ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

REPORT NO. 110016v2

PART 3A PRELIMINARY ENVIRONMENTAL ASSESSMENT

REMEDIATION OF THE FORMER GASWORKS AT THE CORNER OF TARCUTTA AND CROSS STREETS, WAGGA WAGGA NSW

ENVIRONMENTAL EARTH SCIENCES NSW

REPORT TO THE COUNCIL OF THE CITY OF WAGGA WAGGA
APRIL 2010

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EXECUTIVE SUMMARY

The former Tarcutta Street gasworks contains groundwater contamination which poses a potential risk to human health (domestic users of groundwater) and the environment (particularly the Murrumbidgee River).

The former Tarcutta Street Gasworks site on the corner of Cross and Tarcutta Streets in Wagga Wagga has been declared by the Department of Environment Climate Change and Water to contain contamination which poses a significant risk of harm to human health and the environment. The site has also been declared a remediation site under the Contaminated Land Management Act 1997.

The proposed remediation approach involves the excavation and removal of the ongoing source of groundwater contamination (tar impacted soil and the contents of a naptha oil injection well). This material will be transported offsite for treatment which will be the subject of a separate approvals process. Following source removal, groundwater remediation pipework will be installed for future use if necessary and the excavation will be backfilled.

The Council of the City of Wagga Wagga (Council) require approval to undertake remediation of the site under Part 3A of the EP&A Act 1997 because it is both a declared remediation site by the Department of Environment, Climate Change and Water and is listed in the Wagga Wagga Local Environmental Plan as being in a heritage conservation area.

This preliminary environmental assessment is designed to support an application by Council for Ministerial approval to carry out remediation of the site comprising the excavation of contaminated material and backfilling the excavation. It outlines the current condition of the site, the proposed remedial works and the environmental issues that require consideration or further investigation as part of the development process.

The key environmental issues that require detailed consideration as part of the environmental assessment for the proposed remediation of the former Tarcutta Street Gasworks in Wagga Wagga are:

- Groundwater;
- Waste Management;
- Traffic;
- Ecology;
- Heritage; and
- Geotechnics.

We consider that other relevant environmental issues associated with the remedial works can be addressed by a construction environmental management plan, subplans and controls.

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1 INTRODUCTION

1.1 Purpose and scope

This document is designed to support an application by the Council of the City of Wagga Wagga under Part 3A of Section 75E of the Environmental Planning and Assessment Act (1979) (EP&A Act) for Ministerial approval to carry out the remediation of the former Tarcutta Street Gasworks, Wagga Wagga, NSW.

This preliminary environmental assessment outlines the current condition of the site, the proposed remedial works and the likely environmental issues that require further investigation or consideration. Advice is sought from the Minister about additional assessment which may be required in an environmental assessment under Section 75E of the EP&A Act 1979.

1.2 Site history and proposal background

1.2.1 History

The former Tarcutta Street Gasworks in Wagga Wagga, NSW, is located on the western side of the Murrumbidgee River (which forms the eastern site boundary) and is bound by Tarcutta Street to the west, Cross Street to the north and an information centre and playground to the south. See Figure 1.

The Tarcutta Street gasworks site was privately constructed by March 1881 and acquired by Council in 1888 (Broomham, 1997). Operations on site included production of town gas, coke, tar and pitch production (Dames & Moore, 1992). Waste products generated by these activities included tar, ash, coke, spent oxides, ammonical liquor and naptha oil. These wastes were stored and/or disposed of into soil, groundwater, a creek which formerly ran through the site and was backfilled and the Murrumbidgee River. See Figure 2 for past site features.

During the years of operation the layout and infrastructure of the site was changed. There are known to have been three gasholders on the site. A tar distillery existed at the rear of the retort building between at least 1943 and 1952. This distillery would have converted gasworks tar into various industrial chemicals and useful by-products. Waste products produced by the tar distillery would have included light oils and naptha-oil which would have been disposed into a former creek on site which drained into the Murrumbidgee River until this practice was objected to and it was likely then disposed via an injection well into groundwater.

The gasworks site was also gradually extended towards the creek channel using backfill material including ash, coke and various other production wastes including 200 to 250 drums of pitch which were reported to be buried to the south east of gasholder number 2 (Dames & Moore, 1992).

In the 1940s, the south eastern portion of the creek (running through the current Cabarita Park) was backfilled with reportedly “clean fill” and demolition rubble (Dames & Moore, 1992). During this decade the gasworks was also extended towards the creek channel with ash, coke and various other wastes used as backfill material.

A levee bank was constructed alongside the river in the 1950s, upstream and south of the gasworks. However this did not protect the eastern portion of the site from flooding and flushing. A layer of tar sludge was often observed (approximately 150mm thick) at the mouth of the creek where it measured 2 metres wide (Dames & Moore, 1992).

Some of the structures and facilities at the site were demolished between 1960 and 1965 following which a reportedly "major site cleanup" was undertaken in the early 1970's. This involved excavation of the creek bed and removal of tarry wastes and "coloured dirt" to a clean base and cutting back the levee to "clean material". A large number of the buried drums of pitch near gasholder number 2 were also reportedly excavated (Dames & Moore, 1992).

After a major flood inundated the site and scoured the creek channel in 1974, the levee bank was extended across the river frontage to the site. This involved the excavation of fill materials, some of which may have been contaminated. The excavations were backfilled with "clean select fill" (Dames & Moore, 1992).

Remedial works recommenced again in 1977 after tarry water was observed to be draining into the river three years after the construction of the levee. A portion of the levee bank was excavated (where the former creek mouth was) and a small drainage pipe which was discharging the tarry waters was removed. Tarry wastes left over from the 1970s "clean up" were also removed except for a small area at the foot of the levee bank adjacent to the river (Dames & Moore, 1992). In order to prevent further seepage of tar into the river, a concrete cut off wall was built at the mouth of the former creek, however, small quantities of tar usually re-appeared after the drop of high river water levels despite the wall being extended twice (Dames & Moore, 1992).

Other remedial activities in the late 1970s to mid 1980's included the demolition of most buildings and structures and the removal of the tar wells and pits, the coke handling plant/bunker and foundations and retort building. The removed contaminated materials were replaced with "clean fill" and road base, and were sealed for the construction of the car park. The creek channel was backfilled under Council supervision (Dames & Moore, 1992).

An underground tar tank was found during construction of the Playhouse theatre in 1985. The tank was known to have leaked during its years of operation and contaminated soils and some tarry wastes were excavated and removed from site. The adjacent coal hopper may have acted as a collection pit for any tars leaking from the tank.

In 1989, the last remaining above ground structure (gas holder 3) was demolished. In May 1993, a construction gang encountered some gasworks waste, a number of pipes and a tank at the site. The tank and surrounding impacted soil was removed (Environmental & Earth Sciences, 1993).

1.2.2 Proposal background

As a result of the disposal of gasworks wastes at the site, contamination of site soil and groundwater has resulted. Soil contamination is providing an ongoing source of groundwater contamination which is migrating such that it potentially poses a risk to human health and the environment, particularly domestic users of groundwater and the Murrumbidgee River.

Although some remediation of contamination has occurred at the site in the past, the Department of Environment and Conservation, currently the Department of Environment, Climate Change and Water (DECCW) determined that the site is still contaminated in such a way as to present a significant risk of harm to human health and the environment. The site

was declared a remediation site under the Contaminated Land Management Act 1997, on 10 August 2007.

Since this date further environmental investigation of the site has been undertaken and a remedial action plan (RAP) has been developed by Environmental Earth Sciences NSW which aims to remove the significant risk of harm posed by contamination at the site. A groundwater use exclusion zone (Figure 4) was also implemented surrounding the site by DECCW to protect the health of domestic groundwater users until remediation is undertaken. There are currently no licensed groundwater users within this exclusion zone. Three licensed groundwater bores are located within this area however none will be used for groundwater extraction because one is likely to be an industrial bore (GW015092) no longer present on the former gasworks site and two others are simply groundwater monitoring bores (GW025176 and GW025184).

The RAP will be approved by the DECCW accredited contaminated site auditor for the site, Peter Ramsay, before remediation is commenced. In addition, approval to undertake the proposed remediation works is required from the Minister under Part 3A of the EP&A Act because it is both a declared remediation site and is in a heritage conservation area. This preliminary environmental assessment supports an application to undertake the remediation under Part 3A.

1.2.3 Current use and condition

The site is located on the western side of the Murrumbidgee River (which forms the eastern site boundary) and is bound by Tarcutta Street to the west, Cross Street to the north and an information centre and playground to the south. The site currently exists predominantly as a public bitumen car park with concrete curbing and garden beds. The Playhouse Theatre and surrounding garden is located in the north east corner of the site and the Wagga Wagga visitor information centre exists to the south of the car park.

An earth levee bank exists along the eastern boundary of the site parallel to the Murrumbidgee River and a bare earth area exists in the north west corner of the site. The Murrumbidgee River adjacent the site is over 50 metres wide and approximately one metre deep at its lowest. Across the Murrumbidgee River land appears to be used for grazing.

Residences and a church exist opposite the site across Cross Street and, parkland, the Civic Theatre, the Council Chambers and motels exist opposite the site across Tarcutta Street.

Pertinent site details are presented in Table 1.

TABLE 1 SITE DETAILS

Item	Details
Site Owners	The Council of the City of Wagga Wagga and the NSW Department of Lands
Address	Corner of Tarcutta and Cross Streets, Wagga Wagga, NSW
Legal Description	Lots 3 and 4 in DP 828377, Lot 1 in DP717828, Lot 10 Section 86 in DP759031 and Undefined Crown Lands
Site Area	Approximately 1.7 hectares
Local Government Authority	The Council of the City of Wagga Wagga
Locality and site Map	Refer to Figure 1

1.2.4 Previous investigations

Following the gasworks being made redundant in 1964, the following environmental investigations were completed for the site:

- Dames and Moore (1992) — Preliminary site investigation former gasworks site, Cnr Tarcutta and Cross Streets Wagga;
- Environmental & Earth Sciences (1992) — Contamination investigation of the vacant land at the intersection of Tarcutta and Cross Streets, Wagga Wagga;
- Environmental & Earth Sciences (1992) — Investigation into the source of the tar seep from the old gas works, Cross Street, Wagga Wagga;
- Environmental & Earth Sciences (1993) — Remediation option and action plan for the former gas works, Wagga Wagga;
- Environmental & Earth Sciences (1994) — Remedial works at the former Tarcutta Street gasworks, Wagga Wagga, NSW;
- Environmental & Earth Sciences (1994) — Source location at the former Tarcutta Street gas works, Wagga Wagga, NSW;
- Environmental & Earth Sciences (2006) — Limited groundwater investigation at the former Tarcutta Street gasworks site, Wagga Wagga, NSW;
- Environmental & Earth Sciences NSW (2006) — Potential liability of the Tarcutta Street Gasworks site, Wagga Wagga, New South Wales to the Council of the City of Wagga Wagga;
- Environmental & Earth Sciences NSW (2007) — March 2007 groundwater monitoring at the former Tarcutta Street gasworks site, Wagga Wagga, NSW;
- Environmental & Earth Sciences NSW (2007) — NAPL extraction trial from borehole BH30 at the former Tarcutta Street gasworks site, Wagga Wagga, NSW;
- Environmental & Earth Sciences NSW (2007) — Quarterly groundwater monitoring at the former Tarcutta Street gasworks site, Wagga Wagga, NSW;
- Environmental & Earth Sciences NSW (2007) — Data review, conceptual site model and sampling and analysis plan for the former gasworks at the corner of Cross and Tarcutta Streets, Wagga Wagga, NSW;
- Environmental Earth Sciences NSW (2008) — Detailed environmental site investigation of the former gasworks site at the corner of Tarcutta and Cross Streets, Wagga Wagga, NSW;
- Environmental Earth Sciences NSW (2009) — Further site investigation of the former gasworks site at the corner of Tarcutta and Cross Streets, Wagga Wagga, New South Wales;
- Environmental Earth Sciences NSW (2009) — Remedial Action Plan for the former gasworks site at the corner of Tarcutta and Cross Streets, Wagga Wagga, New South Wales; and
- Environmental Earth Sciences NSW (2009) — Vapour assessment at Civic Centre Theatre, corner of Baylis and Morrow Street, Wagga Wagga.

During these environmental investigations, a conceptual understanding of the site involving site geology/hydrogeology, the source of contamination, exposure pathways and receptors to contamination have been developed and refined.

1.3 Status of contamination

Previous investigations have revealed that liquid tar exists within fill material and natural soil beneath the car park to the south and south west of the Playhouse Theatre. This tar has contaminated shallow groundwater which has the potential to impact the Murrumbidgee River.

A minor volume of tar impacted soil remains in the base of the infilled creek, between a previously installed groundwater interception trench and a concrete wall installed on the bank of the Murrumbidgee River.

Sediments bearing deep groundwater were found not to be consistent beneath the site, however deep groundwater contamination arising from the injection of ammonical liquor and naptha oil is wide spread and appears to be migrating offsite predominantly towards Tarcutta Street but also towards Cross Street. Although the variability of the water bearing sediments makes it difficult to assess the migration direction and discharge location of deep contaminated groundwater it is still considered to have significant potential to impact the Murrumbidgee River and/or domestic users of groundwater. The Wollundry Lagoon to the west of the site is not considered to be in hydraulic conductivity with the deep aquifer and is therefore not likely to be impacted by deep groundwater contamination.

Significant contaminated soil was identified beneath the Playhouse Theatre however no free tar was identified. Vapour sampling has so far indicated that there was no unacceptable risk of vapour exposure to users of the theatre from contamination remaining beneath it, and due to the heavy clay nature of the soil matrix, the contamination is unlikely to leach to groundwater. For these reasons, remediation of soil beneath the Playhouse Theatre is not considered necessary.

Contaminated soil (except for tar within the tar wells) in the former process area of the gasworks site, to the west of the Playhouse Theatre, is deemed suitable to remain on site beneath a barrier to human contact (such as site paving, a 0.5m thick soil cap etc.).

The key environmental issues discussed further in Section 5 of this report which we deem require further environmental assessment under Section 75H of the EPA Act include:

- Groundwater;
- Waste management;
- Traffic;
- Ecology;
- Heritage; and
- Geotechnics.

1.4 The proponent

The Council of the City of Wagga Wagga are applying to remediate the former Tarcutta Street Gasworks site in Wagga Wagga, NSW.

The Tarcutta Street gasworks site was privately constructed by March 1881 and acquired by Council in 1888 (Broomham, 1997). It produced town gas and associated wastes for 76 years until 1964 resulting in contamination to land from the wastes it produced.

2 DESCRIPTION OF THE PROPOSAL

2.1 Project scope

In summary, the proposal requiring approval will involve:

- excavating contaminated soil;
- installing groundwater remediation pipework for future use if necessary; and
- backfilling the resulting excavation.

Excavated contaminated soil will be transported offsite for treatment. The treatment of contaminated soil will be undertaken under a separate approval process.

2.2 Proposed remedial strategy

The recommended remedial strategy detailed in Environmental Earth Sciences NSW remedial action plan aims to demonstrate how to remediate groundwater at the site so that it no longer poses an unacceptable risk to human health and/or the environment.

The proposed remediation approach is to excavate the grossly impacted material at the site and transport it offsite for treatment.

The primary objective of this approach is to remove the bulk of the readily bioavailable and mobile tar and tar impacted soil. It will be limited to the practical extent of excavation at the site. By removing the primary contamination source, the risk posed by groundwater contamination will mitigate with time through natural attenuation. It is anticipated that this strategy will remove as much as practicable of the ongoing source of groundwater impact (>95% of the primary source/s and >50% of the secondary source, this being the impacted soil). See Figure 3 for the proposed excavation area.

The remedial strategy has commenced by implementation of a groundwater use exclusion zone (Figure 4) surrounding the site to protect local domestic and/or commercial users of potentially contaminated groundwater. Further groundwater assessment and monitoring following remediation will be undertaken to assess the requirement for groundwater remediation.

In the mean time, the ongoing source of groundwater contamination (liquid tar impacted soil and the naphtha oil injection well) must be remediated. Source remediation will involve:

- removing overburden then excavating and remediating the mobile, leachable and bioavailable source of PAH contamination at the site being the liquid tar impacted fill material and natural soil and impacted groundwater encountered during this excavation where practicable;
- identifying the location of the naptha oil and ammonical liquor injection well in the vicinity of the former gasworks process area of the site and excavating its contents down to the deep water bearing sediments (see Figures 2 and 3);
- transport for off-site treatment approximately 9,200 m^3 of tar impacted soil (hazardous waste) at a location yet to be determined (contaminated soil treatment will be undertaken under a separate approvals process);

- backfilling all excavations on site (following validation) as soon as the tar impacted material is excavated and installing groundwater treatment/extraction pipe work (should it be required in future) during backfilling;
- capping the ash and coke fill material beneath a 0.5 metre cap of validated soil or 100-150 mm thick paving; and
- following source remediation an environmental management plan (EMP) and a voluntary management proposal (VMP) must be prepared to manage and monitor the remaining contamination and ensure the risk it poses is adequately managed. This may involve initiating a program of enhanced monitored natural attenuation to stimulate the microbial degradation of hydrocarbons within the groundwater. Monitoring results will enable the assessment of whether source remediation has resulted in an acceptable rate of decrease in concentrations of chemicals of concern within groundwater. Concentrations will be compared to published investigation guidelines for the protection of human health and the environment, similar values or site specific remediation criteria derived in a risk assessment. If concentrations of chemicals of concern are not decreasing at an acceptable rate then active groundwater remediation using the groundwater remediation pipe work installed during backfilling could be implemented. This could take the form of air sparging or pumping and treating groundwater *ex-situ*. The requirement for and effectiveness of these groundwater remedial options should be evaluated based on current technology at the time it is required (if it is required).

The RAP also outlines a number of measures required as a minimum to protect the surrounding neighbours and workers carrying out the remediation works. Procedures for environmental controls, operating controls and occupational health and safety have been included. While the RAP provides an outline of necessary measures to be followed it will be the responsibility of the contractor undertaking the works to ensure that all works on site comply with WorkCover, DECCW and all other applicable regulatory requirements.

Geotechnical advice should be sought when preparing a remedial works specification to ensure the Playhouse Theatre and levee bank are not impacted and that appropriate shoring and benching is implemented to enable the impacted tar to be excavated.

It is also recommended that all stakeholders in the site concur with the remedial action plan before remediation commences.

2.2.1 Soil excavation and handling

Stage 1 – Remedial works specification

- A remedial works specification will be prepared, which will include geotechnical advice to detail the engineering specifications and materials handling requirements for remediation. This will also define the works methodology required to protect human health and the environment and to ensure the project progresses smoothly.

Stage 2 – Site establishment

- Safe Work Method Statements, OH&S plans and Traffic Management Plans will be prepared;
- a dilapidation survey must be undertaken on the Playhouse Theatre;
- all necessary searches such as Dial Before You Dig will be performed and a service location will be undertaken by a Telstra accredited service locator;

- fencing, barricades, necessary caution signage and silt control measures must be erected;
- all necessary machinery and equipment including site sheds and ablution blocks will be floated to the site.

Stage 3 – Excavation of contaminated material

- all works will be supervised by a qualified environmental scientist or engineer;
- the bitumen surface and curb and guttering overlying the tarry impacted material will be excavated and transported to offsite for processing, recycling or disposal;
- all overburden that is not impacted with tar or deemed suitable to remain onsite as a result of the risk assessment must be excavated and stockpiled away from the work area for validation and reinstatement following remediation The areas of overburden requiring excavation has been estimated to be 6,335 m^3;
- the required extent of excavation will be specifically determined onsite by observations made by the supervising environmental scientist. However it has been estimated that the total volume of tar impacted soil requiring excavation is 7,065 m^3 (*in-situ*) based on investigation locations identified with significant tar impact (a 30% variation should be considered giving a total volume of approximately 9,200 m^3). The area where this impacted soil must be excavated from has been illustrated on Figure 3;
- following excavation, tar impacted material will be transported in vehicles licensed to carry hazardous waste to the treatment facility. This may have to be done in stages depending on the area available for treatment;
- perched groundwater encountered during excavation must be collected by tanker truck and treated. This may be able to be undertaken through the tar impacted soil treatment process, otherwise a separate disposal/treatment option will be required;
- if the ammonical liquor injection well is encountered it should be excavated and impacted soil from it should be transferred to the treatment facility. Any light non aqueous phase liquid (LNAPL) on the surface of deep groundwater encountered during this excavation must also be removed. Volume estimates for excavation of the injection well and removal of LNAPL are difficult to determine as the well has not been located to date;
- excavation is expected to be required to a depth of at least 7.5 metres below site surface (the injection well excavation may extend to 12 metres below ground surface) and as such will have to be benched, undertaken in stages and will likely need to be shored;
- geotechnical advice will be required to establish safe excavation distances from infrastructure, particularly the Playhouse Theatre and what shoring and/or building underpinning will be required; and
- the levee bank between the site and the River must remain in place to minimise the chances of potential flooding during site works.

Stage 4 – Transport to treatment facility

- the excavated soil that is determined to require treatment must be transported to the treatment facility in trucks and trailers with appropriate DECCW licenses for transport of hazardous waste (treatment of contaminated soil will be undertaken under a separate approvals process). Soil excavation and truck loading should be managed logistically

to minimise the volume and time that soil is exposed (to minimise potential odour issues).

2.2.2 Validation

To confirm that the grossly impacted soil has been removed and that the remaining material is suitable to remain on site, validation will be undertaken.

Samples must be collected on an approximately 10 m grid (both laterally and vertically) across the walls and floor of the excavations. The grid node positioning of validation samples will have to be flexible to account for operational difficulties and site characteristics. As excavation will occur in stages, ongoing validation will be undertaken in stages as required.

Validation results that exceed the adopted validation criteria may require further remediation in that area.

2.2.3 Reinstatement of the excavation

The excavation should be backfilled with soil that is deemed suitable for commercial and parkland/open space land use. Depending on the treatment method used, the treated excavated soil may be suitable to be beneficially reused to backfill excavations at the site. It is anticipated that if soil is bioremediated it will be suitable for reuse on site across all depths.

Some gasworks wastes such as ash and coke that are determined to be a low potential hazard may be reused below at least 2 metres of suitable soil free of gasworks waste but above the shallow water bearing zone. Consideration should be given to physical amenity of the final site surface.

During backfilling, groundwater remediation pipe work should be installed to enable deep and/or shallow groundwater remediation to be undertaken in the future if required. It is anticipated that further technical detail will be provided in the remedial works specification.

Geotechnical advice should be sought or the suitability of the backfill to achieve the compaction required and to ensure groundwater flow is not inhibited. The reinstated soil shall be compacted to a suitable standard as required for the development.

2.2.4 Post source remediation/management

As the remedial strategy aims to remove the grossly tar impacted material only, hydrocarbon impacted soil will remain following remediation. Reinstatement earthworks will ensure a cover of compacted suitably clean topsoil of at least three metres thickness. This cap must provide a barrier to human contact and when compacted, will also reduce rainfall infiltration and hence leaching of remaining contamination to groundwater and prevent vapour migration. Ongoing use of the site must ensure that this cap remains.

Although the remediation strategy aims to reduce groundwater impacts from gasworks waste in the long term through source removal (and natural attenuation), the current risk posed by shallow and deep groundwater contamination likely migrating offsite (particularly benzene contamination within the deep aquifer migrating towards the south west) to local domestic and commercial users of groundwater and to the Murrumbidgee River is a hazard that should continue to be managed.

For this reason, a groundwater monitoring program following earthworks at the site must be implemented. This program is likely to involve additional groundwater monitoring which

should be undertaken annually for three years at a minimum or until monitoring demonstrates that the risk to potential users is very low.

Should monitoring show that concentrations of contaminants within groundwater will not decrease to an acceptable level (to be determined by a site specific risk assessment) within an acceptable timeframe, then active groundwater remediation using the pipe work installed during remediation could be commenced.

A groundwater use exclusion zone (Figure 4) has been implemented surrounding the site by the Department of Environment, Climate Change and Water (DECCW) to protect people potentially using groundwater locally for domestic and/or commercial use. The exclusion zone is within Johnston Street to the north, Thorne Street to the west, Tompson Street to the south and it extends 200 metres across the Murrumbidgee River (Figure 4). The exclusion zone should remain following remediation until groundwater monitoring demonstrates that it can be removed.

A site environmental management plan (EMP) and a voluntary management proposal (VMP) must be developed following remediation to ensure that these ongoing issues are managed appropriately.

2.3 Remediation criteria

All material to remain or site or to be reinstated will be required to meet criteria for acceptable concentrations of chemicals of concern. These criteria will be derived from a site specific risk based assessment undertaken in line with environmental risk assessment principles such as those outlined in the National Environment Protection Measure (NEPM). The site specific risk assessment will assess important factors such as exposure scenarios and current bioavailability and toxicological data.

Waste classification criteria (DECC (2008) *Waste Classification Guidelines Part 1: Classifying waste)* will also be applied to the transport and any disposal of material from the site. Any specific waste approval will be developed in direct consultation with DECCW.

2.4 Environmental protection practices

All environmental management procedures should be undertaken in a tiered manner as works progress and as more tarry impacted material is uncovered. The approach to be taken will be detailed in a construction environmental management plan (CEPM) for the works. The potential environmental impacts during development must be minimised and managed through the use of environmental controls.

Final environmental protection practices will be guided and/or modified by planning consent conditions. The key environmental controls likely to be required are discussed in Section 5.

2.5 Capital investment value

The remediation planning, setup, earthworks, geotechnical shoring, consulting, transport and treatment of waste has been estimated to cost in the vicinity of $6 million.

2.6 Remediation timeframe

An indicative timing for the project is as follows:

- excavation and site works – 6 months; and
- reinstatement – 3 months.

3 RELEVANT LEGISLATION

3.1 Commonwealth legislation

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

A search of the Commonwealth Environment Protection and Biodiversity conservation Act 1999 protected matters (National Environmental Significance) database (Appendix A) revealed no maters of National Environmental Significance would apply to this proposal other than potential impact on threatened species and ecological communities.

3.2 State legislation

3.2.1 Environmental Planning and Assessment Act 1979

The remediation and validation of the former Tarcutta Street Gasworks site in Wagga Wagga, NSW is a project to which Part 3A of the New South Wales Environment Planning and Assessment Act 1979 applies.

Clause 28 of Schedule 1 of the State Environmental Planning Policy (Major Development) 2005 states “Development for the purpose of remediation of land that is category 1 remediation work on a remediation site”. As the site has been declared a remediation site by DECCW, Part 3A of the Act applies.

3.2.2 Contaminated land management Act 1997

The objective of the Contaminated land management Act 1997 is to establish a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation under Division 2 of Part 3.

The site has been designated a remediation site under the Act by the Department of Environment Climate Change and Water and the Council of the City of Wagga Wagga are responsible for remediation of contamination on site.

The site investigation and remediation process is also being audited by a NSW DECCW accredited contaminated sites auditor (Peter Ramsay) under this Act.

3.2.3 Other Legislation

The following approvals have been considered as part of the proposed remediation:

- the Protection of the Environment Operations Act 1997 states that “scheduled activities” and “scheduled development work” require environment protection licenses to regulate water, air and noise pollution. The proposed works are not considered to be scheduled activities under this Act;
- the Roads Act 1993 states that development that will affect a public road requires approval from the Roads and Traffic Authority or local Council. As the proposed

remediation will not impact public roads, approval is not likely to be required under this Act; and

- the water management Act 2000 states that approval is required from the Relevant Catchment Management Authority for developments that could significantly interfere with a water source or aquifer or if it is a controlled activity (involves excavation) in, on or under waterfront land. The proposed remediation involves significant excavation adjacent to the Murrumbidgee River and may interfere with groundwater, however clause 1(h) of Section 75U of the EP&A Act 1979 states that approval is not required for projects being assessed under Part 3a of the Act. Therefore approval under this Act is not considered necessary.

The design and supervision of remediation of the site must be undertaken in compliance with relevant industry the legislation, guidelines and standards, including the:

- Australian and New Zealand Environment and Conservation Council (2000) Australian water quality guidelines for fresh and marine ecosystems;
- Department of Environment and Conservation (2007) Guidelines for the assessment and management of groundwater contamination;
- Department of Environment and Conservation (2008) Waste classification guidelines Part 1: Classifying waste;
- National Environment Protection Council (1999) National Environment Protection (Assessment of Site Contamination) Measure (NEPM);
- National Environmental Health Forum (NEHF) (1996) Health-based soil investigation levels;
- National Health and Medical Research Council/ Natural Resource Management Ministerial Council (2004) National water quality management strategy – Australian drinking water guidelines;
- NSW Department of Environment and Conservation (2006) Contaminated sites: guidelines for the NSW site auditor scheme;
- NSW Department of Environment and Conservation (2007) Guidelines for the assessment and management of groundwater contamination;
- NSW Environment Protection Authority (EPA) (1994) Contaminated sites: guidelines for assessing service station sites;
- NSW EPA (1995) Contaminated sites: sampling design guidelines;
- NSW EPA (1997) Contaminated sites: guidelines for consultants reporting on contaminated sites;
- NSW EPA (2003) Draft guidelines for the assessment of former gasworks sites; and
- Standards Australia AS4482.1 (2005) Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile substances.
- Standards Australia AS4482.2 (1999) Guide to the investigation and sampling of sites with potentially contaminated soil. Part 2: Volatile substances.

Council understand that they have a significant ongoing responsibility to manage the site into the future and as such, intend to comply with all DECCW notices and directives.

Offsite treatment of contaminated soil will be undertaken under a separate approvals process to the project subject to this Part 3a application.

3.2.4 State Environment Planning Policy 55

- The Department of Urban Affairs and Planning & Environment Protection Authority (1998) Managing Land Contamination, Planning Guidelines State Environmental Planning Policy 55 (SEPP 55) Remediation of Land sets out the framework for contaminated land investigation and remediation works in New South Wales. SEPP 55 classifies the remediation of the former Tarcutta Street Gasworks in Wagga Wagga as Category 1 remediation work;
- Category 1 remediation work requires consent from the relevant local government authority (in this case the Council of the City of Wagga Wagga). As this remediation is deemed a major project in accordance with the Major Project SEPP, consent is not considered to be required from the Council of the City of Wagga Wagga.

3.3 Local planning instrument

3.3.1 Wagga Wagga Local Environment Plan

The Wagga Wagga Local Environmental Plan determines that the site is located in a heritage conservation area. As the proposed remediation is deemed to be a major project in accordance with the Major Projects State Environmental Planning Policy (SEPP) consent is not considered to be required from the Council of the City of Wagga Wagga under the Wagga Wagga Local Environmental Plan.

4 CONSULTATION

Community and stakeholder consultation will be managed by the Council of the City of Wagga Wagga in conjunction with DECCW. Council has indicated their commitment to stakeholder communication and liaison for this project. Their intention is to consult with stakeholders early and often.

A community liaison program must be undertaken prior to works commencing informing them of at least the proposed works, timing, human health and environmental protection measures. The community consultation program must include (as a minimum):

- a letter drop to nearby landholders and a community meeting prior to works;
- a 24 hour number for complaints; and
- a separate emergency services briefing.

5 PRELIMINARY ENVIRONMENTAL ASSESSMENT

5.1 Key environmental issues

The following key environmental issues have been identified as being pertinent to the proposed remediation:

- odour and air quality;
- surface water;

- groundwater;
- dust;
- waste management;
- noise;
- stormwater;
- sediment;
- traffic;
- ecology;
- heritage; and
- geotechnical stability, including that of the adjacent levee bank of the Murrumbidgee River.

A preliminary evaluation of these issues and recommendations towards more detailed assessment are presented in the following sections.

5.1.1 Odour and air quality

Based on our experience remediating similar former gasworks sites, significant odour is generated during the excavation of impacted material. Strict odour management will be required.

The objective of odour management is to minimise the reduction in air quality due to odours associated with the remedial process. The major receptors will be the community in the areas surrounding the excavation area. Works must be conducted in a manner to aim not to cause offensive odours at and beyond the site boundaries or cause offensive odour complaints.

The activities likely to produce odour include: excavation, contaminated soil loading and handling of potentially odorous material.

Odour control measures should include:

- undertaking regular odour inspections and an odour monitoring program;
- monitoring weather conditions, wind direction and wind speed on a daily basis;
- limiting the size of the open face of the excavation area;
- placing organic barriers and/or non odorous soil should be used over odorous excavation faces or odorous stockpiles. A ready supply of commercially available material should be kept on site at all times;
- placing synthetic barriers such as plastic and/or tarpaulins should be used over odorous excavation faces or odorous stockpiles. A ready supply of tarpaulins/plastic should be available on site;
- utilising an odour barrier foam product which can be applied to open excavations or stockpiles if required;
- using odour neutralising/suppressant sprays along the perimeter fence line and in operating areas (these can be increased on an as need basis). A ready supply of this material should be available on site;

- reducing rates of production to prevent excessive odour generation;
- excavating test pits in advance to determine the likely level of odours likely to be generated, to ensure the correct tier of management is applied. If odour is still noticed, work should be stopped until odour dissipates (if possible) and re-evaluate the odour control techniques to result in continued works with minimal odour output; and
- at the end of each days work, ensuring all newly disturbed areas have sufficient cover for the night, check effectiveness of controls and implement further controls if required.

Should odour control during excavation and loading prove to be extremely difficult, a negative pressure enclosure may be constructed to aid odour management.

Odour Classification
During works the odour status of works should be classified frequently by a trained representative.

All works must be classified depending on their potential for offensive odour. The odour classification that should be adopted during this project are as follows:

1. No Odour – stockpiles with no odour and no potential for offsite impacts;
2. Slight Odour – stockpiles or excavations classified with slight odour do contain a very mild odour which does not have the potential to be detectable beyond the site boundary and can be managed on site;
3. Moderate Odour – stockpiles or excavations classified with moderate odour do contain odour which does have a potential to be detectable intermittently beyond the site boundary depending on conditions and thus can be managed as set out under stockpile odour control methodology;
4. Strong Odour - stockpiles or excavations classified with strong odour contain a strong odour which would be detectable beyond the site boundary under most conditions. This odour can be managed when the stockpile is static but during handling may result in offsite impacts.
5. Very Strong Odour - stockpiles classified with very strong odour contain a very strong odour which would be detectable beyond the site boundary and would be considered offensive causing offsite impacts.

Benzene monitoring should also be undertaken at the excavation face and on the site boundary to evaluate if there are any health risks to site workers or the public during works.

The following odour control measures should be implemented on stockpiles and excavations for each odour classification discussed above.

- No Odour - stockpiles or excavations classified with no odour may not be covered with any physical barrier but dust control measures must be implemented to manage potential dust generation;
- Slight Odour – stockpiles or excavations classified with slight odour must be covered with a light to moderate layer of organic matter. A ready supply of available material must be kept on site at all times.
- Moderate Odour – stockpiles or excavations classified with be moderate odour should be covered with a heavy layer of organic matter. If necessary, either a short term or long term odour suppressant foam must also be applied to the surface of the stockpile or excavation to further suppress potential odours.

When should work procedures be reviewed and activities modified

- when a strong or very strong odour is detected at the site boundary;
- when adverse weather conditions prevail or are predicted (eg: consistent or heavy rain);
- when the site is influenced by strong winds, defined by wind speed 5 minute averages that exceeds 40kph (11 m/s);
- when an odour has been produced that has the potential to be offensive and discharge off-site;
- when a perimeter odour detection walk result is unacceptable;
- when an odour complaint has been received;
- when the site scientist or project manager for the site indicates to do so;
- when instructed by DECCW or Council as a result of odour complaints; and
- when our immediate neighbours have indicated a pre-arranged major event.

In the event that an odour complaint is received, a complaints register should be completed, Council should be informed and the issue addressed as soon as practically possible by the contractors representative.

Records that should be kept:

- Daily site inspection form;
- Bureau of Meteorology (BoM) forecasts, readings and on-site weather station readings; and
- Complaints / Enquiries register.

No further assessment into odour and vapour generation during works is considered necessary.

5.1.2 Groundwater

The entire aim of this remediation project is to mitigate the ongoing risk to human health and the environment posed by groundwater contamination. For this reason further assessment of the impact the proposed works may have on groundwater chemistry is not considered to be required.

Further assessment is however recommended to assess groundwater dewatering requirements to enable the excavation to be undertaken. This will aid in planning requirements for wastewater treatment, transport and/or disposal.

5.1.3 Surface water, stormwater and sediment

The remedial action plan developed by Environmental Earth Sciences NSW details requirements for sediment and siltation controls to be implemented during works to ensure that surface water is not adversely impacted.

Sediment and erosion control are important as it is a serious offence under the Protection of the Environment Operation Act (1997) to place or expose any soil or waste in an area where it can be washed into any stormwater drain or waterway. Therefore drains should be blocked or barricaded and silt fencing, sandbags and/or hay bales should be used to prevent offsite sediment movement.

These controls must be implemented by the contractor undertaking works and their integrity and effectiveness monitored daily. Monitoring must also include inspection of all stormwater drains surrounding the site to ensure impacted water and/or sediment is not entering them.

Runoff water, including that due to rain that has not been in contact with any contaminated material is not of concern however must be managed in such a manner to prevent it coming in contact with contaminated soil or exposed soil surfaces on site that may generate sediment. Contaminated material may be exposed at the surface and any surface water that comes into contact with this material must be collected. Where possible, excavated material will be placed on the up-gradient side of the excavation and covered with tarpaulins. In this way, minimal rainwater will come into contact with contaminated material, and if it does, run-off waters will be contained within the excavation.

Samples of any water suspected to be contaminated must be analysed to determine its manner of disposal in accordance with current DECCW guidelines and Water Supply Authority regulations.

The proposed remediation will occur on land adjacent to the Murrumbidgee River. It is considered however that the river will not be significantly impacted by works because in addition to the sediment and stormwater controls to be implemented a large levee bank exists between the proposed work area and the River. It is considered extremely unlikely that impacted soil, water or sediment will flow overland towards the Murrumbidgee River.

As groundwater dewatering will be required to enable the proposed excavation to be undertaken, a hydraulic gradient away from the river will be maintained during works.

For these reasons further assessment into the potential impact the proposed remediation may have on surface water is not considered necessary.

5.1.4 Dust

The objectives of dust management are to minimise a reduction in air quality outside of the excavation area due to dust. Works must be conducted in a manner as to not cause excessive dust on or beyond the site boundaries.

The following activities at the site have the potential to generate dust during remediation:

- excavation and stockpiling of soil;
- loading soil/gravels on or off trucks;
- cartage of treated soil;
- wind movement across stockpiles and exposed soil areas; and
- backfilling of excavations.

The general control measures which must be implemented for dust management include:

- undertaking regular dust inspections and/or dust monitoring program;
- monitoring the dust conditions within the site along the site boundary during works likely to generate dust to ensure onsite works are not causing offsite impacts;
- maintaining of shade cloth on fences and fence extensions;
- personnel working in areas during potential dust generating works will wear the appropriate personal protection equipment (PPE);

- undertaking potential dust generating works during low wind days (if possible); and
- monitoring the weather conditions during potential dust generating works;
- if strong wind conditions are expected, dust monitoring will be intensified and high risk activities should be avoided or reschedule them to fit better with prevailing and forecast weather conditions;
- if severe weather conditions are expected, the Site Environmental Manager must be notified and the cessation of operations during days of severe weather (strong wind days) may be decided, however, the duty is on all employees to make their supervisor aware of strong wind which may cause offensive dust to be carried off site; and
- appropriate dust monitoring must be undertaken.

Table 2 details the specific requirements to control dust at the site.

An environmental consultant or contractor representative must be present at the site during remedial works who is designated to manage environmental controls including dust suppression and odour management.

In the event that a dust complaint is received, the complaints register must be completed, Council must be notified and issues raised must be addressed as soon as practically possible by a contractor representative.

We consider there to be no further requirement to assess the impacts that dust may pose from the proposed remediation.

5.1.5 Waste management

The most significant wastes which are likely to be produced as part of the proposed remediation are contaminated soil and water.

Contaminated soil must be loaded into trucks and transported offsite to a licensed treatment facility for treatment prior to them being certified for either beneficial reuse or disposal to landfill. Further assessment is required into the availability and capacity of a licensed facility to treat the impacted soil. Once identified, this facility will be subject to a separate approvals process.

Waste water generated during the remediation must be classified in accordance with the Department of Environmental and Conservation (2008) Waste classification guidelines Part 1: Classifying waste.

Further assessment is deemed to be required into the volume of waste water which will be generated and requirements for its treatment, transport and/or disposal.

TABLE 2 SPECIFIC REQUIREMENTS FOR DUST MANAGEMENT

Hazard	Control Measures
Loading and unloading of trucks	• continuous patrol of loading and unloading areas with the site water cart or hose • cease operations during strong wind days
Relocation of stockpiles	• plan and co-ordinate works for shifting of existing stockpiles in as efficient manner and short time as possible to reduce disturbance of potentially dust generating material and reduce the double handling of stockpiled material • limiting the surface area of each stockpile during relocation by uncovering only part of the stockpile each time • dampen stockpile material prior to stockpile handling and transfer. Once the stockpile has been relocated, immediately recover the stockpile by using one or more of the following controls. (A ready supply of available material should be kept on site at all times): • using damp heavy organic barriers such as straw and/or mulch, or synthetic barriers such as plastic and/or tarpaulins; • utilise a soil stabilising product; and • water sprays in operating areas and on stockpiles/exposed areas. • monitor weather conditions, wind direction and wind speed on a daily basis; • if dust is still observed, stop works until dust controlled and re-evaluate the dust control techniques to result in continued works with minimal dust output • undertake regular dust inspections in accordance with a monitoring program • At the end of each days work, ensure all newly disturbed areas have sufficient cover for the night
Handling of soil	• utilise water sprays during any screening • cease operations during strong wind days
Hazard	• Control Measures
Wind erosion of stockpiles	▪ placement of stockpiles at appropriate moisture conditions where possible ▪ restrict the height of each stockpile ▪ rough exposed surfaces of the stockpile to promote infiltration of water ▪ watering and/or mulching of stockpiles to reduce dust generation ▪ long term stockpiles should be revegetated with a cover crop such as barley or rye
Trucks transport on-site	▪ prevent truck overloading ▪ cease operations during strong wind days
Unsealed onsite roads	▪ regular patrols by site water cart on roads to suppress dust ▪ if the need arises, aggregate can be placed over the high traffic unsealed surface surfaces to suppress dust

5.1.6 Noise

Earthmoving machinery will be used onsite to facilitate its remediation. Noise producing machinery and equipment should only be operated between the hours of 7.00 am and 5.00 pm Monday to Friday, unless requested otherwise by Council. No work will be undertaken on public holidays. If it is necessary to work outside these hours, special permission must be obtained from Council and local residents should be notified. Should alternate noise conditions be set out by Council these will be complied with as appropriate.

Australian Standard AS2460 outlines guidelines for the minimisation of noise on construction and demolition sites and these must be adhered to at all times. Should, however, machinery which has a potential to generate prolonged noise be required, then the activity must be reduced to that which is completely necessary with appropriate planning to ensure tasks are completed as quickly as possible.

No further assessment of noise impacts is considered necessary.

5.1.7 Traffic

The proposed remedial strategy involves, loading contaminated soil into plastic lined trucks licensed to transport hazardous waste and transporting the waste offsite to a licensed hazardous waste treatment facility.

A traffic management plan must be prepared as part of the environmental assessment for the project.

5.1.8 Heritage

The Wagga Wagga Local Environmental Plan designates that former Tarcutta Street Gasworks Site is in a heritage conservation area. No heritage items are mapped on the proposed remediation sites.

As such, a heritage conservation management plan is required to be completed as part of the environmental assessment for the proposed remediation.

5.1.9 Geotechnical stability

The proposed remediation will comprise a deep excavation adjacent to the Playhouse Theatre, the levee band adjacent to the Murrumbidgee River and may encounter shallow and deep groundwater.

Geotechnical investigation and advice is required as part of the environmental assessment for the proposed remediation.

5.2 Other Environmental Issues

5.2.1 Ecology

A search of the Commonwealth Environment Protection and Biodiversity conservation Act 1999 protected matters (National Environmental Significance) database (Appendix A) revealed the proposed remediation may impact threatened species and ecological communities. As such further investigation into this matter is required in the environmental assessment for the proposed works.

5.2.2 Visual amenity

The visual appearance of the site will change going from a car park to a construction site for the duration of works. Despite this, the outcome of the remediation will be beneficial to the community in that it will mitigate the risk to human health and the environment posed by contamination. Despite this the community and other stakeholders should be informed of the change in visual amenity of the site for the duration of works.

5.2.3 Occupational health and safety

Occupational health and safety requirements to be implemented during the proposed remediation have been detailed in the remedial action plan prepared by Environmental Earth Sciences NSW in 2009 and have been based on our significant experience working on similar projects. These must be further detailed in the remedial works specification to be developed for the works.

No further investigation into OH&S requirements are considered necessary.

6 CONCLUSIONS

This preliminary environmental assessment relates to the Part 3a application for excavation of contaminated soil and backfilling of the excavation at the former Tarcutta Street gasworks site in Wagga Wagga. Environmental issues which require further consideration as part of this project are presented in the following sections.

6.1 Environmental issues to be addressed in more detail

This preliminary environmental assessment recommends that the following key environmental issues be further investigated as part of an environmental assessment for the remediation of the former Tarcutta Street Gasworks site in Wagga Wagga:

- Groundwater;
- Waste Management;
- Traffic;
- Ecology;
- Heritage; and
- Geotechnics.

These issues require further evaluation to establish how they will be managed throughout the proposed remediation.

6.2 Other environmental issues

We suggest that the following issues can be easily managed through the preparation and of a construction environment management plan to be implemented by the contractor undertaking works:

- odour and air quality;
- visual amenity;

- occupational health and safety;
- surface water;
- dust;
- noise;
- stormwater; and
- sediment.

7 REFERENCES

Australian and New Zealand Environment and Conservation Council (2000) Australian water quality guidelines for fresh and marine ecosystems;

Australian Government (1999) Environment Protection and Biodiversity Conservation Act;

Broomham (1997) Survey of Rural Gasworks in NSW Stage 1;

Dames & Moore (1992) Preliminary site investigation former gasworks site Cnr Tarcutta and Cross Streets, Wagga;

Department of Environment and Conservation (2007) Guidelines for the assessment and management of groundwater contamination;

Department of Environment and Conservation (2008) Waste classification guidelines Part 1: Classifying waste;

Department of Urban Affairs and Planning & Environmental Protection Authority (1998) Managing Land Contamination, Planning Guidelines SEPP 55. Remediation of Land.

Environmental & Earth Sciences (1992a) Contamination investigation of the vacant land at the intersection of Tarcutta and Cross Streets, Wagga Wagga. Report number 9212A;

Environmental & Earth Sciences (1992b) Investigation into the source of the tar seep from the old gas works, Cross Street, Wagga Wagga. Report number 9212B;

Environmental & Earth Sciences (1993) Remediation option and action plan for the former gasworks, Wagga Wagga. Report number 9303;

Environmental & Earth Sciences (1996a) Remedial works at the former Tarcutta Street gasworks, Wagga Wagga, NSW. Report number 9434;

Environmental & Earth Sciences (1996b) Source location at the former Tarcutta Street gas works, Wagga Wagga, NSW. Report number 9435;

Environmental & Earth Sciences Pty Ltd (2005) Soil, gas and groundwater sampling manual;

Environmental & Earth Sciences (2006a) Limited groundwater investigation at the former Tarcutta Street gasworks site, Wagga Wagga, NSW. Report number 106087;

Environmental & Earth Sciences NSW (2006b) Potential liability of the Tarcutta Street Gasworks site, Wagga Wagga, New South Wales to the Council of the City of Wagga Wagga. Report number 106087liabilities;

Environmental & Earth Sciences NSW (2007a) March 2007 groundwater monitoring at the former Tarcutta Street gasworks site, Wagga Wagga, NSW. Report number 107015;

Environmental & Earth Sciences NSW (2007b) NAPL extraction trial from borehole BH30 at the former Tarcutta Street gasworks site, Wagga Wagga, NSW. Report number 107016;

Environmental & Earth Sciences NSW (2007c) Quarterly groundwater monitoring at the former Tarcutta Street gasworks site, Wagga Wagga, NSW. Report number 107033;

Environmental Earth Sciences NSW (2007d) Data review, conceptual site model and sampling and analysis plan for the former gasworks at the corner of Cross and Tarcutta Streets, Wagga Wagga, NSW. Report Number 107041;

Environmental Earth Sciences NSW (2008) Detailed site investigation of the former gasworks site at the corner of Tarcutta and Cross Streets, Wagga Wagga, NSW. Report number 107132;

Environmental Earth Sciences NSW (2009a) Further site investigation of the former gasworks site at the corner of Tarcutta and Cross Streets, Wagga Wagga, NSW. Report number 109040;

Environmental Earth Sciences NSW (2009b) Remedial action plan for the former gasworks site on the corner of Tarcutta and Cross Streets in Wagga Wagga. Report number 109040RAP;

Morris (2000) Wagga Wagga, A History;

National Environment Protection Council (1999) National Environment Protection (Assessment of Site Contamination) Measure (NEPM);

National Environmental Health Forum (NEHF) (1996) Health-based soil investigation levels;

National Health and Medical Research Council/ Natural Resource Management Ministerial Council (2004) National water quality management strategy – Australian drinking water guidelines;

NSW Department of Environment and Conservation (2006) Contaminated sites: guidelines for the NSW site auditor scheme;

NSW Department of Environment and Conservation (2007) Guidelines for the assessment and management of groundwater contamination;

NSW Department of Planning (1998) Managing land contamination, Planning Guidelines, State Environmental Planning Policy 55 – Remediation of Land;

NSW Environment Protection Authority (EPA) (1994) Contaminated sites: guidelines for assessing service station sites;

NSW EPA (1995) Contaminated sites: sampling design guidelines;

NSW EPA (1997) Contaminated sites: guidelines for consultants reporting on contaminated sites;

NSW EPA (2003) Draft guidelines for the assessment of former gasworks sites; and

NSW Government (1979) Environmental Planning and Assessment Act;

NSW Government (1993) Roads Act;

NSW Government (1997) Contaminated Land Management Act;

NSW Government (1997) Protection of the Environment Operations Act;

NSW Government (2000) Water Management Act;

Standards Australia AS4482.1 (2005) Guide to the investigation and sampling of sites with potentially contaminated soil.

8 LIMITATIONS

This report has been prepared by Environmental Earth Sciences NSW ABN 109 404 006 in response to and subject to the following limitations:

1. The specific instructions received from the Council of the City of Wagga Wagga;
2. The specific scope of works set out in PO110016 issued by Environmental Earth Sciences NSW for and on behalf of Council of the City of Wagga Wagga;
3. May not be relied upon by any third party not named in this report for any purpose except with the prior written consent of Environmental Earth Sciences NSW (which consent may or may not be given at the discretion of Environmental Earth Sciences NSW);
4. This report comprises the formal report, documentation sections, tables, figures and appendices as referred to in the index to this report and must not be released to any third party or copied in part without all the material included in this report for any reason;
5. The report only relates to the site referred to in the scope of works being located at Lots 3 and 4 in DP 828377, Lot 1 in DP717828, Lot 10 Section 86 in DP759031 and Undefined Crown Lands, on the corner of Tarcutta and Cross Streets, Wagga Wagga, New South Wales (“the site”);
6. The report relates to the site as at the date of the report as conditions may change thereafter due to natural processes and/or site activities;
7. No warranty or guarantee is made in regard to any other use than as specified in the scope of works and only applies to the depth tested and reported in this report;
8. Fill, soil, groundwater and rock to the depth tested on the site may be fit for the use specified in this report. Unless it is expressly stated in this report, the fill, soil and/or rock may not be suitable for classification as clean fill if deposited off site; and
9. Our General Limitations set out at the back of the body of this report.

ENVIRONMENTAL EARTH SCIENCES GENERAL LIMITATIONS

Scope of services

The work presented in this report is Environmental Earth Sciences response to the specific scope of works requested by, planned with and approved by the client. It cannot be relied on by any other third party for any purpose except with our prior written consent. Client may distribute this report to other parties and in doing so warrants that the report is suitable for the purpose it was intended for. However, any party wishing to rely on this report should contact us to determine the suitability of this report for their specific purpose.

Data should not be separated from the report

A report is provided inclusive of all documentation sections, limitations, tables, figures and appendices and should not be provided or copied in part without all supporting documentation for any reason, because misinterpretation may occur.

Subsurface conditions change

Understanding an environmental study will reduce exposure to the risk of the presence of contaminated soil and or groundwater. However, contaminants may be present in areas that were not investigated, or may migrate to other areas. Analysis cannot cover every type of contaminant that could possibly be present. When combined with field observations, field measurements and professional judgement, this approach increases the probability of identifying contaminated soil and or groundwater. Under no circumstances can it be considered that these findings represent the actual condition of the site at all points.

Environmental studies identify actual sub-surface conditions only at those points where samples are taken, when they are taken. Actual conditions between sampling locations differ from those inferred because no professional, no matter how qualified, and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden below the ground surface. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from that predicted. Nothing can be done to prevent the unanticipated. However, steps can be taken to help minimize the impact. For this reason, site owners should retain our services.

Problems with interpretation by others

Advice and interpretation is provided on the basis that subsequent work will be undertaken by Environmental Earth Sciences NSW. This will identify variances, maintain consistency in how data is interpreted, conduct additional tests that may be necessary and recommend solutions to problems encountered on site. Other parties may misinterpret our work and we cannot be responsible for how the information in this report is used. If further data is collected or comes to light we reserve the right to alter their conclusions.

Obtain regulatory approval

The investigation and remediation of contaminated sites is a field in which legislation and interpretation of legislation is changing rapidly. Our interpretation of the investigation findings should not be taken to be that of any other party. When approval from a statutory authority is required for a project, that approval should be directly sought by the client.

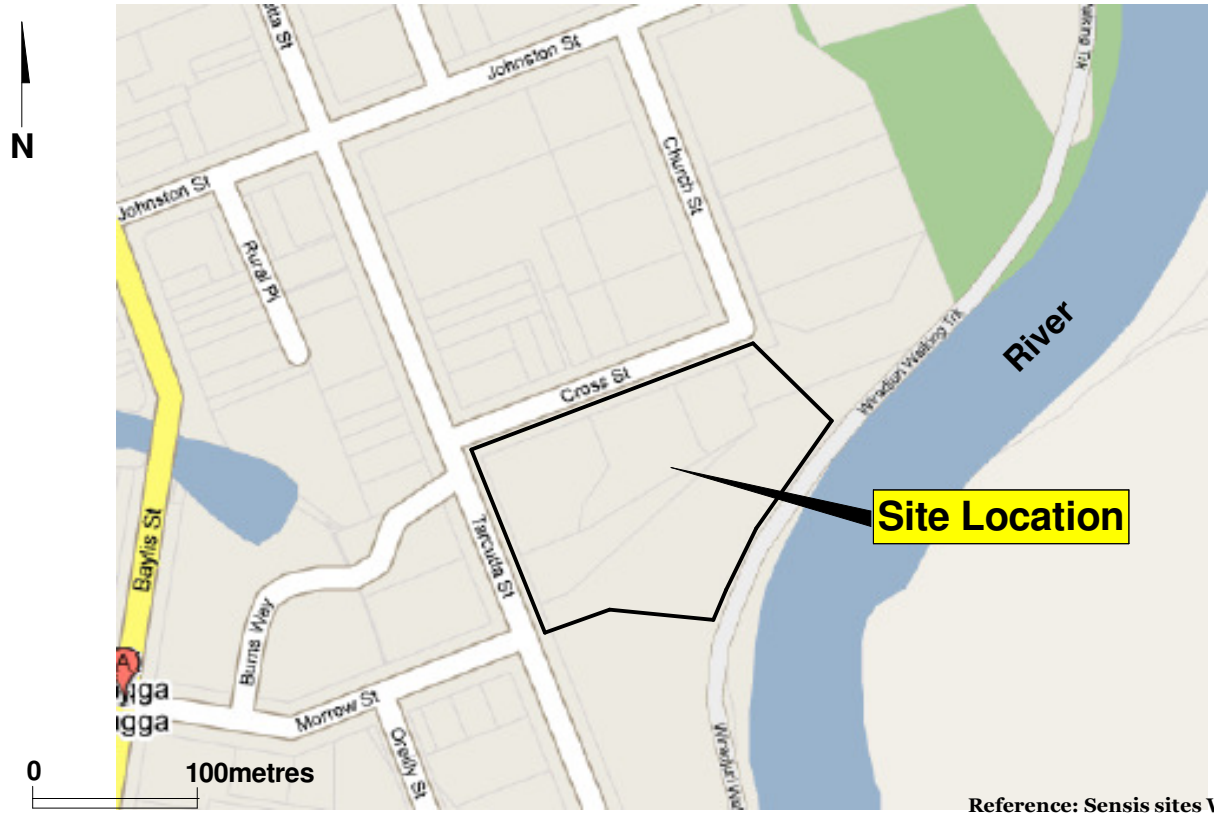
Limit of liability

This study has been carried out to a particular scope of works at a specified site and should not be used for any other purpose. This report is provided on the condition that Environmental Earth Sciences NSW disclaims all liability to any person or entity other than the client in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by any such person in reliance, whether in whole or in part, on the contents of this report. Furthermore, Environmental Earth Sciences NSW disclaims all liability in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by the client, or any such person in reliance, whether in whole or any part of the contents of this report of all matters not stated in the brief outlined in Environmental Earth Sciences NSW's proposal number and according to Environmental Earth Sciences general terms and conditions and special terms and conditions for contaminated sites.

To the maximum extent permitted by law, we exclude all liability of whatever nature, whether in contract, tort or otherwise, for the acts, omissions or default, whether negligent or otherwise for any loss or damage whatsoever that may arise in any way in connection with the supply of services. Under circumstances where liability cannot be excluded, such liability is limited to the value of the purchased service.

FIGURES

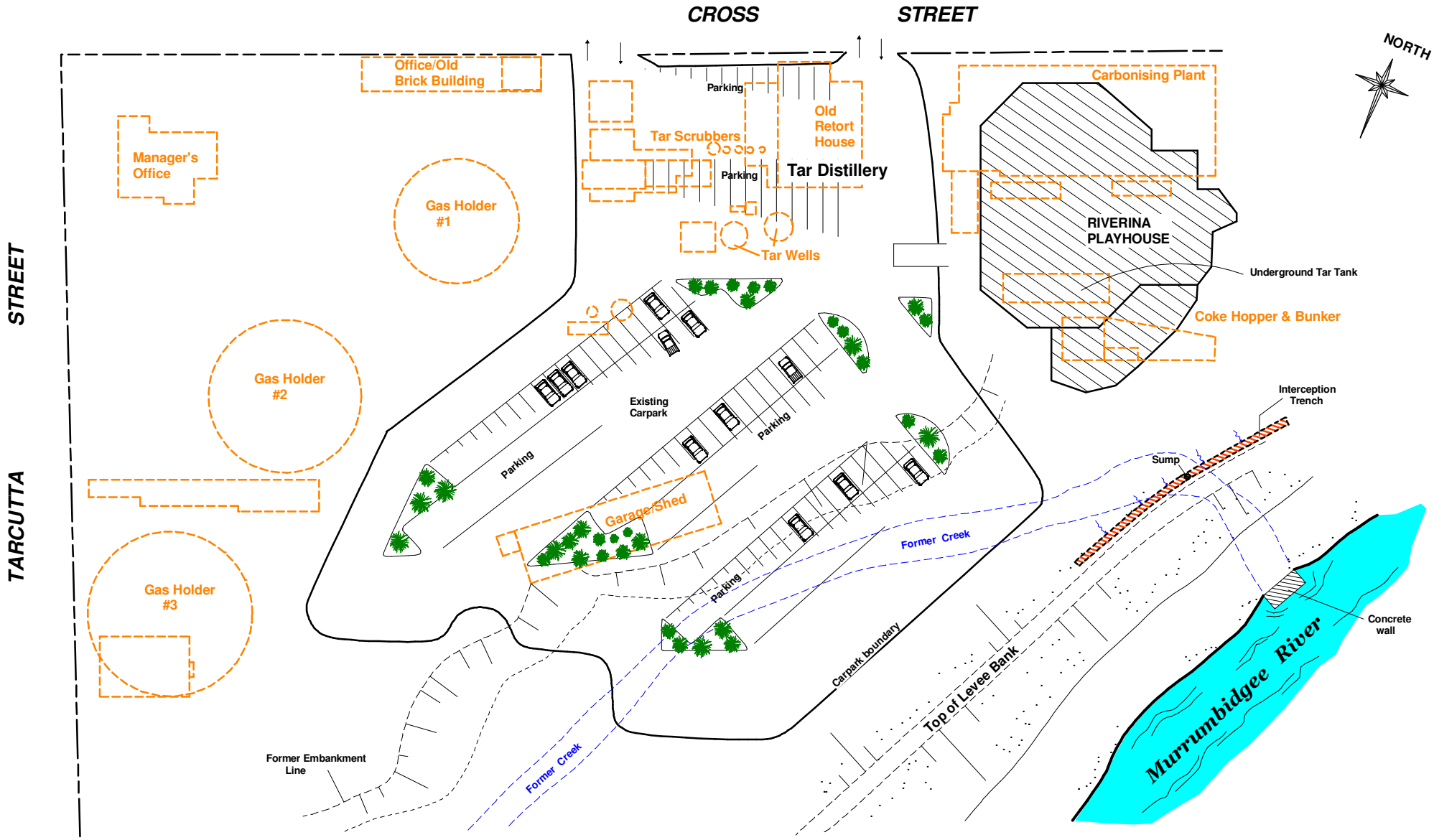
General Locality Map



Reference: Sensis sites Where Is.

Site Locality Plan:

ENVIRONMENTAL EARTH SCIENCES THE KNOW AND THE HOW	Title: Site Locality Plan	
	Location: Cnr. Cross & Tarcutta Streets, Wagga Wagga, NSW	
Client: The Council of the City of Wagga Wagga		Job number: 110016
Drawn by: TRJ	Scale: As shown	Source: See Ref.
Proj Man: DG	Date: 1 March 2010	Figure 1



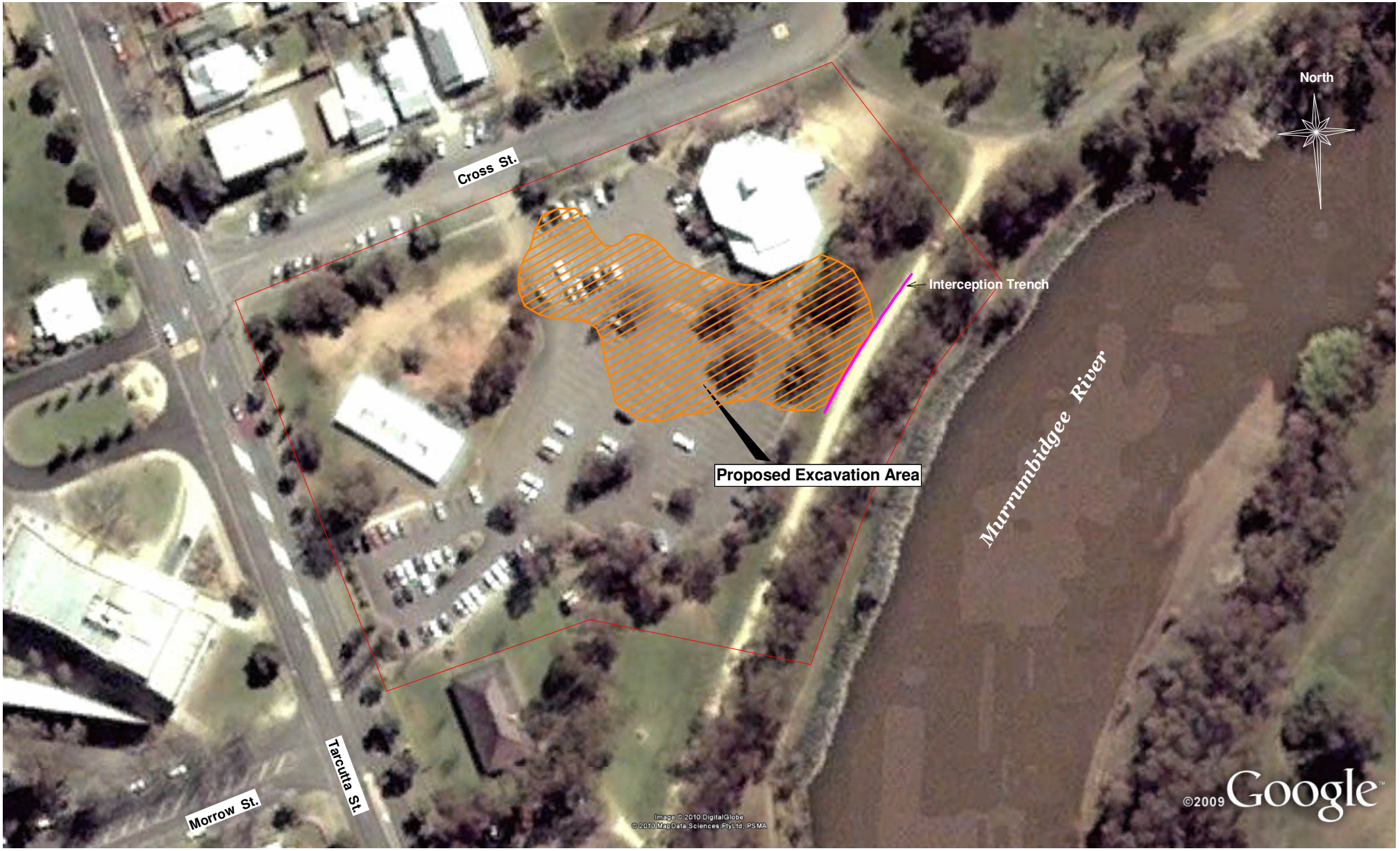
Legend:

- Former site layout

0 — 50metres

SCALE 1:500 Approx.

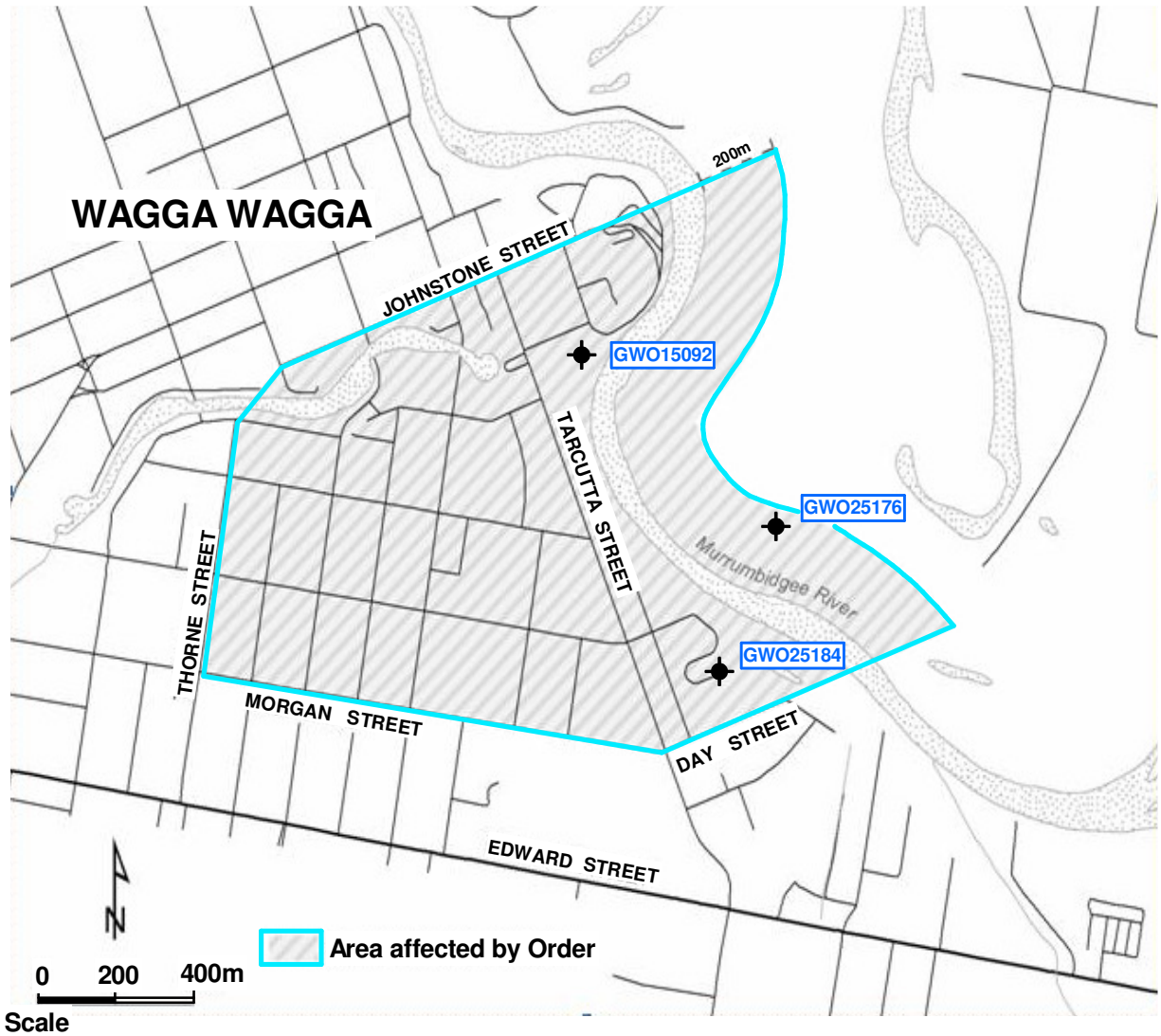
ENVIRONMENTAL EARTH SCIENCES THE KNOW AND THE HOW	Title: Site Layout	
	Location: Cnr. Cross & Tarcutta Streets, Wagga Wagga, NSW	
Client: The Council of the City of Wagga Wagga		Job number: 110016
Drawn by: TRJ	Scale: As shown	Source: N/A
Proj Man: DG	Date: 1 March 2010	Figure 2



0 30metres

Scale

ENVIRONMENTAL EARTH SCIENCES THE KNOW AND THE HOW	Title: Proposed Excavation Area	
	Location: Cnr. Cross St. & Tarcutta Streets, Wagga Wagga, NSW	
Client: The Council of the City of Wagga Wagga		Job number: 109040
Drawn by: TRJ	Scale: As shown	Source: Google Image
Proj Man: DG	Date: 2 March 2010	Figure 3



Reference: From Section 324 (1) of the Water Management Act 2000.

ENVIRONMENTAL EARTH SCIENCES THE KNOW AND THE HOW	Title: Temporary Water Restriction Area	
	Location: Cnr. Cross & Tarcutta Streets, Wagga Wagga, NSW	
Client: The Council of the City of Wagga Wagga		Job number: 110016
Drawn by: TRJ	Scale: As shown	Source: See Ref.
Proj Man: DG	Date: 2 March 2010	Figure 4

APPENDIX A ENVIRONMENTAL PROTECTRION AND BIODIVERSITY ACT 1999 PROTECTED MATTERS SEARCH

Australian Government
Department of the Environment, Water, Heritage and the Arts

Protected Matters Search Tool

You are here: Environment Home > EPBC Act > Search

21 January 2010 10:10

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

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Search Type: Area

Buffer: 1 km

Coordinates: -35.108466,147.372537,
-35.107943,147.374372,
-35.108566,147.375040,
-35.109878,147.374506,
-35.111235,147.374940,
-35.111369,147.373939

This map may contain data which are
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Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	2
Threatened Species:	8
Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	2
Commonwealth Heritage Places:	None
Places on the RNE:	12
Listed Marine Species:	7
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information] (Ramsar Sites)		
FIVEBOUGH AND TUCKERBIL SWAMPS		Within same catchment as Ramsar site
Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area
Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater	Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot	Vulnerable	Breeding likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Nyctophilus timoriensis (South-eastern form) Greater Long-eared Bat	Vulnerable	Species or species habitat may occur within area
Ray-finned fishes		
Maccullochella peelii peelii Murray Cod, Cod, Goodoo	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch	Endangered	Species or species habitat may occur within area
Plants		
Diuris sheaffiana Tricolour Diuris	Vulnerable	Species or species habitat may occur within area
Migratory Species [Dataset Information]	Status	Type of Presence

Migratory Terrestrial Species

Birds

Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat may occur within area

Migratory Wetland Species

Birds

Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area

Migratory Marine Birds

Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area

Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Communications, Information Technology and the Arts - Australian Broadcasting Corporation

Communications, Information Technology and the Arts - Telstra Corporation Limited

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Historic

CBC Bank (former) NSW

Church and Cathedral Group NSW

Civic Group NSW

Hampden Bridge NSW

Murrumbidgee River Rail Bridge NSW

Police Station NSW

St Andrews Manse NSW

St Andrews Presbyterian Church NSW

St Michaels Cathedral NSW

St Michaels Presbytery (The Bishops House) NSW

Wagga Wagga Courthouse NSW

Wagga Wagga Post Office (former) NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was

used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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