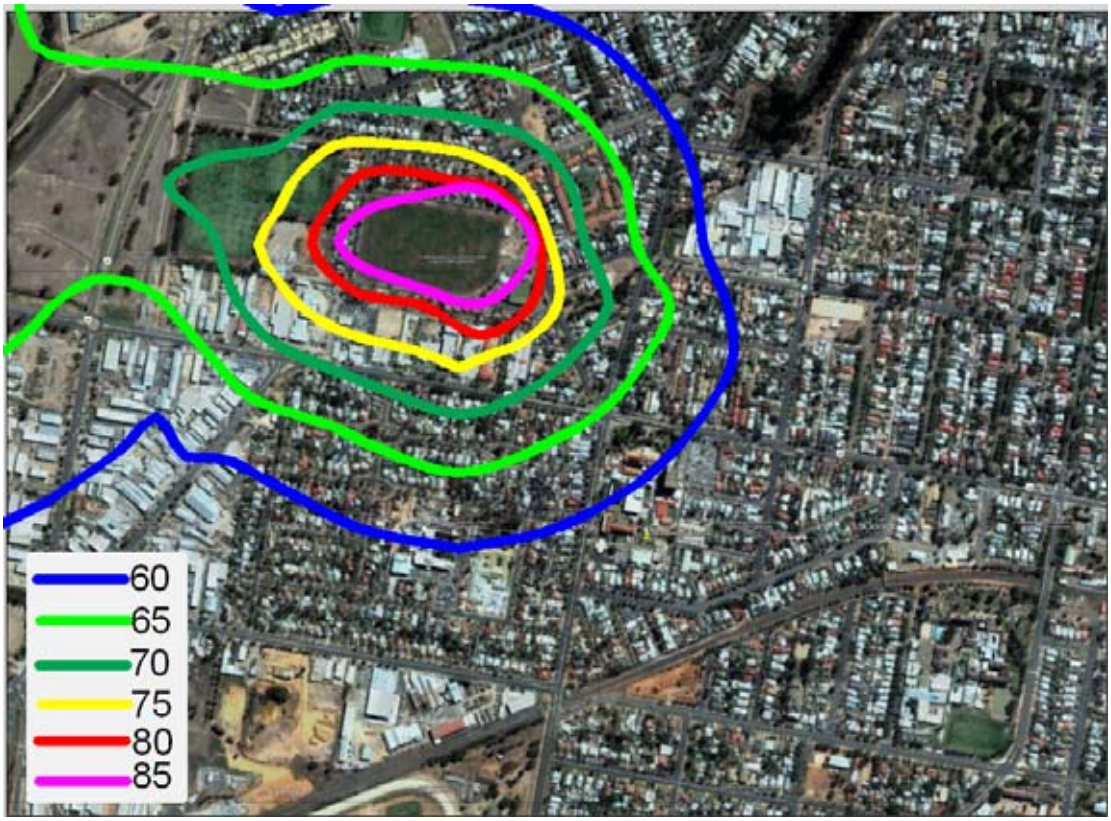
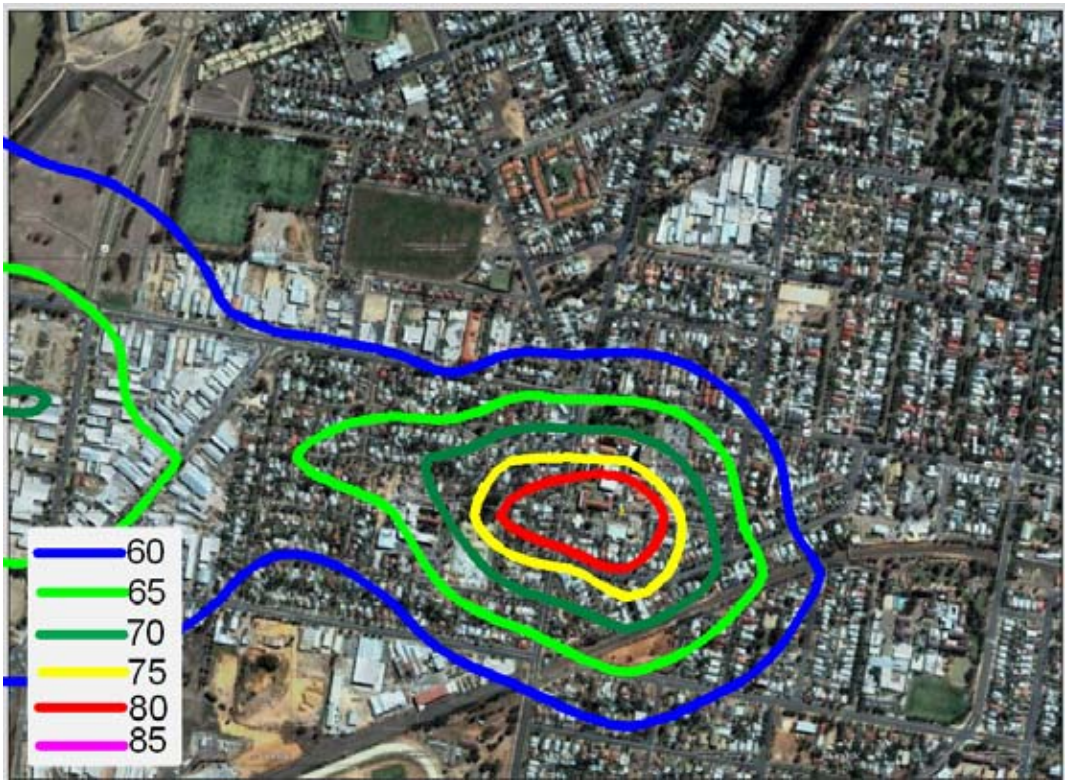


Figure 4-9 L_{Amax} dBA Proposed Departure to the West



5 HELICOPTER NOISE INTO THE HOSPITAL

5.1 Indoor Design Levels

Suitable indoor design sound levels for Hospitals are given in Australian Standard AS 2021-2000 *Acoustics—Aircraft noise intrusion—Building siting and construction*. The indoor design levels for hospitals are:

- Wards, theatres, treatment and consulting rooms: L_{max} 50dBA;
- Laboratories: L_{max} 65dBA; and
- Service Areas: L_{max} 75dBA.

5.2 External Noise Levels and Building Design

Noise levels at the facades of some hospital buildings will exceed 90dBA as helicopters use the rooftop helipad. As the design of the redevelopment is at a concept stage, only guidelines for suitable building elements can be given. In general the weakest element is glazing. Typical glazing and wall recommendations are given in Table 5-1.

Table 5-1 Typical Glazing Requirements for Helicopter Noise

Location	Helicopter Noise L_{Amax} dBA	Building Envelope Requirement, R_W	Example Glazing	Example Wall
		Level 5		
IPU Medical/Stroke	80-90	35-45	Double / Secondary glazing, 6mm and 10mm, 200mm airgap	150 mm concrete block or rendered 140 mm solid brick wall
		Level 4		
IPU Medical/Surgical	80-90	35-45	Double / Secondary glazing, 6mm and 10mm, 200mm airgap	150 mm concrete block or rendered 140 mm solid brick wall
Gem	70-80	35	6mm laminated	150 mm concrete block or rendered 140 mm solid brick wall
		Level 3		
IPU Ortho / Surgical	75-85	40	Double / Secondary glazing, 6mm and 10mm, 200mm airgap	150 mm concrete block or rendered 140 mm solid brick

Location	Helicopter Noise L_{Amax} dBA	Building Envelope Requirement, R_W	Example Glazing	Example Wall
				wall
Rehab	60-75	30	6mm	140mm hollow block
Ambulatory Care	<60	25	4mm	140mm hollow block
Rehab / Offices	60-65	25	4mm	140mm hollow block
		Level 2		
Womens and Children's	75-85	40	Double / Secondary glazing, 6mm and 10mm, 200mm airgap	150 mm concrete block or rendered 140 mm solid brick wall
IPU Paediatrics	60-80	35	6mm laminated	150 mm concrete block or rendered 140 mm solid brick wall
Ambulatory Care	<60	25	4mm	140mm hollow block
Admin	60-80	35	6mm laminated	150 mm concrete block or rendered 140 mm solid brick wall
		Level 1		
Procedures, Mental Health	65-80	35	6mm laminated	150 mm concrete block or rendered 140 mm solid brick wall
ICU	65-80	35	6mm laminated	150 mm concrete block or rendered 140 mm solid brick wall
Education	65-75	30	6mm	140mm hollow block
Ambulatory Care	<60	20	4mm	140mm hollow block

Location	Helicopter Noise L_{Amax} dBA	Building Envelope Requirement, R_W	Example Glazing	Example Wall
		Ground Level		
Mental Health	65-75	30	6mm	140mm hollow block
Emergency	65-75	30	6mm	140mm hollow block
Health Info, Café, Renal	65-70	25	4mm	140mm hollow block
Ambulatory Care	<60	20	4mm	140mm hollow block

6 CONCLUSION

Noise from helicopter operations was assessed at both the existing helipad near Wagga Wagga Hospital, and a new helipad proposed as part of the Wagga Wagga Integrated Regional Health Service Redevelopment. The new helipad would be located on the roof of the redevelopment

A variety of helicopters would use the helipad. The number of flights to the hospital would increase from the 47 to 78 if the helipad were relocated to the hospital.

"On ground" noise was assessed for both helipads. The daytime and evening goals are predicted to be met at all locations for noise from the proposed helipad. Exceedances of the night time goal would be predicted within approximately 200m of either helipad, with exceedances up to 15dBA at a few residences closest to the helipad. Night time operations would not be frequent.

Flight noise was predicted using the USA FAA's prediction software (INM). The predicted levels for long term noise are that:

- for the existing helipad the $L_{Aeq,24hour}$ would exceed 40dBA at approximately 7 houses;
- for the proposed helipad the $L_{Aeq,24hour}$ would exceed 40dBA at approximately 40 houses; and
- the noise would not exceed the $L_{Aeq,24hour}$ 60dBA at any house for either helipad.

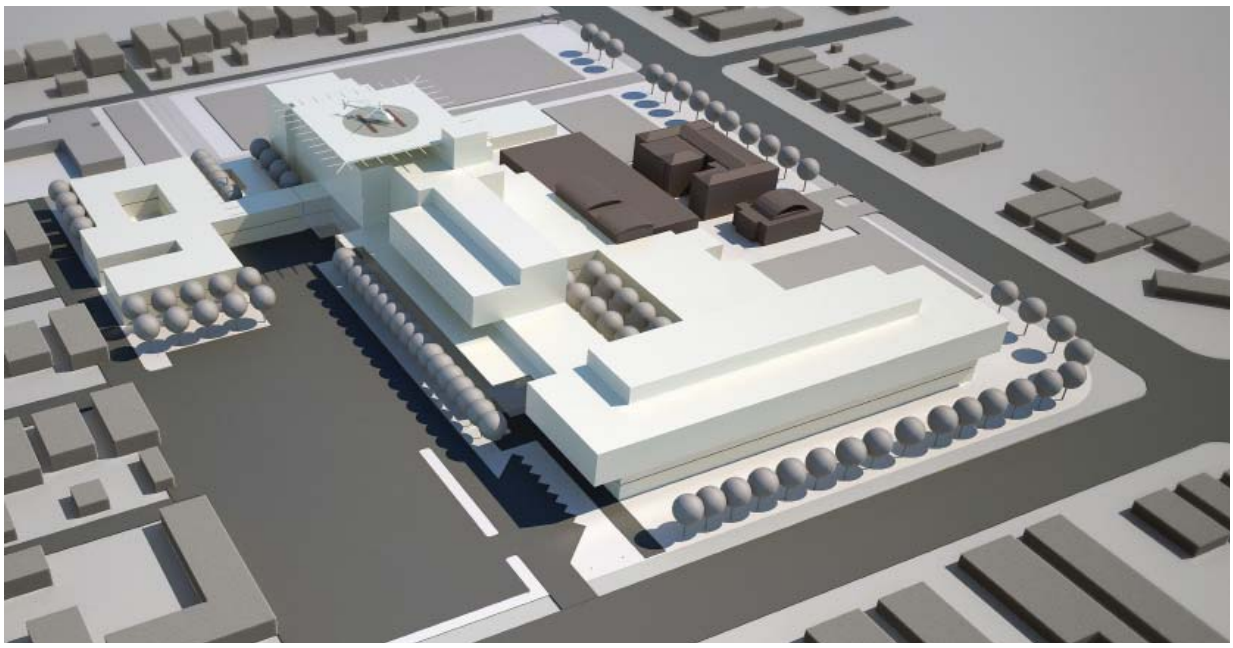
Flights to and from the proposed helipad would cause more noise impact than the existing helipad due to increased flight numbers, and overflying more residents, particularly on flight paths to the west of the hospital. However, the noise would not be at such a level that construction of new residences would be considered unacceptable.

Noise into the hospital itself would be controlled by suitable building elements and architectural design. A range of glazing options is proposed for various hospital areas. The final choice of building elements would depend on the incorporation of other architectural features such as awnings that could screen the window from helicopter noise.

Version	Status	Date	Prepared by	Checked by
A	Final	17 March 2011	George Jenner	Rob Bullen

APPENDIX L

Arborist's Report



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WAGGA WAGGA BASE HOSPITAL TREE SURVEY

This survey was undertaken using standard tree assessment criteria and is the result of a detailed site inspection on Tuesday March 29, 2011.

This report was requested by the Senior Project Officer - Wagga Wagga Base Hospital Redevelopment to seek information on the general health and structural integrity of the trees currently in existence on site. The trees inspected in this report are marked on Plan -110331 Wagga Base Tree Survey.

The survey was carried out from the ground by Visual Tree Inspection.

Survey results

1 Tulip tree (*Liriodendron tulipifera)*

12m in height with a DBH of 350mm. The tree is failing with lots of deadwood present in the canopy and a small cavity in the north side at 1m.

2 Monterey Cypress *(Cupressus macrocarpa)*

Approximately 17m in height with a DBH of 900mm.

3 Monterey Cypress *(Cupressus macrocarpa)*

Approximately 17m in height with a DBH of 800mm.

4 American Ash *(Fraxinus spp)*

Approximately 7m in height with a DBH of 400mm. In good condition and of sound structural integrity

5 Flowering plum *(Prunus x blireana)*

Approximately 2m in height with a DBH of 200mm. Immature specimen in good condition

6 Flowering Plum *(Prunus x blireana)*

Approximately 2m in height with a DBH of 200mm. Immature specimen in good condition

7 Box Elder *(Acer negundo)*

Approximately 12 m in height with 3 leaders.

The earth around the trunk is compacted, turf is worn thin and there is evidence of previous mechanical damage to exposed roots. There are 9 small cavities in the trunk including a cavity in the fork of the northernmost leader and a structural crack on the western side with callousing on the wound on either side. There is a dead limb on the eastern side of the tree.

8 Arizona Cypress *(Cupressus glabra 'Limelight')*

Approximately 7 m in height with a DBH of 400mm.

In good condition and of sound structural integrity

9 Arizona Cypress *(Cupressus glabra 'Limelight')*

Approximately 12 m in height with a DBH of 400mm. In good condition and with well structured branching

10 Golden Ash (*Fraxinus excelsior 'Aurea')*

Approximately 9 m in height with a DBH of 400mm.

Evidence of previous mechanical damage to exposed roots. There is evidence of previous white ant activity in a large cavity in the eastern leader and a small cavity on a southern limb. There is a lot of deadwood present in the canopy.

11 She Oak (*Allocasuarina cunninghamiana)*

Approximately 22m in height with a DBH of 500mm.

Some exposed roots and a small canker at the base on the northern side.

Evidence of some previous limb failures but otherwise good condition

12 Weeping Chinese Cypress (*Cupressus funebris)*

Approximately 16m in height with a DBH of 380mm. Separates into 3 leaders at 1m.

13 Desert Ash (*Fraxinus angustifolia)*

Approximately 12m in height with a DBH of 500mm. In poor condition with lots of limb failure and deadwood in the canopy. Mechanical damage to exposed roots is also visible.

14 Golden Ash (*Fraxinus excelsior 'Aurea')*

Approximately 8m in height branching to 3 leaders at 1m.

Very poor specimen.A small cavity exists between the leaders on the Western side.

15 Red Oak (*Quercus rubra*)

Approximately 18m in height with a DBH of 900mm. Dieback exists in the canopy

16 Tulip tree *(Liriodendron tulipifera)*

Approximately 16m in height with a DBH of 450mm. The tree is in poor health with dieback present in the canopy and epicormic growth in the lower half.

17 Desert Ash (*Fraxinus angustifolia)*

Approximately 11m in height with a DBH of 600mm. Poor form with decayed limbs on the Western side. Lopped previously at 2.5 and 5m. All new growth epicormic.

18 Desert Ash (*Fraxinus angustifolia)*

Approximately 11m in height with a DBH of 600mm. Poor form from being lopped previously at 2.5 and 5m. All new growth epicormic.

19 Canary Island date Palm *(Phoenix canariensis)*

Approximately 12m in height with DBH of 900mm. Great form and very healthy specimen

20 Liquidamber *(Liquidambar styraciflua)*

Approximately 8m in height with DBH of 600mm. A healthy specimen

21 Canary Island date Palm *(Phoenix canariensis)*

Approximately 12m in height with DBH of 900mm. Great form and very healthy specimen

22 Liquidamber *(Liquidambar styraciflua)*

Approximately 8m in height with DBH of 500mm. Poor form with lots of deadwood in the canopy

23 Liquidamber *(Liquidambar styraciflua)*

Approximately 8m in height with DBH of 500mm. A healthy specimen

24 Arizona Cypress *(Cupressus glabra 'Limelight')* (5 TREES)

Approximately 6m in height with DBH of 500-600mm. All healthy specimens

25 Claret Ash (*Fraxinus angustifolia 'Raywood')*

Approximately 8m in height with a DBH of 450mm. In good condition and of sound structural integrity

26 Claret Ash (*Fraxinus angustifolia 'Raywood')*

Approximately 10m in height with a DBH of 900mm. Multiple leaders and 1/4 of the canopy is dead.

27 Irish Strawberry Tree *(Arbutus unedo)* 3 Trees

Approximately 3.5m in height with a DBH of 700mm. All have multiple leaders and epicormic growth to base. Ground below is compacted, some canker and deadwood is present in each canopy.

28 Chilean Willow (*Salix chilensis)*

Approximately 5m in height with a DBH of 1000mm. Poor specimen with a lot of deadwood present in the canopy

29 Eucalyptus *(Eucalyptus spp)*

Approximately 6m in height with a DBH of 500mm. Unhealthy specimen. Mistletoe present in canopy. Multiple leaders and canker.

30 Silky Oak (*Grevillea robusta)*

Approximately 10m in height with a DBH of 900mm. In good condition.

31 Silky Oak (*Grevillea robusta)*

Approximately 10m in height with a DBH of 650mm. Evidence of previous formative pruning on the western side but otherwise in good condition.

32 Claret Ash (*Fraxinus angustifolia 'Raywood')*

Approximately 8m in height with a DBH of 450mm. In good condition and of sound structural integrity

33 Silky Oak (*Grevillea robusta)*

Approximately 5m in height with a DBH of 800mm. Poor specimen. The central leader has been lost or removed. There is dieback in the canopy.

34 Evergreen Alder (*Alnus jorullensis)*

Approximately 5m in height with a DBH of 400mm. Poor specimen with a lot of dieback in the canopy

35 Evergreen Alder (*Alnus jorullensis)*
Approximately 5m in height with a DBH of 500mm. Poor specimen which is growing at an angle due to previous vehicle damage. Canker at the base of the trunk.

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40 Evergreen Alder (*Alnus jorullensis)*
Approximately 5m in height with a DBH of 600mm. In good condition.

41 Evergreen Alder (*Alnus jorullensis)*
Approximately 5m in height with a DBH of 600mm. Some deadwood in canopy

42 Evergreen Alder (*Alnus jorullensis)*
Approximately 4m in height with a DBH of 500mm. In good condition.

Evergreen Alder (*Alnus jorullensis)*
Approximately 4m in height with a DBH of 600mm. In good condition.

43 Evergreen Alder (*Alnus jorullensis)*
Approximately 5m in height with a DBH of 600mm. Poor specimen with a lot of dieback in the canopy.

44 Evergreen Alder (*Alnus jorullensis)*
Approximately 5m in height with a DBH of 500mm. Poor specimen with a lot of dieback in the canopy.

45 Evergreen Alder (*Alnus jorullensis)*
Approximately 5m in height with a DBH of 500mm. In good condition.

Conclusion

Trees are an important asset to any built environment and can greatly improve the physical and visual amenity of an area.

At the time of inspection, many of the younger trees on site, and most of the trees fronting Edward and Docker Streets are in good condition and should be retained wherever possible as part of the site's redevelopment.

However, most of the older trees currently on site have defects in accordance with their situation, that being mainly carpark/road verge situations. Those in poor condition should be removed and replaced as part of the site's redevelopment.

It is important to note that no tree can be guaranteed risk free. All trees represent some degree of risk. Some defects you cannot see through visual inspection, and contributing factors such as wind, pests, bacterial infection and storm damage must be taken into consideration. This report is an interpretation of the effects of the current environmental circumstances on the trees on the site.

Recommendations

Any trees removed as a result of the Wagga Wagga Base Hospital redevelopment should be replaced on site wherever possible with suitable species to provide shade, shelter, visual balance and to improve the amenity of the site as a whole.

For any further information relating to this report please contact us.

somewhere.
LANDSCAPE ARCHITECTS, DESIGNERS AND DREAMERS

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Phone 02 6384 7333 Fax 026384 7358

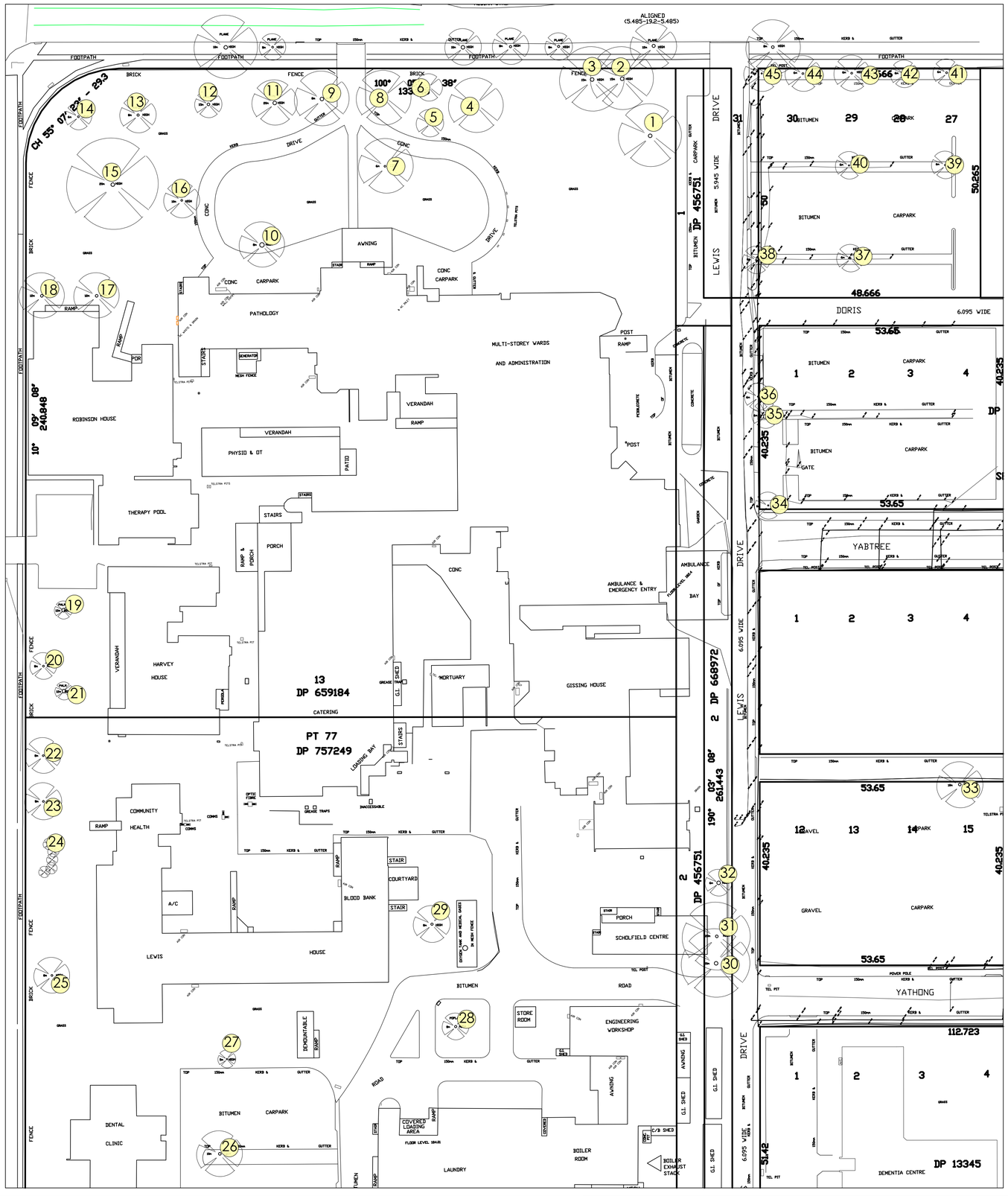
WAGGA WAGGA OFFFICE : 16 Fitzmaurice St, Wagga Wagga NSW 2650

Phone 02 6931 0792 Fax 02 6921 8388

Legend

Existing trees

Notes



TREE INVENTORY

*DBH = Diameter at Breast Height

1. **Tulip tree (*Liriodendron tulipifera)***
12m in height with a DBH of 350mm. The tree is failing with lots of deadwood present in the canopy and a small cavity in the north side at 1m.

2. **Monterey Cypress *(Cupressus macrocarpa)***
Approximately 17m in height with a DBH of 900mm.

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Approximately 17m in height with a DBH of 800mm.

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Approximately 7m in height with a DBH of 400mm. In good condition and of sound structural integrity

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Approximately 2m in height with a DBH of 200mm. Immature specimen in good condition

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Approximately 12 m in height with 3 leaders.
The earth around the trunk is compacted, turf is worn thin and there is evidence of previous mechanical damage to exposed roots. There are 9 small cavities in the trunk including a cavity in the fork of the northernmost leader and a structural crack on the western side with calllousing on the wound on either side. There is a dead limb on the eastern side of the tree.

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Approximately 7 m in height with a DBH of 400mm.
In good condition and of sound structural integrity

9. ***Cupressus glabra 'Limelight'***
Approximately 12 m in height with a DBH of 400mm.
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Approximately 9 m in height with a DBH of 400mm.
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Separates into 3 leaders at 1m.

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Dieback exists in the canopy

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Great form and very healthy specimen

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Approximately 10m in height with a DBH of 900mm
Multiple leaders and 1/4 of the canopy is dead.

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Approximately 3.5m in height with a DBH of 700mm
All have multiple leaders and epicormic growth to base.
Ground below is compacted, some canker and deadwood is present in each canopy.

28. **Chilean Willow (*Salix chilensis)***
Approximately 5m in height with a DBH of 1000mm.
Poor specimen with a lot of deadwood present in the canopy

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Unhealthy specimen. Mistletoe present in canopy.
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In good condition.

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somewhere.
LANDSCAPE ARCHITECTS, DESIGNERS AND DREAMERS
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Young NSW 2794
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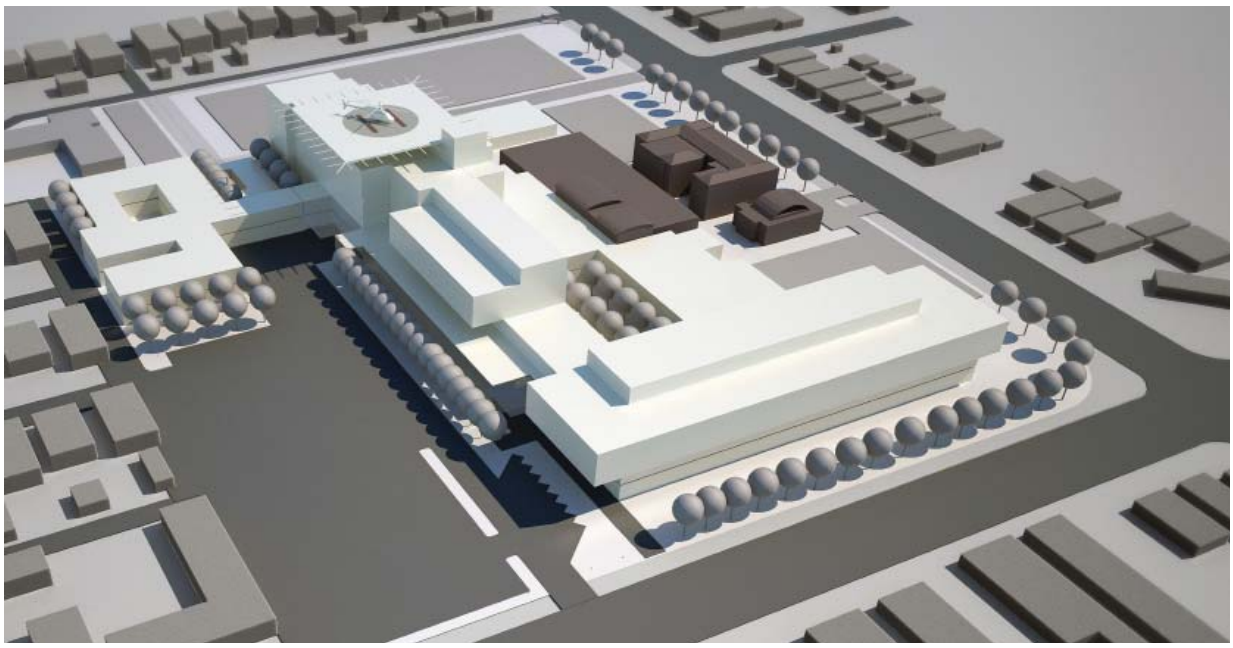
TREE SURVEY PLAN
Wagga Wagga Base Hospital

N

Scale: 1:5000 @ A1
Status:For comment
Project No: 147
Date: 05/04/2011
Checked By: AD
Drawing No: L01
Rev: A

APPENDIX M

Quantity Surveyor's Certificate of Cost



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9th December 2010

Frank Tong
Capital Insight
Level 6
77 Berry Street
North Sydney NSW 2060

Dear Frank

Masterplan for the redevelopment of Wagga Wagga Hospital

As requested in your e-mail earlier today please find set out below our calculation of the Capital Investment Value (CIV) for the above project.

It is our understanding that the CIV should include all costs necessary to 'establish & operate the project'. We would therefore suggest that the estimate of CIV is the value of our latest broad order of cost estimate, dated 1st December 2010, with the following provisions excluded - land & property acquisition costs, loose furniture, fittings & equipment, temporary works, relocations, contingencies.

We confirm that we in the preparation of our broad order of cost estimate we have reviewed the relevant design information available as at the end of November 2010, comprising:

- Sketch drawings and schedules prepared by the Project Architect – Rice Daubney
- Advice and preliminary design information prepared by the Structural Engineer and Services Engineers - SKM

Our cost estimate:

- Excludes GST
- Has a base date of December 2010 with escalation applied to each stage to reflect when it is envisaged that the work will be carried out.
- Has been priced using the functional areas set out in the Schedule of Accommodation priced at rates derived from our data base together with and prices reflective of market conditions at the time of preparation.

On the basis of the above the CIV would be:

The estimated total project cost		$417,889,000
Less:	Land & property acquisition	$1,211,200
	Loose FF&E	$22,523,400
	Temporary works	$2,081,800
	'Relocations'	$55,000
	Contingencies	$74,423,900
The CIV for this project is therefore		**$317,593,700**

Davis Langdon
An AECOM Company

We trust the above is sufficient for your requirements. However, should you have any comments or queries, or require any further information please do not hesitate to contact me.

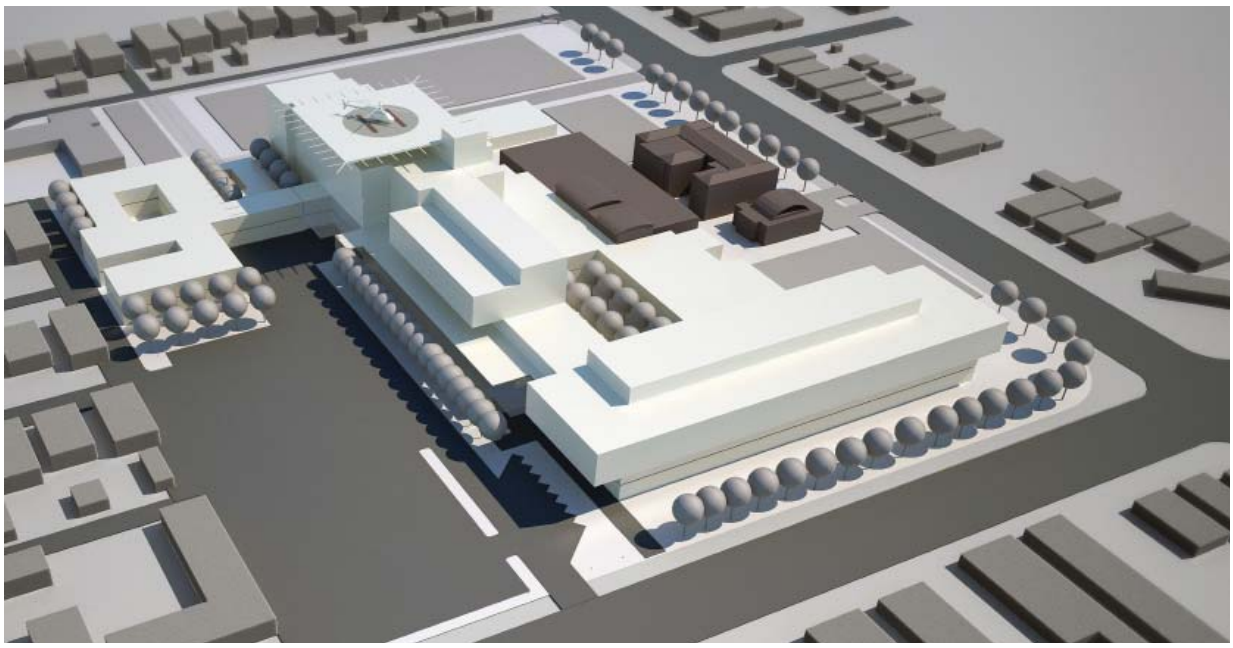
Yours sincerely

Doug Rayment
Associate

L:\27428 Wagga Wagga Hospital\Letter - Wagga masterplan - CIV.doc

APPENDIX N

Wagga Wagga Health Service Cluster
Waste Management Plan



WAGGA WAGGA HEALTH SERVICE CLUSTER

WASTE MANAGEMENT PLAN 2010 - 2011

Mission Statement

The Wagga Wagga Cluster is committed to maintaining a waste management system that is safe, efficient, cost effective and considers environmental issues.

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SECTION 1 - Introduction

This Waste Management Plan describes the current policies and procedures for Wagga Wagga Health Service Cluster. It provides goals & targets to ensure ongoing improvements in all aspects of waste management, including the generation, handling, storage and disposal of all forms of waste. Wagga Wagga Health Service Cluster is committed to minimising waste, in accordance with the NSW Government Waste Reduction and Purchasing Policy.

This plan is based on the NSW Health Department PD2005_132."Waste Management Guidelines for Health Care Facilities - August 1998", PD 2007_036. Infection Control Policy, relevant legislation relating to Environmental Protection, and PD 2005_360 Occupational Health & Safety. As legislation and policies are constantly revised, this plan should be reviewed annually.

To be effective, this plan must be widely promoted throughout the hospital.

1.1 Aims

To protect public health and safety.
To provide a safe work environment
To minimise the environmental impact of waste generation treatment & disposal.
Reduce waste handling & disposal volumes/costs without compromising health care.

1.2 Objectives

To adopt and implement the Waste Management Plan throughout the hospital and community health services.
To monitor performance and review the Waste Management Plan at least annually.
Adopt a waste minimisation policy which incorporates realistic purchasing guidelines.
Develop concise waste segregation principles and promote practical guidelines for re-usable products.
Foster commitment from all staff and management to actively participate in waste avoidance, reduction, reuse and recycling programs.
Introduce a continuing waste management education program for all staff to increase awareness of Occupational Health & Safety issues and waste minimisation principles.
Adopt policies and procedures to minimise the environmental impact of waste treatment and disposal.

SECTION 2 – Definitions

Hospital Waste can be divided into seven broad categories which are defined in the NSW Health Department Waste Management Guidelines for Health Care Facilities (1998). Clinical, cytotoxic, pharmaceutical, chemical and radioactive wastes are classified as Hazardous wastes under Part 3, Schedule 1 of the Waste Regulation and section 3 of the Waste Guidelines.

2.1 Clinical waste

Clinical waste is waste which has the potential to cause sharps injury, infection or offence. Clinical waste includes the following types of waste:

- sharps;
- human tissue (excluding hair, teeth and nails);
- bulk body fluids and blood;
- visibly blood stained body fluids and visibly blood stained disposable material and equipment;
- laboratory specimens and cultures, animal tissues, carcasses or other waste arising from laboratory investigation or for medical or veterinary research, unless treated to standards approved by the Director-General of NSW Health.

2.2 Cytotoxic Waste

Cytotoxic waste means material contaminated with residues or preparations containing materials toxic to cells, principally through action on cell reproduction. This includes any residual cytotoxic drug, and any discarded material associated with the preparation or administration of cytotoxic drugs.

2.3 Pharmaceutical Waste

Consists of pharmaceuticals or other chemical substances specified in the Poisons List under the Poisons and Therapeutic Goods Act 1966. Pharmaceutical substances include expired or discarded pharmaceuticals, filters or other materials contaminated by pharmaceutical products.

2.4 Chemical Waste

Chemical waste is generated from the use of chemicals in medical applications, domestic services, maintenance, laboratories, during sterilisation processes and research. It includes mercury, cyanide, azide, formalin, and glutaraldehyde, which are subject to special disposal requirements. Chemical wastes included in the Dangerous Goods Regulations and Poisons and Therapeutic Goods Act are also included in this stream.

2.5 Radioactive Waste

Radioactive waste is material contaminated with radioactive substances which arises from medical or research use of radionuclides. It is produced, for example, during nuclear medicine, radio immunoassay and bacteriological procedures, and may be in a solid liquid or gaseous form and includes the body waste of patients under treatment. Reference should be made to the *Radiation Control Act 1990* and the Radiation Control Regulation 1993.

Radioactive waste, once lead shielded and allowed to decay to a safe level as set by the Regulatory authority, is no longer deemed to be radioactive waste. Certain radioactive wastes are classified as hazardous waste in the Waste Regulation.

2.6 Recyclable Products

Items which are composed of materials or components, capable of being remanufactured or reused. Items are considered recyclable if facilities are available to collect and reprocess them.

2.7 Organic Products

This includes wood, garden waste, food and vegetable scraps and natural fibrous material which are biodegradable.

2.8 Liquid Waste

Liquid wastes are defined in the Waste Regulation. These wastes include grease trap waste, used lubricating oil and waste normally discharged to the sewer.

2.9 General Waste

Any waste not included above, which is not capable of being composted, recycled, reprocessed or re-used. **This stream includes incontinence pads, sanitary waste and disposable nappies**.

SECTION 3 - Organisational Issues

Wagga Wagga Health Service serves Wagga and surrounding areas
The hospital has approximately 270 beds (actual bed numbers vary according to activity demands). These beds comprise the following -

28 Medical
58 Surgical
8 Intensive care
21 Obstetrics
4 Special Care Nursery
28 Rehab
16 Yathong Lodge
19 Paediatric
18 Psychiatric
6 Renal
10 Day Surgery
10 Other (Ambulatory Care) Day only
12 Other (Ambulatory Care) 23 hr Ward

Occupied Bed Days Wagga Wagga Base Hospital:	69,272 (2006)	67,567 (2005/06)
Occasions Of Service Wagga Wagga Community Health:	94,416 (2004)	

Total Staff: 641 FTE for Cluster
The Manager of the Cluster: A/GM L West

3.1 Employer's Legal responsibilities

Employers have a number of legal responsibilities, which include:

developing and maintaining a safe work environment and safe work practices
ensuring hospital activities do not breach environmental standards prescribed in the State and Federal legislation;
providing staff training and education for the safe handling of waste.

Refer to the legislation list in Appendix1.

3.2 Employees Responsibilities

Employees also have responsibilities, which include:

Complying with safety instructions and use safe work practices for their own protection and for the protection other staff and the public
Actively supporting environmental initiatives introduced by the Waste Management Committee.
Be aware and comply with the requirements for the handling of chemical substances according to Material Safety Data Sheets (MSDS).
Attend and actively participate in waste management training.

Refer to Legislation list in Appendix 1.

3.3 Licensing Requirements

Wagga Wagga Cluster generates more than 2 tonnes of clinical (Hazardous) waste per year	**YES**
Wagga Wagga Cluster stores more than 500kg of clinical (Hazardous) waste at any one time	**YES**
Wagga Wagga Cluster transports more than 40 kg clinical (Hazardous) waste	**NO**
Wagga Wagga Cluster is licensed as a treatment facility	**NO**
Wagga Wagga Cluster requires a license	**YES**

A copy of the License is held by Wagga Wagga Cluster License No. 6677 Renewal date: 05/4/2008.
Senior Environmental health Officer at Public Health unit facilitates this process.

3.4 Waste Management Committee

3.4.1 Terms of Reference

To be reviewed annually.
The Committee may co-opt any other relevant personnel to address specific issues.
Nominated Waste Management Chairperson **Business and Support Manager**
Nominated Waste Management Coordinator **Infection Control CNC**
Meeting Frequency **Monthly**

Table 1: Waste Management Committee Members

Position	Name	Contact Number	Responsibility
Secretary	Executive Administration Officer	6614	Minute keeping. Administration Support.
Infection Control	Infection Control CNC	6231	Advise on infection control issues. Liaison with the Infection Control Committee.
Community Health Representative	J. McLennan	6411	Advise on Community Health related matters
Purchasing officer	As required		Report on product usage/ wastage & other supply issues.
Engineer/ Maintenance	Asset Management Manager WWHSC	6644	Advise on structural and maintenance issues relating to the storage, treatment & disposal of waste. Monitor water and energy usage.
Domestic services	Manager Hotel Services	6295	Supervision of cleaning staff . Maintain daily records of waste generation.
Waste Collector		Page 7823	Support monitoring of waste and provide front line information to the membership
Executive Representatives	Business and Support Manager Community Health Manager	6651 6479	Executive representation Financial and administrative support
Clinical Representatives	Barry Horsley (ORS) Kate Jensen (Path) Sharon Townsend (Ward3)	6665 6605 6367	Advise on clinical matters
Environmental Health Officer	As required Tony Burns Senior Environmental Health Officer	69235755	Liaison with Council. Advise on disposal issues and services external to the hospital. Independent Audits of the hospital.

3.4.2 Objectives of the Waste Management Plan

1. All waste is disposed into the correct waste streams

- *Improve waste segregation practices (increase compliance by 10% in the first year (Tables 5, 6 & 7)*
- *Conduct a waste audit and prepare a comprehensive report of current waste generation, segregation, handling, storage and disposal practices and costs*
- *Liaise with council, private waste contractors and Area Health Services with regard to the transport and disposal of waste external to the hospital.*
- *Seek a commitment from Management to comply with all relevant Legislation (Appendix 2)*
- *Conduct ongoing audits of waste (refer Section 4.1). Ensure information is relayed to staff*

2. Waste volumes are reduced; Waste minimization and recycling is increased

- *Promote waste management principles throughout cluster (Department Heads and department meetings, signs, posters, notice boards, bulletins, competitions etc*
- *Implement a waste avoidance & minimisation program incorporating the Waste Reduction & Purchasing Policy [WRAOO – refer to Table 3]*
- *Implement a Recycling program and increase recycling by at least 10 % in the first year (Table 4)*

3. Waste management practices optimize staff safety

- *Develop OH&S strategies for injury prevention, and for reporting, treating and follow up of injuries associated with waste handling*
- *Develop spill management strategies for all waste categories*
- *Provide appropriate Personal Protective equipment and offer staff vaccinations*
- *Conduct a Waste Management Numerical Profile Audit annually and review the Waste management Plan*
- *Implement an ongoing waste management training program which caters for all staff including management.*
- *Consult with Management on waste handling & storage issues relating to the design and layout of buildings, renovations & extensions*

3.5 Purchasing Policy

All purchasing for the WWBH&CS will be based on the premise of waste avoidance and minimisation and will comply with the GSAHS purchasing policy.

Refer to Area Purchasing Policy.

Table 3: Product Evaluation

.....Date: 02/05/2007

Product	In Contract Y/N	Cost Centre/ Department	Quantity / Year	Cost / Year	Recycled %	% Capable of using recycled or recyclable components	Recyclable	Disposable	Reusable Alternative Available	
							Market Available? Y/N	Bio-degradable %	Y/N	Cost $*
Photocopy paper		All				0	Y	100%	NA	NA
Office communication paper		All				100	Y	100%	NA	NA
Office stationary		All				0	Y	100%	NA	NA
Computer paper		All				0	Y	100%	NA	NA
Photocopiers		All				0	-	-	-	-
Printers		All				0	-	-	-	-
Facsimile		All				0	-	-	-	-
Toner Cartridges		All				0	Y	0	NA	NA

3.6 Education and Training

Wagga Wagga Cluster is developing an education package covering the knowledge and application of the core principals for waste management.

The person responsible for coordinating and running training activities is the CNC Infection Control. Orientation courses for new employees and refresher courses are to be run whenever there is a change in process, and / or at least annually.

A register of course attendances is held by: CNC Infection Control

Wagga Wagga Health Service Cluster is compiling an education plan for this facility that includes sessions to:

Senior management
Current Employees
New Employees (orientation)

The following topics are to be covered by all staff:
Safe work practices
Staff awareness of policies at orientation
Legislation & licensing
Provision and safe use of PPE
Infection Control and Hygiene procedures
Waste stream definitions
Costs and benefits of waste minimisation
Reduce/reuse/recycle
First aid / needlestick injury
Spill management
Manual handling
Environmental impacts of waste disposal

A Waste Management Educational CD ROM is being distributed to all departments to enable staff to view WM education as time allows whilst on duty.

A publicity campaign has been designed to reinforce the principals of the waste management plan. Options being considered by the Waste Management Committee are:
posters
brochures
notice boards
with pay slips
newsletters
waste awareness days
email message
Department Managers meetings
Department meetings

References:
South West Sydney Area Health Services, 1994, *SEE: Better Waste Management*
Medical Safework Video, The safe handling of biomedical waste, A safety training module.

SECTION 4- Waste Management Strategies

4.1 Waste Minimisation

4.1.1 Waste Avoidance

Avoidance initiatives introduced last year: Minimising waste – materials mananagment
New Avoidance initiatives proposed this year: Daniels Sharps containers

4.1.2 Reuse Strategy

Wagga Wagga Base Hospital does not re-use single use items that have penetrated the skin
Reuse initiatives introduced last year:

- clean theatre wraps reused for plaster & fracture clinics in ED and Ambulatory Care
- office paper reused for printing, scrap paper
- computer printouts given to staff for children to draw on
- cardboard boxes returned to materials management for reuse

New Reuse initiatives proposed this year:

- child care craft supplies
- catering containers for staff
- shredded paper mulch for gardens & chicken sheds
-

Methods of cleaning/disinfection/sterilisation:

- steam sterilisation & thermal disinfection for theatre items
- ultrasonic cleaning and manual cleaning

4.1.3 Waste Reduction

Waste reduction initiative introduced last year:

-

New Waste Reduction initiatives proposed this year:

- cooking oil
- consultation with staff re waste management

4.1.4 Recycling

Recycling initiatives introduced last year:

- cardboard boxes
- milk cartons
- paper/shredding
- cafeteria rubbish – cans, bottles
- toner cartridges
- telephone directory
- mercury amalgams
- silver – x-ray

New Recycling initiatives proposed this year:

- pharmacy drug containers
- kitchen/catering containers
- plastic wrap
- theatre wraps
- oil containers - engineering
- cleaning agent bottles

- coffee shop items
- Recycling of batteries

4.2 Audits

Auditing is an essential management tool for measuring the level of compliance with the Waste Management Guidelines. Audits can also identify opportunities for water and energy conservation. The audit comprises four components:

				Proposed	Conducted
1.	Numerical profile	mini audit	Date		
2.	Segregation audit		Date	as per Patient first initiative	
3.	Energy audit		Date	[..... /..... /.....]	[..... /..... /.....]
4.	Water audit		Date	[...../...../.....]	[...../...../.....]

4.2.1 Waste Management Numerical Profile Audit

The Wagga Wagga Cluster will utilise the O H S & R numerical profile audit to measure compliance with waste management guidelines.

4.2.2 Segregation Audit

Guidelines for conducting a segregation audit

Both clinical waste and general waste should be inspected to accurately determine the level of segregation. Other categories of waste and recyclable materials can also be audited (except hazardous, cytotoxic and radioactive waste).

4.2.2.1 Requirements

The Audit should be carried out in a well ventilated, well-lit area with smooth, impervious floors. A stainless steel table or suitable platform such as a mortuary table with elevated sides to retain liquids should be used to sort waste. Hand washing facilities should be available.

Staff performing the audit should wear adequate personal protective equipment AND should be adequately vaccinated (including Hepatitis B). A note taker will be required to record and take photographs if necessary. Photographs or video recordings can be valuable in illustrating and highlighting problem areas.

Ensure that the origin of the waste is clearly identified by name (ie theatre, Ward name) or by numbering, colour coding, or bar coding. The date collected should also be clearly marked on the containers.

4.2.2.2 Equipment

Scales suitable for weighing all waste.
A supply of suitable containers to receive waste and recyclables once segregated.
Knife or scalpel for opening bags.
Long handled tongs or tweezers for removing items of waste.
Supply of sodium hypochlorite bleach (4%) with mop and bucket.
Thick rubber gauntlet gloves, mask, apron, face shield and waterproof boots.

Thick plastic sheeting to line table surface.

4.2.2.3 Procedure

If waste volumes are small, it may be possible to inspect all bags/containers, however where this is not practical, a minimum of 10% of all bags should be selected at random for inspection. If one days waste is to be inspected, ensure that additional waste from previous days are not included (eg. Monday may include weekends waste) and note whether the day selected is representative.

First record the weight of each bag/container on the audit form (attached). Carefully open the bag and place each item into the appropriate category (Clinical, General or Recyclable - refer to the attached guide to the classification of waste). Re-weigh each category and record the results on the audit form. Total each column and calculate the percentage of Clinical waste, general waste and recyclable material.

Note: If recyclable items are identified in the clinical waste, they should not be removed for recycling if visibly contaminated with blood or body fluids.

Wagga Wagga Cluster Segregration Audit Plan

The Waste Committee will audit the following departments:

Theatre
Ward 1
Ward 2
Ward 5/ LW
Ward 3 – Medical
Emergency

Audits are to be conducted every three months in line with PFI.

Table 5: Waste Classifications for Waste Segregation Audit

Note:- This list is not all inclusive. The table acknowledges the existence of disposable items, but does not endorse their use.

Clinical	Domestic	Recyclable
Bandages & dressings contaminated with blood	Food scraps AND disposable food containers	Glass
Blood stained gloves	Gloves (NOT stained with blood)	Paper
Blood stained disposable surgical hardware	Disposable food utensils	Aluminium (cans, foil etc)
Used needles & syringes	Flowers (if not compostable)	Cardboard
Used drainage & suction containers (full/empty)	Plastic bottles (non-recyclable)	Steel cans
Theatre gowns soiled with blood	Disused office supplies	Milk cartons
Bulk blood & body fluids (not capable of safe disposal to the sewer)	Personal items	PET (polyethylene Tetrachloride) Plastic bottles
Treated Pathology waste (used culture plates/tubes etc)	Un-used medical supplies	HDPE (High Density Poly-Ethylene) Plastic bottles * [2]
Blood stained disposable bed liners	Bed liners (not visibly blood stained)	Cooking oils & fats
Blood stained disposable napkins/ incontinence pads	Disposable napkins (NOT visibly blood stained)	Polypropylene bottles *[5]
	Oxygen masks & tubing (clean)	X-ray film
	Bed pan covers (clean)	
	Sterile wraps	
	Dressing / Treatment trays	
	Paper tissues & hand towel	
	Wrappings	
	Drained IV bags & tubing	

Key: □*□ denotes recycling symbol.

Table 6: Waste Audit Form

GENERAL /CLINICAL WASTE (circle appropriate type) Date:...../...../19.....

Waste Origin Eg. Path lab, Maternity	Total Weight (kg)	Clinical		General		Recyclable		Comments (a) Clinical (b) General (c) Recyclable
		Weight	%	Weight	%	Weight	%	
								a)
								b)
								c)
								a)
								b)
								c)
								a)
								b)
								c)
								a)
								b)
								c)
								a)
								b)
								c)
TOTAL								

AUDITOR:.....RECORDER:.....

Table 7: Data Analysis from Waste Audit

Waste	Daily Volume (kg)	Estimated Annual Volume (kg)	Average Volume/ Bed Day	Average Volume/ Staff	Cost/kg
Clinical					
General					
Recyclable					

4.2.3 Energy Audit

Engineering to provide information on ways to decrease energy use.
Obtain baseline data .

[The Australian Healthcare Association and The Greenhouse Challenge have produced a Healthcare Workbook titled "Managing Energy for Profits" which sets targets for reducing greenhouse gas emissions. Further details on how to conduct energy audits and become more energy efficient can be obtained from the Australian Healthcare Association at PO Box 54, Deakin West , ACT, 2600 or {www.aha.asn.au}, Phone 02 6285 1488 or Fax 02 6282 2395]

4.2.4 Water Audit

The Riverina Water will be contacted to obtain information on methods to decrease water use.
Obtain baseline data.

SECTION 5 - Waste Handling, Containment and Transport

Wagga Wagga Cluster has an adequately trained team responsible for the handling, internal transport, spill management and disposal of clinical and related wastes.

5.1 Review

The Waste Management Committee review of the collection process including manual handling and transportation is due on .31../.07.../2008. This review will be co-ordinated by the Wagga Wagga Hotel Services Manager.

The review to include the following areas:
transport via least sensitive routes;
collection process and frequency;
handling;
placement of mobile garbage bins, bags and containers;
location of waste storage area;
Contractor collection points.

5.2 Waste Handling

Sharps are handled in accordance with the Infection Control Policy Directive 2005_247. **YES** NO
Manual handling is in accordance with the National Code of Practice for Manual Handling YES **NO**
Hand washing and hand care is in accordance with the Infection Control Policy Directive 2007_036 **YES** NO
Management of Needlestick Injuries is in accordance with Departmental Circular 98/11. **YES** NO

Table 8: Clinical Waste

Date: ...../...../.....

Department (eg. Theatre)	Location (eg. Panroom)	Container Type (eg. Bag, MGB)	Collection Frequency/Time	Collection by Whom	Storage location

Sharps Containers

Wagga Wagga Cluster provides purpose designed sharps containers to ensure a safe system of work. An annual audit is conducted by the supplier to determine the appropriateness in terms of size and location based on the risks associated with each invasive procedure. This is in line with the Area Health Service contract.

Sharps container/s used: Daniels Sharps
Size/s: range of sizes used in all clinical areas. Majority of containers are 22.7 litre nestable. Additional sizes are used as required. Containers also in public toilets
The containers are collected by (if contractor) [insert details]
The containers are disinfected by (if reusable): no reusable containers
Containers are not overfilled **YES**
Containers comply with Australian Standards **YES**
Kept out of children's reach (ie minimum 1.4m above floor) **YES**
Labeled with hospital, date & ward **NO**
Sealed before removal **YES**

Table 9: Sharps Containers

Date: …../…../…..

Department (eg. Theatre)	Location (eg. Panroom)	Collection Frequency/Time	Collection by Whom	Storage location

Table 10: General Waste

Date: …../…../…..

Department (eg. Theatre)	Location (eg. Panroom)	Collection Frequency/Time	Collection by Whom	Storage location

5.3 Waste Bags

Bags are not overfilled **YES** No
Bags are held away from the body when being handled **YES** NO
Bags are sealed at the point of generation/collection **YES** NO
The bag closures used are: Cable ties
The waste collection times are: twice daily am and pm
Waste bags are free of heavy metals (inorganic dyes) **YES** NO

5.4 Waste Trolleys & Mobile Garbage Bins (MGBs)

Are the trolleys used exclusively for waste transport? **YES** NO
Are trolleys lidded, leakproof and made of rigid material? YES **NO**
Trolleys are not overfilled YES **NO**
Do MGBs have lockable lids **YES** NO
Are the trolleys and MGBs colour coded and labelled in accordance with Appendix 4
Cleaning frequency: weekly

The following procedures are followed when cleaning trolleys and MGBs:

Thoroughly scrub trolleys and MGBs with pH neutral detergent
Trolleys and MGBs should be left to dry
Cleaned trolleys and bins are to be stored separately from soiled containers
Wear appropriate personal protective equipment
Waste water must not be discharged to storm water or other system systems designed to carry unpolluted water.

5.5 Tracking

All waste bags, MGBs and sharps containers are labeled with the hospital, ward and date
The labeling method used: Bar coding
The person responsible for tracking is: Stericorp

5.6 Holding Areas

Clinical waste is stored in an enclosed structure with lockable door and smooth impervious floor. **YES** NO
Approximate duration of storage: up to one week
"First in first out" policy ..... **YES** NO
Water supply available ..... **YES** NO
Suitable drainage provided (specify eg. sewer, septic tank) *[insert details here]*
Permanent natural ventilation provided ..... **YES** NO
Adequate lighting provided ..... **YES** NO
Are spill kits located in the holding area ..... YES **NO**
Where are the spill kits located:: *[insert locations here]*
Who holds the keys for the holding area: Hotel Services
If an enclosed structure is not available, where is the location of holding area *Not applicable*
Holding Area not accessible to the public: ..... YES **NO**
Is the holding are enclosed by a fence or other barrier ..... YES **NO**
Radioactive wastes with short half-lives are stored on the premises until radioactivity is undetected.
Separate radiation storage room ..... **N/A** YES NO
Radioactive storage bin provided ..... **N/A** YES NO
Is a collection tank provided for liquid waste ..... **N/A** YES NO

5.7 Personal Protective Equipment (PPE)

The following protective barriers are available or accessible:

eye shields	**YES** NO	specify:	
gloves	**YES** NO	specify:	
gowns	**YES** NO	specify:	do we require this
masks	**YES** NO	specify:	
aprons	**YES** NO	specify:	
footwear	**YES** NO	specify:	

The PPE worn when handling waste the following types of waste are:
General:
Clinical:
Cytotoxic: Please refer to safe work
Radioactive: practices
Sharps:

5.8 Spill Management

5.8.1 Spill Kits

The person responsible for maintaining the kits is ..... *Ward manger where kit held*
Commercially available kits supplied ? ..... **YES** NO
What is the name of the Company: *Material management*
Spill kits for clinical waste are maintained in the following areas: *Every ward*
Spill kits for cytotoxic waste are maintained in the following areas: ward 3 – medical ward, Emergency, OT, Children's ward,
Spills kits for mercury spills are maintained in the following areas: *Emergency, maternity, children's ward,*
A recommended equipment list for spill's kits is located in Appendix 3.

5.8.2 Management of blood or body substance spills

Spot Cleaning

- Put on disposable gloves
- Wipe up spot immediately with a damp cloth, alcohol, or paper towel may be used.
- Discard contaminated materials in Clinical waste bag.
- Wash hands thoroughly.

Other spills

- Collect appropriate spill kit from designated location
- Wear disposable gloves, eyewear, mask and apron
- Remove the bulk of the blood and body substances with absorbent material
- Use pan and scraper to scoop up absorbent materials and unabsorbed blood or body substances
- Discard Clinical materials in Clinical waste bag for disposal
- Wash hands thoroughly
- Mop the area with a detergent solution
- Wipe the site with disposable towels soaked in a solution of 1% (10,000 ppm) available chlorine.
- Clean and disinfect pan, scraper, mop and bucket
- Re-usable eyewear and apron should be cleaned and disinfected after use
- Replace any used items and return the spill kit to the designated location

If a spill occurs on a carpeted area, mop up as much of the spill as possible using disposable towels then clean with a detergent. Arrange for the carpet to be shampooed as soon as possible. (Circular 95/13).

5.8.3 Cytotoxic Spills

- Collect cytotoxic spill kit from designated location
- Put out a sign to notify of potential hazard.
- Wear appropriate PPE as outlined in WorkCover guidelines.
- Double glove with latex inner and heavy duty outer gloves
- Lay absorbent towels or mats over the spill
- Scrape up any broken glass and absorbent materials and place in cytotoxic waste bag
- Mop the area with warm water and detergent
- Remove shoe covers, outer gloves, disposable overalls, mask and goggles and place in waste bag/container
- Seal waste bag and place in cytotoxic waste bin or have it collected in the usual manner.
- Replace any used items and return the spill kit to the designated location

5.8.4 Formaldehyde Spills

- Shut off all sources of ignition
- Ventilate area as much as possible
- Collect Clinical waste spills kit from designated area
- Wear goggles or face shield for spills or leaks where concentrations of formaldehyde in air are great enough to cause eye irritation.
- For higher concentrations wear an approved supplied air helmet or self contained breathing apparatus with full face piece.
- If leak or spill is small, dilute with plenty of water and run to waste
- For large spills, absorb in a suitable material (dry sand, earth, vermiculite) and dispose as approved by local Council
- Mop or wipe over spill area with warm water and detergent
- Replace any used items and return the spill kit to the designated location

5.8.5 Glutaraldehyde Spills

- Ventilate area as much as possible
- Collect Glutaraldehyde spill kit from designated area
- Wear goggles or face shield
- Dilute with plenty of water and run to waste
- Mop or wipe over spill area with warm water and detergent
- Replace any used items and return the spill kit to the designated location

5.8.6 Mercury Spills

- Ventilate area of spill
- Collect mercury spills kit from designated area
- Wear impervious disposable gloves
- Pick up droplets using a pasteur pipette, eye dropper or suction bottle

- Store the waste in an unbreakable lidded container, preferably under a solution of sodium thiosulphate (photographic fixer).
- Decontaminate the area by sprinkling sulphur powder over the spill area. The volume of powder used should be at least twice the volume of the spill.
- Mix well by a brush, where possible
- Allow about half an hour for the formation of mercuric sulphide
- Sweep up the sulphur using the dustpan and brush, avoid generating dust
- Dispose of the dust in an impervious sealed container
- Seal and discard all cleaning equipment
- Replace any used items and return the spill kit to the designated location

For spills on carpeted area, follow the first five steps described above. For decontamination, the carpet has to be removed. Once the carpet is removed the decontamination procedures can be followed.

5.8.7 Cidex OPA Spills

Procedure

- Remove unnecessary people from the spill area
- Place Caution Fluid Spill sign on the floor
- Fit Personal Protective Equipment – Gown, overshoes, mask, safety goggles and gloves
- Sprinkle Neutraliser Powder evenly over entire spill area
- Remove Absorb Pillows from Plastic Bag
- Place Absorb pillow on spill area, start at outer edge of spill, apply light pressure and sweep in to absorb all liquid
- Place used Absorb Pillows into black garbage bag
- Wipe any excess residue from floor with Neutraliser Wipes
- Place contaminated wipes into black garbage bag
- Place all Personal Protective Equipment into black garbage bag and seal the bag
- Wash hands
- Follow your facility's waste disposal practices and all state and local regulations
- Mop floor with a neutral detergent and water or notify Environmental Services for general floor cleaning – once floor has been mopped and is dry Caution sign can be removed
- Order replacement Spill Kit from GSAHS Procurement and Supply

5.9 Transport

Transportation complies with the EPA's *Special conditions applicable to the transportation of trade waste being contaminated wastes generated in hospitals, health institutions and medical laboratories*.
All of Generic Hospital's Transporters and Contractors are outlined in Table 11 .

5.9.1 Community Health

Clinical Waste is not transported in the drivers compartment:		**YES** NO
Waste Containers:	Rigid and leakproof	**YES** NO
	Secure fitting lids	**YES** NO
	Securely mounted in the vehicle	**YES** NO
	Cleaned regularly	**YES** NO
	Clearly labelled	**YES** NO
Vehicles are always locked when unattended		YES NO
Vehicles carry a suitable spill kit		YES **NO**

Table 11: Transporters and Contractors

..... Date:...../...../19.....

Waste Type	Name of Contractor and/or Transporter	Address	Contact Phone	Trade Waste License No	Destination
Clinical					
General					
Sharps					
Cytotoxic					
Grease Trap					
Hazardous					
Pharmaceutical					

SECTION 6 - Waste Treatment and Disposal

Wagga Wagga Clusteris responsible for its waste from generation to final disposal (□cradle to grave"). For this reason, documentation is kept on the date of disposal, the amount of waste disposed, where the waste is disposed and the contractors and transporters.

Table 12: Chemicals, Pesticides & Pharmaceuticals

..... Date:...../...../19.....

Chemical, Pesticide Pharmaceutical	Use	MSDS Available Yes/No	Storage Location	Disposal Method (Ie. sewer, landfill, incinerator etc)	Quantity & Frequency	Trade Waste License & Contractor receipt

Table 13: Radioactive Waste

..... Date:...../...../19.....

Radioactive Material	Half Life	Storage Location	Storage Duration	Disposal Method	
				Where	How and By Whom

6.1 Radioactive Waste Disposal – not applicable

The safe handling and disposal of radioactive materials is regulated by the NSW Radiation Control Act, 1990, and the Radiation Control Regulation, 1993.The current guideline being used by Generic Hospital is the NH&MRC *Code of practice for the disposal of radioactive wastes by the user*.
Is the facility licensed by the Environment Protection Authority YES NO
License Number: *[insert number here]*
Radiation Safety Officer: *[insert name here]*
Are any radioactive gases discharged? YES NO
Who maintains the system? *[insert name here]*
Are detailed records of disposal kept - covering the type of radionuclides, estimated activity, physical nature of material, date disposed and method of disposal YES NO

6.2 Disposal of Clinical Waste in Isolated Rural Areas - not applicable

Is the landfill licensed by the EPA to receive clinical waste YES NO
Is the waste covered immediately YES NO
Does the public have access to this part of the waste facility YES NO
Is the hospital given any written acknowledgment of receipt YES NO
Does the hospital keep records of amount and date of disposal YES NO
Do hospital staff supervise the disposal YES NO

6.3 Disposal of Products of Conception and Non-viable Foetuses

Less than 20 weeks gestation or less than 400gms

How are products of conception disposed: *From OT – clinical waste, From maternity via funeral director or pathology*
Are parents permitted to take these products home YES **NO**
If yes, how are these products disinfected: *Not applicable*
How are these products packaged: *Not applicable*
Does the cemetery provide memorial services burial of these products: **YES** NO
Do any Funeral Directors participate in the provision of a memorial service **YES** NO
If yes, which ones: For details and further enquiries please consult maternity services

Greater than 20 weeks gestation or greater than 400gms

How are products of conception disposed: *funeral director/ pathology*
Are parents permitted to take these products home YES **NO**
If yes, how are these products disinfected: *Not applicable*
How are these products packaged: *Not applicable*
Does the cemetery provide memorial services burial of these products: **YES** NO
Do any Funeral Directors participate in the provision of a memorial service **YES** NO
If yes, which ones: For details and further enquiries please consult maternity services

6.4 Radiography Wastewater – not applicable

A silver recovery unit is installed: YES NO
If YES the Silver recovery unit is serviced by:{insert name}
If NO used fixer and developer is removed by: {insert name}
Waste is managed in accordance with the PURE Code of Practice (Appendix 1) YES NO
Trade waste agreement with sewage authority {provide details}

Table 14: Treatment and Disposal

…… Date: …./ ……/ …

Waste Type	Treatment		Disposal		Trade Waste Agreement/License No.
	Method	Contractor	Method	Contractor	
General Waste					
Clinical Waste					
Sharps					
Pathology Waste					

Table 15: Waste Management - Annual Report

..... Date:...../...../19.....

Waste	Quantity/Annum (litres or kgs)	Handling Costs (Container cleaning, replacement etc)	Transport Costs	Treatment Costs	Disposal Costs	Total Cost
General Waste						
Clinical Waste						
Sharps						
Radioactive						
Cytotoxic						
Chemical Waste						

Any problems experienced?

SECTION 7: Occupational Health and Safety

The Hospital's copy of the Occupational Health and Safety Act 1983 & Regulations is available at: *[insert details here]* (describe location)

Copies of the provisions of sections 23, 24, 25, 26 & 31 of the Occupational Health & Safety Act are displayed in the following locations:*[insert locations here]*

An Accident/Incident Register is kept in *[insert details here]*(describe location), and is maintained by *[insert details here]*

All waste handling injuries and incidents are investigated by *[insert details here]* (Name & Position) immediately they are reported. Preventive action will be initiated as soon as practical and a report submitted to the Occupational Health and Safety Committee.

Waste handlers are represented on the Occupational Health and Safety Committee by
[insert details here](name)
[insert details here](position)

All staff who handle waste and recyclable materials:

- Receive accredited training in basic infection control, personal hygiene, safe handling techniques, correct use of Personal Protective Equipment, spill management procedures and the requirements of the Occupational Health and Safety Act 1983
- Are issued with appropriate Person Protective Equipment and compelled to wear it while handling waste.
- Are issued with a comprehensive statement of duties and standard operating procedures manual.
- Have access to equipment and facilities which minimise manual handling and promote personal hygiene.
- Have access to and are familiar with Material Safety Data Sheets (MSDS) for all chemicals used.
- Are aware of the requirements of the Infection Control Policy (95/13)
- Are offered appropriate vaccination as summarised in Table 16.

Table 16: Waste Handling Staff Immunisation:

Date:....../....../19.....

(Please add or delete any immunisation relevant to your hospital)

Name	Employee's Title	Training Completed	Immunisation Up to Date
		YES NO	Hep B Y / N Tetanus Y / N Hep A Y / N Other
		YES NO	Hep B Y / N Tetanus Y / N Hep A Y / N Other
		YES NO	Hep B Y / N Tetanus Y / N Hep A Y / N Other
		YES NO	Hep B Y / N Tetanus Y / N Hep A Y / N Other
		YES NO	Hep B Y / N Tetanus Y / N Hep A Y / N Other
		YES NO	Hep B Y / N Tetanus Y / N Hep A Y / N Other

SECTION 8: Bibliography & Acknowledgments

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Acknowledgements
The authors would like to acknowledge the following Hospitals and Health Services for for their assistance in development of the Generic Plan; Albury Base Hospital, Central West Health Service, Griffith Base Hospital, Hay Hospital, Royal Newcastle Hospital, South Western Sydney Area Health Service, Wagga Wagga Base Hospital, and War Memorial Hospital Waverley.

Appendix 1: Legislation

Health care establishments need to observe all public and occupational requirements. Compliance with standards set for the ambient environment as well as for effluent and emission limits, (NHMRC; 1995).

The following list of legislation may be applicable to most Hospitals.
Protection of the Environment Operations Act 1997
Dangerous Goods Act 1975
Dental Technicians Registration Act 1975 & Regulations
Environmentally Hazardous Chemicals Act 1985
Environmental Offences and Penalties Act 1989.
Local Government Act 1993 & Regulations
Medical Practices Act 1992 & Regulations
Nurses Act 1991 & Regulations
NSW Occupational Health and Safety Act 1983, Regulations and Associated Legislation
Public Health Act 1991
Radiation Control Act 1990
Water Board Act 1987
Waste Minimisation and Management Act 1995

Guidelines:-

NHMRC, 1995 (draft), National Guidelines for the management of Clinical and related wastes.
Sedgwick, 1995, Minimum Standards and Guidelines for Waste Management, NSW Health Department
EPA, 1991, Special conditions applicable to the Transportation of Trade Waste being Contaminated Wastes generated in Hospitals, Health Institutions and Medical Laboratories.
EPA, 1991, Special Conditions Applicable to the Storage of Trade Wastes being Contaminated Wastes Generated in Hospitals, Health Institutions and Medical Laboratories.
NHMRC, 1985, Code of Practice for the Disposal of Radioactive Wastes by the User, Australian Government Publishing Service, Canberra.
NHMRC, 1996, Infection Control In the Health Care Setting, Australian Government Publishing Service, Canberra.
Photographic Uniform Regulations for the Environment (PURE), 1997, Code of Practice for Liquid Waste Management & Disposal (Photographic, Graphic Art and X-Rays).

Australian Standards:-

X AS/NZS 3816:1998. Management of clinical and related wastes.
X AS/NZS 4261 - 1994. Reusable sharps containers for collection of sharp items used in human, and animal medical applications.
X AS 4031 - 1992. Non-reusable containers for the collection of sharp medical items used in health care areas.
X AS 1251-1 1982. Polyethylene (polythene) Garbage Bags - Low Density. Withdrawn

NSW Health Department Circulars:-

X 95/49 30 June 1995 Guidelines and Competencies for the handling of cytotoxic drugs and related waste in NSW Health Care Establishments.
X 95/49 30 June 1995 Guidelines for handling cytotoxic drugs and related waste in health care establishments. 95/13 30 June 1995 NSW Health Infection Control Policy 88/192 21 September 1988. Guide to Incineration. Contaminated Waste Incinerator Specification Guidelines.
X 98/11 2 Febuary 1998. Management if health care workers potentially exposed to HIV, hepatitis B and hepatitis C.

Appendix 2: Needle Stick and Blood or Body Fluid Exposure

This is an example of a needlestick policy. If you have your own policy, please insert it here]

Staff Instructions - Needlestick injury and Blood or Body fluid exposure
Immediate Action
a) Penetrating injury/needlestick injury

Induce bleeding by gently squeezing
Wash promptly and thoroughly with soap and water

b) Mucosal Splash

Rinse copiously with water
If eyes are Clinical rinse while open with tap water or saline
If blood gets in the mouth, spit out and rinse with water and spit out again. Repeat several times.

Report incident to Supervisor or out of hours Nursing Supervisor. Please complete incident form and WorkCover notification form. Return form to your Supervisor immediately. (WorkCover notification form has to be posted to WorkCover within 7 days)

Report to Accident/Emergency
It is important to report to Accident/Emergency in the first instance so that the RMO can make an assessment of exposure. This then determines whether you need to be prescribed the drug AZT Zidovudine.

For initial and/or subsequent blood screening you have the option of attending

Accident/Emergency Department
A Sexual Health Clinic
General Practitioner.

When you are assessed by the RMO on duty, he/she will carry out the following:

First Aid treatment if required
Assess the significance of blood/body fluid exposure
Assess your Hepatitis B vaccination status
Counsel you regarding a number of issues concerning Hepatitis B/C, HIV
Obtain your consent for blood tests
Extract blood for, Hepatitis B antibodies (titre levels), Hepatitis C antibodies, HIV.

Hepatitis B vaccination/immunoglobulin
If you have not been vaccinated against Hepatitis B, the RMO will give an injection of Hepatitis B vaccine, and possibly Hepatitis B immunoglobulin. Hepatitis B follow up vaccination should be carried out by the Staff Immuniser. Results should be collected from Accident/Emergency within 24 hours. If your Hep B results show insufficient antibodies, Hep B immunoglobulin must be administered within 72 hours. If sufficient antibodies are present a Hep B vaccination booster will only be required. A Tetanus injection will be required if not received within the last 5-10 years.

HIV/Hep C results must be collected (in person) from the RMO within 7 days. Results must not be given over the phone.

Follow-up blood tests (after 1st initial blood test)
You will need further blood tests for

#	Hepatitis B	3 months after injury (titre levels)
#	Hepatitis C	3 months after injury, then 6 months
#	HIV	3 months after injury, then 6 months

Counselling Services Available
Generic Hospital, contact the Infection Control Sister OR Needle Stick Hotline 1800 804 823

Appendix 3: Spill's Kits

[Some of these kits are commercially available or can be made up by your hospital]

Clinical Waste Spill kit could contain:

broom
mop and mop bucket
a large (10 litre) reusable plastic container or bucket with fitted lid, containing;
2 plastic general waste garbage bags for the disposal of any general waste;
2 Clinical waste bags for the disposal of Clinical waste;
a pan and scraper;
5 granular disinfectant sachets containing 10,000 ppm available chlorine or equivalent;
disposable rubber gloves suitable for cleaning
detergent
disposable cloths and sponges
disposable overalls
heavy duty gloves suitable for handling Clinical waste
eye protection
a plastic apron
a mask (for protection against inhalation of powder from disinfectants, or aerosols generated from the spills).
incident report form
waste spill sign

The Cytotoxic spill kit consists of:

mop and mop bucket
a large (10 litre) reusable plastic container or bucket with fitted lid, containing;
2 cytotoxic waste bags for the disposal of cytotoxic waste
2 pairs of disposable hooded overalls
shoe covers
long heavy duty gloves
latex gloves
a mask (for protection against inhalation of powder from disinfectants, or aerosols generated from the spills).
splash goggles
absorbent toweling / absorbent spill mat
incident report reform
waste spill sign
5 granular disinfectant sachets containing 10,000 ppm available chlorine or equivalent;
a pan and scraper.

The Mercury spill's kit consists of:

2 unbreakable lidded containers
spill sign
pasteur pipette
eye dropper
sodium thiosulphate
mask (for protection against inhalation of powder or aerosols generated from the spill)
dust pan and brush
sulphur powder
incident form

Appendix 4: Colour Coding

Prescribed Colour and Symbols for waste bags and containers

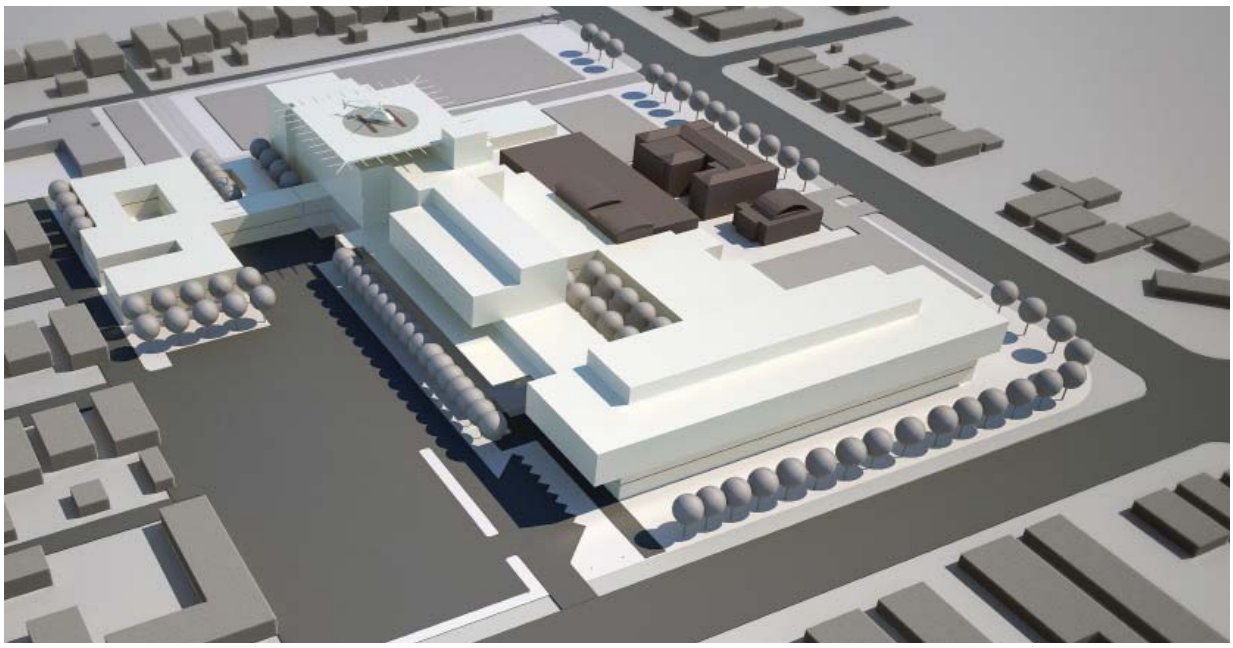
Type of waste	*Colour of bags / Containers*	*Colour of Letters*	*Symbols*
Clinical	Yellow	Black	
Cytotoxic	Lilac	Violet	
Radioactive	Scarlet	Black	
General Waste	opaque white	no colour	no symbol

Recommended Government Colour Coding for Recycling

NSW Government Colour Coded Recycling System for Workplaces & Public Places	
Aluminium Cans	Yellow
Brown Glass	Brown
White Glass	White
Green Glass	Light Green
Mixed Glass	Red
Compostables	Maroon
Good Quality Paper	Blue
Newspapers, magazines	Green
Plastics (PETE)	Orange

APPENDIX O

Preliminary Contamination Assessment



Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Contamination Assessment

Proposed Redevelopment
Wagga Wagga Base Hospital
Edward Street, Wagga Wagga NSW

Prepared for
Health Infrastructure

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Douglas Partners
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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		25 May 2011
Reviewer		25 May 2011

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Executive Summary

This report presents the results of a Preliminary Contamination Assessment undertaken for a proposed redevelopment at Wagga Wagga Base Hospital, located on Edward Street, Wagga Wagga (referred to as the 'Site'). The investigation was commissioned in an email dated 2 March, 2011, by Mr Frank Tong of Capital Insight Pty Ltd and was undertaken in accordance with Douglas Partners' proposal dated 16 February, 2011.

This assessment has been conducted in conjuction with a geotechnical investigation and was undertaken to evaluate the likely potential for contamination at the Site. The assessment involves a desktop study of the historical land uses of the property and a "walkover" Site inspection with the objective of identifying potentially contaminating activities that could have taken place within the Site and on adjoining properties. Environmental sampling was undertaken from eight of the ten geotechnical boreholes. Two of the Boreholes (101 & 106) were converted into groundwater piezometers for groundwater sampling purposes. Details of the field and laboratory work are given in this report whilst the geotechnical investigation was reported separately.

The Site is currently occupied by a number of separate buildings, some of which date back to the early 1900s. The main hospital building located within the central part of the Site is eight storeys in height. The original three storey hospital building located adjacent to the main building (adjacent to the lawn area that fronts Edward Street) is still operational. A number of smaller brick buildings ranging in height from between one and three storeys are located throughout the site and are currently used as university buildings, hospital nursing quarters, engineering/ maintenance buildings and hospital specialist buildings. A relatively newly constructed theatre building (CSB building) is located to the south-west of the main building and is between two and three storeys in height.

It is understood that the proposed redevelopment of the Site will include the demolition of all buildings except the CSB building (the newly constructed theatre building), Harvey House (UNSW medical building) and the Hydrotherapy Pool building. The proposed new main building will vary between two and eight storeys in height and will spread out across the Site as shown on Drawing 1, Appendix B. The preliminary conceptual design also includes a service tunnel under the new building constructed to a depth equivalent to approximately one basement level.

A review of the historical aerial photographs, the baseline archaeological assessment report, site walkover survey and field observations indicate that the greater majority of the Site was developed into a hospital in the early 1900s. No historical records were available for review prior to the site being developed into a hospital. However, the baseline archeological assessment report indicated that the Site was unoccupied prior to the construction of the hospital. The information gathered suggested potential contamination associated with:

- Hazardous building materials (asbestos, lead based paints);
- An old boiler and laundry house;
- A workshop area (and former area);
- Imported filling; and
- Migration of contaminants on groundwater from a nearby Caltex service station.

Intrusive site investigation undertaken in conjuction with the geotechnical investigation identified fill materials in Test Bores 101, 105, 107 and 108. The fill materials were underlained by silty clay. No discernible odour or oily staining were observed during the fieldwork. Screening of all samples collected indicate PID reading of <1 ppm.

The results of the soil analysis indicated that concentrations of heavy metals, TPH, BTEX, PAH, OCP, OPP, PCB, VOC and total phenols in the samples analysed were either below the laboratory PQL or the adopted Site Assessment Criteria (SAC). With regard to asbestos, whilst no asbestos was detected in the soil samples analysed, not all previous locations of old buildings were sampled. In this regard, the potential presence of asbestos contamination cannot be discounted.

On the basis of the field observations and total concentrations of targeted analytes, the identified filling is assigned a preliminary waste classification of General Solid Waste (non-putrescible), whilst the underlying natural clays are assigned a preliminary classification of Virgin Excavated Natural Material (VENM). The classifications are subject to *ex situ* confirmation.

No groundwater contamination issues were identified in the two groundwater monitoring wells that were installed and sampled.

No significant contamination issues have been identified through the scope of works undertaken in completing this assessment. As such, it is considered that the Site is, in general, environmentally suitable for the proposed redevelopment. However, given the limited nature of the assessment, the extent of works proposed, and the areas of potential contamination identified, it is recommended that further assessment of the Site be undertaken prior to construction. As the existing buildings (proposed for demolition) present a potential source of contamination (i.e. asbestos and lead) it would be advisable to undertake additional investigations upon completion of demolition.

Prior to demolition a hazardous materials assessment should be undertakent to identify any building hazards (e.g. asbestos and lead based paints) requiring particular management / disposal. Should such materials be identified then the removal works will require the engagement of appropriately licenced contractors.

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Report on Preliminary Contamination Assessment
Proposed Wagga Wagga Base Hospital Redevelopment
Edward Street, Wagga Wagga NSW

1. Introduction

This report presents the results of a Preliminary Contamination Assessment undertaken for a proposed addition of new buildings at Wagga Wagga Base Hospital located on Edward Street, Wagga Wagga (referred to as the Site). The investigation was commissioned in an email dated 2 March, 2011, by Mr Frank Tong of Capital Insight Pty Ltd and was undertaken in accordance with Douglas Partners' proposal dated 16 February, 2011.

This assessment has been conducted in conjuction with a geotechnical investigation and was undertaken to evaluate the likely potential for contamination at the Site. The assessment was requested as part of the development application process. The assessment involved a desktop study of the historical land uses of the property, a "walkover" Site inspection with the objective of identifying potentially contaminating activities that could have taken place within the Site and on adjoining properties, and limited environmental sampling and testing.

Environmental sampling was undertaken in conjuction with the geotechnical investigation from eight of the ten (10) geotechnical targeted boreholes. Two of the boreholes were converted into groundwater piezometers for groundwater sampling purposes.

Details of the field and laboratory work are given in this report whilst the geotechnical investigation has been reported separately.

2. Scope of Work

The scope of work for the assessment is summarised below:-

- Acquire and review historic aerial photos to identify land uses and changes in the land that may indicate potential for contamination;
- Review of the Contaminated Land Register for Notices issued under the *Contaminated Land Management Act* 1997 for any listed properties in the vicinity of the subject Site;
- Review of any site history information that may be made available from the client;
- Acquire information from WorkCover NSW regarding any past registrations for storing dangerous goods;
- Review of site and regional geological, topographical and acid sulphate soil maps;
- Conduct a site inspection to identify current site features and any visually apparent indicators of potential contamination (e.g. fly tipping, filling, unusual staining, underground tanks);

- Obtain samples of soil/ fill from 8 boreholes in conjuction with the geotechnical investigation at depths based upon subsurface conditions and signs of contamination. Collect additional 5-10% replicates for QA/QC requirements;
- Screen all soil samples collected with a photo-ionisation detector (PID) to detect the presence or likely absence of volatile organic compounds;
- Conduct laboratory analysis on selected soil and sediment samples (including replicate QA/QC sample) at a NATA accredited laboratory for a combination of the following potential contaminants:-
  - Heavy metals - As, Cd, Cr, Cu, Pb, Hg, Ni, Zn - (16 samples);
  - Total Petroleum Hydrocarbons (TPH) – (11 samples);
  - Benzene, Toluene, Ethylbenzene and Xylene (BTEX) – (11 samples);
  - Polycyclic Aromatic Hydrocarbons (PAH) – (16 samples);
  - Phenols – (9 samples);
  - Polychlorinated Biphenyls (PCB) – (9 samples);
  - Organochlorine pesticides (OCP) – (9 samples);
  - Organophosphate pesticides (OPP) – (9 sampes);
  - Volatile Organic Compounds (VOC) – (3 samples); and
  - Asbestos – (4 samples).
- Purge and recover groundwater samples from two monitoring wells installed as part of the geotechnical investigation;
- Conduct laboratory analysis on the groundwater samples, including Heavy Metals, TPH, BTEX, PAH, OCP, OPP, PCB, Phenols, VOC and Hardness;
- Provision of this Preliminary Contamination Assessment report including a preliminary waste classification assessment will be provided as part of the report.

3. Site Identification and Description

3.1 Site Identification

The site identification information is summarised as follows:

Item	Details
Site Owner	Wagga Wagga Base Hospital / Health Administration of NSW Health
Site Address	Corner Edward and Docker Street, Wagga Wagga, NSW
Lot & DP Number	DP 659184, Lots 1-2 DP 456751, Lot 1 DP668972, Lots 27-31 DP 7850, Lots 1-4 DP 13345 Section A, Lots 2-3 & 12-15 DP 13345 Section B, Lots 1-6 DP 13345 Section C.
Local Government Authority	Wagga Wagga City Council
Current land use	Commercial (hospital)
Approximate Site Area	5.7 hectares
Site Plan & Locality Map	A site plan and locality map in Drawing 1, Appendix B.

3.2 Site Description

The Site is an existing hospital approximately rectangular in shape with area totalling approximately 57,000 m^2. It has an approximate 220 m northern frontage to Edward Street and a length of approximately 270 m along Docker Street on the western boundary. The eastern boundary is irregular and typically fronts neighbouring residential boundaries and hospital support buildings. Rawson Avenue borders the Site along the southern boundary (refer to Drawing 1, in Appendix B).

4. Site History

A review of site history information was conducted based on historical aerial photos, a WorkCover NSW Dangerous Goods database search, and a search for regulatory Notices (issued under *Contaminated Land Management* (CLM) *Act* 1997 and *Protection of the Environment Operations* (POEO)) *Act* 1997. Historical title deeds search was not undertaken as part of this preliminary contamination assessment.

4.1 Historical Aerial Photographs

Selected historical aerial photographs for eight years (1944, 1953, 1971, 1980, 1985, 1990, 2001 & 2010) were reviewed to establish the changes to the physical features of the Site over the years. The Wagga Wagga Base Hospital – Baseline Archaeological Assessment report by Archaeological and

Management Solutions Pty Ltd, dated January 2011 was also used as reference for identifying buildings on Site. The photos are included in Appendix C and relevant features are described below.

1944

The 1944 aerial photograph shows that the Site has been developed with the majority of the hospital's buildings were already existing. The notable feature of the Site is the presence of residential buildings along the east, across Lewis Drive. The surrounding land use appears to be residential in nature.

1953

The 1953 aerial photograph shows that no discernible changes occurred since the 1944 aerial photo other than the increase in residential buildings to the north and south-west of the site.

1971

The 1971 aerial photograph shows that the site has been redeveloped to include several building extentions including the east wing of the main hospital, nurses home extention, and new buildings to the south.

No significant changes to the surrounding land use is observed since the 1953 aerial photograph. The current location of the Caltex service station along the corner of Edward and Docker Street to the west of the Site appears to have a similar building orientation However, this location appears to have been redeveloped in the 1971 aerial photograph.

1980

Whilst the 1980 aerial photograph is not clear, it appears that there is no significant change that occurred on site since the 1971 aerial photograph. Similarly, the surrounding land use appears to have not undergone any significant development.

1985

Some residential areas adjacent to Lewis Drive appear to have been demolished. Several buildings can now be seen south of the site. These buildings are noted to have been used as workshop, laundy and boiler house. No significant changes to the surrounding land use is observed since the 1980 aerial photograph.

1990

More residential buildings adjacent to Lewis Drive have been demolished and converted into car parks. New buildings to the south west and to the south east appear to have been constructed between 1985 and 1990.

The location of the current Caltex service station off site appears to have been redeveloped since the 1985 aerial photograph.

2001

A few more residential buildings adjacent to Lewis Drive appear to have been demolished since the 1990 aerial photograph. A new building located at the centre of the site has been constructed between 1990 and 2001.

2010

No significant change to the site has occurred since the 2001 aerial photograph with the exception of the construction of a building in front of Robinson House located west of the main hospital building.

4.2 NSW WorkCover Dangerous Goods Database

A search of the NSW WorkCover dangerous goods database indicated that there were no registered dangerous goods storage depots at the subject site other than liquid oxygen. WorkCover search documentation is attached in Appendix D.

4.3 Statutory Notices

The NSW Office of Environment and Heritage (OEH) Register of Notices issued under the *Contaminated Land Management Act*, 1997, was searched on 25 March, 2011. The search of the OEH database indicated that two environmental protection licences have been issued by the OEH within 500 m from the Site. These two lisences relate to the hazardous and/or industrial and/or Group A waste generated by Wagga Wagga Base Hospital and Calvary Hospital. According to the OEH website, both licenses were no longer in force.

No Notices or Orders issued by the OEH with respect to the subject Site.

5. Site Condition and Surrounding Environment

5.1 Current and Future Land Use

The Site is currently occupied by a number of separate buildings, some of which date back to the early 1800s. The main hospital building located within the central part of the Site is eight storeys in height and is understood to have been constructed around the 1960s. The original three storey hospital building located adjacent to the main building (adjacent to the lawn area that fronts Edward Street) is still operational. A number of smaller brick buildings ranging in height from between one and three storeys are located throughout the site and are currently used as university buildings (Harvey House), hospital nursing quarters, engineering/ maintenance buildings and hospital specialist buildings. A relatively newly constructed theatre building (CSB building) is located to the south-west of the main building and is between two and three storeys in height. Open asphalt and gravel car parks are located along the eastern side of the site.

It is understood that the proposed redevelopment of the site comprises three stages of construction activities including the demolition of all buildings except the CSB building (the newly constructed theatre building), Harvey House (UNSW medical building) and the Hydrotherapy Pool building. The proposed new main building will vary between two and eight storeys in height and will spread out across the Site.

The preliminary conceptual design also includes a service tunnel under the new building constructed to a depth equivalent to approximately one basement level. Open spaced car parking will be located on ground level only towards the north-eastern corner and south-western corners of the Site.

The proposed layout advised at the time of preparing this report is shown on Drawing 1, Appendix B.

5.2 Topography and Drainage

The local topography indicates that the Site falls gently to the north with a cross fall of approximately 2 m over a total distance of 270 m (DP, Report on Geotechnical Investigation, Project 72320.00 dated May 2011; DP, 2011). The stormwater runoff is expected to flow into street drains.

5.3 Surrounding Land Use

The surrounding site uses include:

- North - Residential areas across Edward Street;
- South - Residential areas across Rawson Avenue;
- East - Residential areas and asphalt/gravel car parks; and
- West - Residential areas and Caltex service station across Docker Street, corner Edward Street.

6. Geology and Hydrology

Reference to the Wagga Wagga 1:250 000 Geological Series Sheet (SI 55-15) indicates that the northern half of the Site is underlain by unconsolidated sand, silt, clay and gravel (floodplain sediments) and includes high-level Tertiary aged terrace sediments of the Murray Valley comprising gravel, sand, silt and clay. The southern half of the Site is shown to be underlain by the Wagga Marginal Base Formation comprising shale, slate, quartzite, sandstone and subgreywacke.

The field work confirmed the presence of alluvial clays, sands and gravelly sand extending to over 25 m depth (DP, 2011).

A groundwater bore search from the NSW Office of Water [previously Department of Water and Energy, now part of the now part of the Department of Primary Industries] database was conducted. At least 42 groundwater bores were identified within a 500 m radius of the Site. Work summaries from the nearest sourrounding bores indicated that the authorised and intended purposes of the

groundwater bores were for dewatering, monitoring, recreational and domestic purposes. The domestic bore is located approximately and 650 m north east, down-hydraulic-gradient of the Site. The work summaries of the selected registered bores near the Site are included in Appendix E.

The Site is generally slopes down from north to north east. Regional groundwater and surface water is expected to generally flow in the north-east direction towards Murrumbidgee River. Groundwater was observed at 6.3 m below ground level (bgl) equivalent to 169.5 m RL.

7. Site Inspection and Fieldwork Observations

A Site walkover was carried out by an experience geotechnical engineer from DP on 5 April, 2011. Based on the site walkover, the following observations were made.

- An old boiler house was noted to have been built near Borehole 108 (Photo 1, Appendix F). No stressed vegetation was found in the grassed areas outside the building footprints. A new boiler house is located adjacent to the current laundry building.
- A Caltex service station was observed approximately 30m to the northwest off-site, across Docker Street (Photo 2). Borehole 106 (Photo 3) was placed down-gradient of Caltex service station. No stressed vegetation was observed near borehole 106.
- An oxygen tank was observed to be present on site (Photo 4).

No indicators of potential underground storage tanks were noted on site.

Field screening of all soil samples collected for laboratory analysisis indicate a Photo-Ionisation-Detector reading of <1 ppm. No hydrocarbon odour or staining was observe in any of the soil samples collected.

8. Areas and Contaminants of Potential Concern

A review of the historical aerial photographs, the baseline archaeological assessment report, site walkover survey and field observations indicate that the majority of the Site was developed into a hospital in the early 1900s. No historical records were available for review prior to the site being developed into a hospital. However, the baseline archeological assessment report indicated that the Site was unoccupied prior to the construction of the hospital.

A portion of the Site, particularly the eastern boundary (accross Lewis Drive) has been used for residential purposes since the 1940s. Some of these residential properties have been demolished between 1980s to 2001. Demolition of theses structures may cause near surface soil impacts from Asbestos Containing Materials (ACM) and lead-based paint. Pesticides and insecticides may have also been used on the former residential areas as termite treatments, particularly within the building footprint.

The former Rawson House, the old boiler and laundry house were structures built in the early 1900s. These structures have been since demolished and therefore the area may have also been impacted

by ACM and/or lead-based paints. It is likely that the old boiler may have used gas or coal fuel in the past. Also, maintenance of this facility may cause incidental spillage of petroleum based chemicals including TPH, BTEX and PAH.

The location of the former and current workshop may have used petroleum-based products (e.g. hydraulic oils, solvents, etc.). Spillage and/or inappropriate disposal of these products may cause contamination of the subsurface soil by TPH, BTEX, and other VOCs. These potential chemical contaminants may also be present within the oxygen depot as a result of maintenance.

A Caltex service station is located approximatedly 30 m northwest of the Site. Migration of any groundwater contamination posed by the service station may have the potential to impact the groundwater beneath the Site. Potential contaminants of concern include TPH, BTEX, lead, PAH and phenols.

The site is likely to have been filled in part prior to a during development. Some filling may have originated off-site. At this stage the source of any filling that may be on site is not known. Therefore a potential for contamination of filling exists.

9. Sampling Analysis and Quality Plan

9.1 Data Quality Objectives

The scope of the Preliminary Contamination Assessment works has been devised generally in accordance with the seven step data quality objective (DQO) process, as defined in Australian Standard *Guide to the investigation and sampling of sites with potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds (AS 4482.1 – 2005)*. The DQO process is outlined as follows:

(a) State the Problem

The site is required to be rendered suitable for commercial / hospital land use. The purpose of this investigation is to assess the preliminary nature and extent of the site contamination issues, and to establish whether the site is suitable or can be rendered suitable for its intended land use. This will be achieved by obtaining data to characterize the soil with respect to the identified contaminants of potential concern in Section 8.

(b) Identify the Decision

The suitability of the Site for the proposed land use will be assessed on the basis of the current soil and groundwater investigations. The soil analytical data is to be compared to the Site Assessment Criteria (SAC) for a ‘commercial’ landuse (refer to Section 10 for more details).

(c) Identify Inputs to the Decision

The primary inputs that will be utilized to assess the suitability of the Site are:

- available information regarding previous and current activities undertaken on the Site and the surrounding area (if any);
- The local geology, topography and hydrology;
- Potential contaminants;
- Published guidelines for assessing soil and groundwater quality; and
- Field observations/measurements and analytical results from the limited number of soil and groundwater samples.

(d) Define the Boundary of the Assessment

The boundary of the assessment is defined by the boundary of the subject Site i.e., the Wagga Wagga Base Hospital as identified in Section 3.1. The Site comprises an irregularly shaped parcel of land with an approximate land area of 5.7 ha.

(e) Develop a Decision Rule

The analytical results will be assessed against relevant published guideline criteria as discussed in Section 10.

(f) Specify Acceptable Limits on Decision Errors

In order to ensure the quality of the soil and groundwater data, appropriate and adequate quality assurance and quality control (QA/QC) measures and evaluations will be incorporated into the sampling and testing regime.

DP will achieve the required sampling accuracy and precision through the analysis of 5% field duplicate/replicate samples. The potential for cross contamination and loss of volatiles will be assessed using trip blanks and trip spikes.

Appropriate sampling procedures will be undertaken to ensure that cross contamination does not occur and will follow DP's Standard Operating Procedures Manual. This specifies that:-

- Standard operating procedures are followed;
- Site safety plans are developed prior to commencement of works;
- Duplicate or replicate field samples are collected and analysed;
- Samples are stored under secure, temperature controlled conditions;
- Chain-of-custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory; and that
- Contaminated soil, fill or groundwater originating from the site area is disposed in accordance with relevant regulatory guidelines.

A field and laboratory QA/QC regime, comprising the collection and analysis of replicate samples will be implemented to meet the requirements associated with the following data quality indicators (DQIs).

- conformance with specified holding times;
- accuracy of spiked samples within the laboratory's acceptable range (typically 70-130% for inorganic contaminants and greater for some organic contaminants);
- field and laboratory duplicate and replicate samples will have a precision average of +/- 30% relative percent difference (RPD) for inorganic analytes and +/- 50% RPD for organic analytes; and
- field replicates will be collected at a frequency of at least 10% of all samples (comprising 5% intra-laboratory replicates and 5% inter-laboratory replicates).

The results of field and laboratory QA/QC including RPD and other QA/QC analysis are shown in Appendix I, with the full laboratory reports included in Appendix H.

(g) Optimise the Design for Obtaining Data

The above information (steps 1 to 6) was used to optimise the sampling, analysis and quality plan for the contamination assessment of the site. Discussed in the proceeding sections are the sampling pattern, density, location and depth requirements to meet the objectives of the Preliminary Contamination Assessment.

9.2 Sampling Pattern

Due to the size, presence of existing structures and operational nature of the Site, a judgemental (targeted) sampling pattern based on the geotechnical investigation purposes was adotped. The judgemental sampling pattern allowed for some of the sampling points to be selected based on information gathered in the site history information and site inspection prior to field work. The judgemental sample locations selected included areas where an elevated potential for contamination existed, such as:

- The location of the previous laundry and boiler house (near borehole 108);
- The location of the former Rawson House (around borehole 105);
- The down-gradient location of the off-site Caltex service station (borehole 106);
- Selected locations within the former residential areas across Lewis Drive (boreholes 102, 103 & 104); and
- The location of the Schofield Centre building (borehole 101).

It is noted that the location and number of the boreholes were agreed with Capital Insight Pty Ltd and were designed prior to the preparation of this Sampling Analysis and Quality Plan. Other areas of environmental concern as identified in Section 8 may have not been captured. Moreover, the sampling regime does not comply with the NSW EPA's *Sampling Design Guidelines* (1995) and is therefore considered as preliminary in nature.

9.3 Sampling Density

Based on the size of the site (5.7 ha) and in accordance with the NSW EPA Contaminated Sites *Sampling Design Guidelines*, 1995, a minimum of 81 systematic sample points are recommended for site characterisation. However, given the preliminary nature of the assessment, eight judgemental sample locations were adopted, including two locations for groundwater sampling.

9.4 Sample Location

Sample locations are indicated in Drawing 1 in Appendix B. A total of ten geotechnical borehole locations were placed over the site. However, only eight out of the ten locations were included in this assessment.

9.5 Sample Depth

Samples were collected at multiple depths within fill and 0.5m into natural material to allow for the evaluation of various types of strata. Sample depths generally ranged between 0 – 2.4 m below ground level (bgl), refer to logs provided in Appendix G.

9.6 Analytical Scheme

The analytical scheme was designed to be preliminary in nature and around the inferred potential for contamination and is summarised in Table 1. Generally the samples analysed were selected to provide information on the characterisation of the fill, fly tipped material and natural soils.

Table 1: Analytical Scheme

Sample Location	8 HM	PAH	TPH / BTEX	Phenols	OCP/OPP/ PCB	VOC	Asbestos	Rationale
101	✓	✓	✓	✓	✓	✓	✓	Characterisation of soil within the Schofield Centre.
102, 103 & 104	✓	✓	✓	✓	✓		✓	Characterisation of soil within former residential areas across Lewis Drive.
105	✓	✓	✓	✓	✓		✓	Characterisation of filling and the subsurface natural soil in the former Rawson House.
106	✓	✓	✓	✓	✓	✓	✓	Characterisation of soil down-hydraulic-gradient of the off-site Caltex service station.
107 & 108	✓	✓	✓	✓	✓		✓	Characterisation of filling and the subsurface natural soil in the former laundry and boiler house.

Notes:

8 HM	8 heavy metals including arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc
PAH	Polycyclic Aromatic Hydrocarbons (PAH)
TPH/BTEX	Total Petroleum Hydrocarbons (TRH) and benzene, toluene, ethyl benzene, and total xylenes (BTEX)
Phenols	As total phenols
PCB	Polychlorinated biphenyls
OPP	Organophosphate pesticides
OCP	Organochlorine pesticides
Asbestos	Asbestos (selected samples only)
VOC	Volatile organic compounds

9.7 Sample Collection

A total of 10 geotechnical boreholes (BH101, BH102, BH103, BH104, BH105, BH106, BH107, BH107A, BH108 and BH109) were drilled at the Site for purpose of geotechnical investigation. The boreholes were drilled to depths of 2.4 m to 26.95 m with a truck-mounted Scout drilling rig using spiral auger and rotary washboring techniques within the soil. Bore BH107 was discontinued and relocated (BH107A) approximately 1 m to the west after premature refusal at a depth of 2.4 m.

Environmental samples were collected from all boreholes except borehole 109. Disturbed soil samples were taken from the cuttings returned by the auger blade and used for identification and classification purposes. Soil samples were logged on site by a senior engineering geologist.

Slotted PVC standpipes were installed in bores BH101 and BH106 to allow for sampling of the groundwater and measurement of the groundwater level during the investigation period. The bores were set out relative to existing surface features (e.g. buildings and boundaries) by tape measurement

and the reduced surface levels (RLs) at each test location (to AHD) were interpolated from the site survey plan (untitled) provided.

9.8 Sampling Procedure

Environmental sampling was conducted according to standard operating procedures described in the DP *Field Procedures Manual*. In summary, all sampling data was recorded on DP Chain-of-Custody sheets, and the general sampling procedure comprised:

- the use of stainless steel sampling equipment for the collection of soil samples;
- washing of all sampling equipment in a 3% solution of phosphate free detergent (Decon 90) then rinsing with distilled water prior to each sample being collected;
- transfer of the sample into new glass jars or acidified glass bottles, sealed with a teflon lined lid;
- labelling of the sample containers with individual and unique identification including Project No. Sample No. and depth;
- placement of the containers into a chilled, enclosed and secure container for transport to the laboratory; and
- use of chain of custody documentation to ensure that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

10. Site Assessment Criteria

10.1 Soil

Soil contaminant threshold concentrations for commercial sites are sourced from the NSW EPA *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme* (2006) and *Guidelines for Assessing Service Station Sites* (1994).

The adopted SAC are given in Table 2 for the contaminants of potential concern. The threshold concentrations adopted for the Site includes Health-based Investigation Levels (HIL) for commercial / industrial land uses.

It is noted that the HIL provided in the NSW EPA *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme* (2006) were adopted from the National Environmental Protection Council's (NEPC) *National Environmental Protection (Assessment of Site Contamination) Measure* (NEPM), Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater (1999). The SAC for soils are included in Table 2 below.

Table 2: Site Assessment Criteria for Soils

Analyte	Site Assessment Criteria	
	Health-based Investigation Levels [a] (mg/kg)	HIL Maximum Allowable Concentration [b] (mg/kg)
As	500	1250
Cd	100	250
Cr (III)	60%	150%
Cu	5000	12500
Pb	1500	3750
Hg	75	187.5
Ni	3000	7500
Zn	35000	87500
C_6-C_9	65 [c]	NE
C_{10}-C_{14}	1000 [c]	NE
C_{15}-C_{28}		
C_{29}-C_{36}		
Benzene	1 [c]	NE
Ethylbenzene	50 [c]	NE
Toluene	130 [c]	NE
Xylene	25 [c]	NE
PAH (total)	100	250
Benzo(a)pyrene	5	12.5
DDT + DDD + DDE	1000	2500
Heptachlor	50	125
Aldrin + Dieldrin	50	120
Chlordane	250	625
Phenol	42,500	106,250
PCB	20	50
Asbestos	None Detected in surface soils [d]	NE

Notes

a. NSW EPA *Contaminated Sites Guidelines for the NSW Site Auditor Scheme* (2006) Health Investigation Levels Column 1

b. A concentration of 2.5 times the HIL is considered a potential "hot spot"

c. NSW EPA *Guidelines for Assessing Service Station Sites*, 1994. Threshold concentrations for sensitive sites, (for TPH and BTEX), for all landuses.

d. NSW EPA Auditor Advice.

NE Not established

10.2 Groundwater

According to the DECC's (now OEH's) "*Guidelines for the Assessment and Management of Groundwater Contamination*" (2007), the preliminary assessment of groundwater contamination must be based on the assumption that drinking water is a potential beneficial use if the site fits any of the following criteria:

1. The aquifer beneath the site is included in the Department of Natural Resources (DNR, now part of the now part of the Department of Primary Industries) list of major aquifers of drinking water quality.

2. There are identified users of groundwater from the aquifer as a potable water source.

If neither of the previous conditions identify groundwater as a potential drinking water supply then groundwater indicators should be used to demonstrate whether the aquifer is suitable, or otherwise, for use as a drinking water source. The OEH has indicated that groundwater with Total Dissolved Solids (TDS) concentrations below 2000 mg/L should be considered suitable for use as a drinking water supply, and protected as such, unless it can be demonstrated that other site-specific factors, such as low yield, render such use unlikely (DECC 2007).

The aquifer beneath the site is listed by DNR as a protected aquifer as an actual or potential drinking water supply. The salinity of the groundwater on site is <2,000 mg/L and therefore may be suitable for domestic purposes. There are no licensed groundwater bores used for drinking purposes on site. The nearest registered domestic drinking water bore is located 650 m north east of the site.

Given the aquifer is considered potentially suitable for drinking water use, the adopted groundwater assessment criteria at the site are based on the *Australian Drinking Water Guidelines* (NHMRC, 2004) and the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000) using 95% protection level for moderately disturbed ecosystems (freshwater). Selection of the groundwater investigation level (GIL) for a fresh water ecosystem was based on the proximity of the site to a sensitive surrounding surface water receptor (i.e. the Murrumbidgee River).

In the case of total petroleum hydrocarbons (TPH), in view of the absence of OEH endorsed guidelines, the *Airport (Environment Protection) Regulations' (1997), Schedule 2 Water Pollution Accepted Limits*: Table 1.03 – Accepted limits of contamination, have been applied as screening criteria.

Adopted site assessment criteria for groundwater are summarised in Table 3.

Table 3: Groundwater Assessment Criteria (µg/L)

Analytes	Trigger values for Fresh Water[1, 3]	Trigger Value for Drinking Water [2, 3]	Airport Regulations (1997) [4]	Adopted Groundwater Investigation Level (GIL)
Organics				
TPH (C_6-C_9)	NE	NE	150	150 [5]
TPH (C_{10}-C_{36})	NE	NE	600	600 [5]
Benzene	950	1	300	1
Toluene	180 (LR)	800	300	800
Ethylbenzene	80 (LR)	300	140	300
o - Xylene	350	600	NE	600
m - Xylene	75 (LR)			
p - Xlyene	200 (LR)			
Chloroform	370 (LR)	200	NE	200
Benzo(a)pyrene	0.2 (LR)	0.01	NE	0.01
Anthracene	0.01 (LR)	NE	NE	0.01
Phenanthrene	0.6 (LR)	NE	NE	0.6
Fluoranthene	1 (LR)	NE	NE	1.0

Analytes	Trigger values for Fresh Water[1, 3]	Trigger Value for Drinking Water [2, 3]	Airport Regulations (1997) [4]	Adopted Groundwater Investigation Level (GIL)
Naphthalene	16	NE	NE	16
Total phenolics	320	2	50	2
Aldrin	0.001 (LR)	0.3	NE	0.3
Chlordane	0.08 (LR)	1	NE	1
DDE	0.03 (LR)	NE	NE	0.03
DDT	0.01 (LR)	20	NE	20
Dieldrin	0.01 (LR)	0.3	NE	0.3
Endosulfan	0.2 (LR)	30	NE	30
Endrin	0.02 (LR)	NE	NE	0.02
Heptachlor	0.09 (LR)	0.3	NE	0.3
Azinphos-methyl	0.02 (LR)	3	NE	3
Chlorpyrifos	0.01 (LR)	10	NE	10
Diazinon	0.01 (LR)	3	NE	3
Dimethoate	0.15 (LR)	50	NE	50
Fenitrothion	0.02 (LR)	10	NE	10
Malathion	0.05 (LR)	NE	NE	0.05
Aroclor 1242	0.6 (LR)	NE	NE	0.6
Aroclor 1254	0.03 (LR)	NE	NE	0.03
Heavy Metals				
Arsenic (total)	13	7	50	7
Cadmium	0.2	2	0.2	2
Chromium	1	50	10	50
Copper	1.4	2000	2	2000
Lead	3.4	10	1.0	10
Mercury (inorganic)	0.6	1	0.1	1
Nickel	11	20	15	20
Zinc	8	NE	5	8

Notes:

[1] ANZECC and ARMCANZ (2000) National Water Quality Management Strategy - Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Trigger values under the 95% protection level - fresh water.

[2] NHMRC (2004) National Water Quality Management Strategy – Australian Drinking Water Guidelines.

[3] NSW DECC Contaminated Sites Guidelines on Duty to Report contamination under the Contaminated Land Management Act 1997 (2009).

[4] Airport (Environment Protection) Regulations (1997), Schedule 2 Water Pollution Accepted Limits: Table 1.03

[5] In the absence of established threshold concentrations for TPH compounds in groundwater, the Airport Regulations (1997) was used as screening criteria.

LR Low reliability trigger value as defined in ANZECC/ARMCANZ 2000

NE = Not Established

B = Bioaccumulative

10.3 Waste Classification Criteria

Filling and Topsoil

The preliminary *in situ* waste classification for filling and topsoil materials was determined in accordance with the six step process outlined in the Department of Environment and Climate Change (DECC; now OEH) *Waste Classification Guidelines* April 2008 (revised July 2009), as follows:

1. Is it a special waste?
2. Is it a liquid waste?
3. Is the waste "pre-classified"?
4. Does the waste have hazardous waste characteristics?
5. Chemical Assessment
6. Is the waste putrescibles?

It should be noted that it is possible that the filling and topsoil materials could be classified in the future as Excavated Natural Material (ENM) in accordance with the *Protection of the Environment Operations (Waste) Regulation 2005, General Exemption Under Part 6, Clause 51 and 51A, The Excavated Natural Material Exemption (ENM),* 2008. Under the general exemption, ENM is defined as naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

- been excavated from the ground, and
- contains at least 98% (by weight) natural material, and
- does not meet the definition of Virgin Excavated Natural Material in the Act.

ENM may be applied to land as engineering fill or used in earthworks provided the contaminant concentrations in the material is within the threshold concentrations prescribed in the general exemption. For large volumes of this type of material, there is potentially a significant cost saving in not having to dispose the material at a licensed landfill.

However, the ENM guidelines require a strict sampling and testing regime that would need to be implemented to achieve such a classification. The preliminary works undertaken under this current assessment do not meet the regime required.

Residual Soil and Bedrock

The *Protection of the Environment Operations Act* 1997, the *Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation* 2008, and the *Waste Classification Guidelines* April 2009, define virgin excavated natural materials (VENM) such as clay, gravel, sand, soil and rock, as materials that:

- Are not mixed with any other waste;
- Have been excavated from areas that are not contaminated as a result of industrial, commercial, mining or agricultural activities;

- Do not contain sulphidic ores or soils;
- Consist of excavated natural materials that meet such criteria as may be approved by the EPA.

The abovementioned criteria have been adopted in determining the preliminary assignment of the VENM classification to the natural soils and bedrock to be excavated from the Site as part of the proposed development.

In order to assign re-usability options to the VENM classified materials, the following publications with background concentration ranges for Australian soils have been referenced:

- NEPC (1999). *National Environmental Protection (Assessment of Site Contamination) Measure*, Schedule B(1) Guidelines on the Investigation Levels for Soil and Groundwater, Background Ranges.
- Australian and New Zealand Environment and Conservation Council/National Health and Medical Research Council (ANZECC/NHMRC): *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (1992), Environmental Soil Quality Guidelines Column A Background (ANZECC A).

With regard to the organic contaminants with no published background concentration ranges, the respective practical quantitation limits of the analytes were used as the evaluation threshold.

11. Results of Soil and Groundwater Investigation

A summary of the laboratory results are included in Tables 4 to 9 (for soils and groundwater respectively). NATA laboratory reports are included in Appendix H. The reported VOC concentrations have not been listed, however all concentrations were found to be below the laboratory reporting limits except toluene and chloroform in groundwater.

Table 4: Results of Laboratory Analysis for Soil in mg/kg, unless otherwise stated (Heavy Metals & Asbestos)

Sample ID / Depth (m)	F – filling N – natural	Heavy Metals								Asbestos
		As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	
BH101/0.1-0.2	F	8	<0.5	17	25	64	0.4	12	120	-
BH101/0.5-0.6	N	8	<0.5	29	18	13	<0.1	13	25	-
BH102/0.4-0.5	N	7	<0.5	26	21	22	0.1	13	61	-
BH102/2-2.2	N	8	<0.5	28	17	12	<0.1	12	24	-
BH103/0.5-0.6	N	9	<0.5	28	18	14	<0.1	19	40	-
BH104/0.3-0.4	N	9	<0.5	28	18	13	<0.1	15	28	-
BH105/0.2-0.3	F	<4	<0.5	16	11	12	<0.1	10	36	NAF
BH105/0.8-0.9	F	4	<0.5	19	28	46	1.1	11	67	-
BH106/0.1-0.2	F	6	<0.5	21	14	44	0.1	13	59	NAF
BH106/1.75-2.0	N	6	<0.5	33	17	14	<0.1	22	44	-
BH107/1.9-2.0	F	9	<0.5	22	15	14	<0.1	14	29	-
BH107/2.2-2.4	F	6	<0.5	14	8	13	<0.1	9	23	-
BH107A/1.5-1.6	N	6	<0.5	26	14	12	<0.1	11	23	-
BH108/0.1-0.2	F	<4	<0.5	13	7	7	<0.1	9	20	NAF
BH108/2-2.2	N	7	<0.5	29	17	15	<0.1	14	25	-
BD1/290311	N	5	<0.5	19	18	37	0.4	12	89	NAF
Soil Investigation Levels										
Health-based Investigation Levels		500	100	400	5000	1500	75	3000	35000	NAG^
Maximum values of Specific Contaminant Concentration for Waste Classification without TCLP										
General Solid Waste		500	100	1900	NE	1500	50	1050	NE	NE
Restricted Solid Waste		2000	400	7600	NE	6000	200	4200	NE	NE
Provisional Background Concentration										
NEPC (1999)		1-50	1	5-1000	2-100	2-200	0.03	2-500	10-300	NE
ANZECC (1992)		0.2-30	0.04-2	0.5-110	1-190	<2-200	0.001-0.1	2-400	2-180	NE

Notes:
- not analysed
^ No asbestos present in soil at the surface (Correspondence from NSW EPA Director of Contaminated Sites to Accredited Site Auditors).
NAF No asbestos found at the reporting limit
NAG No Asbestos on Ground
NE Not established
PQL Practical Quantitation Limit (PQL)
BD1 is a replicate sample of BH102/0.4-0.5 (labelled as BH109/0.1-0.3 in the COC & Laboratory analysis).
TCLP Toxicity Characteristic Leaching Procedure.

Table 5: Results of Laboratory Analysis for Soil in mg/kg (TPH, BTEX & PAH)

Sample ID / Depth (m)	F – filling N – natural	TPH		Benzene	Toluene	Ethylbenzene	Xylene	PAH	
		C_6-C_9	C_{10}-C_{36}					Total	Benzo(a)pyrene
BH101/0.1-0.2	F	<25	<250	<0.5	<0.5	<1	<3	2.54	0.24
BH101/2-2.2	N	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
BH102/0.4-0.5	N	<25	<250	<0.5	<0.5	<1	<3	0.79	0.09
BH102/2-2.2	N	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
BH103/0.5-0.6	N	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
BH104/0.3-0.4	N	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
BH105/0.2-0.3	F	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
BH105/0.8-0.9	F	-	-	-	-	-	-	<PQL	<0.05
BH106/0.1-0.2	F	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
BH106/1.75-2.0	N	-	-			-	-	<PQL	<0.05
BH107/1.9-2.0	F	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
BH107/2.2-2.4	F	-	-	-	-	-	-	<PQL	<0.05
BH107A/1.5-1.6	N	-	-	-	-	-	-	<PQL	<0.05
BH108/0.1-0.2	F	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
BH108/2-2.2	N	-	-	-	-	-	-	<PQL	<0.05
BD1/290311	N	<25	<250	<0.5	<0.5	<1	<3	<PQL	<0.05
Soil Investigation Levels									
Health-based Investigation Levels		65	1000	1	50	130	25	100	5
Maximum values of Specific Contaminant Concentration for Waste Classification without TCLP									
General Solid Waste		650	10000	18	518	1080	1800	200	0.8
Restricted Solid Waste		2600	40000	72	2073	4320	7200	800	3.2
Provisional Background Concentration									
NEPC (1999)		NE	NE	NE	NE	NE	NE	NE	NE
ANZECC (1992)		NE	NE	0.05-1	0.1-1	NE	NE	0.95-5	NE

Notes:
- not analysed
^ No asbestos present in soil at the surface (Correspondence from NSW EPA Director of Contaminated Sites to Accredited Site Auditors).
NE Not established
PQL Practical Quantitation Limit (PQL)
BD1 is a replicate sample of BH102/0.4-0.5 (labelled as BH109/0.1-0.3 in the COC & Laboratory analysis).
TCLP Toxicity Characteristic Leaching Procedure.

Table 6: Results of Laboratory Analysis for Soil (OCP, OPP, PCB & Total phenols)

Sample ID / Depth (m)	F – filling N – natural	OCP	OPP	PCB	Phenols
BH101/0.1-0.2	F	<0.1	<0.1	<0.1	<5
BH102/0.4-0.5	N	<0.1	<0.1	<0.1	<5
BH103/0.5-0.6	N	<0.1	<0.1	<0.1	<5
BH104/0.3-0.4	N	<0.1	<0.1	<0.1	<5
BH105/0.2-0.3	F	<0.1	<0.1	<0.1	<5
BH106/0.1-0.2	F	<0.1	<0.1	<0.1	<5
BH107/1.9-2.0	F	<0.1	<0.1	<0.1	<5
BH108/0.1-0.2	F	<0.1	<0.1	<0.1	<5
BD1/290311	N	<0.1	<0.1	<0.1	<5
Soil Investigation Levels					
Health-based Investigation Levels		50/250/ 1000/50*	NE	20	42500
Maximum values of Specific Contaminant Concentration for Waste Classification without TCLP					
General Solid Waste		<50 for total OCP	NE	200	518
Restricted Solid Waste		NE	NE	800	2073
Provisional Background Concentration					
NEPC (1999)		NE	NE	NE	NE
ANZECC (1992)		0.001-0.97	NE	0.02-0.1	NE

Notes:
- not analysed
* given in order Aldrin+Dieldrin/Chlordane/ DDD+DDE+DDT/Heptachlor
NE Not established
BD1 is a replicate sample of BH102/0.4-0.5 (labelled as BH109/0.1-0.3 in the COC & Laboratory analysis).
TCLP Toxicity Characteristic Leaching Procedure.

Table 7: Results of Laboratory Analysis for Groundwater (Heavy Metals, TPH & Hardness, in µg/L unless otherwise stated)

Sample ID	Heavy Metals								TPH		Hardness ^
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{36}	
GW101	1	0.2	<1	<1	<1	<0.4	2	4	<10	<250	230
GW106	<1	0.5	<1	**6**	2	<0.4	4	44	27	200	120
BD1/070411	1	0.2	<1	<1	<1	<0.4	<1	2	<10	<250	-
Groundwater Investigation Level											
Trigger value for drinking water	7	2	50	2000	10	1	20	NE	65^^	1000^^	NE
Trigger value for freshwater	13	0.2	1	1.4	3.4	0.6	11	8	65^^	1000^^	NE

Notes:

- Not analysed
^ in mg / L
^^ Provisional guideline
Italics Guideline value < laboratory practical quantitation limit (PQL)
Bold Exceeded the applicable GILs
BD1 Field replicate sample of GW101
NE Not established

Table 8: Results of Laboratory Analysis for Groundwater (BTEX, PAH and B(a)P), in µg/L

Sample ID	Benzene	Toluene	Ethylbenzene	Xylene	Naphthalene	B(a)P	Total PAH
GW101	<1	<1	<1	<3	<1	*<1*	<PQL
GW106	<1	3	<1	<3	<1	*<1*	<PQL
BD1/070411	<1	<1	<1	<3	<1	*<1*	<PQL
Groundwater Investigation Level							
Trigger value for drinking water	1	800	300	600	NE	*0.01*	NE
Trigger value for freshwater	950	180	80	350/75/200	16	*0.2*	NE

Notes:

Italics Guideline value < laboratory practical quantitation limit (PQL)

- Not analysed

^ in mg / L

BD1 Field replicate sample of GW101

B(a)P Benzo(a)pyrene

NE Not established

PQL Practical Quantitation Limit

Table 9: Results of Laboratory Analysis for Groundwater (OCP, OPP, PCB, Phenols & Chloroform), in µg/L

Sample ID	OCP	OPP	PCB	Phenols	Chloroform
GW101	*<0.2*	*<0.2*	<2	<0.5	<1
GW106	*<0.2*	*<0.2*	<2	<0.05	16
BD1/070411	*<0.2*	*<0.2*	<2	<0.5	-
Groundwater Investigation Level					
Trigger value for drinking water	0.3/1/NE/20/0.3/30/ NE/0.3^	3/10/3/50/10NE^^	NE	2	200
Trigger value for freshwater	*0.001/ 0.08/0.03/0.01/ 0.01/0.2/0.02/0.09^*	*0.02/ 0.01/0.01/ 0.15/0.02/0.05^^*	0.03/0.6^^^	320	270

Notes:

Italics Guideline value < laboratory practical quantitation limit (PQL)

- Not analysed

^ given in order aldrin, chlordane, DDE, DDT, dieldrin, endosulfan, endrin, heptachlor

^^ given in order azinphos-methyl, chlorpyrifos, diazinon, dimethoate, fenitrothion, malathion

^^^ given in order arochlor 1242; arochlor 1254

BD1 Field replicate sample of GW101

PQL Practical Quantitation Limit; 0.0010 µg/L for OCP; 0.010 for OPP; 0.010 for PCB;

12. Discussion of Results

12.1 Soils

The results of the soil analysis indicate that concentrations of heavy metals, TPH, BTEX, PAH, OCP, OPP, PCB, VOC and total phenols in the samples analysed were either below the laboratory PQL or the adopted HIL.

With regard to asbestos, whilst no asbestos was detected in the soil samples analysed, not all previous locations of old buildings were sampled. In this regard, the potential presence of asbestos contamination cannot be discounted.

12.2 Groundwater

The results of the groundwater analysis indicate that the concentrations of heavy metals, TPH, BTEX, PAH, OCP, OPP, PCB, VOC and total phenols in the samples analysed were either below the laboratory PQL or the adopted GIL with the exception of copper in monitoring well 106 at 6 µg/L exceeding the ANZECC 2000 guideline for the protection fresh water ecosystems at 1.4 µg/L. Background soil copper concentrations are elevated and are likely to be associated with the GIL exceedance. The concentration, however, is not uncommon in urban environments and is therefore not considered to be significant.

The laboratory PQL for OPP and OCP were higher than the trigger values for the protection of freshwater ecosytems and therefore no comparison was made for these particular analytes. However, the concentration of OPP and OCP in soil were below the laboratory PQL indicating that OCP and OPP concentrations in groundwater is unlikely to be present at concentration above the adopted trigger values for the protection of freshwater ecosystems.

12.3 Provisional Waste Classification

On the basis of the field observations and total concentrations of targeted analytes, the dark brown sandy filling and roadbase at Boreholes 101, 105, 107 and 108 are provisionally classified as General Solid Waste (non-putrescible). Material with this classification can be disposed to an OEH (incorporating EPA) licensed waste facility that is able to legally accept general solid waste, on the provision that the material is not cross contaminated with any other material not covered in the assessment, including any asbestos debris.

On the basis of the on site observations and the analytical results, it is considered that the orange brown/brown silty clay with some ironstone gravels and trace sand is classifiable as VENM according to NSW DECC's *Waste Classification Guidelines* 2009, provided that the VENM material is not mixed / cross-contaminated with other filling /anthropogenic material such as building rubble (e.g. asbestos, bricks, etc.).

In view of the preliminary nature of the current assessment and the limited sampling regime adopted, the provisional waste classification only provides an indication of the likely waste classification of the material to be excavated. Once excavated, the materials should be stockpiled at a designated area for

inspection and verification to finalise the waste classification in accordance with the DECC *Waste Classification Guidelines* (2008).

13. Conclusion and Recommendations

The current Preliminary Contamination Assessment was conducted to assess the potential for contamination of the site based on past and present site usage and the likely nature of any contamination.

No significant contamination issues have been identified through the scope of works undertaken in completing this assessment. As such, it is considered that the Site is, in general, environmentally suitable for the proposed redevelopment. However, given the limited nature of the assessment, the extent of works proposed, and the areas of potential contamination identified, it is recommended that further assessment of the Site be undertaken prior to construction. As the existing buildings (proposed for demolition) present a potential source of contamination (i.e. asbestos and lead) it would be advisable to undertake additional investigations upon completion of demolition.

Prior to demolition a hazardous materials assessment should be undertakent to identify any building hazards (e.g. asbestos and lead based paints) requiring particular management / disposal. Should such materials be identified then the removal works will require the engagement of appropriately licenced contractors.

14. Limitations

Douglas Partners (DP) has prepared this report for a project at Wagga Wagga Base Hospital, Edward Street, Wagga Wagga, NSW in accordance with DP's proposal dated 16 February 2011 and acceptance received from Mr Frank Tong of Capital Insight Pty Ltd on 2 March 2011. The report is provided for the exclusive use of Capital Insight for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions only at the specific sampling or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of anthropogenic influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be limited by undetected variations in ground conditions between sampling locations. The advice may also be limited by budget constraints imposed by others or by Site accessibility.

This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations

or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion given in this report.

Douglas Partners Pty Ltd

Appendix A

About this Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

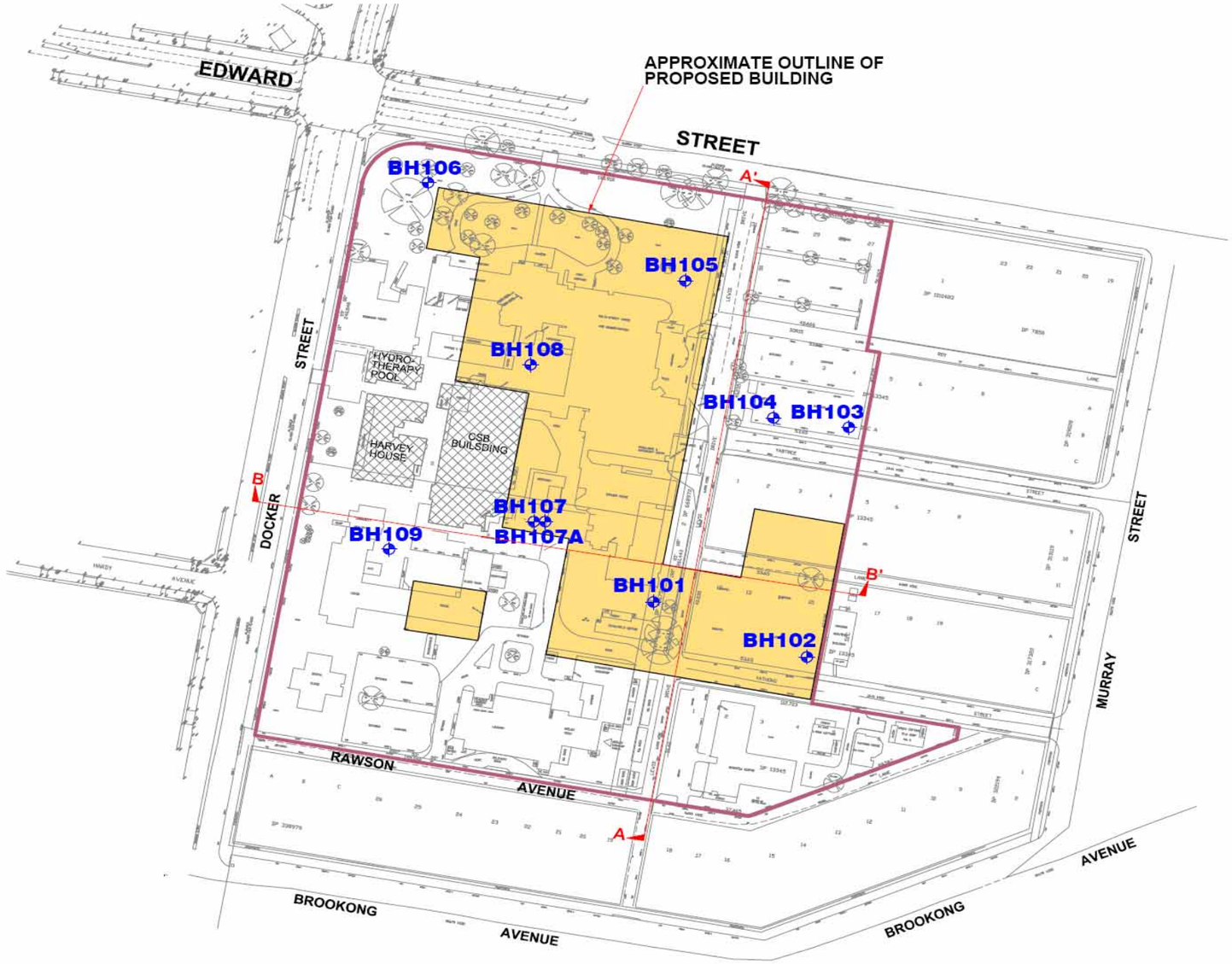
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Site Drawings



Locality Plan

LEGEND

- Borehole Location
- Approximate Site Boundary
- Existing Building to Remain

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Health Infrastructure	TITLE:	**Site Plan and Locality Map**
OFFICE:	Sydney	DRAWN BY:	RA		**Proposed Wagga Wagga Base Hospital Redevelopment**
SCALE:	As shown	DATE:	23.05.11		**Edward Street, Wagga Wagga**

MGA

PROJECT No:	72320.01
DRAWING No:	1
REVISION:	A

Appendix C

Aerial Photographs

Plate 1: 1944

Plate 2: 1953

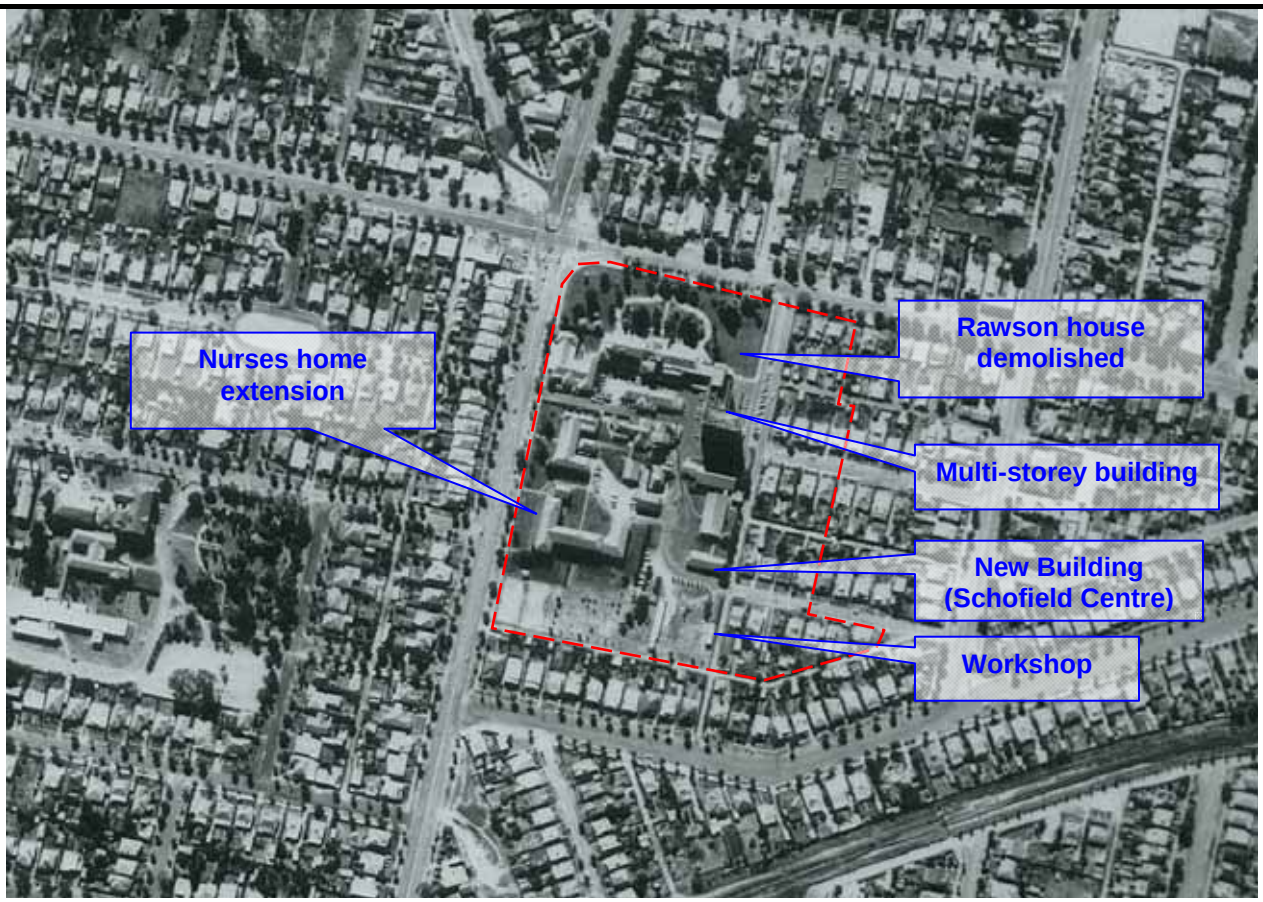


Plate 3: **1971**

Plate 4: 1980

Plate 5: 1985

Plate 6: 1990

Plate 7: 2001

Plate 8: 2010

Appendix D

WorkCover Search

WorkCover
NEW SOUTH WALES

5 APR 2011

Our Ref: D11/041684
Your Ref: Rene Alvier

04 April 2011

Attention: Rene Alvier
Douglas Partners Pty Ltd
96 Hermitage Road
West Ryde NSW 2114

Dear Mr Alvier,

RE SITE: Wagga Wagga Base Hospital Edward Street Wagga Wagga

I refer to your site search request received by WorkCover NSW on 30 March 2011 requesting information on licences to keep dangerous goods for the above site.

Enclosed are copies of the documents that WorkCover NSW holds on Dangerous Goods Licences 35/022029 relating to the storage of dangerous goods at the above-mentioned premises, as listed on the Stored Chemical Information Database (SCID).

If you have any further queries please contact the Dangerous Goods Licensing Team on (02) 4321 5500.

Yours Sincerely

Diana Hayes
Senior Licensing Officer
Dangerous Goods Notification Team

NOTIFICATION INQUIRIES

Ms / Mrs / Other (please specify) _____ Family name Taylor.

Paul Other names William

0428 427 588 Business fax number 02 69 69 5744.

Address paul.taylor@gsghs.health.nsw.gov.au.

Number or Acknowledgement Number (if known)

29

er (if known)

—

angerous goods are to be kept

Street

Corners Edwards and Docker Streets

ocality Postcode

Wagga Wagga 2650

Nearest cross Street

Docker Street.

Lot and DP if no street number

Is the site staffed? If yes state number of employees 200 approx.

Site staffing: Hours per day 24 Days per week 7.

Site Emergency Contact

Phone number **Name**

02 69 38 6141. Peter Lloyd

Nature of site (eg petrol station, warehouse etc)

Base Hospital.

Nature of primary business activity

Health Care.

ABN Number (if any)

Website details (if any)

What is the ANSZIC code most applicable to your business? (see guide for list of codes and further information)

Code 861 Description Hospitals.

Attach a site sketch(s) of the premises. Refer to the Guide GDG01 for information on the requirements for the site sketch.

Attach a legible photocopy page from a local Street Directory or other map showing the locality of the premises. Mark the location of the premises with an X.

NOTIFICATION OF DANGEROUS GOODS ON PREMISES FORM

FDG01

List the dangerous goods that will be stored and/or processed on these premises (refer to Guide GDG01). Copy this page and attach additional sheets if there is insufficient space.

Depot No	Type of storage location or process	Class	Maximum Storage Capacity (L, kg)
1	Above Ground Vessel	2.2	15,000 L.

UN Number	Proper Shipping Name	Class	PG (I, II, III)	Product or Common Name	HazChem Code	Typical Qty	Unit eg L, kg
1073	Liquid Oxygen.	2.2.		Liquid Oxygen.	2SE	12000	L.

Depot No	Type of storage location or process	Class	Maximum Storage Capacity (L, kg)

UN Number	Proper Shipping Name	Class	PG (I, II, III)	Product or Common Name	HazChem Code	Typical Qty	Unit eg L, kg

Depot No	Type of storage location or process	Class	Maximum Storage Capacity (L, kg)

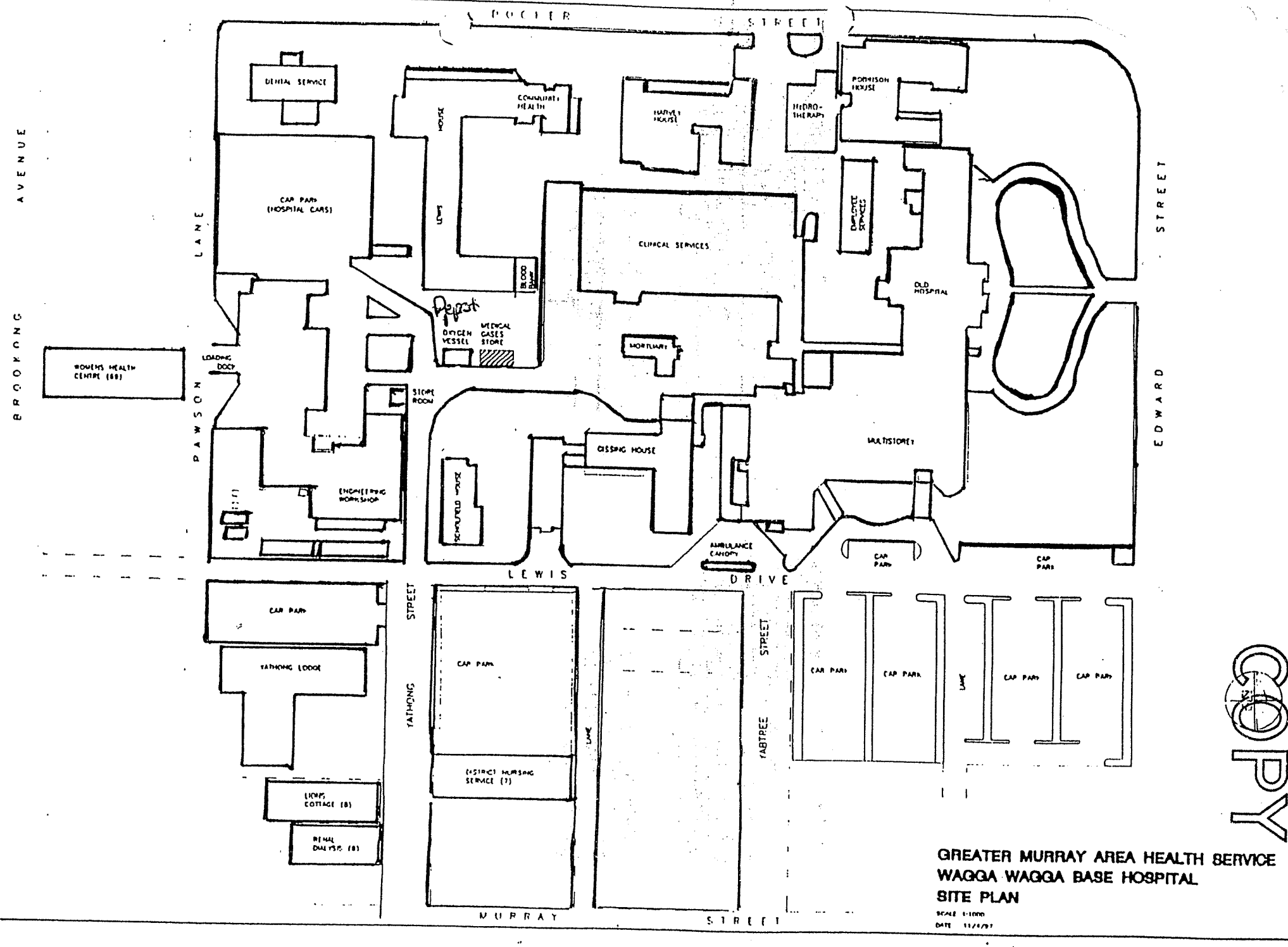
UN Number	Proper Shipping Name	Class	PG (I, II, III)	Product or Common Name	HazChem Code	Typical Qty	Unit eg L, kg

Depot No	Type of storage location or process	Class	Maximum Storage Capacity (L, kg)

UN Number	Proper Shipping Name	Class	PG (I, II, III)	Product or Common Name	HazChem Code	Typical Qty	Unit eg L, kg

Depot No	Type of storage location or process	Class	Maximum Storage Capacity (L, kg)

UN Number	Proper Shipping Name	Class	PG (I, II, III)	Product or Common Name	HazChem Code	Typical Qty	Unit eg L, kg



COPY

GREATER MURRAY AREA HEALTH SERVICE
WAGGA WAGGA BASE HOSPITAL
SITE PLAN

SCALE 1:1000
DATE 11/1/97

BOX 499

WorkCover New South Wales, 400 Kent Street, Sydney 2000. Tel: 9370 5000 Fax: 9370 5999 ALL MAIL TO G.P.O. BOX 5364 SYDNEY 2001

Licence No. 35/022029

APPLICATION FOR RENEWAL

OF LICENCE TO KEEP DANGEROUS GOODS

WORKCOVER NEW SOUTH WALES

ISSUED UNDER AND SUBJECT TO THE PROVISIONS OF THE DANGEROUS GOODS ACT, 1975 AND REGULATION THEREUNDER

DECLARATION: Please renew licence number 35/022029 to 31/10/2001 . I confirm that all the licence details shown below are correct (amend if necessary).

Paul Morrow ..... Paul Morrow ..... 11/9/00 .....

(Signature) *(Please print name)* *(Date signed)*

for: WAGGA WAGGA BASE HOSPITAL

*THIS **SIGNED** DECLARATION SHOULD BE **RETURNED TO:** **(please do not fax)***

WorkCover New South Wales
Dangerous Goods Licensing Section
GPO BOX 5364
SYDNEY 2001

Enquiries: ph (02) 9370 5187
fax (02) 9370 6104

Details of licence on 4 September 2000

Licence Number 35/022029 **Expiry Date** 31/10/2000

Licensee WAGGA WAGGA BASE HOSPITAL

Postal Address: BOX 159 P O WAGGA WAGGA NSW 2650

Licensee Contact PAUL MORROW Ph. 069 386664 Fax. 069 386 506

Premises Licensed to Keep Dangerous Goods
WAGGA WAGGA BASE HOSPITAL
EDWARD ST & DOCKER ST WAGGA WAGGA 2650

Nature of Site HOSPITALS (EXCEPT PSYCHIATRIC HOSPITALS)

Major Supplier of Dangerous Goods BOC

Emergency Contact for this Site PAUL MORROW Ph. 069 386664

Site staffing 24 HRS 7 DAYS

Details of Depots

Depot No.	Depot Type	Goods Stored in Depot	Qty
OXY1	ABOVE-GROUND TANK	Class 2.2	15000 L
		UN 1073 OXYGEN, REFRIGERATED LIQUID	12000 L

RECEIVED
SERVICE CENTRE
15 SEP 2000
WORKCOVER
NEW SOUTH WALES

Form DG10

WorkCover New South Wales. 400 Kent Street, Sydney 2000. Telephone (02) 9370 5000 ALL MAIL TO LOCKED BAG 10 CLARENCE STREET SYDNEY 2000

Reference

WORKCOVER
NEW SOUTH WALES

APPLICATION FOR RENEWAL

OF LICENCE TO KEEP DANGEROUS GOODS

ISSUED UNDER AND SUBJECT TO THE PROVISIONS OF THE DANGEROUS GOODS ACT, 1975 AND REGULATION THEREUNDER

DECLARATION: *Please renew licence number 35/022029 to 1997. I confirm that all the licence details shown below are correct (amend if necessary).*

Stephen Butt ..... STEPHEN BUTT 26.9.96

(Signature) *(Please print name)* *(Date signed)*

for: WAGGA WAGGA BASE HOSPITAL

*THIS **SIGNED** DECLARATION SHOULD BE **RETURNED TO:***

WorkCover New South Wales
Dangerous Goods Licensing Section (Level 3)
Locked Bag 10
P O CLARENCE STREET 2000

RECEIVED
30 SEP 1996
SCIENTIFIC SERVICES
BRANCH

Details of licence on 23 September 1996

Licence Number 35/022029 **Expiry Date** 01/11/96

Licensee WAGGA WAGGA BASE HOSPITAL

Postal Address BOX 159 P O, WAGGA WAGGA 2650
Licensee Contact Stephen Butt Ph. 069 386672 Fax. 069 ~~217711~~ 386506
Premises Licensed to Keep Dangerous Goods
EDWARD ST & DOCKER ST
WAGGA WAGGA 2650

Nature of Site HOSPITALS (EXCEPT PSYCHIATRIC HOSPITALS) **Major Supplier of Dangerous Goods** B O C

Emergency Contact for this Site Stephen Butt ph. 069 386666

Site staffing 24 HRS 7 DAYS

Details of Depots

Depot No.	Depot Type	Goods Stored in Depot	Qty
OXY1	ABOVE-GROUND TANK	Class 2.2	15000 L
		UN 1073 OXYGEN, REFRIGERATED L	12000 L

DATE
-8 OCT 1996

APPLICATION FOR LICENCE (or AMENDMENT or TRANSFER of LICENCE) FOR THE KEEPING OF DANGEROUS GOODS

Application is hereby made for— *a licence (or amendment of the licence) *the transfer of the licence described below.

(*delete whichever is not required)

for the keeping of dangerous goods in or on the premises

FEE: $10.00 per Depot for new licence.
$10.00 for amendment or transfer.

Name of Applicant in full (see over)	
Trading name or occupier's name (if any)	WAGGA WAGGA BASE HOSPITAL.
Postal address	P.O.BOX 159. WAGGA WAGGA.NSW. Postcode 2650.
Address of the premises including street number (if any)	EDWARD ST. WAGGA WAGGA.NSW. Postcode 2650.
Nature of premises (see over)	HOSPITAL.
Telephone number of applicant	STD Code 069 Number 215755.

9754 10/087-2 03A

Particulars of type of depots and maximum quantities of dangerous goods to be kept at any one time.

Depot number	Type of depot (see over)	Storage capacity	Dangerous goods: Product being stored	C & C Office use only
1	ABOVEGROUND TANK.	7,000 l	LIQUID OXYGEN.	00 001 040 0 / 1 040 7
2				
3				
4				
5				
6			4B	
7				
8				
9				
10				
11				
12				

DEPARTMENT OF INDUSTRIAL RELATIONS
632/85
- 3 JUL 1985
WAGGA WAGGA

INSPECTORS FIELD COLLECTION
51
RECEIPT No. 15362
DATE 27/7/82
AMOUNT $10.00

Has site plan been approved? Yes ~~NO~~ If yes, no plans required. ~~If no, a location site plan~~.

Have premises previously been licensed? Yes ~~NO~~ If yes, state name of previous occupier. AS ABOVE.

Name of company supplying flammable liquid (if any) C.I.G. (VIC.)

Signature of applicant ..... Date 7.7.82

For external explosives magazine(s), please fill in side 2.

FOR OFFICE USE ONLY

CERTIFICATE OF INSPECTION

I, R.J. LANCASTER being an Inspector under the Dangerous Goods Act, 1975, do hereby certify that the premises described above do comply with the requirements of the Dangerous Goods Act, 1975, and the Dangerous Goods Regulation with regard to their situation and construction for the keeping of dangerous goods of the nature and in the quantity specified.

Signature of Inspector ..... Date 27/7/82

APPLICATION FOR LICENCE (or AMENDMENT or TRANSFER of LICENCE) FOR THE KEEPING OF DANGEROUS GOODS

Application is hereby made for—*a licence (or amendment of the licence) *the transfer of the licence for the keeping of dangerous goods in or on the premises described below.

(*delete whichever is not required)

FEE: $10.00 per Depot

23 NOV 1978

7448 29/11/78 038

Name of Applicant in full (see over)	Surname WAGGA WAGGA BASE HOSPITAL Given Names
Trading name or occupier's name (if any)	Wagga Wagga Base Hospital
Postal address	P.O. Box 159 Wagga Wagga Postcode 2650
Telephone number of applicant	STD Code 069 Number 21-2062
Address of the premises in or on which the depot or depots are situated (including street number, if any)	Edward Street, Wagga Wagga NSW 2650 Postcode 2650
Nature of premises (see over)	Public Hospital

PLEASE ATTACH SITE PLAN

Particulars of type of depots and maximum quantities of dangerous goods to be kept at any one time.

Depot number	Type of depot (see over)	Storage capacity	Dangerous goods: Product being stored	C & C Office use only
1	Above Ground Tank	2520 lts.	Liquid oxygen DD	1-040-33
2				
3				
4				
5				
6				
7				
8	Dept. of Labour & Industry			
9	WAGGA WAGGA			
10	4 DEC 1978			
11	78/787			
12				

Name of company supplying flammable liquid (if any) Commonwealth Industrial Gases (Vic)

Have premises previously been licensed? No

If known, state name of previous occupier N/A Licence No. N/A

Signature of applicant FOR WAGGA WAGGA BASE HOSPITAL Date 1.11.197

Chief Executive Officer

For external explosives magazine(s), please fill in side 2.

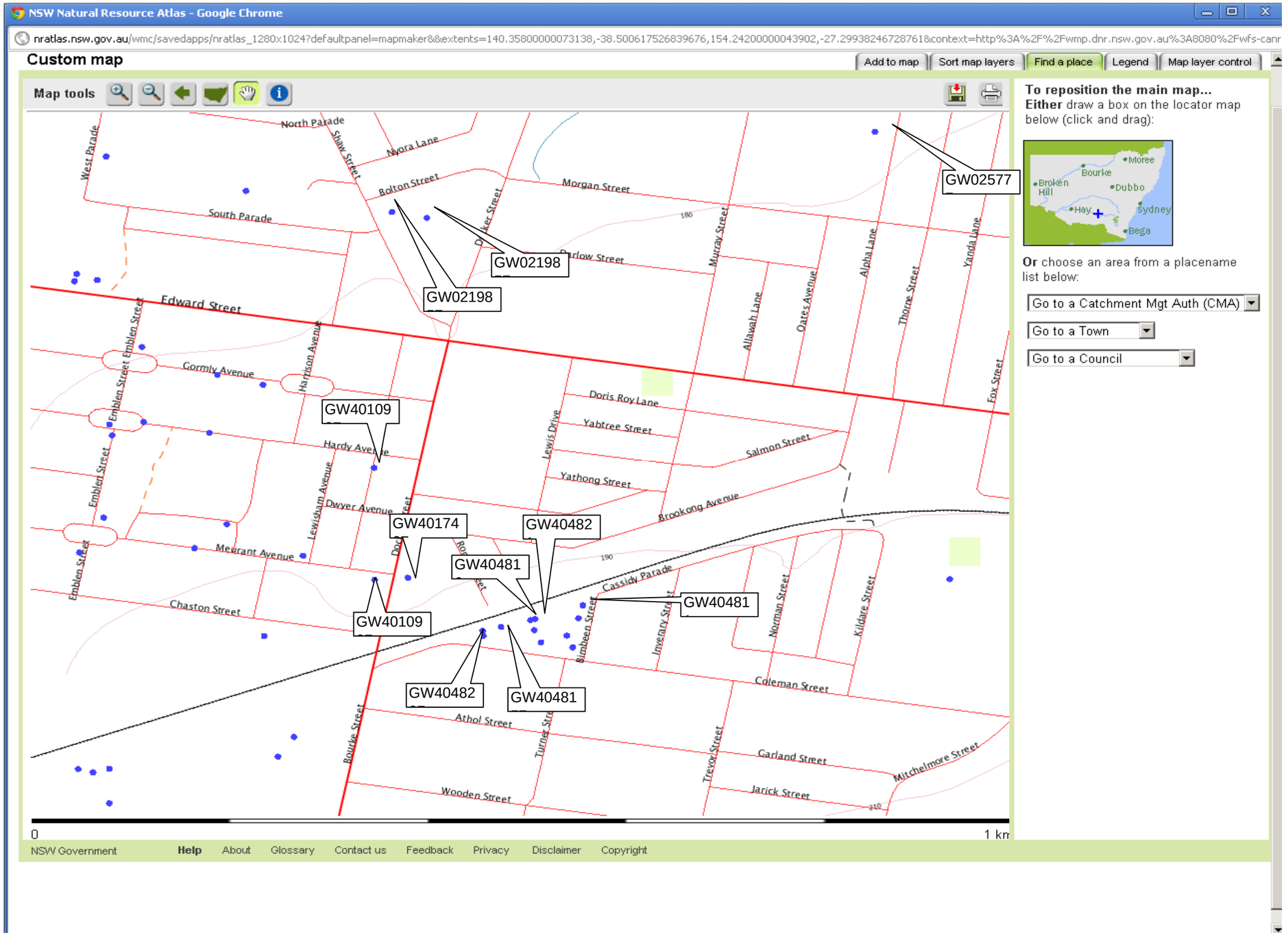
FOR OFFICE USE ONLY

CERTIFICATE OF INSPECTION

I, R. S. LANCASTER being an Inspector under the Dangerous Goods Ac 1975, do hereby certify that the premises described above do comply with the requirements of the Dangerous Goods Ac

Appendix E

Groundwater Bore Data



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT:	Health Infrastructure		TITLE:	**Licensed Groundwater Bores** **Proposed Wagga Wagga Base Hospital Redevelopment** **Edward Street, Wagga Wagga**	N MGA	PROJECT No: 72320.01
	OFFICE:	Sydney	DRAWN BY: RA				DRAWING No: 2
	SCALE:	As shown	DATE: 23.05.11				REVISION: A

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW025777

Works Details (top)

GROUNDWATER NUMBER	GW025777
LIC-NUM	40BL016235
AUTHORISED-PURPOSES	DOMESTIC
INTENDED-PURPOSES	GENERAL USE
WORK-TYPE	Well
WORK-STATUS	Supply Obtained
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	1965-04-01
FINAL-DEPTH (metres)	9.10
DRILLED-DEPTH (metres)	9.10
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N/A
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	410 - MURRUMBIDGEE RIVER
AREA-DISTRICT	
CMA-MAP	8327-1N
GRID-ZONE	55/2
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	(Unknown)
NORTHING	6114284.00
EASTING	533044.00
LATITUDE	35 6' 49"

LONGITUDE	147 21' 45"
GS-MAP	0079B1
AMG-ZONE	55
COORD-SOURCE	GD.,ACC.MAP
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	SEC 77

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	4 757249

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	Concrete Cylnder	-0.60	-0.60	914			(Unknown)

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
4.60	9.20	4.60	Unconsolidated	3.00					(Unknown)

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	4.57	4.57	Loam Black River		
4.57	9.14	4.57	Gravel River Water Bearing		

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW021985

Works Details (top)

GROUNDWATER NUMBER	GW021985
LIC-NUM	40BL014286
AUTHORISED-PURPOSES	RECREATION (GROUNDWATER)
INTENDED-PURPOSES	RECREATION (GROUNDWATER)
WORK-TYPE	Well
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	Local Govt
COMMENCE-DATE	
COMPLETION-DATE	1964-08-01
FINAL-DEPTH (metres)	14.60
DRILLED-DEPTH (metres)	14.60
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N/A
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	410 - MURRUMBIDGEE RIVER
AREA-DISTRICT	
CMA-MAP	8327-1N
GRID-ZONE	55/2
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	(Unknown)
NORTHING	6114133.00
EASTING	532436.00
LATITUDE	35 6' 54"

LONGITUDE	147 21' 21"
GS-MAP	0079B1
AMG-ZONE	55
COORD-SOURCE	GD.,ACC.MAP
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	209

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	PT 1 757249

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	Concrete Cylnder	-0.90	-0.90	864			(Unknown)

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
5.50	14.60	9.10	Unconsolidated	5.50		12.63			(Unknown)

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	5.49	5.49	Clay Black Loamy		
5.49	7.92	2.43	Sand Fine Water Supply		
7.92	14.63	6.71	Gravel River Water Supply		

should be sought in interpreting and using this data.

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW021985

Works Details (top)

GROUNDWATER NUMBER	GW021985
LIC-NUM	40BL014286
AUTHORISED-PURPOSES	RECREATION (GROUNDWATER)
INTENDED-PURPOSES	RECREATION (GROUNDWATER)
WORK-TYPE	Well
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	Local Govt
COMMENCE-DATE	
COMPLETION-DATE	1964-08-01
FINAL-DEPTH (metres)	14.60
DRILLED-DEPTH (metres)	14.60
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N/A
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	410 - MURRUMBIDGEE RIVER
AREA-DISTRICT	
CMA-MAP	8327-1N
GRID-ZONE	55/2
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	(Unknown)
NORTHING	6114133.00
EASTING	532436.00
LATITUDE	35 6' 54"

LONGITUDE	147 21' 21"
GS-MAP	0079B1
AMG-ZONE	55
COORD-SOURCE	GD.,ACC.MAP
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	209

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	PT 1 757249

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	Concrete Cylnder	-0.90	-0.90	864			(Unknown)

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
5.50	14.60	9.10	Unconsolidated	5.50		12.63			(Unknown)

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	5.49	5.49	Clay Black Loamy		
5.49	7.92	2.43	Sand Fine Water Supply		
7.92	14.63	6.71	Gravel River Water Supply		

should be sought in interpreting and using this data.

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW401093

Works Details (top)

GROUNDWATER NUMBER	GW401093
LIC-NUM	40BL187033
AUTHORISED-PURPOSES	DEWATERING (GROUNDWATER)
INTENDED-PURPOSES	DEWATERING (GROUNDWATER)
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	Rotary
OWNER-TYPE	
COMMENCE-DATE	
COMPLETION-DATE	1998-07-29
FINAL-DEPTH (metres)	45.00
DRILLED-DEPTH (metres)	45.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N A
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6113685.00
EASTING	532363.00
LATITUDE	35 7' 9"

LONGITUDE	147 21' 19"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	Map Interpretation
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	ADJ LOT54 DP15274

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	54 15274

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	45.00	228			Rotary
1	1	Casing	PVC Class 12	0.00	27.00	160.3	142.7		C: 0-10m; Glued; Cap
1	1	Opening	Screen	27.00	45.00	160.3			(Unknown); PVC Class 12; A: 1mm; Glued
1		Annulus	Waterworn/Rounded	10.00	45.00				(Unknown); GS: 3-5mm; Q: 1m³

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
27.00	45.00	18.00		1.20		1.00	45.00		1320.00

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	2.00	2.00	SILTY CLAY, BROWN		

2.00	3.00	1.00	SILTY SANDY CLAY, SAND 5%, FINE, DARK BROWN
3.00	5.00	2.00	CLAYEY SILT, BROWN TO DARK
5.00	6.00	1.00	CLAY, LOAM. LIGHT BROWN
6.00	9.00	3.00	SANDY CLAY, FINE TO MEDIUM SAND
9.00	10.00	1.00	SAND, MEDIUM TO COARSE, BROWN TO RED
10.00	12.00	2.00	WEATHERED SILTSTONE, SOME SAND 5%, BROWN
12.00	14.00	2.00	WEATHERED SILTSTONE WITH MEDIUM TO COARSE SAND, 10%, IRON OXIDIZED
14.00	19.00	5.00	WEATHERED SILTSTONE, FE OXIDIZED, WELL LAYERED, MOTTLING
19.00	20.00	1.00	WEATHERED SILTSTONEWITH SAND, FE OXIDIZED, WELL LAYERED, MOTTLING
20.00	25.00	5.00	WEATHERED SILTSTONE, IRON OXIDIZED, WELL LAYERED, QUARTZ VEINING EVIDENT
25.00	29.00	4.00	SHALE, SLIGHTLY WEATHERED, GOOD CLEAVAGE, LIGHT BROWN
29.00	37.00	8.00	SHALE, LIGHT GREY/GREEN, SLIGHTLY WEATHERED, WELL CLEAVED,FIRM,QUARTZ VEINING EVIDENT 10%
37.00	41.00	4.00	SHALE, DARK GREY TO BLACK, WELL DEVELOPED CLEAVAGE
41.00	45.00	4.00	QUARTZ, MILKY TO CLEAR, VEINING, SOME DARK GREY SHALE

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW401740

Works Details (top)

GROUNDWATER NUMBER	GW401740
LIC-NUM	40BL187026
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	
COMMENCE-DATE	
COMPLETION-DATE	1998-09-10
FINAL-DEPTH (metres)	5.50
DRILLED-DEPTH (metres)	5.50
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N A
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6113488.00
EASTING	532408.00
LATITUDE	35 7' 15"

LONGITUDE	147 21' 20"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	OFF MEURANT AVE

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	CNR BOURKE, CULLEN CNR EDWARD, CHASTON

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	5.50				(Unknown)

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.25	0.25	TOPSOIL,D/ BROWN		
0.25	0.50	0.25	SILTY CLAY, D/BROWN		
0.50	1.00	0.50	CLAY, ORANGE		
1.00	2.00	1.00	SANDY CLAY, ORANGE		
2.00	5.00	3.00	CLAY, ORANGE YELLOW		
5.00	5.50	0.50	SANDY CLAY, ORANGE YELLOW		

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW401092

Works Details (top)

GROUNDWATER NUMBER	GW401092
LIC-NUM	40BL187032
AUTHORISED-PURPOSES	DEWATERING (GROUNDWATER)
INTENDED-PURPOSES	DEWATERING (GROUNDWATER)
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	Down Hole Hammer
OWNER-TYPE	
COMMENCE-DATE	
COMPLETION-DATE	1998-07-06
FINAL-DEPTH (metres)	72.00
DRILLED-DEPTH (metres)	72.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N A
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	1.87
SALINITY	1548.00
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6113485.00
EASTING	532363.00
LATITUDE	35 7' 15"

LONGITUDE	147 21' 19"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	Map Interpretation
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	ADJ LOT30 DP15274

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	30 15274

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	72.00	228			Down Hole Hammer
1	1	Casing	PVC Class 12	0.00	48.00	160.3	142.7		C: 0-10m; Glued; Cap
1	1	Opening	Screen	48.00	54.00	160.3			(Unknown); PVC Class 12; A: 1mm; Glued
1	1	Opening	Screen	60.00	72.00	160.3			(Unknown); PVC Class 12; A: 1mm; Glued
1		Annulus	Waterworn/Rounded	10.00	72.00				(Unknown); GS: 3-5mm; Q: 1.25m³

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
48.00	54.00	6.00				1.60	72.00		1548.00

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	3.00	3.00	SILTY CLAY, LIGHT BROWN		
3.00	4.00	1.00	SANDY CLAY, FINE, SAND 60%		
4.00	5.00	1.00	FINE SANDY CLAY, TOP OF REGOLITH		
5.00	6.00	1.00	WEATHERED SILTSTONE, IRON OXIDE, LIGHT GREY LAYERING		
6.00	7.00	1.00	WEATHERED SILTSTONE, LIGHT GREY		
7.00	8.00	1.00	WEATHERED SILTSTONE, CLEAVAGE, IRON OXIDE STAINING		
8.00	9.00	1.00	WEATHERED SILTSTONE, IRON STAINING, LIGHT GREY, IRON OXIDE RED		
9.00	10.00	1.00	WEATHERED SILTSTONE, LAYERING LIGHT GREY		
10.00	11.00	1.00	WEATHERED SILTSTONE, IRON OXIDE PREDOMINANT		
11.00	12.00	1.00	WEATHERED SILTSTONE, OXIDISED, LAYERING		
12.00	13.00	1.00	WEATHERED SILTSTONE, IRON DOMINANT		
13.00	14.00	1.00	WEATHERED SILTSTONE, GOOD CLEAVAGE, IRON OXIDE, LIGHT GREY		
14.00	15.00	1.00	WEATHERED SILTSTONE, LAYERING, SOME QUARTZ VEINING, RED		
15.00	16.00	1.00	WEATHERED SILTSTONE, CLEAVAGE, VERY CLAY DOMINANT		
16.00	17.00	1.00	WEATHERED SILTSTONE, RED, VERY FIRM		
17.00	18.00	1.00	WELL WEATHERED SILTSTONE, YELLOW IRON OXIDE STAINING, MOIST		
18.00	19.00	1.00	SILTSTONE,GREY, SLIGHTLY WEATHERED		
19.00	20.00	1.00	SILTSTONE, GREY, VERY FINE GRAINED, IRON OXIDE STAINED		
20.00	22.00	2.00	WEATHERED SILTSTONE, VERY FINE GRAINED, IRON STAINING		
22.00	23.00	1.00	SILTSTONE, VERY FINE GRAINED		
23.00	24.00	1.00	SHALE, WEATHERED, GOOD CLEAVAGE, BLACK		
24.00	25.00	1.00	SHALE, GOOD CLEAVAGE, BLACK, SLIGHTLY WEATHERED		
25.00	27.00	2.00	SHALE, DARK GREY, IRON OXIDE STAINING, PARTLY WEATHERED		
27.00	28.00	1.00	SHALE, WEATHERED, GREY, OXIDE MOTTLING		
28.00	29.00	1.00	WEATHERED SILTSTONE, DARK GREY MOTTLING		
29.00	30.00	1.00	WEATHERED SILTSTONE, GREY SLIGHT YELLOW STAINING, VERY FINE GRAINED		
30.00	31.00	1.00	WEATHERED SILTSTONE, VERY FINE GRAINED, DARK GREY		
31.00	32.00	1.00	SHALE, SLIGHTLY WEATHERED, WELL CLEAVED, IRON OXIDE STAINING, FIRM		
32.00	33.00	1.00	SHALE, FIRM, SLIGHTLY WEATHERED		
33.00	34.00	1.00	SHALE, FIRM IRON OXIDE STAINING		
34.00	35.00	1.00	SHALE, BLACK FIRM, IRON STAINING		
35.00	36.00	1.00	SHALE, SLIGHTLY WEATHERED BROWN		
36.00	37.00	1.00	SILTSTONE, FIRM GREY/GREEN, FINELY LAYERED		
37.00	38.00	1.00	SHALE, WEATHERED, MOIST, VERY OXIDIZED WBZ		

38.00	43.00	5.00	SHALE, BLACK, SLIGHTLY WEATHERED WBZ
43.00	45.00	2.00	WEATHERED SHALE, SLATE
45.00	72.00	27.00	BLACK SHALE, WELL CLEAVED, SOME QUARTZ VEINING

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW404822

Works Details (top)

GROUNDWATER NUMBER	GW404822
LIC-NUM	40BL192019
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	Man obs - sporadic 1 to 5 years - water quality.
CONSTRUCTION-METHOD	Auger - Solid Flight
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-09-03
FINAL-DEPTH (metres)	21.00
DRILLED-DEPTH (metres)	21.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	FORMER MOBIL DEPOT
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	20.00
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	410 - MURRUMBIDGEE RIVER
AREA-DISTRICT	
CMA-MAP	8327-1N
GRID-ZONE	55/2
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6113393.00
EASTING	532509.00
LATITUDE	35 7' 18"

LONGITUDE	147 21' 24"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1//75580

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1 75580

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	21.00	100			Auger - Solid Flight
1	1	Casing	PVC Class 18	0.00	15.00	50	49		(Unknown)
1	1	Opening	Screen	14.00	21.00	50			PVC Class 18; (Unknown)

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	1.00	1.00	FILL		
1.00	3.00	2.00	CLAY		
3.00	21.00	18.00	SHALE		

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW404815

Works Details (top)

GROUNDWATER NUMBER	GW404815
LIC-NUM	40BL192019
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	Man obs - sporadic 1 to 5 years - water quality.
CONSTRUCTION-METHOD	Auger - Solid Flight
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-09-04
FINAL-DEPTH (metres)	21.00
DRILLED-DEPTH (metres)	21.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	FORMER MOBIL DEPOT
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	16.80
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	410 - MURRUMBIDGEE RIVER
AREA-DISTRICT	
CMA-MAP	8327-1N
GRID-ZONE	55/2
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6113400.00
EASTING	532534.00
LATITUDE	35 7' 18"

LONGITUDE	147 21' 25"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1//75580

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1 75580

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	21.00	100			Auger - Solid Flight
1	1	Casing	PVC Class 18	0.00	15.00	50	49		(Unknown)
1	1	Opening	Screen	15.00	21.00	50			PVC Class 18; (Unknown)

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	1.00	1.00	FILL		
1.00	3.00	2.00	CLAY		
3.00	21.00	18.00	SHALE		

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW404816

Works Details (top)

GROUNDWATER NUMBER	GW404816
LIC-NUM	40BL192019
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	Man obs - sporadic 1 to 5 years - water quality.
CONSTRUCTION-METHOD	Auger
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2005-06-15
FINAL-DEPTH (metres)	19.50
DRILLED-DEPTH (metres)	19.50
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	FORMER MOBIL DEPOT
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	17.00
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	410 - MURRUMBIDGEE RIVER
AREA-DISTRICT	
CMA-MAP	8327-1N
GRID-ZONE	55/2
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6113412.00
EASTING	532574.00
LATITUDE	35 7' 18"

LONGITUDE	147 21' 27"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1//75580

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1 75580

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	19.50	120			Auger
1	1	Casing	PVC Class 18	0.00	11.00	50	49		(Unknown)
1	1	Opening	Screen	10.50	19.50	50			PVC Class 18; (Unknown)

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	19.50	19.50	SILT		

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW404821

Works Details (top)

GROUNDWATER NUMBER	GW404821
LIC-NUM	40BL192019
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	Man obs - sporadic 1 to 5 years - water quality.
CONSTRUCTION-METHOD	Auger - Solid Flight
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-09-04
FINAL-DEPTH (metres)	26.00
DRILLED-DEPTH (metres)	20.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	FORMER MOBIL DEPOT
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	14.60
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	410 - MURRUMBIDGEE RIVER
AREA-DISTRICT	
CMA-MAP	8327-1N
GRID-ZONE	55/2
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6113414.00
EASTING	532580.00
LATITUDE	35 7' 18"

LONGITUDE	147 21' 27"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1//75580

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1 75580

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	26.00	100			Auger - Solid Flight
1	1	Casing	PVC Class 18	0.00	15.00	50	49		(Unknown)
1	1	Opening	Screen	14.00	20.00	50			PVC Class 18; (Unknown)

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	1.00	1.00	FILL		
1.00	4.00	3.00	CLAY		
4.00	20.00	16.00	SHALE		

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 23, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW404811

Works Details (top)

GROUNDWATER NUMBER	GW404811
LIC-NUM	40BL192019
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	Manual observations - 6 monthly to annually - water quality
CONSTRUCTION-METHOD	Auger
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2005-05-31
FINAL-DEPTH (metres)	20.00
DRILLED-DEPTH (metres)	20.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	FORMER MOBIL DEPOT
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	14.90
SALINITY	
YIELD	

Site Details (top)

REGION	40 - MURRUMBIDGEE
RIVER-BASIN	410 - MURRUMBIDGEE RIVER
AREA-DISTRICT	
CMA-MAP	8327-1N
GRID-ZONE	55/2
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6113438.00
EASTING	532645.00
LATITUDE	35 7' 17"

LONGITUDE	147 21' 30"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1//84636

Licensed (top)

COUNTY	WYNYARD
PARISH	SOUTH WAGGA WAGGA
PORTION-LOT-DP	1 75580

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	20.00	120			Auger
1	1	Casing	PVC Class 18	0.00	11.50	50	49		(Unknown)
1	1	Opening	Screen	9.50	11.00	.5			PVC Class 18; (Unknown)

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	2.50	2.50	SILT		
2.50	3.50	1.00	SILT		
3.50	8.00	4.50	CLAY		
8.00	20.00	12.00	SILT		

Appendix F

Site Photographs

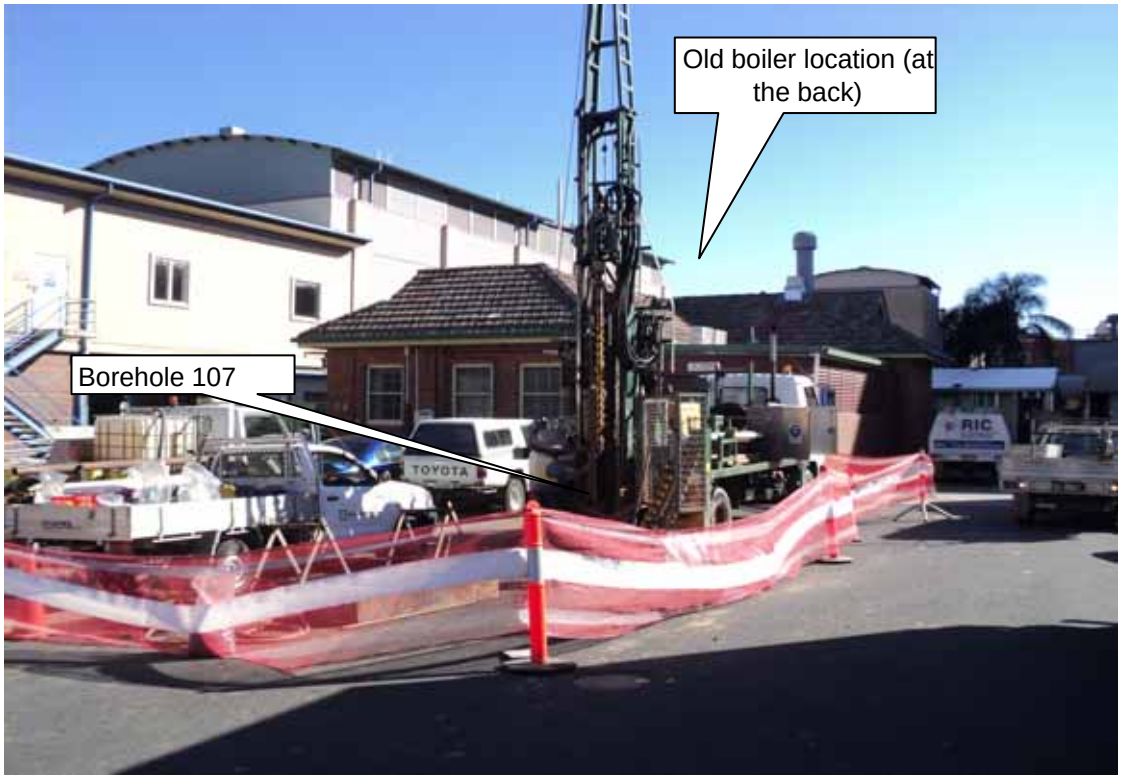


Photo 1 - Borehole 107

Photo 2 - Caltex Service Station

Douglas Partners Geotechnics / Environment / Groundwater	Site Photographs	PROJECT: 72320.01
	Preliminary Contamination Assessment	PLATE No: 1
	Wagga Wagga Base Hospital	REV: A
	CLIENT: Health Infrastructure	DATE: 24.05.11

Photo 3 - Borehole 106

Photo 4 - Liquid Oxygen Depot

Douglas Partners Geotechnics / Environment / Groundwater	Site Photographs Preliminary Contamination Assessment Wagga Wagga Base Hospital	PROJECT: 72320.01 PLATE No: 2 REV: A
	CLIENT: Health Infrastructure	DATE: 24.05.11

Appendix G

Borehole Log Results

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base


Concrete


Filling

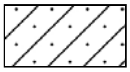
Soils


Topsoil

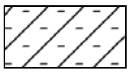

Peat


Clay

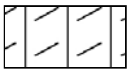

Silty clay

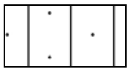

Sandy clay

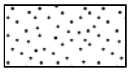

Gravelly clay

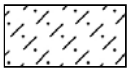

Shaly clay

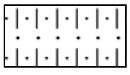

Silt


Clayey silt


Sandy silt

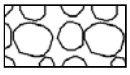

Sand

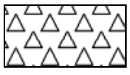

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

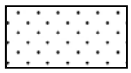

Talus

Sedimentary Rocks

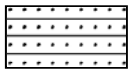

Boulder conglomerate

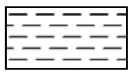

Conglomerate


Conglomeratic sandstone

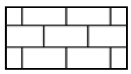

Sandstone


Siltstone


Laminite

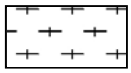

Mudstone, claystone, shale

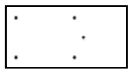

Coal


Limestone

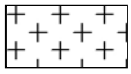
Metamorphic Rocks

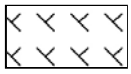

Slate, phyllite, schist

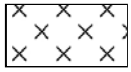

Gneiss

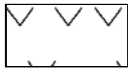

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 183.0 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 72320.00
DATE: 28/3/2011
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
183	0.2	FILLING (TOPSOIL) - dark brown, sandy silt filling with rootlets, dry		E	0.1				Gatic cover
				D	0.2				Quick-set concrete
	0.5	SILTY CLAY - stiff to very stiff, brown silty clay with a trace of sand			0.3				
				E	0.5				
		SILTY CLAY - hard, red brown silty clay, dry			0.6				Bentonite
182	1				1.0				
				S			20,22,20 N = 42		
					1.45				
181	2	2.0 SILTY CLAY - very stiff, orange brown silty clay, dry		E	2.0				
					2.2				
					2.5				
				S			10,13,17 N = 30		
180	3				2.95				
179	4	4.0 SILTY CLAY - hard, orange brown silty clay with some sub-rounded ironstone gravel, dry		S	4.0		16,22,20/100mm refusal		
					4.4				
		4.5-4.7m: rounded quartz gravel							
178	5								
				S	5.5		13,24,20/100mm refusal		
177	6				5.9				
								31-03-11	
176	7	7.0 GRAVELLY SILTY CLAY - hard, orange brown, gravelly (sub-rounded ironstone and quartz gravel) silty clay, dry		S	7.0		26,28,20/100mm refusal		
					7.4				
175	8	8.0 SILTY CLAY - hard, orange brown, silty clay with a trace of ironstone gravel, moist							
				S	8.5		10,16,17 N = 33		
174	9				8.95				
	10.0				10.0				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** HQ to 8.8m

TYPE OF BORING: Solid flight auger (TC-bit) to 8.50m; Rotary (water) to 26.95m

WATER OBSERVATIONS: No free groundwater observed.Standpipe pumped dry on 30/3/11&4/4/11.Water level at 6.6m on 31/3/11& 6.7m on 5&7/4/11

REMARKS: Standpipe piezometer installed: Solid 0.0-6.0m; Slotted 6.0-26.95m; Bentonite plug 0.3-1.0m; Quick-set concrete 0.0-0.3m with Gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 183.0 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 72320.00
DATE: 28/3/2011
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
173		SILTY CLAY - very stiff, orange brown, silty clay with some schist gravel, moist		S	10.45		10,10,12 N = 22		
172	11								11
				S	11.5 11.8		12,24 refusal (bouncing)		
171	12	11.7m: ironstone gravel band (~100mm thick)							12
170	13 13.0	SILTY CLAY - hard, grey silty clay, moist		S	13.0 13.45		13,21,23 N = 44		13
169	14								14 Backfilled with gravel
	14.54	SILTY CLAY - very stiff, red brown, silty clay with some ironstone gravel, moist		S	14.5 14.95		7,9,13 N = 22		
168	15								15
167	16 16.0	GRAVELLY SILTY CLAY - hard, red brown, gravelly (rounded quartz, schist and ironstone gravels) silty clay, moist		S	16.0 16.45		9,15,23 N = 38		16 Machine slotted PVC screen
166	17								17
				S	17.5 17.95		17,25/130mm refusal		
165	18								18
164	19 19.0	SILTY CLAY - very stiff, red brown silty clay, moist		S	19.0 19.45		7,10,14 N = 24		19

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** HQ to 8.8m

TYPE OF BORING: Solid flight auger (TC-bit) to 8.50m; Rotary (water) to 26.95m

WATER OBSERVATIONS: No free groundwater observed.Standpipe pumped dry on 30/3/11&4/4/11.Water level at 6.6m on 31/3/11& 6.7m on 5&7/4/11

REMARKS: Standpipe piezometer installed: Solid 0.0-6.0m; Slotted 6.0-26.95m; Bentonite plug 0.3-1.0m; Quick-set concrete 0.0-0.3m with Gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 183.0 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 72320.00
DATE: 28/3/2011
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	20.3	SILTY CLAY - very stiff, red brown silty clay, moist *(continued)*							
		SILTY CLAY - very stiff, red brown silty clay with some ironstone gravel, moist		S	20.5		7,10,14 N = 24		
					20.95				
				S	23.5		7,10,18 N = 28		
					23.95				
				S	26.5		10,12,20 N = 32		
	26.95				26.95				End cap
		Bore discontinued at 26.95m - target depth achieved							

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** HQ to 8.8m

TYPE OF BORING: Solid flight auger (TC-bit) to 8.50m; Rotary (water) to 26.95m

WATER OBSERVATIONS: No free groundwater observed.Standpipe pumped dry on 30/3/11&4/4/11.Water level at 6.6m on 31/3/11& 6.7m on 5&7/4/11

REMARKS: Standpipe piezometer installed: Solid 0.0-6.0m; Slotted 6.0-26.95m; Bentonite plug 0.3-1.0m; Quick-set concrete 0.0-0.3m with Gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 183.8 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 72320.00
DATE: 29 - 30/3/2011
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
183	0.1	FILLING (ROADBASE) - grey, sandy gravel (blue metal), dry		A	0.1				
		SILTY CLAY - very stiff, orange brown, silty clay with some ironstone gravel and a trace of sand, dry		E*	0.4 0.5				
	1			S	1.0		5,8,18 N = 26		
					1.45				
182	2			E	2.0 2.2				
	2.5	SILTY CLAY - hard, orange brown silty clay, dry		S	2.5		10,15,25 N = 40		
181	3				2.95				
180	4			S	4.0		15,25/130mm refusal		
					4.45				
179	5								
				S	5.5		18,22,20 N = 42		
178	6				5.95				
				A	6.0 6.2				
177	7	7.0 SILTY CLAY - hard, orange brown, silty clay with some sub-rounded schist gravel and a trace of ironstone gravel, dry		S	7.0		9,13,16 N = 29		
176	8				7.45				
	8.5	SILTY CLAY - hard, orange brown, silty clay with a trace of ironstone gravel, dry		S	8.5		9,19,16 N = 35		
175	9				8.95				
174					10.0				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** HQ to 3.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 8.50m; Rotary (water) to 16.0m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Dry on completion of auger drilling. *Denotes field replicate sample BD1/29.3.11 collected

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 183.8 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 72320.00
DATE: 29 - 30/3/2011
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
173	11	SILTY CLAY - hard, orange brown, silty clay with a trace of ironstone gravel, dry *(continued)*		S	10.45		8,23,25 N = 48		11
172	11.5 12	SILTY CLAY - very stiff, red brown, silty clay with a trace of quartz and ironstone gravel, moist		S	11.5 11.95		6,8,12 N = 20		11.5 12
171	13 13.0	SILTY CLAY - hard, red and grey, silty clay with some ironstone gravel, moist		S	13.0 13.45		8,16,26 N = 42		13
170	14								14
169	15			S	14.5 14.95		10,20,28 N = 48		15
168	16			S	16.0		9,18,23 N = 41		16
	16.45	Bore discontinued at 16.45m - target depth achieved			16.45				
167	17								17
166	18								18
165	19								19
164									

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** HQ to 3.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 8.50m; Rotary (water) to 16.0m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Dry on completion of auger drilling. *Denotes field replicate sample BD1/29.3.11 collected

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 72320.00
DATE: 30/3/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
182	0.04	ASPHALT - 40mm thick		A	0.1				
	0.2	ROADBASE - grey, angular blue metal gravel, 160mm thick		B	0.2				
		SILTY CLAY - hard, orange brown, silty clay with a trace of ironstone gravel, dry		E	0.5				
	1				0.6				
				S	1.0		8,17,33 N = 50		
181					1.45				
	2			E	2.0				
		2.25m: grading to very stiff and moist			2.2				
	2.3	SILTY CLAY - very stiff, orange brown silty clay with some ironstone gravel, moist			2.5				
180				S			5,8,14 N = 22		
	3	2.85-3.0m: sub-rounded quartz gravel (to 10mm)		A	2.9				
					2.95				
					3.0				
179	3.5	SILTY CLAY - very stiff, orange brown, silty clay with a trace of ironstone gravel, moist							
	4			S	4.0		5,8,10 N = 18		
178					4.45				
	5								
177				S	5.5		7,11,16 N = 27		
	6				5.95				
176									
	7	7.0 SILTY CLAY - very stiff, orange brown, silty clay with a trace of sand, moist		S	7.0		5,10,10 N = 20		
175					7.45				
	8								
174	8.5	SILTY CLAY - stiff to very stiff, orange brown, silty clay with a trace of sand, moist		S	8.5		5,6,10 N = 16		
	9	8.95 Bore discontinued at 8.95m - target depth achieved			8.95				
173									

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC-bit) to 8.50m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Hole backfilled on 31/3/11. Dry on completion and the following day

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.2 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 104
PROJECT No: 72320.00
DATE: 31/3/2011
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
182	0.04	ASPHALT - 40mm thick							
	0.2	ROADBASE - blue grey, angular basalt gravel, dry		E	0.3				
		SILTY CLAY - hard, orange brown, silty clay with a trace of ironstone gravel, dry			0.4				
	1			S	1.0		9,17,20 N = 37		
					1.45				
				E	1.6				
					1.7				
180	2	2.0m: grading to very stiff							
				S	2.5		10,10,22 N = 32		
	3				2.95				
	4	4.0 SILTY CLAY - very stiff, orange brown silty clay, dry		S	4.0		6,8,15 N = 23		
		4.5m: becoming brown			4.45				
177	5								
				S	5.5		6,6,12 N = 18		
	6				5.95				
	7	7.0 SILTY CLAY - very stiff, orange brown, silty clay with a trace of ironstone gravel, dry		S	7.0		7,9,11 N = 20		
					7.45				
174	8								
	8.5	SILTY CLAY - stiff to very stiff, orange brown silty clay, moist		S	8.5		5,7,9 N = 16		
	9				8.95				
173									
	10.0				10.0				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC-bit) to 14.50m

WATER OBSERVATIONS: Free groundwater observed on hole completion at 14.95m on 31/3/11 and at 12.75m on 1/4/11

REMARKS: Hole backfilled on 1/4/11

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.2 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 104
PROJECT No: 72320.00
DATE: 31/3/2011
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
172		SILTY CLAY - very stiff, mottled grey and orange brown, silty clay with some sand, moist		S	10.45		3,8,10 N = 18		
171	11				11.5				11
	11.65	SAND - dense, orange brown, medium to coarse grained sand, moist		S	11.95		6,15,17 N = 32		
170	12								12
	13 13.0				13.0				13
169	13.2	SANDY CLAY - very stiff, brown, sandy (medium grained) sand, moist		S			11,13,14 N = 27		
		SAND - medium dense, orange brown, medium to coarse grained sand with a trace of clay, moist			13.45				
168	14								14
					14.5				
				S			4,8,13 N = 21	▼	
	15 14.95	Bore discontinued at 14.95m			14.95			31-03-11	15
167									
	16								16
166									
	17								17
165									
	18								18
164									
	19								19
163									

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC-bit) to 14.50m

WATER OBSERVATIONS: Free groundwater observed on hole completion at 14.95m on 31/3/11 and at 12.75m on 1/4/11

REMARKS: Hole backfilled on 1/4/11

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 181.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 105
PROJECT No: 72320.00
DATE: 31/3/2011
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
181	0.15	FILLING (TOPSOIL) - poorly compacted, brown, sandy silt filling with some grass rootlets, dry		E	0.2				
		FILLING - poorly compacted, orange brown, silty clay filling with some building rubble (concrete, tile) and quartz gravel, dry			0.3				
				E	0.8				
	1				0.9				1
	1.2	SILTY CLAY - very stiff, orange brown, silty clay with a trace of ironstone gravel, dry		S	1.2		2,11,18 N = 29		
180					1.65				
	2			E	2.0				2
					2.2				
179	2.5	SILTY CLAY - hard, orange brown silty clay, dry		S	2.5		13,18,22 N = 40		
	3				2.95				3
178									
	4				4.0				4
	4.0	SILTY CLAY - very stiff to hard, orange brown silty clay		S			9,12,20 N = 32		
177					4.45				
	5								5
176	5.5	SILTY CLAY - very stiff, brown silty clay, dry		S	5.5		7,9,12 N = 21		
		6.0m: becoming moist			5.95				
	6								6
175									
	7			S	7.0		6,8,12 N = 20		7
174					7.45				
	8								8
173				S	8.5		7,10,14 N = 24		
	9				8.95				9
172									
	10.0				10.0				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC-bit) to 10.0m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 181.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 105
PROJECT No: 72320.00
DATE: 31/3/2011
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
171	10.45	SAND - medium dense, orange brown, medium to coarse grained sand with a trace of clay, moist		S	10.45		8,9,11 N = 20 (no sample recovered)		
		Bore discontinued at 10.45m - target depth achieved							
	11								11
170									
	12								12
169									
	13								13
168									
	14								14
167									
	15								15
166									
	16								16
165									
	17								17
164									
	18								18
163									
	19								19
162									

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased
TYPE OF BORING: Solid flight auger (TC-bit) to 10.0m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⫧	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 106
PROJECT No: 72320.00
DATE: 5/4/2011
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
182	0.2	FILLING (TOPSOIL) - poorly compacted, brown, silty clay filling with some sand		E*	0.1				Gatic cover
					0.2				Concrete
	0.4	SILTY CLAY - hard, orange brown silty clay, dry		B	0.3				
		SILTY CLAY - hard, orange brown, silty clay with a trace of ironstone gravel, dry							Bentonite
	1								1
181				S	1.3		7,22,20 N = 42		
				E	1.75				
	2	2.0m: very stiff			2.0				2
180				S	2.5		16,29,25 N = 54		
	3				2.95				3
179	4	4.0 SILTY CLAY - stiff, mottled orange brown and grey, silty clay with a trace of ironstone gravel and sand, moist		S	4.0		4,4,5 N = 9		4
178					4.45				
	5								5
177	5.5	SILTY CLAY - very stiff, brown silty clay, moist		S	5.5		5,8,12 N = 20		
	6				5.95				6
176	7	7.0 SILTY CLAY - hard, brown, silty clay with a trace of sand, dry		S	7.0		10,13,21 N = 34		7
175					7.45				
	8								Backfilled with gravel
174				S	8.5		8,16,19 N = 35		8
	9				8.95				9
173					10.0				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** HQ to 15.0m

TYPE OF BORING: Pot holing to 1.2m; Solid flight auger to 14.50m; Rotary (water) to 15.50m

WATER OBSERVATIONS: Free groundwater observed at 13.10m

REMARKS: *Denotes field replicate sample BD2/5.4.11 collected. Standpipe piezometer installed: solid 0.0-6.0m; Slotted 6.0-15.5m; Bentonite plug 0.3-1.0m; Quick-set concrete 0.0-0.3m with gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 106
PROJECT No: 72320.00
DATE: 5/4/2011
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
172	10.35	SILTY CLAY - hard, brown, silty clay with a trace of sand, dry *(continued)*		S	10.45		14,23,25 N = 48		Machine slotted PVC screen
		SAND - dense, medium to coarse grained sand, dry							
11		10.95m: rounded quartz gravel							11
171				S	11.5 11.95		16,25,25 N = 50		
12				A	12.5				12
170									
13	13.1	SAND - dense, medium to coarse grained, brown sand with some clay and rounded quartz gravel (to 50mm diameter), saturated		S	13.0 13.45		12,12,19 N = 31	▼	13
169									
14									14
	14.4	CLAYEY SAND - dense, medium to coarse grained, clayey sand with some rounded quartz gravel, wet		A S	14.4 14.5 14.95		10,15,25 N = 40 (no sample recovered)		
168									
15									15
	15.5	Bore discontinued at 15.5m - target depth achieved							End cap
167									
16									16
166									
17									17
165									
18									18
164									
19									19
163									

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** HQ to 15.0m

TYPE OF BORING: Pot holing to 1.2m; Solid flight auger to 14.50m; Rotary (water) to 15.50m

WATER OBSERVATIONS: Free groundwater observed at 13.10m

REMARKS: *Denotes field replicate sample BD2/5.4.11 collected. Standpipe piezometer installed: solid 0.0-6.0m; Slotted 6.0-15.5m; Bentonite plug 0.3-1.0m; Quick-set concrete 0.0-0.3m with gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.3 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 107
PROJECT No: 72320.00
DATE: 6 - 7/4/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
182	0.07	ASPHALT - 70mm thick							
	0.4	FILLING (ROADBASE) - angular blue metal gravel and sand							
		FILLING - poorly compacted, red brown, silty clay filling with granite gravel, slag and some sand, moist		S	1.35		3,3,2 N = 5		
181	1				1.8				
				E	1.9				
	2				2.0				
	2.2			A	2.2				
180	2.4	FILLING - poorly compacted, medium grained sand filling with some clay, moist		E	2.4				
		Bore discontinued at 2.4m - hole abandoned due to obstruction							
	3								
179									
	4								
178									
	5								
177									
	6								
176									
	7								
175									
	8								
174									
	9								
173									

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Pot holing to 1.30m; Solid flight auger to 2.40m

WATER OBSERVATIONS: No free groundwater observed whilst auger drilling

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.3 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 107A
PROJECT No: 72320.00
DATE: 7/4/2011
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
182	0.07	ASPHALT - 70mm thick							
	0.4	FILLING (ROADBASE) - brown, angular blue metal gravel filling with sand, dry		E	0.4 0.5				
		SILTY CLAY - apparently very stiff, red brown silty clay, dry							
181	1								1
	1.5	SILTY CLAY - very stiff, red brown, silty clay with some ironstone gravel, dry			1.5				
				S E	1.6 1.95		7,9,18 N = 27		
180	2								2
	2.5	SILTY CLAY - stiff, red brown, silty clay with a trace of ironstone gravel, dry			2.5				
				S	2.95		6,6,8 N = 14		
179	3								3
	4.0	SILTY CLAY - very stiff, red brown, silty clay with a trace of ironstone gravel, dry			4.0				
178	4			S	4.45		5,8,14 N = 22		4
	5								5
177					5.5				
	6			S	5.95		6,9,14 N = 23		6
176	7				7.0				7
				S	7.45		4,6,11 N = 17		
175	8								8
	8.5	SILTY CLAY - stiff to very stiff, red brown and grey, silty clay, moist			8.5				
174				S	8.95		6,7,9 N = 16		
	9								9
173	10.0				10.0				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Pot holing to 1.2m; Solid flight auger (TC-bit) to 13.0m

WATER OBSERVATIONS: Free groundwater observed at 13.10m on SPT sampler

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.3 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 107A
PROJECT No: 72320.00
DATE: 7/4/2011
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
172	11	SILTY CLAY - hard, red brown silty clay, moist		S	10.45		9,14,30 N = 44		
171	11.5	SILTY CLAY - stiff, mottled orange brown and grey, silty clay, moist 12.0m: gravel		S	11.5 11.95		5,6,7 N = 13		
170	12								
169	13 13.0	SILTY CLAY - hard, orange brown silty clay, moist		S	13.0		8,15,19 N = 34	▼	
	13.45	Bore discontinued at 13.45m			13.45				
168	14								
167	15								
166	16								
165	17								
164	18								
163	19								

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Pot holing to 1.2m; Solid flight auger (TC-bit) to 13.0m

WATER OBSERVATIONS: Free groundwater observed at 13.10m on SPT sampler

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 181.8 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 108
PROJECT No: 72320.00
DATE: 6/4/2011
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
181	0.0	FILLING - poorly compacted, medium grained clayey sand filling, moist		A	0.1				
					0.2				
	0.4	SILTY CLAY - apparently hard, red brown silty clay, dry							
	1								1
	1.4	SILTY CLAY - hard, red brown silty clay, dry			1.4				
180				S			5,17,22 N = 39		
					1.85				
	2				2.0				2
				A	2.2				
		2.5m: with a trace of ironstone gravel			2.5				
179				S			10,13,25 N = 38		
	3				2.95				3
178									
	4								4
	4.0	SILTY CLAY - very stiff, brown silty clay, moist			4.0				
				S			5,9,13 N = 22		
177					4.45				
	5								5
					5.5				
				S			5,7,13 N = 20		
176	6				5.95				6
175									
	7				7.0				7
		7.0m: becoming grey brown		S			4,8,12 N = 20		
					7.45				
174	8								8
	8.5	SILTY CLAY - stiff, brown silty clay, moist			8.5				
173				S			5,6,8 N = 14		
	9				8.95				9
172	10.0				10.0				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Pot holing to 1.2m; Solid flight auger (TC-bit) to 10.0m

WATER OBSERVATIONS: No free groundwater observed whilst auger drilling

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 181.8 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 108
PROJECT No: 72320.00
DATE: 6/4/2011
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SILTY CLAY - stiff, brown silty clay, moist *(continued)*		S			3,5,6 N = 11		
	10.45	Bore discontinued at 10.45m - target depth achieved			10.45				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Pot holing to 1.2m; Solid flight auger (TC-bit) to 10.0m

WATER OBSERVATIONS: No free groundwater observed whilst auger drilling

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.4 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 109
PROJECT No: 72320.00
DATE: 1 - 5/4/2011
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
182	0.4	FILLING (TOPSOIL) - poorly compacted, dark brown, silty clay filling (topsoil) with some sand, moist		E	0.1 0.2				
		SILTY CLAY - apparently stiff, orange brown silty clay, dry		B A	0.4 0.5 0.6				
181	1.0	SILTY CLAY - stiff, orange brown silty clay, dry		S	1.0 1.45		4,4,9 N = 13		
180	2			S	2.5 2.95		4,5,7 N = 12		
179	3								
178	4.0	SILTY CLAY - very stiff, orange brown silty clay, dry		S	4.0 4.45		7,11,14 N = 25		
	5	5.0m: trace of ironstone gravel							
177				S	5.5 5.95		7,10,12 N = 22		
176	6								
175	7.0	SILTY CLAY - stiff, orange brown, silty clay with a trace of ironstone gravel, dry		S	7.0 7.45		4,7,8 N = 15		
174	8								
	8.5	SILTY CLAY - hard, red brown, silty clay with a trace of ironstone gravel, dry		S	8.5 8.95		10,12,21 N = 33		
173	9								
					10.0				

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased
TYPE OF BORING: Solid flight auger (TC-bit) to 10.0m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Wagga Wagga Base Hospital Redevelopment
LOCATION: Edward Street, Wagga Wagga

SURFACE LEVEL: 182.4 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 109
PROJECT No: 72320.00
DATE: 1 - 5/4/2011
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	10.15	10.10m: rounded quartz gravel		S	10.15		20 refusal		
		Bore discontinued at 10.15m - target depth achieved							

RIG: Scout **DRILLER:** JS **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC-bit) to 10.0m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

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Appendix H

Laboratory Reports and Chain of Custody Documentation

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 55247

Client:
Douglas Partners
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Paul Gorman

Sample log in details:

Your Reference:	**72320.01, Wagga Wagga**		
No. of samples:	4 soils		
Date samples received / completed instructions received	11/05/11	/	11/05/11

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	18/05/11	/	12/05/11
Date of Preliminary Report:	Not Issued		

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Results Approved By:

Alex Tam
Approved Signatory

Asbestos ID - soils					
Our Reference:	UNITS	55247-1	55247-2	55247-3	55247-4
Your Reference	----------	BH105/0.2-0.3	BH106/0.1-0.2	BH108/0.1-0.2	BH109/0.1-0.3
Type of sample	----------	Soil	Soil	Soil	Soil
Date analysed	-	12/05/2011	12/05/2011	12/05/2011	12/05/2011
Sample mass tested	g	Approx 35	Approx 35	Approx 35	Approx 35
Sample Description	-	Sandy Soil & Rock	Sandy Soil & Rock	Sandy Soil & Rock	Sandy Soil & Rock
Asbestos ID in soil	-	No asbestos found at reporting limit of 0.1g/kg	No asbestos found at reporting limit of 0.1g/kg	No asbestos found at reporting limit of 0.1g/kg	No asbestos found at reporting limit of 0.1g/kg
Trace Analysis	-	Respirable fibres not detected	Respirable fibres not detected	Respirable fibres not detected	Respirable fibres not detected

Method ID	Methodology Summary
AS4964-2004	Asbestos ID - Qualitative identification of asbestos type fibres in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques.

Report Comments:

Asbestos ID was analysed by Approved Identifier: Alex Tam
Asbestos ID was authorised by Approved Signatory: Alex Tam

INS: Insufficient sample for this test
NA: Test not required
<: Less than
PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than
NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY

Project Name: Wagga Wagga .....
Project No: 72320.01..... Sampler: Peter Hartcliff..... .....
Project Mgr: Paul Gorman..... Phone: 02 9809 0666 .....
Email: rene.alviar@douglaspartners.com.au .....
Date Required: Normal TAT ..... Lab Quote No. .....

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2068
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth (m)	Lab ID	Sampling Date	Sample Type S - soil W – water A - Air	Container type	Analytes: Asbestos ID							Notes
BH105/0.2-0.3	0.2-0.3	1	31.03	S	J	X							
BH106/0.1-0.2	0.1-0.2	2	05.04	S	J	X							
BH108/0.1-0.2	0.1-0.2	3	06.04	S	J	X							
BH109/0.1-0.3	0.1-0.3	4	05.04	S	J	X							

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: 9910 6200

Job No: 55247
Date received: 11-5-11
Time received: 2pm
Received by: ES
Temp: Cool/Ambient
Cooling: Ice/icepack
Security: Intact/Broken/None

Lab Report No. .....
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114
Phone: (02) 9809 0666
Fax: (02) 9809 4095

Relinquished by: Rene Alviar Signed: Date & Time: Received By: E Shaw (ELS) Date & Time: 11-5-11, 2pm

Relinquished by: Signed: Date & Time: Received By: Date & Time:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 54136

Client:
Douglas Partners
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Rene Alviar

Sample log in details:

Your Reference:	**72320.01, Wagga Wagga**
No. of samples:	24 Soils, 3 Waters
Date samples received / completed instructions received	11/04/11 / 11/04/11

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	18/04/11 / 18/04/11
Date of Preliminary Report:	Not Issued

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Results Approved By:

Jacinta Hurst
Laboratory Manager

Nancy Zhang
Chemist

Rhian Morgan
Reporting Supervisor

Nick Sarlamis
Inorganics Supervisor

Giovanni Agosti
Technical Manager

Jeremy Faircloth
Chemist

VOCs in soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	54136-3 BH101/2-2.2 30/03/2011 Soil	54136-14 BH106/1.75-2.0 5/04/2011 Soil	54136-16 BH107/2.2-2.4 7/04/2011 Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011
Dichlorodifluoromethane	mg/kg	<1	<1	<1
Chloromethane	mg/kg	<1	<1	<1
Vinyl Chloride	mg/kg	<1	<1	<1
Bromomethane	mg/kg	<1	<1	<1
Chloroethane	mg/kg	<1	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1	<1
trans-1,2-dichloroethene	mg/kg	<1	<1	<1
1,1-dichloroethane	mg/kg	<1	<1	<1
cis-1,2-dichloroethene	mg/kg	<1	<1	<1
bromochloromethane	mg/kg	<1	<1	<1
chloroform	mg/kg	<1	<1	<1
2,2-dichloropropane	mg/kg	<1	<1	<1
1,2-dichloroethane	mg/kg	<1	<1	<1
1,1,1-trichloroethane	mg/kg	<1	<1	<1
1,1-dichloropropene	mg/kg	<1	<1	<1
Cyclohexane	mg/kg	<1	<1	<1
carbon tetrachloride	mg/kg	<1	<1	<1
Benzene	mg/kg	<0.5	<0.5	<0.5
dibromomethane	mg/kg	<1	<1	<1
1,2-dichloropropane	mg/kg	<1	<1	<1
trichloroethene	mg/kg	<1	<1	<1
bromodichloromethane	mg/kg	<1	<1	<1
trans-1,3-dichloropropene	mg/kg	<1	<1	<1
cis-1,3-dichloropropene	mg/kg	<1	<1	<1
1,1,2-trichloroethane	mg/kg	<1	<1	<1
Toluene	mg/kg	<0.5	<0.5	<0.5
1,3-dichloropropane	mg/kg	<1	<1	<1
dibromochloromethane	mg/kg	<1	<1	<1
1,2-dibromoethane	mg/kg	<1	<1	<1
tetrachloroethene	mg/kg	<1	<1	<1
1,1,1,2-tetrachloroethane	mg/kg	<1	<1	<1
chlorobenzene	mg/kg	<1	<1	<1
Ethylbenzene	mg/kg	<1	<1	<1
bromoform	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
styrene	mg/kg	<1	<1	<1

VOCs in soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	54136-3 BH101/2-2.2 30/03/2011 Soil	54136-14 BH106/1.75-2.0 5/04/2011 Soil	54136-16 BH107/2.2-2.4 7/04/2011 Soil
1,1,2,2-tetrachloroethane	mg/kg	<1	<1	<1
o-Xylene	mg/kg	<1	<1	<1
1,2,3-trichloropropane	mg/kg	<1	<1	<1
isopropylbenzene	mg/kg	<1	<1	<1
bromobenzene	mg/kg	<1	<1	<1
n-propyl benzene	mg/kg	<1	<1	<1
2-chlorotoluene	mg/kg	<1	<1	<1
4-chlorotoluene	mg/kg	<1	<1	<1
1,3,5-trimethyl benzene	mg/kg	<1	<1	<1
tert-butyl benzene	mg/kg	<1	<1	<1
1,2,4-trimethyl benzene	mg/kg	<1	<1	<1
1,3-dichlorobenzene	mg/kg	<1	<1	<1
sec-butyl benzene	mg/kg	<1	<1	<1
1,4-dichlorobenzene	mg/kg	<1	<1	<1
4-isopropyl toluene	mg/kg	<1	<1	<1
1,2-dichlorobenzene	mg/kg	<1	<1	<1
n-butyl benzene	mg/kg	<1	<1	<1
1,2-dibromo-3-chloropropane	mg/kg	<1	<1	<1
1,2,4-trichlorobenzene	mg/kg	<1	<1	<1
hexachlorobutadiene	mg/kg	<1	<1	<1
1,2,3-trichlorobenzene	mg/kg	<1	<1	<1
Surrogate Dibromofluorometha	%	89	90	110
Surrogate aaa-Trifluorotoluene	%	109	106	111
Surrogate Toluene-d_8	%	97	96	92
Surrogate 4-Bromofluorobenzene	%	95	94	72

vTRH & BTEX in Soil						
Our Reference:	UNITS	54136-1	54136-3	54136-4	54136-5	54136-6
Your Reference	----------	BH101/0.1-0.2	BH101/2-2.2	BH102/0.4-0.5	BH102/2-2.2	BH103/0.5-0.6
Date Sampled	----------	30/03/2011	30/03/2011	29/03/2011	29/03/2011	30/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
vTRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	84	109	87	87	86

vTRH & BTEX in Soil						
Our Reference:	UNITS	54136-8	54136-10	54136-13	54136-15	54136-19
Your Reference	----------	BH104/0.3-0.4	BH105/0.2-0.3	BH106/0.1-0.2	BH107/1.9-2.0	BH108/0.1-0.2
Date Sampled	----------	31/03/2011	31/03/2011	5/04/2011	7/04/2011	6/04/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
vTRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	86	87	83	110	108

vTRH & BTEX in Soil		
Our Reference:	UNITS	54136-21
Your Reference	----------	BH109/0.1-0.3
Date Sampled	----------	5/04/2011
Type of sample		Soil
Date extracted	-	12/04/2011
Date analysed	-	12/04/2011
vTRH C_6 - C_9	mg/kg	<25
Benzene	mg/kg	<0.5
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	107

sTRH in Soil (C10-C36)						
Our Reference:	UNITS	54136-1	54136-3	54136-4	54136-5	54136-6
Your Reference	----------	BH101/0.1-0.2	BH101/2-2.2	BH102/0.4-0.5	BH102/2-2.2	BH103/0.5-0.6
Date Sampled	----------	30/03/2011	30/03/2011	29/03/2011	29/03/2011	30/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
$TRHC_{10}$ - C_{14}	mg/kg	<50	<50	<50	<50	<50
$TRHC_{15}$ - C_{28}	mg/kg	<100	<100	<100	<100	<100
$TRHC_{29}$ - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	87	85	86	87	87

sTRH in Soil (C10-C36)						
Our Reference:	UNITS	54136-8	54136-10	54136-13	54136-15	54136-19
Your Reference	----------	BH104/0.3-0.4	BH105/0.2-0.3	BH106/0.1-0.2	BH107/1.9-2.0	BH108/0.1-0.2
Date Sampled	----------	31/03/2011	31/03/2011	5/04/2011	7/04/2011	6/04/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
$TRHC_{10}$ - C_{14}	mg/kg	<50	<50	<50	<50	<50
$TRHC_{15}$ - C_{28}	mg/kg	<100	<100	<100	<100	<100
$TRHC_{29}$ - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	87	87	88	88	82

sTRH in Soil (C10-C36)		
Our Reference:	UNITS	54136-21
Your Reference	----------	BH109/0.1-0.3
Date Sampled	----------	5/04/2011
Type of sample		Soil
Date extracted	-	12/04/2011
Date analysed	-	12/04/2011
$TRHC_{10}$ - C_{14}	mg/kg	<50
$TRHC_{15}$ - C_{28}	mg/kg	<100
$TRHC_{29}$ - C_{36}	mg/kg	<100
Surrogate o-Terphenyl	%	89

PAHs in Soil						
Our Reference:	UNITS	54136-1	54136-3	54136-4	54136-5	54136-6
Your Reference	----------	BH101/0.1-0.2	BH101/2-2.2	BH102/0.4-0.5	BH102/2-2.2	BH103/0.5-0.6
Date Sampled	----------	30/03/2011	30/03/2011	29/03/2011	29/03/2011	30/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.2	<0.1	0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.5	<0.1	0.2	<0.1	<0.1
Pyrene	mg/kg	0.5	<0.1	0.3	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.2	<0.1	0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	0.4	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.24	<0.05	0.09	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	87	93	89	89	89

PAHs in Soil						
Our Reference:	UNITS	54136-8	54136-10	54136-11	54136-13	54136-14
Your Reference	----------	BH104/0.3-0.4	BH105/0.2-0.3	BH105/0.8-0.9	BH106/0.1-0.2	BH106/1.75-2.0
Date Sampled	----------	31/03/2011	31/03/2011	31/03/2011	5/04/2011	5/04/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	0.6	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	1.3	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	1.3	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	0.5	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.6	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.9	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	0.61	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Surrogate p-Terphenyl-d_{14}	%	88	85	92	87	90

PAHs in Soil						
Our Reference:	UNITS	54136-15	54136-16	54136-18	54136-19	54136-20
Your Reference	----------	BH107/1.9-2.0	BH107/2.2-2.4	BH107A/1.5-1.6	BH108/0.1-0.2	BH108/2-2.2
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011	6/04/2011	6/04/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	93	88	87	88	88

PAHs in Soil		
Our Reference:	UNITS	54136-21
Your Reference	----------	BH109/0.1-0.3
Date Sampled	----------	5/04/2011
Type of sample		Soil
Date extracted	-	12/04/2011
Date analysed	-	12/04/2011
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.2
Pyrene	mg/kg	0.3
Benzo(a)anthracene	mg/kg	0.1
Chrysene	mg/kg	0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	0.09
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Surrogate p-Terphenyl-d_{14}	%	85

Organochlorine Pesticides in soil						
Our Reference:	UNITS	54136-1	54136-4	54136-6	54136-8	54136-10
Your Reference	----------	BH101/0.1-0.2	BH102/0.4-0.5	BH103/0.5-0.6	BH104/0.3-0.4	BH105/0.2-0.3
Date Sampled	----------	30/03/2011	29/03/2011	30/03/2011	31/03/2011	31/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	91	95	94	93	97

Organochlorine Pesticides in soil					
Our Reference:	UNITS	54136-13	54136-15	54136-19	54136-21
Your Reference	----------	BH106/0.1-0.2	BH107/1.9-2.0	BH108/0.1-0.2	BH109/0.1-0.3
Date Sampled	----------	5/04/2011	7/04/2011	6/04/2011	5/04/2011
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	89	94	93	83

Organophosphorus Pesticides						
Our Reference:	UNITS	54136-1	54136-4	54136-6	54136-8	54136-10
Your Reference	----------	BH101/0.1-0.2	BH102/0.4-0.5	BH103/0.5-0.6	BH104/0.3-0.4	BH105/0.2-0.3
Date Sampled	----------	30/03/2011	29/03/2011	30/03/2011	31/03/2011	31/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	91	95	94	93	97

Organophosphorus Pesticides					
Our Reference:	UNITS	54136-13	54136-15	54136-19	54136-21
Your Reference	----------	BH106/0.1-0.2	BH107/1.9-2.0	BH108/0.1-0.2	BH109/0.1-0.3
Date Sampled	----------	5/04/2011	7/04/2011	6/04/2011	5/04/2011
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	89	94	93	83

PCBs in Soil						
Our Reference:	UNITS	54136-1	54136-4	54136-6	54136-8	54136-10
Your Reference	----------	BH101/0.1-0.2	BH102/0.4-0.5	BH103/0.5-0.6	BH104/0.3-0.4	BH105/0.2-0.3
Date Sampled	----------	30/03/2011	29/03/2011	30/03/2011	31/03/2011	31/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1221*	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	91	95	94	93	97

PCBs in Soil					
Our Reference:	UNITS	54136-13	54136-15	54136-19	54136-21
Your Reference	----------	BH106/0.1-0.2	BH107/1.9-2.0	BH108/0.1-0.2	BH109/0.1-0.3
Date Sampled	----------	5/04/2011	7/04/2011	6/04/2011	5/04/2011
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1221*	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	89	94	93	83

Total Phenolics in Soil						
Our Reference:	UNITS	54136-1	54136-4	54136-6	54136-8	54136-10
Your Reference	----------	BH101/0.1-0.2	BH102/0.4-0.5	BH103/0.5-0.6	BH104/0.3-0.4	BH105/0.2-0.3
Date Sampled	----------	30/03/2011	29/03/2011	30/03/2011	31/03/2011	31/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	13/04/2011	13/04/2011	13/04/2011	13/04/2011	13/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011	13/04/2011	13/04/2011
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Total Phenolics in Soil					
Our Reference:	UNITS	54136-13	54136-15	54136-19	54136-21
Your Reference	----------	BH106/0.1-0.2	BH107/1.9-2.0	BH108/0.1-0.2	BH109/0.1-0.3
Date Sampled	----------	5/04/2011	7/04/2011	6/04/2011	5/04/2011
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	13/04/2011	13/04/2011	13/04/2011	13/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011	13/04/2011
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5

Acid Extractable metals in soil						
Our Reference:	UNITS	54136-1	54136-3	54136-4	54136-5	54136-6
Your Reference	----------	BH101/0.1-0.2	BH101/2-2.2	BH102/0.4-0.5	BH102/2-2.2	BH103/0.5-0.6
Date Sampled	----------	30/03/2011	30/03/2011	29/03/2011	29/03/2011	30/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Arsenic	mg/kg	8	8	7	8	9
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	17	29	26	28	28
Copper	mg/kg	25	18	21	17	18
Lead	mg/kg	64	13	22	12	14
Mercury	mg/kg	0.4	<0.1	0.1	<0.1	<0.1
Nickel	mg/kg	12	13	13	12	19
Zinc	mg/kg	120	25	61	24	40

Acid Extractable metals in soil						
Our Reference:	UNITS	54136-8	54136-10	54136-11	54136-13	54136-14
Your Reference	----------	BH104/0.3-0.4	BH105/0.2-0.3	BH105/0.8-0.9	BH106/0.1-0.2	BH106/1.75-2.0
Date Sampled	----------	31/03/2011	31/03/2011	31/03/2011	5/04/2011	5/04/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Arsenic	mg/kg	9	<4	4	6	6
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	28	16	19	21	33
Copper	mg/kg	18	11	28	14	17
Lead	mg/kg	13	12	46	44	14
Mercury	mg/kg	<0.1	<0.1	1.1	0.1	<0.1
Nickel	mg/kg	15	10	11	13	22
Zinc	mg/kg	28	36	67	59	44

Acid Extractable metals in soil						
Our Reference:	UNITS	54136-15	54136-16	54136-18	54136-19	54136-20
Your Reference	----------	BH107/1.9-2.0	BH107/2.2-2.4	BH107A/1.5-1.6	BH108/0.1-0.2	BH108/2-2.2
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011	6/04/2011	6/04/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Arsenic	mg/kg	9	6	6	<4	7
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	22	14	26	13	29
Copper	mg/kg	15	8	14	7	17
Lead	mg/kg	14	13	12	7	15
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	14	9	11	9	14
Zinc	mg/kg	29	23	23	20	25

Acid Extractable metals in soil		
Our Reference:	UNITS	54136-21
Your Reference	----------	BH109/0.1-0.3
Date Sampled	----------	5/04/2011
Type of sample		Soil
Date digested	-	12/04/2011
Date analysed	-	12/04/2011
Arsenic	mg/kg	5
Cadmium	mg/kg	<0.5
Chromium	mg/kg	19
Copper	mg/kg	18
Lead	mg/kg	37
Mercury	mg/kg	0.4
Nickel	mg/kg	12
Zinc	mg/kg	89

Moisture						
Our Reference:	UNITS	54136-1	54136-3	54136-4	54136-5	54136-6
Your Reference	----------	BH101/0.1-0.2	BH101/2-2.2	BH102/0.4-0.5	BH102/2-2.2	BH103/0.5-0.6
Date Sampled	----------	30/03/2011	30/03/2011	29/03/2011	29/03/2011	30/03/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011	13/04/2011	13/04/2011
Moisture	%	20	17	10	11	11

Moisture						
Our Reference:	UNITS	54136-8	54136-10	54136-11	54136-13	54136-14
Your Reference	----------	BH104/0.3-0.4	BH105/0.2-0.3	BH105/0.8-0.9	BH106/0.1-0.2	BH106/1.75-2.0
Date Sampled	----------	31/03/2011	31/03/2011	31/03/2011	5/04/2011	5/04/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011	13/04/2011	13/04/2011
Moisture	%	13	10	9.4	12	12

Moisture						
Our Reference:	UNITS	54136-15	54136-16	54136-18	54136-19	54136-20
Your Reference	----------	BH107/1.9-2.0	BH107/2.2-2.4	BH107A/1.5-1.6	BH108/0.1-0.2	BH108/2-2.2
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011	6/04/2011	6/04/2011
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/04/2011	12/04/2011	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011	13/04/2011	13/04/2011
Moisture	%	12	8.8	13	9.9	15

Moisture		
Our Reference:	UNITS	54136-21
Your Reference	----------	BH109/0.1-0.3
Date Sampled	----------	5/04/2011
Type of sample		Soil
Date prepared	-	12/04/2011
Date analysed	-	13/04/2011
Moisture	%	21

VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	54136-25 GW101 7/04/2011 Water	54136-26 GW106 7/04/2011 Water
Date extracted	-	13/04/2011	13/04/2011
Date analysed	-	14/04/2011	14/04/2011
Dichlorodifluoromethane	µg/L	<10	<10
Chloromethane	µg/L	<10	<10
Vinyl Chloride	µg/L	<10	<10
Bromomethane	µg/L	<10	<10
Chloroethane	µg/L	<10	<10
Trichlorofluoromethane	µg/L	<10	<10
1,1-Dichloroethene	µg/L	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1
1,1-dichloroethane	µg/L	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1
Bromochloromethane	µg/L	<1	<1
Chloroform	µg/L	<1	16
2,2-dichloropropane	µg/L	<1	<1
1,2-dichloroethane	µg/L	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1
1,1-dichloropropene	µg/L	<1	<1
Cyclohexane	µg/L	<1	<1
Carbon tetrachloride	µg/L	<1	<1
Benzene	µg/L	<1	<1
Dibromomethane	µg/L	<1	<1
1,2-dichloropropane	µg/L	<1	<1
Trichloroethene	µg/L	<1	<1
Bromodichloromethane	µg/L	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1
Toluene	µg/L	<1	3
1,3-dichloropropane	µg/L	<1	<1
Dibromochloromethane	µg/L	<1	<1
1,2-dibromoethane	µg/L	<1	<1
Tetrachloroethene	µg/L	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1
Chlorobenzene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
Bromoform	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
Styrene	µg/L	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1
o-xylene	µg/L	<1	<1

VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	54136-25 GW101 7/04/2011 Water	54136-26 GW106 7/04/2011 Water
1,2,3-trichloropropane	µg/L	<1	<1
Isopropylbenzene	µg/L	<1	<1
Bromobenzene	µg/L	<1	<1
n-propyl benzene	µg/L	<1	<1
2-chlorotoluene	µg/L	<1	<1
4-chlorotoluene	µg/L	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1
Tert-butyl benzene	µg/L	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1
Sec-butyl benzene	µg/L	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1
4-isopropyl toluene	µg/L	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1
n-butyl benzene	µg/L	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1
Hexachlorobutadiene	µg/L	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	103	100
Surrogate toluene-d8	%	101	103
Surrogate 4-BFB	%	107	105

vTRH & BTEX in Water				
Our Reference:	UNITS	54136-25	54136-26	54136-27
Your Reference	----------	GW101	GW106	BD1/070411
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011
Type of sample		Water	Water	Water
Date extracted	-	13/04/2011	13/04/2011	13/04/2011
Date analysed	-	14/04/2011	14/04/2011	14/04/2011
TRH C_6 - C_9	µg/L	<10	27	<10
Benzene	µg/L	<1	<1	<1
Toluene	µg/L	<1	3	<1
Ethylbenzene	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
o-xylene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	103	100	106
Surrogate toluene-d8	%	101	103	100
Surrogate 4-BFB	%	107	105	98

sTRH in Water (C10-C36)				
Our Reference:	UNITS	54136-25	54136-26	54136-27
Your Reference	----------	GW101	GW106	BD1/070411
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011
Type of sample		Water	Water	Water
Date extracted	-	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011
$TRHC_{10}$ - C_{14}	µg/L	<50	200	<50
$TRHC_{15}$ - C_{28}	µg/L	<100	<100	<100
$TRHC_{29}$ - C_{36}	µg/L	<100	<100	<100
Surrogate o-Terphenyl	%	81	98	89

PAHs in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	54136-25 GW101 7/04/2011 Water	54136-26 GW106 7/04/2011 Water	54136-27 BD1/070411 7/04/2011 Water
Date extracted	-	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011	12/04/2011
Naphthalene	µg/L	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1
Fluorene	µg/L	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1
Anthracene	µg/L	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1
Pyrene	µg/L	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1
Chrysene	µg/L	<1	<1	<1
Benzo(b+k)fluoranthene	µg/L	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1
Surrogate p-Terphenyl-d_{14}	%	83	103	95

OCP in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	54136-25 GW101 7/04/2011 Water	54136-26 GW106 7/04/2011 Water	54136-27 BD1/070411 7/04/2011 Water
Date extracted	-	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011
HCB	µg/L	<0.2	<0.2	<0.2
alpha-BHC	µg/L	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2
Surrogate TCLMX	%	85	104	98

OP Pesticides in water				
Our Reference:	UNITS	54136-25	54136-26	54136-27
Your Reference	----------	GW101	GW106	BD1/070411
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011
Type of sample		Water	Water	Water
Date extracted	-	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011
Diazinon	µg/L	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2
Chlorpyriphos	µg/L	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2
Surrogate TCLMX	%	85	104	98

PCBs in Water				
Our Reference:	UNITS	54136-25	54136-26	54136-27
Your Reference	----------	GW101	GW106	BD1/070411
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011
Type of sample		Water	Water	Water
Date extracted	-	12/04/2011	12/04/2011	12/04/2011
Date analysed	-	13/04/2011	13/04/2011	13/04/2011
Arochlor 1016	µg/L	<2	<2	<2
Arochlor 1221*	µg/L	<2	<2	<2
Arochlor 1232	µg/L	<2	<2	<2
Arochlor 1242	µg/L	<2	<2	<2
Arochlor 1248	µg/L	<2	<2	<2
Arochlor 1254	µg/L	<2	<2	<2
Arochlor 1260	µg/L	<2	<2	<2
Surrogate TCLMX	%	85	104	98

Total Phenolics in Water				
Our Reference:	UNITS	54136-25	54136-26	54136-27
Your Reference	----------	GW101	GW106	BD1/070411
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011
Type of sample		Water	Water	Water
Date extracted	-	13/4/2011	13/4/2011	13/4/2011
Date analysed	-	13/4/2011	13/4/2011	13/4/2011
Total Phenolics (as Phenol)	mg/L	<0.5	<0.05	<0.5

HM in water - dissolved				
Our Reference:	UNITS	54136-25	54136-26	54136-27
Your Reference	----------	GW101	GW106	BD1/070411
Date Sampled	----------	7/04/2011	7/04/2011	7/04/2011
Type of sample		Water	Water	Water
Date prepared	-	12/4/2011	12/4/2011	12/4/2011
Date analysed	-	13/4/2011	13/4/2011	13/4/2011
Arsenic-Dissolved	µg/L	1	<1	1
Cadmium-Dissolved	µg/L	0.2	0.5	0.2
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	<1	6	<1
Lead-Dissolved	µg/L	<1	2	<1
Mercury-Dissolved	µg/L	<0.4	<0.4	<0.4
Nickel-Dissolved	µg/L	2	4	<1
Zinc-Dissolved	µg/L	4	44	2

Miscellaneous Inorganics			
Our Reference:	UNITS	54136-25	54136-26
Your Reference	----------	GW101	GW106
Date Sampled	----------	7/04/2011	7/04/2011
Type of sample		Water	Water
Date prepared	-	12/04/2011	12/04/2011
Date analysed	-	12/04/2011	12/04/2011
Hardness	mgCaCO3 /L	230	120
Calcium - Dissolved	mg/L	43	24
Magnesium - Dissolved	mg/L	31	15

Method ID	Methodology Summary
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Inorg-030	Total Phenolics - determined colorimetrically following disitillation, based upon APHA 21st ED 5530 D.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.

QUALITY CONTROL VOCs in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	54136-14	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Date analysed	-			13/04/2011	54136-14	13/04/2011 || 13/04/2011	LCS-1	13/04/2011
Dichlorodifluoromethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Chloromethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Vinyl Chloride	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Bromomethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Chloroethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Trichlorofluoromethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,1-Dichloroethene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
trans-1,2-dichloroethene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,1-dichloroethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	LCS-1	70%
cis-1,2-dichloroethene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
bromochloromethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
chloroform	mg/kg	1	Org-014	<1	54136-14	<1 || <1	LCS-1	87%
2,2-dichloropropane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,2-dichloroethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	LCS-1	81%
1,1,1-trichloroethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	LCS-1	68%
1,1-dichloropropene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Cyclohexane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
carbon tetrachloride	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Benzene	mg/kg	0.5	Org-014	<0.5	54136-14	<0.5 || <0.5	[NR]	[NR]
dibromomethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,2-dichloropropane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
trichloroethene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	LCS-1	71%
bromodichloromethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	LCS-1	87%
trans-1,3-dichloropropene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
cis-1,3-dichloropropene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,1,2-trichloroethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Toluene	mg/kg	0.5	Org-014	<0.5	54136-14	<0.5 || <0.5	[NR]	[NR]
1,3-dichloropropane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
dibromochloromethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	LCS-1	87%
1,2-dibromoethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
tetrachloroethene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	LCS-1	66%
1,1,1,2-tetrachloroethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
chlorobenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Ethylbenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
bromoform	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
m+p-xylene	mg/kg	2	Org-014	<2	54136-14	<2 || <2	[NR]	[NR]
styrene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]

QUALITY CONTROL VOCs in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
o-Xylene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,2,3-trichloropropane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
isopropylbenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
bromobenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
n-propyl benzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
2-chlorotoluene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
4-chlorotoluene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,3,5-trimethyl benzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
tert-butyl benzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,2,4-trimethyl benzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,3-dichlorobenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
sec-butyl benzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,4-dichlorobenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
4-isopropyl toluene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,2-dichlorobenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
n-butyl benzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,2,4-trichlorobenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
hexachlorobutadiene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
1,2,3-trichlorobenzene	mg/kg	1	Org-014	<1	54136-14	<1 || <1	[NR]	[NR]
Surrogate Dibromofluorometha	%		Org-014	93	54136-14	90 || 80 || RPD: 12	LCS-1	99%
Surrogate aaa-Trifluorotoluene	%		Org-014	119	54136-14	106 || 114 || RPD: 7	LCS-1	115%
Surrogate Toluene-d_8	%		Org-014	98	54136-14	96 || 97 || RPD: 1	LCS-1	101%
Surrogate 4-Bromofluorobenzene	%		Org-014	93	54136-14	94 || 92 || RPD: 2	LCS-1	95%

QUALITY CONTROL vTRH & BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-2	12/04/2011
Date analysed	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-2	12/04/2011
vTRH C_6 - C_9	mg/kg	25	Org-016	<25	54136-1	<25 || <25	LCS-2	85%
Benzene	mg/kg	0.5	Org-016	<0.5	54136-1	<0.5 || <0.5	LCS-2	81%
Toluene	mg/kg	0.5	Org-016	<0.5	54136-1	<0.5 || <0.5	LCS-2	78%
Ethylbenzene	mg/kg	1	Org-016	<1	54136-1	<1 || <1	LCS-2	86%
m+p-xylene	mg/kg	2	Org-016	<2	54136-1	<2 || <2	LCS-2	90%
o-Xylene	mg/kg	1	Org-016	<1	54136-1	<1 || <1	LCS-2	90%
Surrogate aaa-Trifluorotoluene	%		Org-016	89	54136-1	84 || 85 || RPD: 1	LCS-2	87%

QUALITY CONTROL sTRH in Soil (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-2	12/04/2011
Date analysed	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-2	12/04/2011
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	54136-1	<50 || <50	LCS-2	88%
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	54136-1	<100 || <100	LCS-2	93%
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	54136-1	<100 || <100	LCS-2	89%
Surrogate o-Terphenyl	%		Org-003	82	54136-1	87 || 89 || RPD: 2	LCS-2	88%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Date analysed	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	<0.1 || <0.1	LCS-1	105%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	<0.1 || <0.1	LCS-1	107%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	0.2 || 0.2 || RPD: 0	LCS-1	117%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	0.5 || 0.5 || RPD: 0	LCS-1	120%
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	0.5 || 0.5 || RPD: 0	LCS-1	114%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	0.2 || 0.2 || RPD: 0	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	0.2 || 0.2 || RPD: 0	LCS-1	108%
Benzo(b+k)fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	54136-1	0.4 || 0.4 || RPD: 0	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	54136-1	0.24 || 0.23 || RPD: 4	LCS-1	106%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	0.2 || 0.1 || RPD: 67	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	54136-1	0.1 || 0.1 || RPD: 0	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		Org-012 subset	98	54136-1	87 || 90 || RPD: 3	LCS-1	101%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Date analysed	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
HCB	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	107%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	108%
Heptachlor	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	104%
delta-BHC	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	100%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	112%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	111%
Dieldrin	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	111%
Endrin	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	102%
pp-DDD	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	118%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	LCS-1	108%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-005	96	54136-1	91 || 93 || RPD: 2	LCS-1	107%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Date analysed	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Diazinon	mg/kg	0.1	Org-008	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Dimethoate	mg/kg	0.1	Org-008	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Ronnel	mg/kg	0.1	Org-008	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	54136-1	<0.1 || <0.1	LCS-1	102%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	54136-1	<0.1 || <0.1	LCS-1	90%
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	54136-1	<0.1 || <0.1	LCS-1	87%
Surrogate TCLMX	%		Org-008	96	54136-1	91 || 93 || RPD: 2	LCS-1	63%
QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Date analysed	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1221*	mg/kg	0.1	Org-006	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	54136-1	<0.1 || <0.1	LCS-1	102%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	54136-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	96	54136-1	91 || 93 || RPD: 2	LCS-1	67%
QUALITY CONTROL Total Phenolics in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/04/2011	54136-1	13/04/2011 || 13/04/2011	LCS-1	13/04/2011
Date analysed	-			13/04/2011	54136-1	13/04/2011 || 13/04/2011	LCS-1	13/04/2011
Total Phenolics (as Phenol)	mg/kg	5	Inorg-030	<5	54136-1	<5 || <5	LCS-1	80%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date digested	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Date analysed	-			12/04/2011	54136-1	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	54136-1	8 || 8 || RPD: 0	LCS-1	107%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Cadmium	mg/kg	0.5	Metals-020 ICP-AES	<0.5	54136-1	<0.5 || <0.5	LCS-1	108%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	54136-1	17 || 17 || RPD: 0	LCS-1	105%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	54136-1	25 || 23 || RPD: 8	LCS-1	104%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	54136-1	64 || 59 || RPD: 8	LCS-1	103%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	54136-1	0.4 || 0.3 || RPD: 29	LCS-1	118%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	54136-1	12 || 12 || RPD: 0	LCS-1	106%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	54136-1	120 || 110 || RPD: 9	LCS-1	106%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			12/04/2011
Date analysed	-			13/04/2011
Moisture	%	0.1	Inorg-008	<0.1

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/04/2011	[NT]	[NT]	LCS-W1	13/04/2011
Date analysed	-			14/04/2011	[NT]	[NT]	LCS-W1	14/04/2011
Dichlorodifluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Chloromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Vinyl Chloride	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Bromomethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Chloroethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Trans-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	106%
Cis-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Chloroform	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	106%
2,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	106%
1,1,1-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	106%
1,1-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Cyclohexane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Carbon tetrachloride	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Dibromomethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Trichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	124%
Bromodichloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	101%
trans-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
cis-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1,2-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Dibromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	98%
1,2-dibromoethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	103%
1,1,1,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromoform	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
m+p-xylene	µg/L	2	Org-013	<2	[NT]	[NT]	[NR]	[NR]
Styrene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1,2,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
o-xylene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,3-trichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Isopropylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
n-propyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
2-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
4-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3,5-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Tert-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,4-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Sec-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,4-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
4-isopropyl toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
n-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dibromo-3-chloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,4-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Hexachlorobutadiene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
1,2,3-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-013	93	[NT]	[NT]	LCS-W1	101%
Surrogate toluene-d8	%		Org-013	98	[NT]	[NT]	LCS-W1	104%
Surrogate 4-BFB	%		Org-013	93	[NT]	[NT]	LCS-W1	100%
QUALITY CONTROL vTRH & BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/04/2011	[NT]	[NT]	LCS-W1	13/04/2011
Date analysed	-			14/04/2011	[NT]	[NT]	LCS-W1	14/04/2011
$TRHC_6$ - C_9	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	107%
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	104%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	109%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	108%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	107%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	109%
Surrogate Dibromofluoromethane	%		Org-016	103	[NT]	[NT]	LCS-W1	106%
Surrogate toluene-d8	%		Org-016	92	[NT]	[NT]	LCS-W1	101%
Surrogate 4-BFB	%		Org-016	100	[NT]	[NT]	LCS-W1	99%
QUALITY CONTROL sTRH in Water (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	[NT]	[NT]	LCS-W2	12/04/2011
Date analysed	-			12/04/2011	[NT]	[NT]	LCS-W2	12/04/2011
$TRHC_{10}$ - C_{14}	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W2	69%
$TRHC_{15}$ - C_{28}	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W2	123%
$TRHC_{29}$ - C_{36}	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W2	88%
Surrogate o-Terphenyl	%		Org-003	85	[NT]	[NT]	LCS-W2	92%
QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	[NT]	[NT]	LCS-W1	12/04/2011
Date analysed	-			12/04/2011	[NT]	[NT]	LCS-W1	12/04/2011
Naphthalene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	82%
Acenaphthylene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Fluorene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	89%
Phenanthrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	91%
Anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	90%
Pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	90%
Benzo(a)anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Chrysene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	93%
Benzo(b+k)fluoranthene	µg/L	2	Org-012 subset	<2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W1	86%
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		Org-012 subset	89	[NT]	[NT]	LCS-W1	99%
QUALITY CONTROL OCP in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	[NT]	[NT]	LCS-1	12/04/2011
Date analysed	-			13/04/2011	[NT]	[NT]	LCS-1	13/04/2011
HCB	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
alpha-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	101%
gamma-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
beta-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	102%
Heptachlor	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	99%
delta-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Aldrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	100%
Heptachlor Epoxide	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	105%
gamma-Chlordane	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
alpha-Chlordane	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Endosulfan I	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
pp-DDE	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	103%
Dieldrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	106%
Endrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	94%

QUALITY CONTROL OCP in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
pp-DDD	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	112%
Endosulfan II	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
pp-DDT	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-1	100%
Methoxychlor	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-005	92	[NT]	[NT]	LCS-1	101%
QUALITY CONTROL OP Pesticides in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	[NT]	[NT]	LCS-1	12/04/2011
Date analysed	-			13/04/2011	[NT]	[NT]	LCS-1	13/04/2011
Diazinon	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Dimethoate	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos-methyl	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Ronnel	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-1	106%
Fenitrothion	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-1	98%
Bromophos ethyl	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Ethion	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-1	92%
Surrogate TCLMX	%		Org-008	92	[NT]	[NT]	LCS-1	101%
QUALITY CONTROL PCBs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/04/2011	[NT]	[NT]	LCS-1	12/04/2011
Date analysed	-			13/04/2011	[NT]	[NT]	LCS-1	13/04/2011
Arochlor 1016	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1221*	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	µg/L	2	Org-006	<2	[NT]	[NT]	LCS-1	96%
Arochlor 1260	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	92	[NT]	[NT]	LCS-1	107%

QUALITY CONTROL Total Phenolics in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/04/2011	[NT]	[NT]	LCS-W1	13/04/2011
Date analysed	-			13/04/2011	[NT]	[NT]	LCS-W1	13/04/2011
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-030	<0.05	[NT]	[NT]	LCS-W1	80%
QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			12/4/2011	[NT]	[NT]	LCS-W1	12/4/2011
Date analysed	-			13/4/2011	[NT]	[NT]	LCS-W1	13/4/2011
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	89%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	89%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	87%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	86%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	95%
Mercury-Dissolved	µg/L	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-W1	108%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	85%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	91%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			12/04/2011	54136-25	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Date analysed	-			12/04/2011	54136-25	12/04/2011 || 12/04/2011	LCS-1	12/04/2011
Hardness	mgCaCO3/L	3		3.0	54136-25	230 || 230 || RPD: 0	[NR]	[NR]
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	54136-25	43 || 42 || RPD: 2	LCS-1	89%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	54136-25	31 || 31 || RPD: 0	LCS-1	86%

QUALITY CONTROL VOCs in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	54136-3	12/04/2011
Date analysed	-	[NT]	[NT]	54136-3	13/04/2011
Dichlorodifluoromethane	mg/kg	[NT]	[NT]	[NR]	[NR]
Chloromethane	mg/kg	[NT]	[NT]	[NR]	[NR]
Vinyl Chloride	mg/kg	[NT]	[NT]	[NR]	[NR]
Bromomethane	mg/kg	[NT]	[NT]	[NR]	[NR]
Chloroethane	mg/kg	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane	mg/kg	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	mg/kg	[NT]	[NT]	[NR]	[NR]
trans-1,2-dichloroethene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,1-dichloroethane	mg/kg	[NT]	[NT]	54136-3	65%
cis-1,2-dichloroethene	mg/kg	[NT]	[NT]	[NR]	[NR]
bromochloromethane	mg/kg	[NT]	[NT]	[NR]	[NR]
chloroform	mg/kg	[NT]	[NT]	54136-3	77%
2,2-dichloropropane	mg/kg	[NT]	[NT]	[NR]	[NR]
1,2-dichloroethane	mg/kg	[NT]	[NT]	54136-3	73%
1,1,1-trichloroethane	mg/kg	[NT]	[NT]	54136-3	60%
1,1-dichloropropene	mg/kg	[NT]	[NT]	[NR]	[NR]
Cyclohexane	mg/kg	[NT]	[NT]	[NR]	[NR]
carbon tetrachloride	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzene	mg/kg	[NT]	[NT]	[NR]	[NR]
dibromomethane	mg/kg	[NT]	[NT]	[NR]	[NR]
1,2-dichloropropane	mg/kg	[NT]	[NT]	[NR]	[NR]
trichloroethene	mg/kg	[NT]	[NT]	54136-3	63%
bromodichloromethane	mg/kg	[NT]	[NT]	54136-3	76%
trans-1,3-dichloropropene	mg/kg	[NT]	[NT]	[NR]	[NR]
cis-1,3-dichloropropene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,1,2-trichloroethane	mg/kg	[NT]	[NT]	[NR]	[NR]
Toluene	mg/kg	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL VOCs in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
1,3-dichloropropane	mg/kg	[NT]	[NT]	[NR]	[NR]
dibromochloromethane	mg/kg	[NT]	[NT]	54136-3	83%
1,2-dibromoethane	mg/kg	[NT]	[NT]	[NR]	[NR]
tetrachloroethene	mg/kg	[NT]	[NT]	54136-3	66%
1,1,1,2-tetrachloroethane	mg/kg	[NT]	[NT]	[NR]	[NR]
chlorobenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
bromoform	mg/kg	[NT]	[NT]	[NR]	[NR]
m+p-xylene	mg/kg	[NT]	[NT]	[NR]	[NR]
styrene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,1,2,2-tetrachloroethane	mg/kg	[NT]	[NT]	[NR]	[NR]
o-Xylene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,2,3-trichloropropane	mg/kg	[NT]	[NT]	[NR]	[NR]
isopropylbenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
bromobenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
n-propyl benzene	mg/kg	[NT]	[NT]	[NR]	[NR]
2-chlorotoluene	mg/kg	[NT]	[NT]	[NR]	[NR]
4-chlorotoluene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,3,5-trimethyl benzene	mg/kg	[NT]	[NT]	[NR]	[NR]
tert-butyl benzene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,2,4-trimethyl benzene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,3-dichlorobenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
sec-butyl benzene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,4-dichlorobenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
4-isopropyl toluene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,2-dichlorobenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
n-butyl benzene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,2-dibromo-3-chloropropane	mg/kg	[NT]	[NT]	[NR]	[NR]
1,2,4-trichlorobenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
hexachlorobutadiene	mg/kg	[NT]	[NT]	[NR]	[NR]
1,2,3-trichlorobenzene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate Dibromofluorometha	%	[NT]	[NT]	54136-3	95%
Surrogate aaa-Trifluorotoluene	%	[NT]	[NT]	54136-3	123%
Surrogate Toluene-d_8	%	[NT]	[NT]	54136-3	110%
Surrogate 4-Bromofluorobenzene	%	[NT]	[NT]	54136-3	95%

QUALITY CONTROL vTRH & BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	54136-4	12/04/2011
Date analysed	-	[NT]	[NT]	54136-4	12/04/2011
vTRH C_6 - C_9	mg/kg	[NT]	[NT]	54136-4	84%
Benzene	mg/kg	[NT]	[NT]	54136-4	81%
Toluene	mg/kg	[NT]	[NT]	54136-4	76%
Ethylbenzene	mg/kg	[NT]	[NT]	54136-4	84%
m+p-xylene	mg/kg	[NT]	[NT]	54136-4	89%
o-Xylene	mg/kg	[NT]	[NT]	54136-4	87%
Surrogate aaa-Trifluorotoluene	%	[NT]	[NT]	54136-4	89%
QUALITY CONTROL sTRH in Soil (C10-C36)	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	54136-4	12/04/2011
Date analysed	-	[NT]	[NT]	54136-4	12/04/2011
TRH C_{10} - C_{14}	mg/kg	[NT]	[NT]	54136-4	89%
TRH C_{15} - C_{28}	mg/kg	[NT]	[NT]	54136-4	94%
TRH C_{29} - C_{36}	mg/kg	[NT]	[NT]	54136-4	90%
Surrogate o-Terphenyl	%	[NT]	[NT]	54136-4	87%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	54136-14	12/04/2011 || 12/04/2011	54136-4	12/04/2011
Date analysed	-	54136-14	12/04/2011 || 12/04/2011	54136-4	12/04/2011
Naphthalene	mg/kg	54136-14	<0.1 || <0.1	54136-4	104%
Acenaphthylene	mg/kg	54136-14	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	54136-14	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	54136-14	<0.1 || <0.1	54136-4	96%
Phenanthrene	mg/kg	54136-14	<0.1 || <0.1	54136-4	103%
Anthracene	mg/kg	54136-14	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	54136-14	<0.1 || <0.1	54136-4	105%
Pyrene	mg/kg	54136-14	<0.1 || <0.1	54136-4	99%
Benzo(a)anthracene	mg/kg	54136-14	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	54136-14	<0.1 || <0.1	54136-4	96%
Benzo(b+k)fluoranthene	mg/kg	54136-14	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	54136-14	<0.05 || <0.05	54136-4	96%
Indeno(1,2,3-c,d)pyrene	mg/kg	54136-14	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	54136-14	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	54136-14	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%	54136-14	90 || 91 || RPD: 1	54136-4	87%

QUALITY CONTROL Total Phenolics in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	54136-4	13/04/2011
Date analysed	-	[NT]	[NT]	54136-4	13/04/2011
Total Phenolics (as Phenol)	mg/kg	[NT]	[NT]	54136-4	75%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	54136-14	12/04/2011 || 12/04/2011	54136-4	12/04/2011
Date analysed	-	54136-14	12/04/2011 || 12/04/2011	54136-4	12/04/2011
Arsenic	mg/kg	54136-14	6 || 6 || RPD: 0	54136-4	100%
Cadmium	mg/kg	54136-14	<0.5 || <0.5	54136-4	101%
Chromium	mg/kg	54136-14	33 || 32 || RPD: 3	54136-4	102%
Copper	mg/kg	54136-14	17 || 17 || RPD: 0	54136-4	103%
Lead	mg/kg	54136-14	14 || 14 || RPD: 0	54136-4	93%
Mercury	mg/kg	54136-14	<0.1 || <0.1	54136-4	122%
Nickel	mg/kg	54136-14	22 || 22 || RPD: 0	54136-4	99%
Zinc	mg/kg	54136-14	44 || 44 || RPD: 0	54136-4	91%
QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	54136-26	12/4/2011
Date analysed	-	[NT]	[NT]	54136-26	13/4/2011
Arsenic-Dissolved	µg/L	[NT]	[NT]	54136-26	91%
Cadmium-Dissolved	µg/L	[NT]	[NT]	54136-26	87%
Chromium-Dissolved	µg/L	[NT]	[NT]	54136-26	86%
Copper-Dissolved	µg/L	[NT]	[NT]	54136-26	80%
Lead-Dissolved	µg/L	[NT]	[NT]	54136-26	88%
Mercury-Dissolved	µg/L	[NT]	[NT]	54136-26	80%
Nickel-Dissolved	µg/L	[NT]	[NT]	54136-26	81%
Zinc-Dissolved	µg/L	[NT]	[NT]	54136-26	80%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	54136-26	12/04/2011
Date analysed	-	[NT]	[NT]	54136-26	12/04/2011
Hardness	mgCaCO3/L	[NT]	[NT]	[NR]	[NR]
Calcium - Dissolved	mg/L	[NT]	[NT]	54136-26	87%
Magnesium - Dissolved	mg/L	[NT]	[NT]	54136-26	94%

Report Comments:
Total Phenolics:PQL raised due to sample matrix.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions
Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria
Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

Douglas Partners
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CHAIN OF CUSTODY

Project Name: Wagga Wagga .....
Project No: 72320.01..... Sampler: Peter Hartcliff..... .....
Project Mgr: Paul Gorman..... Phone: 02 9809 0666 .....
Email: rene.alviar@douglaspartners.com.au .....
Date Required: Normal TAT ..... Lab Quote No. .....

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2068
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth (m)	Lab ID	Sampling Date	Sample Type S - soil W – water A - Air	Container type	Analytes: Combination 8	Combination 3	8 Heavy Metals	PAH	VOC		Others	Notes
BH101/0.1-0.2	0.1-0.2	1	30.3	S	J	X							
BH101/0.5-0.6	0.5-0.6	2	30.3	S	J								
BH101/2-2.2	2-2.2	3	30.3	S	J		X			X			
BH102/0.4-0.5	0.4-0.5	4	29.03	S	J	X							
BH102/2-2.2	2-2.2	5	29.03	S	J		X						
BH103/0.5-0.6	0.5-0.6	6	30.03	S	J	X							
BH103/2-2.2	2-2.2	7	30.03	S	J								
BH104/0.3-0.4	0.3-0.4	8	31.03	S	J	X							
BH104/1.6-1.7	1.6-1.7	9	31.03	S	J								
BH105/0.2-0.3	0.2-0.3	10	31.03	S	J	X							
BH105/0.8-0.9	0.8-0.9	11	31.03	S	J			X	X				
BH105/2-2.2	2-2.2	12	31.03	S	J								

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: 9910 6200

Job No: 54136
Date received: 11/4/11
Time received: 5pm
Received by: Z-L
Temp: Cool/Ambient
Cooling: Icepack
Security: Intact/Broken/None

Lab Report No. .....
Phone: (02) 9809 0666
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114
Fax: (02) 9809 4095

Relinquished by: RA	Signed:	Date & Time: 11.04.11	Received By: Z-L.	Date & Time: 11/4/11 5pm
Relinquished by:	Signed:	Date & Time:	Received By:	Date & Time:

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CHAIN OF CUSTODY

Project Name: Wagga Wagga .....
Project No: 72320.01..... Sampler: Peter Hartcliff.....
Project Mgr: Paul Gorman..... Phone: 02 9809 0666 .....
Email: rene.alviar@douglaspartners.com.au .....
Date Required: Normal TAT ..... Lab Quote No. .....

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2068
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth (m)	Lab ID	Sampling Date	Sample Type: S - soil W – water A - Air	Container type	Analytes: Combination 8	Combination 3	8 Heavy Metals	PAH	VOC		Others	Notes
BH106/0.1-0.2	0.1-0.2	13	05.04	S	J	X							
BH106/1.75-2.0	1.75-2.0	14	05.04	S	J			X	X	X			
BH107/1.9-2.0	1.9-2.0	15	07.04	S	J	X							
BH107/2.2-2.4	2.2-2.4	16	07.04	S	J			X	X				
BH107A/0.4-0.5	0.4-0.5	17	07.04	S	J								
BH107A/1.5-1.6	1.5-1.6	18	07.04	S	J			X	X				
BH108/0.1-0.2	0.1-0.2	19	06.04	S	J	X							
BH108/2-2.2	2-2.2	20	06.04	S	J			X	X				
BH109/0.1-0.3	0.1-0.3	21	05.04	S	J	X							
BH109/1.4-1.6	1.4-1.6	22	05.04	S	J								
BD1/290311	-	23	29.03	S	J								
BD2/050411	-	24	05.04	S	J								

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: 9910 6200
Job No: 54136
Date received:
Time received:
Received by:
Temp: Cool/Ambient
Cooling: Ice/icepack
Security: Intact/Broken/None

Lab Report No. .....
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114
Phone: (02) 9809 0666
Fax: (02) 9809 4095

Relinquished by: Signed: Date & Time: 11.04.11 Received By: Date & Time: 11/4/11 5pm
Relinquished by: Signed: Date & Time: Received By: Date & Time:

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CHAIN OF CUSTODY

Project No: 72320.01..... Sampler: Peter Hartcliff..... .....
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12 Ashley Street, Chatswood NSW 2068
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth (m)	Lab ID	Sampling Date	Sample Type S - soil W – water A - Air	Container type	Analytes							Notes
						Combination 8	Hardness	VOC				Others	
GW101	-	25	07.04	W	G,V,P	X	X	X					
GW106	-	26	07.04	W	G,V,P	X	X	X					
BD1/070411	-	27	07.04	W	G,V,P	X							

Lab Report No. .....
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114
Phone: (02) 9809 0666
Fax: (02) 9809 4095

Relinquished by:	Signed:	Date & Time: 11.04.11	Received By:	Date & Time: 11/4/11 6pm	
Relinquished by:	Signed:	Date & Time:	Received By:	Date & Time:	

Appendix I

Quality Assurance / Quality Control Procedures and Results

QA/QC PROCEDURES AND RESULTS

The field QC procedures for sampling as prescribed in Douglas Partners Field Procedures Manual were followed at all times during the validation assessment. Field sampling comprised replicate sampling, at a rate of approximately one replicate sample for every ten original samples, equipment rinsate sample and trip spike.

Field QA/QC

Rinsate Sample

Equipment rinsate samples are collected in order to assess the potential for cross contamination due to re-use of sampling equipment. All samples were collected using disposable sampling equipment, and therefore no rinsate sample was collected.

Trip Spike

According to the NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (1997), laboratory prepared trip spikes are to be taken into the field, subjected to the same preservation methods as the field samples, then analysed, for the purposes of determining the losses in volatile organics incurred prior to reaching the laboratory.

The practicalities of trip spikes are currently being debated and a detailed procedure is yet to be finalised. Discussions with the laboratory indicated that trip spikes are generally prepared as aqueous solutions. The laboratory prepared an aqueous trip spike which were preserved in the standard manner and taken into the field unopened. The volatile organic recovery rates are shown below. At this stage, the laboratory has no standard acceptance limits in recovery rates as results from in-house laboratory controls often vary. Whilst no trip spike was collected for this site, PID screening of all soil samples collected indicate that any percentage loss for BTEX during the trip would be trivial.

Trip Blank

Laboratory prepared trip blanks were taken out to the field unopened, subjected to the same preservation methods as the field samples, then analysed, for the purposes of determining the transfer of contaminants into the blank sample incurred prior to reaching the laboratory. Whilst no trip blank was collected for this site, PID screening of all soil samples collected indicate that any cross contamination of volatiles would be trivial and would not affect the outcome of the assessment.

Relative Percentage Difference

A measure of the consistency of results for field samples is derived by the calculation of relative percentage differences (RPDs) for replicate samples. A RPD of $\pm$ 30% is generally considered acceptable for inorganic analytes by EPA, although in general a wider RPD range may be acceptable for organic analytes.

The comparative results of analysis between original and replicates are summarised in the tables below.

Table H1: Results of Intra-Laboratory RPD

Sample ID	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
BH102/0.4-0.5	7	<0.5	26	21	22	0.1	13	61
BD1/290311	7	<0.5	29	17	15	<0.1	14	25
Difference	0	0	3	4	7	0	1	36
%RPD	0	0	11	21	38	**0**	7	84
GW101	1	0.2	<1	<1	<1	<0.4	2	4
BD1/070411	1	0.2	<1	<1	<1	<0.4	<1	2
Difference	0	0	0	0	0	0	1	2
%RPD	0	0	0	0	0	**0**	67	67

Notes:
concentrations below PQL assumed to be zero for RPD calculation
shading indicates RPD greater than ± 30%

The calculated RPD values for the samples and their replicates were generally within the acceptable range of ± 30%. The calculated RPDs exceeding the acceptability range are not, however, considered to be of significant concern due to the generally low levels of metals detected (relative to the adopted guideline levels), the low actual differences in concentration in most of the cases, and the use of replicate samples instead of duplicates to minimise loss of volatiles. Moreover, most concentrations recorded were generally well within the relevant site assessment criteria and hence the findings are unlikely to affect the assessment results.

It is therefore considered that the results indicate an acceptable consistency between the samples and their replicates and indicate that suitable field sampling methodology was adopted and laboratory precision was achieved.

Sample Holding Times

Holding times for various analytes as provided by ELS are presented in the table below.

Table H2: Standard Holding Times

Analyte	Holding Time	
	Soil	Water
Non-organics		
heavy metals	6 months	6 months
asbestos	none	N/A
Organics		
TPH/ BTEX	14 days	7 days
PAH	14 days	7 days
Phenol	14 days	7 days
PCB	14 days	7 days
OCP/ OPP	14 days	7 days

A summary of extraction and sampling dates for each day of sampling is provided in the table below. As can be seen all analysis was conducted within the standard holding times.

Table H3: Actual Holding Times

Date Sampled	soil/ water	Laboratory	Date despatched	Date organic extraction commenced	Holding time (between sampling and organic extraction)	Date report issued
29/03/11	soil	ELS	11/04/11	12/04/11	1	18/04/11
07/04/11	water	ELS	11/04/11	12/04/11	4	18/04/11

Laboratory QA/QC Results

The analytical laboratory is certified by the National Association of Testing Authorities (NATA) and is required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include the following:-

Reagent Blank

A reagent blank sample is prepared and analysed at the beginning of every analytical run, following calibration of the analytical apparatus. The laboratory results for reagent blanks for soil and water analyses indicated concentrations of all analytes to be below respective laboratory practical quantitation (detection) limits. These results are included in the laboratory report in Appendix H.

Spike Recovery

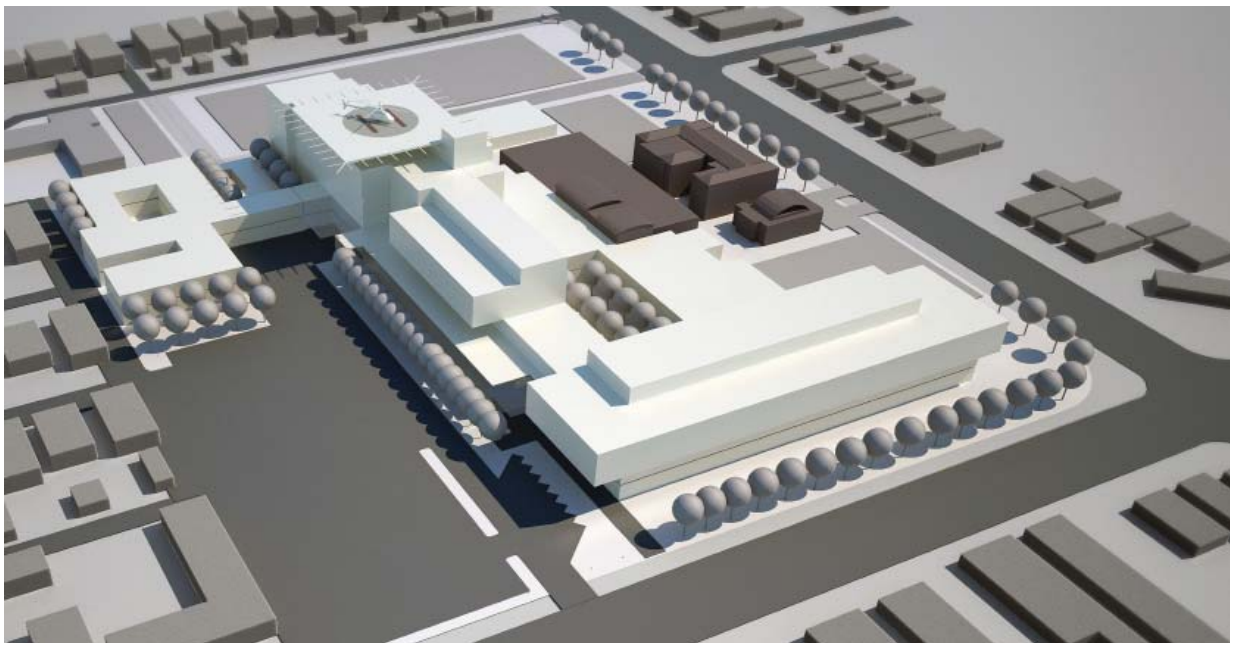
This is a sample replicate prepared by adding a known amount of analyte prior to analysis, and then treated exactly the same as all other samples. The recovery result indicates the proportion of the known concentration of the analyte that is detected during analysis (laboratory accuracy). These results are included in the laboratory reports in Appendix H. Acceptable spike recoveries were reported indicating that the analytical results are not significantly affected by matrix interference.

Duplicates

These are additional portions of a sample which are analysed in exactly the same manner as all other samples. The duplicate sample results are included in the laboratory results in Appendix H.

APPENDIX P

Flora and Fauna Assessment



FLORA AND FAUNA ASSESSMENT

REDEVELOPMENT OF WAGGA BASE HOSPITAL
STURT HIGHWAY, WAGGA WAGGA
CITY OF WAGGA WAGGA

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Contents

1.0 Introduction

This Flora and Fauna Assessment was commissioned by LFA (Pacific) Pty Limited of Sydney on behalf of the Wagga Wagga Base Hospital Redevelopment. The purpose of the report is to describe the flora and fauna of the study area and to provide an assessment of the potential impact of the proposed development

The report contains:

1. a description of the vegetation and a list of plant species observed on the study area;
2. a description of the animal habitats and a list of the animal species observed on the study area;
3. an assessment of the potential impact of the development proposal on flora and fauna, including:
   - species, populations and communities listed under the New South Wales *Threatened Species Conservation Act 1995;*
   - matters of national environmental significance listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*; and
4. a discussion of measures that could be taken to reduce the impact of the development on flora and fauna.

2.0 The Study Area

The **study area** means the area of land that is likely to be affected by the proposal, either directly or indirectly and extends as far as is necessary to take all potential impacts into account. This definition is consistent with the DECC (2007) assessment guidelines. The study area is the site occupied by Wagga Base Hospital, located in the Sturt Highway, Wagga Wagga; see **Figure 1**. The land is level and highly developed, set within the urban environment of the City of Wagga Wagga.

Figure 1. The Study Area.

3.0 Survey Methods

A flora and fauna survey was undertaken in the study area on 21 June 2011. Bearings were taken from a colour aerial photograph showing the extent of the hospital area and the plan in the arborist's report (Somewhere Landscape Architects 2011). The purpose of the survey was to describe the vegetation, to record as many as possible of the plant species present and to search for threatened plant species and communities. The survey covered the whole of the study area.

In addition to the field survey, information was sought in various places regarding the flora and fauna of the Wagga Wagga area, particularly threatened species.

4.0 Flora

The grounds of Wagga Wagga Hospital are a completely modified environment; there is no natural vegetation and almost no native plants on the site. Planted exotic trees, gardens and mown lawn are the vegetation on the site. Planted trees are the dominant feature on the site; these have been documented in the arborist's report by Somewhere Landscape Architects (2011). That report contains a plan and a schedule of the trees on the hospital site; these trees are summarised in **Table 1**. Most of the trees are deciduous and only three are Australian natives.

Table 1
Trees documented in the Arborist's Report

Species	Common Name	No.
Acer negundo	Box Elder	1
Alnus jorullensis	Evergreen Alder	13
Arbutus unedo	Irish Strawberry Tree	3
Casuarina cunninghamiana[1]	River Oak	1
Cupressus funebris	Weeping Chinese Cypress	1
Cupressus macrocarpa	Monterey Cypress	2
Cupresus glabra 'Limelgiht'	Arizona Cypress	7
Eucalyptus sp.	Gum	1
Fraxinus angustifolia 'raywood'	Claret Ash	3
Fraxinus angustifolia	Desert Ash	3
Fraxinus excelsior 'Aurea'	Golden Ash	2
Fraxinus sp.	American Ash	1
Grevillea robusta	Silky Oak	3
Liquidambar styraciflua	Liquidambar	3
Liriodendron tulipifera	Tulip Tree	2
Phoenix canariensis	Canary Island Date Palm	2
Prunus x blireana	Flowering Plum	2
Quercus rubra	Red Oak	1
Salix chilensis	Chilean Willow	1

1. Incorrect name used in arborist's report.

Smaller trees and shrubs, nearly all exotic species, are not documented in the above report but occur throughout the site. Most of these are in gardens around the buildings. Some of the plantings are of "native" species, including the trees River Oak *Casuarina cunninghamiana* and Silky Oak *Grevillea robusta*, and other species such as Bottlebrushes *Callistemon* spp., Native Sarsaparilla *Hardenbergia violacea*, Flax-lily *Dianella* sp. and Bracelet Honeymyrtle *Melaleuca armillaris*.

A small list of indigenous and naturalised plants was recorded on the site; see **Table 2**. The garden plantings include species such as Nandina *Nandina domestica*, Agapanthus *Agapanthus praecox* ssp. orientalis, Diosma *Coleonema pulchrum* and Camellia *Camellia* spp.

Table 2
Indigenous and Naturalised Plants

Species	Common Name
*Arctotheca calendula**	Capeweed
*Bromus cartharticus**	Prairie Grass
*Cirsium vulgare**	Spear Thistle
Cotula australis	Common Cotula
Dichondra repens	Kidney Weed
Gamochaeta ? *americana**	American Cudweed
*Hypochaeris radicata**	Flatweed
*Modiola caroliniana**	Red-flowered Mallow
*Paronychia brasiliensis**	Chilean Whitlow Wort
*Poa bulbosa**	Bulbous Bluegrass
*Polygonum aviculare**	Wireweed
Sonchus asper subsp. *glaucescens**	Prickly Sowthistle
*Sporobolus africanus**	Parramatta Grass
*Stellaria media**	Chickweed
*Taraxacum officinale**	Dandelion
*Trifolium repens**	White Clover

* Introduced (weed) species.

Planted trees occur along the footpaths to the north (Sturt Highway) and west (Docker Street) of the hospital land. To the north there is a row of London Plane Trees *Platanus x acerifolia* and to the west a mixed planting of the native Kurrajong *Brachychiton populneus* and Desert Ash *Fraxinus angustifolia*.

5.0 Fauna

The animal species occurring in the area are typical of inland towns and are a mix of native and introduced species. Only a few bird species were observed during the survey (see below), although various other species no doubt pass through the site from time to time. The artificial habitats present are not favourable in attracting native animals. Few of the planted trees have value for foraging by native animals and no tree hollows (used for roosting and breeding) were found in these trees.

Australian Magpie	*Gymnorhina tibicen*
Common Starling*	*Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*
Galah	*Cacatua roseicapilla*
House Sparrow*	*Passer domesticus*
Red Wattlebird	*Anthochaera carunculata*

6.0 Potential for Threatened Species, Populations and Communities

6.1 Threatened Species

Threatened species in New South Wales are listed on schedules in the New South Wales *Threatened Species Conservation Act 1995* (TSC Act), where they are classified as “critically endangered” (Schedule 1A, Part 1), "endangered" (Schedule 1, Part 1), "vulnerable" (Schedule 2) or "presumed extinct" (Schedule 1, Part 4). Nationally threatened species are similarly listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Information on the occurrence of threatened species in New South Wales is available online from the NSW Wildlife Atlas, maintained by the NSW Office of the Environment and Heritage. The Wildlife Atlas was interrogated for records of threatened species previously recorded in the local area; in this case the area is the Wagga Wagga local government area.

The following threatened plants have been recorded within Wagga Wagga local government area (source: NSW Wildlife Atlas, 16 June 2011; see **Appendix 1**); the number in brackets is the number of local records. No threatened plant species were recorded in the study area and none are expected to occur there given the complete modification of the site and lack of natural vegetation.

Claypan Daisy	*Brachyscome muelleroides* (1)
Dwarf Bush-pea	*Pultenaea humilis* (2)
Mountain	Swainson-pea *Swainsona recta* (2)
Woolly Ragwort	*Senecio garlandii* (2)
Yass Daisy	*Ammobium craspedioides* (3)

The threatened animal species recorded for the Wagga Wagga local government area are listed in **Appendix 1.** The following species are nomadic/migratory and may occur on the site very occasionally; the habitat there is not really suitable for these or any other species listed in **Appendix 1.** There is virtually no foraging resources on the site (e.g. flowering trees) for these species. The figures in brackets indicate the number of records in Wagga Wagga LGA.

Eastern Bentwing Bat	*Miniopterus schreibersii oceanensis* (1)
Gang-gang Cockatoo	*Callocephalon fimbriatum* (12)
Regent Honeyeater	*Xanthomyza phrygia* (2)
Superb Parrot	*Polytelis swainsonii* (83)
Swift Parrot	*Lathamus discolor* (40)
Turquoise Parrot	*Neophema pulchella* (27)

6.2 Migratory Species

In addition to threatened species, the EPBC Act provides for the listing of internationally protected migratory species, i.e. species listed under the Japan - Australia Migratory Bird Agreement (JAMBA), the China - Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). Various internationally protected migratory species occur in the area from time to time, but there is no important habitat on the site for such species and the habitat on the site is not likely to support an ecologically important proportion of a population of such species.

6.3 Endangered Ecological Communities

Endangered ecological communities in New South Wales are listed under the TSC Act (Schedule 1, Part 3). Nationally threatened ecological communities are listed under the EPBC Act. No natural vegetation occurs on the hospital site so that no endangered ecological communities occur on there.

6.4 Endangered Populations

Endangered populations in New South Wales are listed under the TSC Act (Schedule 1, Part 2). There are no provisions under the EPBC Act for the listing of endangered populations. No endangered populations on the study area.

7.0 Impact of the Proposed Development

7.1 Impact on Native Vegetation and Habitat

The proposed redevelopment of the Wagga Wagga Base Hospital will not involve clearing any native vegetation or natural habitats, nor habitats of any importance to native plants or animals. The site is most unattractive to the vast majority of native animals. The planted trees, etc. provide little in the way of foraging resources for native birds and there are almost no breeding resources (e.g. hollow-bearing trees). The buildings are modern and well maintained; they are not likely to be utilised by bats for roosting. Nor are there many other artificial structures, e.g. drains, that could be used by roosting bats.

7.2 Impact on Threatened Species, Populations and Communities

Under the provisions of the *Threatened Species Conservation Act 1995* (TSC Act), the impact of a proposed action, development or activity on species, populations and communities (and their habitats) is assessed by applying various factors set out under Section 5A of the New South Wales *Environmental Planning and Assessment Act 1979* (EPA Act). Commonly referred to as the "seven part test", these factors assist the proponent and the determining authority to decide whether the impact is likely to be significant and whether a Species Impact Statement (SIS) should be prepared.

Assessment under the TSC Act

The "seven part test" is considered below to assist in determining whether the proposed development is likely to have a significant effect on species, populations and communities (and their habitats) listed under the TSC Act. In addressing the 'seven part test of significance', consideration has been given to those matters discussed in the document titled "Threatened Species Assessment Guidelines. The Assessment of Significance" prepared by the Department of Environment and Climate Change in August 2007. Extracts from that document are provided below where relevant to clarify interpretation of the significance assessment. The Guidelines use two important terms when discussing assessment procedures.

Subject site means the area directly affected by the proposal.
Study area means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Guidelines define the following relevant terms:
Life cycle: the series of stages of reproduction, growth, development, ageing and death of an organism.
Viable: the capacity to successfully complete each stage of the life cycle under normal conditions.
Local population the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions:

- The *local population* of a threatened *plant* species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.
- The *local population* of *resident fauna* species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.
- The *local population* of *migratory or nomadic fauna* species comprises those individuals that are likely to occur in the study area from time to time.

In cases where multiples populations occur in the study area, each population should be assessed separately.
Risk of extinction: the likelihood that the local population will become extinct either in the short-term *or* in the long-term as a result of direct or indirect impacts on the viability of that population.

No threatened plants occur on the hospital site. An assessment of all previously recorded threatened animal species in the Wagga Wagga local government area found that no species would find suitable habitat on the site. The redevelopment of the hospital is therefore not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

The Guidelines note that:
This factor is essentially identical to factor (a) except that it refers only to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act, whereas factor (a) refers to species.

The proposed development is not likely to have an adverse effect on the life cycle of any endangered population. No endangered populations occur on the hospital site.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its occurrence is likely to be placed at risk of extinction

The Guidelines define the following important terms:
Local occurrence: the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.
Risk of extinction: similar to the meaning set out in factor (a), this is the likelihood that the local occurrence of the ecological community will become extinct either in the short term *or* in the long-term as a result of direct or indirect impacts on the ecological community, and includes changes to ecological function.
Composition: both the plant and animal species present, and the physical structure of the ecological community. Note that while many ecological communities are identified primarily by their vascular plant composition, an ecological community consists of all plants and animals as defined under the TSC and FM Acts that occur in that ecological community.

No endangered ecological communities occur on the hospital site.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The Guidelines define the following relevant terms:

Habitat: the area occupied, or periodically or occasionally occupied, by any threatened species, population or ecological community and includes all the different aspects (both biotic and abiotic) used by species during the different stages of their life cycles.

Extent: the physical area removed and/or to the compositional components of the habitat and the degree to which each is affected.

Importance: related to the stages of the species' life cycles and how reproductive success may be affected.

Locality: the same meaning as ascribed to local population of a species or local occurrence of an ecological community.

No threatened species, endangered populations or endangered ecological communities occur on the hospital site.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

The Guidelines note that:

This factor is aimed at assessing whether the proposal is likely to affect (directly or indirectly) areas of critical habitat present in the study area. Critical habitat refers only to those areas of land listed in the following registers:

- The Register of Critical Habitat kept by the Director General, DECC [www.nationalparks.nsw.gov.au/npws.nsw/content/critical+hjabitat+protection]
- The Register of Critical Habitat kept by the Director General, DPI [www.fisheries.nsw.gov.au/threatened_species/general/register of critical habitat]

Critical habitat refers only to those areas of land listed in the Registers of Critical Habitat. No critical habitat has been declared on the study area.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

In regard to this factor, the *Guidelines* note that

When deciding whether the proposal is consistent with the objectives or actions of a recovery plan or threat abatement plan, applicants/proponents must consider all relevant approved recovery plans and threat abatement plans.

In 2004 amendments were made to the TSC Act and the FM Act that remove the mandatory requirement to prepare recovery plans and threat abatement plans, and instead requires the preparation of a *threatened species priorities action statement* (TSC Act s. 90A and FM Act s. 220ZVA).

The priorities action statements will set out the measures required to promote the recovery of each threatened species, population and ecological community to a position of viability in nature and for managing each key threatening process. In applying this factor, consideration should be given to measures outlined in the priorities action statements as well as existing recovery plans and threat abatement plans which will remain in place.

There are no relevant recovery plans. No relevant threat abatement plans have been prepared.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Guidelines state that:
In addition to deciding whether the action/activity constitutes a KTP, consideration must also be given to whether the proposal is likely to exacerbate a KTP. Species listed in the determination as being 'at risk' warrant particular consideration if these species are known or likely to occur within the study area of the development or activity.

Key threatening processes in New South Wales are listed under the *Threatened Species Conservation Act 1995* (TSC Act) and *Fisheries Management Act 1994* (FMA Act). Key threatening processes are the things that threaten, or could threaten, the survival or evolutionary development of species, populations or ecological communities. The listed threatening processes can be divided into several categories.
Key threatening processes are the things that threaten - or could threaten - the survival or evolutionary development of species, populations or ecological communities. They are listed in the *Threatened Species Conservation Act*, and include:
Pest animals. Introduced animal species can compete with, and prey upon, native animals. They can also damage native plants and degrade natural habitats.
Weeds. Weeds compete with native plants for resources such as light and nutrients. They can aggressively invade areas, displacing native plants and animals.
Diseases. Exotic fungal infections, viruses and other pathogens can weaken and kill native species.
Habitat loss/change. From large-scale land clearing to the gathering of bushrock for suburban gardens, humans have degraded many native environments across the state.

This development on the hospital site does not involve any key threatening process.

Conclusion of Significance Assessment

The Guidelines make the following comments in regard to forming a conclusion about the significance of the potential impact on threatened species, etc.
The threatened species assessment of significance should **not** be considered a 'pass or fail' test. Instead, consideration of the factors will inform the decision-making process of the likelihood of significant effect. Where necessary, the process will trigger further assessment in the form of a species impact statement.
All factors should be considered as well as any other information deemed relevant to the assessment. The assessment of significance should not be used as a substitute for a species impact statement. Application of the precautionary principle requires that a lack of scientific certainty about the potential impacts of an action does not itself justify a decision that the action is not likely to have a significant impact. If information is not available to conclusively determine that there will not be a significant impact on a threatened species, population or ecological community, or its habitat, then it should be assumed that a significant impact is likely and a species impact statement should be prepared.
Proposed measures that mitigate, improve or compensate for the action, development or activity should not be considered in determining the degree of the effect on threatened species, populations or ecological communities, unless the measure has been used successfully for that species in a similar situation.

In our opinion, the redevelopment of Wagga Wagga Base Hospital is not likely to have a significant effect on any threatened species, populations or communities listed under the *Threatened Species Conservation Act 1995*, or their habitats, and the preparation of a Species Impact Statement (SIS) is not warranted.

Assessment under the EPBC Act
The impact of a proposed action on matters of national environmental significance is assessed under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Matters of national environmental significance are World Heritage properties, National Heritage places, wetlands of international importance (RAMSAR wetlands), threatened species and ecological communities listed under the EPBC Act, migratory species listed under the EPBC Act, Commonwealth marine environment, and nuclear actions (including uranium mining).

An "action" is a project, a development, an undertaking, an activity or a series of activities, and an alteration of any of the above. An action can be on Commonwealth land, State land council land, private land, or water. Approval is required from the Commonwealth Environment Minister for actions that are likely to have a significant impact on a matter of national environmental significance; these are called "controlled actions". A proposed action is a "controlled action" if:

- is likely to have a significant impact on a matter of national environmental significance,
- is likely to have a significant impact on the environment of Commonwealth land,
- is to be undertaken on Commonwealth land and is likely to have a significant impact on the environment anywhere, and
- is an action to be taken by the Commonwealth that is likely to have a significant impact on the environment anywhere.

Only the Commonwealth can advise definitively whether a proposed action is a controlled action; however, the Department of the Environment and Heritage has prepared guidelines to facilitate a self-assessment process to help proponents decide whether an action is likely be a controlled action that should be referred to the Minister for assessment and approval. The *Significant Impact Guidelines: Matters of National Environmental Significance* (DEH May 2006) is used to assess the impact on matters of national environmental significance under the EPBC Act.

The following questions in the *Significant Impact Guidelines* (DEH 2006) must be addressed when deciding whether or not to refer a proposed action to the Commonwealth Minister for the Environment:

1. Are there any matters of national environmental significance located in the area of the proposed action (noting that 'the area of the proposed action' is broader than the immediate location where the action is undertaken; consider also whether there are any matters of national environmental significance adjacent to or downstream from the immediate location that may potentially be impacted)?

2. Considering the proposed action at its broadest scope (that is, considering all stages and components of the action, and all related activities and infrastructure), is there potential for impacts, including indirect impacts, on matters of national environmental significance?

3. Are there any proposed measures to avoid or reduce impacts on matters of national environmental significance (and if so, is the effectiveness of these measures certain enough to reduce the level of impact below the 'significant impact' threshold)?

4. Are any impacts of the proposed action on matters of national environmental significance likely to be significant impacts (important, notable, or of consequence, having regard to their context or intensity)?

An action must be referred to the Commonwealth Minister if the action has, will have, or is likely to have a significant impact on matters of national environmental significance. In addition to setting out "significant impact criteria" for the various matters of national environmental significance, e.g. endangered species, vulnerable species, endangered ecological communities and listed migratory species, the *Guidelines* provide the following important definitions.

"A *significant impact* is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance."

"To be *likely*, it is <u>not</u> necessary for a significant impact to have a greater then 50% chance of happening, it is sufficient if a significant impact on the environment is a real or not remote chance or possibility."

"*Population*, in relation to critically endangered, endangered or vulnerable, threatened species, means:

- a geographically distinct regional population, or collection of local populations; or

- a regional population, or collection of local populations occurring within a particular bioregion."

"An *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

"*Habitat critical to the survival of a species or ecological community*" refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community."

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

An assessment of the matters of national environmental significance known and likely to occur in the Wagga Wagga area (species and communities) found that no matters are likely to occur on the hospital site. At the very most, one of the bird species listed earlier in this report could incidentally fly through the site.

Conclusion, EPBC Act

In our opinion, the redevelopment of Wagga Wagga Base Hospital is not likely to have a significant impact on matters of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act*. Referral to the Commonwealth Minister for the Environment for assessment and approval is therefore not warranted.

8.0 Conclusion and Recommendations

This study and report has identified, described and assessed the flora and fauna on the site of Wagga Wagga Base Hospital where it is proposed to undertake a major redevelopment of the hospital. The hospital is located on completely cleared and highly modified land in an urban setting. The site does not provide any important habitat for native plants and animals, including threatened species.

In our opinion, the redevelopment of the hospital is not likely to have a significant effect on any threatened species, populations or communities listed under the *Threatened Species Conservation Act 1995*, or on matters of national environmental significance. Hence the preparation of a Species Impact Statement (SIS) is not warranted and nor is referral to the Commonwealth Minister for the Environment for assessment and approval.

Recommendations

(i) Landscaping of the site should use some local native plants to attract native fauna. Flowering shrubs and trees are the most valuable.

(ii) The exotic shrub Cotoneaster is an environmental weed and should be removed from the site and not used in landscaping.

9.0 References

Commonwealth of Australia (1999). *Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth Government, Canberra.

Department of Environment & Climate Change NSW (2007). Threatened species assessment guidelines – The assessment of significance, August. Sydney South.

Department of Environment and Heritage (DEH) (2006). *Significant Impact Guidelines: Matters of National Environmental Significance*. Canberra, May.

New South Wales (1994). *Fisheries Management Act 1994*. NSW Government, Sydney.

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Somewhere Landscape Architects (2011). Wagga Wagga Base Hospital Tree Survey. March,

Appendix 1

Threatened Species Recorded in the Wagga Wagga Local Government Area

Source: NSW Wildlife Atlas, 16 June 2011.

Plants	Scientific Name	Common Name	Legal Status	Count
	Ammobium craspedioides	Yass Daisy	V	3
	Brachyscome muelleroides	Claypan Daisy	V	1
	Senecio garlandii	Woolly Ragwort	V	2
	Pultenaea humilis	Dwarf Bush-pea	V	2
	Swainsona recta	Mountain Swainson-pea	E1	2

Amphibia	Scientific Name	Common Name	Legal Status	Count
	Litoria booroolongensis	Booroolong Frog	E1	1
	Litoria raniformis	Southern Bell Frog	E1	2
	Crinia sloanei	Sloane's Froglet	V	2

Aves	Scientific Name	Common Name	Legal Status	Count
	Pyrrholaemus saggitatus	Speckled Warbler	V	29
	Circus assimilis	Spotted Harrier	V	6
	Hieraaetus morphnoides	Little Eagle	V	47
	Stictonetta naevosa	Freckled Duck	V	1
	Burhinus grallarius	Bush Stone-curlew	E1	5
	Cacatua leadbeateri	Major Mitchell's Cockatoo	V	2
	Callocephalon fimbriatum	Gang-gang Cockatoo	V	12
	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	2
	Climacteris picumnus	Brown Treecreeper	V	1026
	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	6
	Stagonopleura guttata	Diamond Firetail	V	26
	Grus rubicunda	Brolga	V	7
	Epthianura albifrons	White-fronted Chat	V	11
	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	20
	Xanthomyza phrygia	Regent Honeyeater	E1	2

	Daphoenositta chrysoptera	Varied Sittella	V	15
	Pachycephala inornata	Gilbert's Whistler	V	5
	Melanodryas cucullata	Hooded Robin	V	13
	Petroica boodang	Scarlet Robin	V	32
	Petroica phoenicea	Flame Robin	V	13
	Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	7
	Glossopsitta pusilla	Little Lorikeet	V	13
	Lathamus discolor	Swift Parrot	E1	40
	Neophema pulchella	Turquoise Parrot	V	27
	Polytelis swainsonii	Superb Parrot	V	83
	Ninox connivens	Barking Owl	V	8
Mammalia	Scientific Name	Common Name	Legal Status	Count
	Dasyurus maculatus	Spotted-tailed Quoll	V	5
	Petaurus norfolcensis	Squirrel Glider	V	69
	Petaurus norfolcensis	Squirrel Glider in the Wagg Wagga Local Government Area	E2	69
	Phascolarctos cinereus	Koala	V	12
	Macrotis lagotis	Bilby	E4	2
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	1
	Myotis macropus	Southern Myotis	V	1
	Vespadelus baverstocki	Inland Forest Bat	V	1
Reptilia	Scientific Name	Common Name	Legal Status	Count
	Delma impar	Striped Legless Lizard	V	1