Review of Environmental Factors

West Camden Water Recycling Plant

Biosolids Treatment Upgrade and Amplification
July 2011

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Publication number SW336 7/11

West Camden WRP Biosolids Treatment Upgrade and Amplification project

Review of Environmental Factors
## Abbreviations/Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADWF</td>
<td>Average Dry Weather Flow</td>
</tr>
<tr>
<td>AHIMS</td>
<td>Aboriginal Heritage Information Management System</td>
</tr>
<tr>
<td>ASS</td>
<td>Acid Sulphate Soils</td>
</tr>
<tr>
<td>ATAD</td>
<td>Autothermal thermophilic aerobic digestion</td>
</tr>
<tr>
<td>CEMP</td>
<td>Construction Environmental Management Plan</td>
</tr>
<tr>
<td>dB</td>
<td>Decibel noise measurement</td>
</tr>
<tr>
<td>dB(A)</td>
<td>Adjusted decibel noise measurement</td>
</tr>
<tr>
<td>DECC</td>
<td>Department of Environment and Climate Change (now OEH)</td>
</tr>
<tr>
<td>DECCW</td>
<td>Department of Environment, Climate Change and Water (now OEH)</td>
</tr>
<tr>
<td>DP&amp;I</td>
<td>Department of Planning and Infrastructure</td>
</tr>
<tr>
<td>DUAP</td>
<td>Department of Urban Affairs and Planning (now DP&amp;I)</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EMAI</td>
<td>Elizabeth Macarthur Agricultural Institute</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Authority (now OEH)</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td><em>Environmental Planning and Assessment Act 1979</em></td>
</tr>
<tr>
<td>EP&amp;A Reg</td>
<td><em>Environmental Planning and Assessment Regulation 2000</em></td>
</tr>
<tr>
<td>EPBC Act</td>
<td><em>Environment Protection and Biodiversity Conservation Act 1999</em></td>
</tr>
<tr>
<td>EPL</td>
<td>Environment Protection Licence</td>
</tr>
<tr>
<td>ESD</td>
<td>Ecologically Sustainable Development</td>
</tr>
<tr>
<td>FAT</td>
<td>Feed averaging tank</td>
</tr>
<tr>
<td>FM Act</td>
<td><em>Fisheries Management Act 1994</em></td>
</tr>
<tr>
<td>ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>Grade ‘B’ Biosolids</td>
<td>An organic solid by-product from wastewater treatment that is safe to use for certain land applications</td>
</tr>
<tr>
<td>INP</td>
<td>Industrial Noise Policy</td>
</tr>
<tr>
<td>Km</td>
<td>Kilometre</td>
</tr>
<tr>
<td>L</td>
<td>Litre</td>
</tr>
<tr>
<td>Leq</td>
<td>Equivalent continuous noise level.</td>
</tr>
<tr>
<td>LA90</td>
<td>Weighted noise level that is exceeded for 90 percent of the time. Considered to represent the background noise level.</td>
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<tr>
<td>LEP</td>
<td>Local Environment Plan</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
</tr>
<tr>
<td>MCA</td>
<td>Multi Criteria Analysis</td>
</tr>
<tr>
<td>ML</td>
<td>Megalitre</td>
</tr>
<tr>
<td>m</td>
<td>Metre</td>
</tr>
<tr>
<td>m³</td>
<td>Cubic metre</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetre</td>
</tr>
<tr>
<td>MWh</td>
<td>Megawatt hour</td>
</tr>
<tr>
<td>NP&amp;W Act</td>
<td>National Parks and Wildlife Act 1974</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>OEH</td>
<td>Office of Environment and Heritage</td>
</tr>
<tr>
<td>OCU</td>
<td>Odour Control Unit</td>
</tr>
<tr>
<td>OU</td>
<td>Odour Unit (measurement)</td>
</tr>
<tr>
<td>PASS</td>
<td>Potential Acid Sulphate Soils</td>
</tr>
<tr>
<td>PHA</td>
<td>Preliminary Hazard Analysis</td>
</tr>
<tr>
<td>RBL</td>
<td>Rating Background Level (ambient noise)</td>
</tr>
<tr>
<td>REF</td>
<td>Review of Environmental Factors</td>
</tr>
<tr>
<td>RNE</td>
<td>Register of National Estate</td>
</tr>
<tr>
<td>SEPP</td>
<td>State Environmental Planning Policy</td>
</tr>
<tr>
<td>SEPP (Infrastructure) 2007</td>
<td>Infrastructure SEPP</td>
</tr>
<tr>
<td>SRT</td>
<td>Sludge retention time</td>
</tr>
<tr>
<td>SWEMS</td>
<td>Sydney Water Environmental Management System</td>
</tr>
<tr>
<td>TSC Act</td>
<td>Threatened Species Conservation Act 1995</td>
</tr>
<tr>
<td>TSR</td>
<td>Total Solids Residual</td>
</tr>
<tr>
<td>TWAS</td>
<td>Thickened waste activated sludge</td>
</tr>
<tr>
<td>VSD</td>
<td>Volatile solids destruction</td>
</tr>
<tr>
<td>WAS</td>
<td>Waste activated sludge</td>
</tr>
<tr>
<td>WRP</td>
<td>Water Recycling Plant</td>
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</tbody>
</table>
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Executive summary

Introduction

Wastewater treatment facilities at the West Camden Water Recycling Plant (WRP) were recently upgraded and amplified to cater for future population growth within the West Camden wastewater catchment and improve the quality of treated wastewater discharges to the Nepean River.

The West Camden WRP can now process an average dry weather flow (ADWF) of 23 ML/d.

The plant’s biosolids treatment capacity was not amplified and is currently limited to about 10.5 ML/d.

Objective

The purpose of this project is to upgrade and amplify the biosolids treatment capacity at West Camden WRP to match the plant’s new wastewater processing capacity.

Planning process

Sydney Water is the proponent and determining authority for this project. Under Section 111 of the Environmental Planning and Assessment Act 1979, Sydney Water must examine all matters likely to affect the environment from this activity.

The State Environmental Planning Policy (Infrastructure) 2007 allows Sydney Water to undertake the work without obtaining development consent from Camden Council.

This REF has been prepared to assess the potential environmental impacts of the project during construction and operation and identify measures to minimise these impacts. It also identifies whether the project is likely to have a significant environmental impact, thereby requiring the preparation of an environmental impact statement, and whether further environmental assessment is required.

Description of the project

The increased biosolids treatment capacity would be achieved by:

- providing pre-treatment to the digester feed sludge
- increasing the capacity of the existing digesters
- providing adequate digester capacity for the increased future load.
Construction would occur in the following sequence:

- upgrade the existing digester heating and mixing components without decommissioning the digesters
- construct one gas phase anaerobic digester, one sludge transfer pumping station and two acid phase digesters
- decommission, clean, refurbish and fit out the mixing system components of the two existing digesters, one digester at a time.

Summary of environmental impacts

Potential construction impacts include:
- noise
- dust generation
- construction traffic

Potential operational impacts include:
- increased operational traffic
- increased energy and chemical use by the plant.

With the implementation of the mitigation measures outlined in this REF, the project is unlikely to have a significant adverse environmental impact.

Environmental management

The contractor would prepare a detailed Construction Environmental Management Plan (CEMP) prior to the commencement of construction, for endorsement by Sydney Water. This CEMP would incorporate the mitigation measures and requirements outlined in this REF.

Sydney Water would review and amend its existing Integrated Management System to incorporate the operational changes to the plant’s facilities and treatment processes resulting from this project.

Stakeholder and community consultation

A Communications Strategy has been prepared and is being implemented for the project. Consultation with key stakeholders will continue throughout the detailed design, construction and operation of the project.

The REF would be available for public viewing at Camden council and on the Sydney Water website for two weeks. Written submissions are welcome and Sydney Water would prepare a Decision Report addressing all issues raised. The project may be refined if a submission raises an important new issue.

The Contractor would be responsible for developing and implementing a Community Liaison Plan during construction.
Recommendation to proceed

The West Camden WRP Biosolids Treatment Upgrade and Amplification project is unlikely to have a significant adverse environmental impact. Accordingly, no environmental impact statement or further environmental assessment is required.

It is recommended that the project proceed.
1. Introduction

1.1 The project

This Review of Environmental Factors (REF) assesses the potential environmental impacts associated with the West Camden Water Recycling Plant (WRP) Biosolids Treatment Upgrade and Amplification project (the project).

The purpose of this project is to upgrade and amplify the biosolids treatment capacity at West Camden WRP to match the plant’s new wastewater processing capacity. When this project is complete, all facilities at the plant would be able to cater for future population growth within the West Camden wastewater catchment to the year 2021-22.

Anaerobic digestion with pre-treatment by acid phase digestion was identified as the preferred digestion option for West Camden WRP (Figure 3.3).

The increased biosolids treatment capacity would be achieved by:

- providing pre-treatment to the digester feed sludge
- increasing the capacity of the existing digesters
- providing adequate digester capacity for the increased future load.

Construction would occur in the following sequence:

- upgrade the existing digester heating and mixing components without decommissioning the digesters
- construct one gas phase anaerobic digester, one sludge transfer pumping station and two acid phase digesters
- decommission, clean, refurbish and fit out the mixing system components of the two existing digesters, one digester at a time.

1.2 Background to the project

Wastewater treatment facilities at the West Camden Water Recycling Plant (WRP) were recently upgraded and amplified to cater for future population growth within the West Camden wastewater catchment and improve the quality of treated wastewater discharges to the Nepean River.

The West Camden WRP can now process an average dry weather flow (ADWF) of 23 ML/d.

The plant’s biosolids treatment capacity was not amplified. The plant has two anaerobic digesters; one operates as a primary digester and the other operates as a secondary digester. The primary digester is heated and its contents are mixed, while the secondary digester is not heated and its contents are not mixed.

These digesters currently have a capacity of about 10.5 ML/d ADWF. Although the digester capacity could be optimised to about 14 ML/d by improving heating and mixing the extra capacity would be fully used by 2014.

The wastewater catchment’s population is anticipated to increase from the current 55,000 to almost 105,000 and flows are anticipated to increase from the current 10.3 ML/d to almost 23 ML/d in 2021-22.
This project would allow the plant to cater for the future population growth within the West Camden wastewater catchment to the year 2021-22.

1.3 Purpose and Scope of the REF

Sydney Water is the proponent (person proposing to carry out the activity) for this project. Sydney Water is a statutory state-owned corporation and as such, is classified as a public authority under Section 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and defined as the determining authority (the authority responsible for approving the project) under Part 5 of the Act.

In accordance with Section 111 of the EP&A Act, Sydney Water is responsible for assessing all matters likely to affect the environment from this activity.

This REF is an assessment of the potential environmental impacts associated with the construction and operation of the West Camden WRP Biosolids Treatment Upgrade and Amplification project.

It uses the Department of Planning and Infrastructure’s (DP&I)’s guideline ‘Is an EIS required?’ (DUAP, 1999) to determine whether the activity is likely to have a significant environmental impact, thereby requiring the preparation of an environmental impact statement (EIS).

The REF identifies whether further environmental assessment is required and also specifies the measures that need to be implemented to avoid or minimise any potential environmental impacts from the project.

1.4 Stakeholder and community consultation

1.4.1 Consultation objectives

Sydney Water has prepared a communications strategy for the project. This strategy ensures that the community and key stakeholders are provided with clear, accurate and timely information throughout all stages of the project, and have an opportunity to comment on the project.

1.4.2 Consultation during project development

This project is an extension of the previous upgrade and amplification project at West Camden WRP which was completed in 2009.

For this project Sydney Water has considered feedback from the West Camden local community and key stakeholders gathered during the planning, detailed design, construction and commissioning of the previous upgrade and amplification project.

Consultation for the previous upgrade and amplification project was done through meetings, workshops, regular updates (media releases, mail outs, briefing sessions and information on Sydney Water’s Website), the public display of an EIS and receipt of submissions which were addressed in a Representations Report.

The consulted stakeholders included: Environment Protection Authority (currently Office of Environment and Heritage), Department of Planning (currently Department of Planning and Infrastructure), Minister for Energy & Utilities (now Minister for Finance and Services), NSW Health, Sydney Catchment Authority, NSW Fisheries (currently NSW Fishing and Aquaculture), Dept of Land and Water (currently Department of Finance and Services), H-N CMT (currently Hawkesbury Nepean Catchment Management Authority), Mine Subsidence Board, NSW Roads
and Traffic Authority, Camden and Wollondilly Councils, the local MP, local councillors, environmental and local community groups.

1.4.3 Community consultation

Sydney Water would deliver relevant information to the community and stakeholders, and manage issues during the detailed design and construction stages of the project. This would be in line with the Communications Strategy for the project.

As part of the Communications Strategy for the project, Sydney Water would undertake broader consultation with the local community and key stakeholders to obtain information that could help mitigate potential environmental impacts from the project.

1.4.4 Consultation before and during construction

The REF would be placed on public display at Camden Council Library for two weeks. The community and stakeholders would be invited to comment on the proposal described in the REF by direct mail-outs and advertising in the local paper. Copies of the REF would be sent to local community groups, key stakeholders and the Camden Council Library.

At the end of the public display period, and once all submissions have been received, Sydney Water would prepare a Decision Report addressing all issues raised. This report would be distributed to the stakeholders who made a submission, and uploaded onto Sydney Water’s website.

The project may be refined if a submission identifies an important new issue.

Sydney Water would provide copies of the REF, Decision Report and more information about the project, to stakeholders and community members who request it. Project contact details can be found on Sydney Water’s Website.

During construction, the Contractor would be required to work with Sydney Water to develop and implement a Community Liaison Plan in line with the overall Communications Strategy. The Contractor would be required to keep the community informed throughout the construction phase and to manage issues and complaints.

Complaints management during construction would be in accordance with the existing Sydney Water Customer Complaint Policy and Procedure.

1.4.5 Consultation during operation

Sydney Water is committed to informing and consulting with the community and stakeholders on the progress of the project. Consultation with key stakeholders and the local community would continue throughout the detailed design, construction and operation of the project. This would ensure that issues and concerns are understood, and the community and stakeholders are kept informed.

Sydney Water’s standard policies and procedures for customer and community relations would apply once the project is commissioned.

1.5 Making a submission

The REF would be displayed for the two weeks from Wednesday 17 August to Wednesday 31 August 2011 at the following locations:
Written submissions from public authorities, interested groups, organisations and the community are invited and should be addressed to the contact listed below:

Wayne Veigel
Environmental Scientist, West Camden WRP Biosolids Treatment Upgrade and Amplification Project.
Sydney Water
PO Box 399
Parramatta NSW 2124

Submissions must be made in writing and may comment on any aspect of the project described in the REF. The closing date for submissions is Wednesday 31 August.

All information in written representations is collected for the sole purpose of assisting in the assessment of the project. The information may be used during the environmental impact assessment process by Sydney Water and may be disclosed to appropriate agencies such as OEH. Where the respondent indicates at the time of submission that the information shall remain confidential, Sydney Water would attempt to ensure that it remains so. However, there may be legislative or legal justification for its release, such as the requirements of the Freedom of Information Act 1989. The supply of information is voluntary.

Each respondent has free access at all times to the information supplied by that respondent but not to any material supplied by others if a respondent has indicated that their representation should remain confidential. Any respondent may make a correction to any information they have provided by making the correction in writing and sending it to the same address where the original documentation was sent by the closing date for submissions of 31 August 2011.
2. Location and planning context

2.1 Location, Landuse, Ownership and Zoning

The project would be carried out at the West Camden WRP. The plant is located on the southern part of a 36 ha Sydney Water property. The general location of the plant is shown on Figure 2-1 below.

![Figure 2-1: Location of Project Works](image)

West Camden WRP is located about 52 km south west of Sydney. The land on which the plant is sited slopes down from the west to east towards a tributary of Matahil Creek. The plant is bounded by Sheathers Lane to the south, Ferguson Lane to the west, Sydney Water and privately owned land to the north and Camden Council’s Bicentennial Reserve to the east (see Figure 2-2).

The plant is situated in a rural setting above the flood plain, with the township of Camden located about 600 m to the east of the plant’s eastern boundary. A new housing development called Camden Grove Estate is currently being built about 500 m to the south west of the plant.

The area is predominantly agricultural and produces dairy products, fruit and vegetables, poultry, turf and beef cattle. Other industries include horticulture (pastures, orchards, flowers and nurseries), mining and extraction (Sydney Water, 2009).
Cleared or partially cleared low landforms are prevalent in this predominantly agricultural area. However, these are interspersed with pockets of remnant woodland including Elderslie Banksia Scrub Forest, Nepean River Flat Forest, Cobbitty Hills Vine Thicket and remnant Cumberland Plain Woodland.

The plant is zoned 5(a) Special Uses under the Camden Local Environmental Plan (LEP) 46. The rest of the Sydney Water property is zoned 1(a) Rural “A”. The land zonings surrounding the plant include:

- 1(a) Rural “A”
- 6(a1) Open Space Existing
- 5(a) Special Uses.

The project would be located in the south-western part of the plant (refer to Figure 4-1).

### 2.2 Environmental Planning and Assessment Act 1979

The EP&A Act and the *Environmental Planning and Assessment Regulation 2000* provide a system for environmental planning, impact assessment and planning approval for proposed developments within NSW. The Act also establishes environmental planning instruments including State Environmental Planning Policies (SEPP)s and Local Environmental Plans (LEP)s.

Statutory State Owned Corporations, such as Sydney Water, are defined as public authorities under Section 4 of the EP&A Act.

In determining the appropriate approval pathway for a development Sydney Water, as proponent, must consider the requirements outlined below in Table 2-1.
Table 2-1: Determining the Approval Pathway

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Comment</th>
</tr>
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<tbody>
<tr>
<td>Has the project been declared ‘critical infrastructure’ or a ‘major project’ under Section 75B or 75C of the EP&amp;A Act.</td>
<td>This project has not been declared a project to which Part 3A applies in either a SEPP or by order of the Minister for Planning published in the Government Gazette. Assessment and approval under Part 3A of the EP&amp;A Act is therefore not required.</td>
</tr>
<tr>
<td>Is the project prohibited?</td>
<td>The project would not be prohibited within any of the zones, according to the relevant LEP (refer to Table 2-2).</td>
</tr>
<tr>
<td>Is development consent required for the project?</td>
<td>Under the relevant LEP, council consent is required for the project within the Camden Local Government Area (refer to Table 2-2). However, the SEPP (Infrastructure) 2007 (the Infrastructure SEPP) operates to remove these LEP-identified consent provisions (refer to Table 2-3), and the project may be carried out without development consent.</td>
</tr>
<tr>
<td>Is there any likelihood of significant environmental impact?</td>
<td>Sydney Water is responsible for determining whether the project is likely to have a significant environmental impact, thereby requiring the preparation of an EIS. After using the DP&amp;I guideline ‘Is an EIS required?’ (DUAP. 1999) Sydney Water considers that the project is unlikely to have a significant environmental impact. Therefore an EIS is not required and approval under Section 75B(2)(b) (Part 3A) of the EP&amp;A Act is not required.</td>
</tr>
</tbody>
</table>

As the project is unlikely to have a significant impact on the environment the Infrastructure SEPP allows the project to be carried out without development consent. Therefore environmental assessment and determination of the Project would be undertaken in accordance with Part 5 of the EP&A Act. Under Part 5, Sydney Water is both the proponent and determining authority for the project.

Under Section 111 of the EP&A Act, Sydney Water is required to examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of this project.

Clause 228 of the *Environmental Planning and Assessment Regulation 2000* identifies the factors that must be taken into account concerning the impact of an activity on the environment. The requirements of Clause 228 have been considered in Appendix 1.

The REF also specifies the measures that need to be implemented to avoid or minimise any potential environmental impacts from the project.

### 2.3 Local Environmental Plans

One LEP is relevant to the project and this is outlined in Table 2-2 below.

Table 2-2: Relevant LEPs

<table>
<thead>
<tr>
<th>Local Environmental Plan (relevant site)</th>
<th>Whether the Project is Prohibited or Development Consent is Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camden LEP (Existing Urban Areas) No. 46 (West Camden WRP)</td>
<td>West Camden WRP is located within the Camden local government area (LGA). Camden Council controls development within the Camden LGA through the Camden LEPs Nos 45, 46, 47, 74, 117 and 121. The Camden (Existing Urban Areas) LEP N.o. 46 is the planning instrument relevant to the West Camden WRP site. The West Camden WRP site is zoned 5(a) Special Uses under the Camden LEP No. 46. Within this land use zoning, utility installations are permitted with Development Consent.</td>
</tr>
</tbody>
</table>
2.4 State Environmental planning policies

Several SEPPs that may be relevant to the project are outlined in Table 2-3 below.

Table 2-3: Relevant SEPPs

<table>
<thead>
<tr>
<th>Policy</th>
<th>Relevance to this Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP)</td>
<td>The Infrastructure SEPP was gazetted in December 2007. It aims to facilitate the effective delivery of infrastructure across NSW. The project is development for the purpose of a biosolids treatment facility, which is defined in clause 105 of this SEPP as: ‘a facility for the treatment of biosolids from a sewage treatment plant or water recycling facility’. Clause 106(1a) of the Infrastructure SEPP states: ‘Development for the purpose of sewage treatment plants or biosolid treatment facilities may be carried out by or on behalf of a public authority or any person licensed under the Water Industry Competition Act 2006 without consent on land in a prescribed zone’. Clause 105 of this SEPP defines a prescribed zone as land equivalent to a number of different zones, including SP1 Special Activities. The 5(a) Special Uses zoning under the Camden LEP No. 46 is an equivalent zone to the SP1 Special Activities zone defined in the Infrastructure SEPP. Clause 106(2a) of the Infrastructure SEPP operates to remove all LEP-identified consent provisions for the project. Clause 13 of this SEPP outlines the requirements for public authorities to consult with the relevant council when the proposed development is likely to have a substantial impact on council infrastructure or services. The project is unlikely to have a substantial impact on Camden Council’s infrastructure or services and therefore consultation with council on this issue is not required. Clause 16 of this SEPP outlines the requirements for public authorities to consult with other public authorities under the following circumstances: a) development that is adjacent to land reserved under the National Parks and Wildlife Act 1974—OEH b) development that is adjacent to a marine park declared under the Marine Parks Act 1997—the Marine Parks Authority c) development that is adjacent to an aquatic reserve declared under the Fisheries Management Act 1994—OEH d) development in the foreshore area within the meaning of the Sydney Harbour Foreshore Authority Act 1998—the Sydney Harbour Foreshore Authority e) development comprising a fixed or floating structure in or over navigable waters—the Maritime Authority of NSW f) development for the purposes of an educational establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land (as defined by the Act)—the NSW Rural Fire Service. The project is unlikely to trigger any of the circumstances listed above. Therefore, consultation with the listed public authorities on these circumstances is not required.</td>
</tr>
</tbody>
</table>
2.5 Regional Environmental Plans

One REP (now deemed a SEPP) is relevant to the project and this is outlined in Table 2-4 below.

Table 2-4: Relevant REPs

<table>
<thead>
<tr>
<th>Policy</th>
<th>Relevance to this Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment. (this plan has been deemed a SEPP since July 1999).</td>
<td>The West Camden WRP is located within the Nepean River catchment and discharges into this catchment, While parts of the Camden LGA fall within the Georges River catchment this SEPP does not apply to this project.</td>
</tr>
</tbody>
</table>

2.6 Legislative Considerations, Licences, Permits and Approvals

Other legislative considerations relevant to the project are outlined in Table 2-5.

Table 2-5: Applicable Legislation, Licences, Permits and Approvals

<table>
<thead>
<tr>
<th>Legislation</th>
<th>Relevance to this Project</th>
<th>Licence/ Permit/ Approval requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection of the Environment Operations Act 1997</td>
<td>West Camden WRP is operated under the West Camden Sewage Treatment System Environment Protection Licence (EPL) Number 1675 issued by the OEH.</td>
<td>Construction would not require a variation to the EPL. No variation to the EPL would be required for the operation of the project. This is because the project would not affect the quantity or quality of treated wastewater discharges.</td>
</tr>
<tr>
<td>Legislation</td>
<td>Relevance to this Project</td>
<td>Licence/ Permit/ Approval requirements</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Heritage Act 1977</td>
<td>The Heritage Act 1977 was introduced to conserve the environmental heritage of NSW. Environmental heritage is defined as including buildings, works, relics or places which are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the state. Section 60 of the Act requires approval for any impact on items of heritage significance listed on the State Heritage Register. The West Camden WRP is not listed on the State Heritage Register. Section 170 of the Act requires Sydney Water to create and maintain a Heritage and Conservation Register. The West Camden WRP is not listed on Sydney Water’s Section 170 Heritage Register.</td>
<td>None</td>
</tr>
<tr>
<td>Threatened Species Conservation Act 1995 (TSC Act)</td>
<td>The TSC Act establishes a framework for the protection of threatened species, populations and ecological communities in NSW (with the exception of fish and marine plants which are covered by the Fisheries Management Act 1994). The EP&amp;A Act lists several factors to be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats. Schedules 1 and 2 of the TSC Act list the terrestrial species, populations and ecological communities considered threatened in NSW. If a significant impact is identified, a Species Impact Statement and licence is required under the TSC Act. The project is unlikely to affect any threatened species, communities or their habitats (see Section 5.2 of this REF) and therefore no approvals would be required under the TSC Act.</td>
<td>None</td>
</tr>
<tr>
<td>National Parks and Wildlife Act 1974 (NP&amp;W Act)</td>
<td>Places, sites and objects of archaeological and cultural Aboriginal significance are protected under the NP&amp;W Act. It is an offence to damage or destroy these without prior permission from the Director General of the OEH. The project would not affect any items or places of Aboriginal archaeological significance (see Section 4.4) and therefore no approvals would be required under this Act.</td>
<td>None</td>
</tr>
<tr>
<td>Fisheries Management Act 1994 (FM Act)</td>
<td>The FM Act, which is administered by the Department of Primary Industries provides protection for aquatic reserves under the Act, marine vegetation such as sea grasses or mangroves, fish habitat and threatened species conservation. The project is located on Sydney Water land and would have no impacts on a protected area/fish passage.</td>
<td>None</td>
</tr>
<tr>
<td>Waste Avoidance and Resource Recovery Act 2001 (WARR Act)</td>
<td>The WARR Act aims to: 'ensure that resource management options are considered against a hierarchy of the following order: i) avoidance of unnecessary resource consumption; ii) resource recovery (including reuse, reprocessing, recycling and energy recovery); iii) disposal'. It also aims to: 'Minimise the consumption of natural resources and final disposal of waste by encouraging the avoidance of waste and the reuse</td>
<td>None</td>
</tr>
</tbody>
</table>
### Legislation

<table>
<thead>
<tr>
<th>Legislation</th>
<th>Relevance to this Project</th>
<th>Licence/ Permit/ Approval requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dangerous Goods Act 1975</td>
<td>Dangerous goods in any quantity must be stored safely and in compliance with the requirements of the Dangerous Goods Act 1975. Depending on their class, dangerous goods above certain quantities must be licenced. A range of chemicals used in the treatment process at the plant are classified as dangerous goods. All chemical use, storage and transportation during construction and operation must meet the requirements of the Act and the relevant approvals. The plant has a licence under the Dangerous Goods Act. The project would not require any change to this licence. This is discussed further in Section 5.8 of this REF.</td>
<td>None</td>
</tr>
<tr>
<td>Contaminated Land Act 2008</td>
<td>The Contaminated Land Management Act 2008 aims to promote better management of contaminated land. The general objective of the Act, stated in section 3 (1), 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’ A particular objective, sets out in section 3 (2) (d), is ‘to ensure that contaminated land is managed with regard to the principles of ecologically sustainable development.’ There are unlikely to be any contaminated soils within the plant. Previous activities at the plant did not involve imported fill material and existing structures are fully lined to prevent contaminants seeping into the soil (Sydney Water, 2001). Therefore, impacts on soil and land contamination are not anticipated, and consequently, contamination management is not required for the project. The mitigation measures detailed in Section 5.6 would be implemented during construction to ensure environmental safety and avoid and/or mitigate any potential contamination impacts.</td>
<td>None</td>
</tr>
</tbody>
</table>
| Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) | Under the EPBC Act activities that are likely to have a significant impact on matters of national environmental significance, Commonwealth lands or actions undertaken by the Commonwealth are subject to assessment and approval. Matters of national environmental significance are identified in the Act as:  
  - world heritage properties;  
  - national heritage properties;  
  - Ramsar wetlands;  
  - nationally threatened species and communities;  
  - migratory species protected under international agreements;  
  - the Commonwealth marine environment; and nuclear actions.  
There are no world heritage properties, national heritage places, | None                                    |
2.7 Sydney Water’s carbon neutrality commitment

Carbon neutrality is the practice of balancing carbon dioxide and other greenhouse gases released into the atmosphere to achieve zero net greenhouse gas emissions. Carbon neutrality is achieved through:

- practices that remove carbon from the atmosphere
- purchasing electricity from renewable energy sources
- sourcing carbon credits from other organisations that have reduced their greenhouse emissions.

Sydney Water is committed to being carbon neutral by 2020. Although this project is not carbon neutral it would not jeopardise Sydney Water’s carbon neutral commitment.
3. Alternatives and justification for the project

3.1 Project need and objective

Wastewater treatment facilities at the West Camden Water Recycling Plant (WRP) were recently upgraded and amplified to cater for future population growth within the West Camden wastewater catchment and improve the quality of treated wastewater discharges to the Nepean River.

The West Camden WRP can now process an ADWF of 23 ML/d.

The plant’s biosolids treatment capacity was not amplified and is currently limited to about 10.5 ML/d. Although the digester capacity could be optimised to about 14 ML/d by improving heating and mixing, the extra capacity would be fully used by 2014.

Hence the need for the biosolids treatment capacity to be upgraded and amplified to match the plant’s new wastewater processing capacity.

The purpose of this project is to upgrade and amplify the biosolids treatment capacity at West Camden WRP to match the new wastewater processing capacity. This increased capacity must be achieved while:

• ensuring stable digester operation and minimising upsets such as foaming and odour problems in the digesters
• ensuring the biosolids product continues to meet the Grade ‘B’ or better stabilisation requirements described in the OEH guidelines for the use and disposal of biosolids products (NSW EPA, 1997)
• maintaining Sydney Water’s ability to re-use all biosolids.

The increased biosolids treatment capacity would be achieved by:

• providing pre-treatment to the digester feed sludge
• increasing the capacity of the existing digesters
• providing adequate digester capacity for the increased future load.

The biosolids thickening, dewatering and dewatered cake-outloading facilities have the same capacity as the liquid treatment facilities and are expected to be able to meet the anticipated 2021-22 loads. It is only the digesters that do not have sufficient capacity to meet the increased future loads.

3.2 Existing Plant operations

WRP description

West Camden WRP was built in the late 1970s. It treats wastewater from the towns and villages of Camden, Camden South, Elderslie, Narellan Vale, Harrington Park, Currrans Hill, Smeaton Grange, Mt Annan, Spring Farm, Kirkham, Camden Park, The Oaks, Oakdale and Belimbla Park.

The plant services a current population of about 55,000 spread across a catchment of 5,900 ha.
Wastewater treatment

The plant currently provides tertiary treatment with nutrient removal and disinfection (see Figure 3-1).

Treated wastewater is dechlorinated prior to its discharge to a tributary of Matahil Creek (see Figure 3-2).

Recycled water transfer and use

An 8 km long transfer pipeline and pumping station located at the plant transfer treated wastewater (tertiary treated effluent) to various sporting fields in the Camden area and a 63 ML capacity dam at the Elizabeth Macarthur Agricultural Institute (EMAI) at Camden Park (see Figure 3-2). This water is used to irrigate pastures and crops at the EMAI.

In 2009-10, 62 ML of the plant’s treated wastewater was recycled, mostly at EMAI (Sydney Water, 2011a).

Biosolids treatment

Biosolids are anaerobically digested to produce a Grade ‘B’ stabilised product. This product is dewatered and the cake is beneficially re-used.

The existing biosolids treatment facilities include sludge thickening facilities, two anaerobic digesters operating in a primary secondary mode, digested sludge dewatering and dewatered cake-outloading.
Figure 3-1: Process flow diagram for West Camden WRP
Figure 3.2 West Camden WRP and recycled water pipeline
3.3 Alternatives and their assessment

Twelve biosolids digestion options were considered for upgrading and amplifying the digestion process at West Camden WRP (CH2M Hill, 2009a):

- pre-treatment by acid phase digestion,
- pre-treatment by sonication
- pre-treatment by cambi
- pre-treatment by crown biogest
- pre-treatment by microsludge
- mesophilic digestion
- recuperative thickening
- temperature phased anaerobic digestion
- anaerobic/aerobic digestion
- aerobic digestion
- solar drying
- autothermal thermophilic aerobic digestion (ATAD).

The do nothing option was also considered.

The descriptions, advantages and disadvantages of these options are listed in Appendix 2.

3.4 Assessment of Options

3.4.1 Short listing of options

The do nothing option was ruled out because it would not meet the project’s objective.
The twelve digestion options were screened using the following criteria:

- increase in volatile solids destruction (VSD)
- net energy consumption
- proven technology
- operability
- odour
- dewaterability
- redundancy and its effect on cost
- footprint
- nutrient load in return streams
- maintainability
- use of existing facilities.

The performance of each option against each criterion is summarised in the following Table. A cross (X) indicates an adverse effect on the criterion, a dash (-) indicates a neutral effect and a tick (✓) indicates a positive effect.
<table>
<thead>
<tr>
<th>Upgrade Option</th>
<th>Possible increase in VSD</th>
<th>Net energy consumption</th>
<th>Proven technology</th>
<th>Operability</th>
<th>Odour</th>
<th>Dewaterability (cake TSR%)</th>
<th>Redundancy and its effect on cost</th>
<th>Footprint</th>
<th>Nutrient load in return streams</th>
<th>Maintainability</th>
<th>Use of existing facilities</th>
<th>Screening Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment – Acid phase digestion</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>X</td>
<td>—</td>
<td>✓</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Pre-treatment – Sonication</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Pre-treatment – Cambi</td>
<td>✓ ✓</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>✓ ✓</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>✓</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Pre-treatment – Crown Biogest</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>X</td>
<td>—</td>
<td>✓ ✓</td>
<td>—</td>
<td>—</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Pre-treatment – Microsludge</td>
<td>✓ ✓</td>
<td>✓</td>
<td>XX</td>
<td>X</td>
<td>—</td>
<td>✓ ✓</td>
<td>—</td>
<td>—</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Mesophilic digestion</td>
<td>—</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>✓</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Recuperative thickening</td>
<td>—</td>
<td>X</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>X</td>
<td>—</td>
<td>—</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Temperature phased anaerobic digestion</td>
<td>✓ ✓</td>
<td>X</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>✓ ✓</td>
<td>X</td>
<td>—</td>
<td>X</td>
<td>XX</td>
<td>X</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Anaerobic / Aerobic digestion</td>
<td>✓ ✓</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>—</td>
<td>✓</td>
<td>—</td>
<td>X</td>
<td>✓</td>
<td>—</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Aerobic digestion</td>
<td>—</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>—</td>
<td>X</td>
<td>XX</td>
<td>✓</td>
<td>Short Listed</td>
</tr>
<tr>
<td>Solar drying</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>XX</td>
<td>✓ ✓</td>
<td>—</td>
<td>X</td>
<td>—</td>
<td>X</td>
<td>—</td>
<td>Short Listed</td>
</tr>
<tr>
<td>ATAD</td>
<td>—</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>XX</td>
<td>X</td>
<td>—</td>
<td>✓</td>
<td>X</td>
<td>—</td>
<td>X</td>
<td>Short Listed</td>
</tr>
</tbody>
</table>
As indicated by Table 3-2 three treatment options were short-listed. These options are described below.

Option 1: - Acid Phase Digestion Pre-Treatment Option – Upgrade existing mesophilic digesters, construct one extra mesophilic anaerobic digester similar to the existing digesters and construct two acid phase digesters to pre-treat the feed sludge to the existing and new anaerobic digesters.

**Process Description**

![Figure 3-3. Process Schematic of Digestion with Acid Phase Pre-Treatment](image)

The TWAS at 6% solids concentration would be pumped to two acid phase digesters, operating in parallel, via the existing TWAS pumps (1 duty + 1 standby). The TWAS would be pumped intermittently and alternating between the two acid phase digesters through automatic on/off valves mounted on the feed lines. Feed TWAS would be heated by heat exchangers to a temperature of around 35 °C, and the digester contents would be maintained at this temperature through continuous heating. Mechanical mixing (via Vaughan chopper pumps) would continuously mix the digester contents.

The optimum Sludge Retention Time (SRT) in the acid phase pre-treatment digesters is one day, and should not exceed two days. As the TWAS flow would vary for different influent qualities (50th percentile, peak month, and peak week), these digesters would be designed to be operated at different levels to control the SRT to about one day under all conditions, but never to exceed two days. TWAS would be hydrolysed and acidified in these digesters. This would significantly reduce foaming and biosolids viscosity. These digesters would be equipped with pH and temperature monitors and the head space gas would be burned because it would be of low quality. Gas production from these digesters is expected to be less than 5% of the total gas produced by the digesters.

The acidified sludge from the acid phase digesters would flow into a collection chamber with odour control and would then be pumped through two new TWAS pumps (1 duty + 1 standby) to the existing mesophilic digesters that would be configured to operate in parallel. Digested sludge from these primary digesters would be collected in a new sludge chamber and pumped to a new mesophilic digester of the same size as the existing digesters through two new sludge transfer pumps (1 duty + 1 standby). These three mesophilic digesters would be called ‘gas phase digesters’ as most of the gas production would occur in them.

For operational flexibility and digester maintenance, the pumping arrangement for the acidified biosolids would be such that any two of the three gas phase digesters could be operated in parallel. Furthermore, the intermediate sludge transfer pumps should be sized such that primary-digested sludge can be pumped directly into the digested sludge feed averaging tank (FAT) for dewatering.
These arrangements would be necessary to take any one of the gas phase digesters out of service for maintenance.

The digested sludge from the secondary digester would be collected in the existing digested sludge FATs, and then dewatered by the existing dewatering equipment that is sized for the 23 ML/d WRP influent flow rate.

**Option 2: Anaerobic/Aerobic Digestion with Acid Phase Digestion Pre-Treatment Option** – Construct two new acid phase digesters, upgrade existing mesophilic digesters and construct one extra mesophilic digester.

**Process Description**

![Process Schematic of Digestion with Anaerobic/Aerobic Digestion](image)

As per the current practice, waste activated sludge would be pumped through the WAS clarifier to thicken the sludge from about a 0.5% solids content to a 1.2% solids content. Supernatant from the WAS clarifier would be sent back to the liquid treatment process and the pre-thickened WAS would be pumped to the WAS FAT. The WAS FAT would be continuously mixed, and a portion of the sludge would be pumped to the centrifuge thickeners to further increase the solids content to 6%.

The remaining sludge from the WAS FAT would be pumped to a new sludge blending tank by the existing bypass pumps that are currently configured to pump the WAS FAT contents to the digested sludge FAT. The bypassed sludge at a 1.2% solids content would be mixed with anaerobically digested sludge at about a 5% solids content in the blending tank to reduce the solids content to about 3% so that the sludge can be processed in the aerobic digesters.

Experience at the Penrith WRP shows that sludge containing 3% solids can be treated in aerobic digesters if they are not too deep and employ submersible aeration.

The TWAS at a 6% solids concentration would be pumped by the existing TWAS pumps to the existing mesophilic digesters that would be configured to operate in parallel. Digested sludge from these digesters would be collected in the new blending tank and mixed with bypassed sludge from the WAS FAT as explained earlier. Mass balance calculations showed that about 20% of the WAS FAT sludge would need to be bypassed to obtain 3% solids in the aerobic digester feed.
The mixed sludge at about a 3% solids concentration would then be pumped to two new aerobic digesters configured for parallel operation. Each aerobic digester would be divided into two cells, and each cell would house a surface aerator. Diffused aeration would perform very poorly, if at all, at a 3% solids concentration, and hence it is not considered. Submersible aerators would also help to transfer heat to the atmosphere. The aerobic digesters would also be fitted with pH meters and DO probes to monitor the operating conditions. The sludge depth would need to be limited to 4.5 m.

When one of the mesophilic digesters needs to be taken out of service for maintenance, the TWAS would be fed to only one anaerobic digester, and would then be digested in the aerobic digesters. Simulations were carried out at the peak month load with this arrangement, and the results showed that the digested sludge would meet the Grade ‘B’ criterion. As submersible aeration equipment is proposed, the complete shutdown of an aerobic digester is not anticipated.

The digested sludge from the aerobic digesters would be pumped to the existing digested sludge FATs by new sludge transfer pumps and then dewatered. There would also be a recycle stream to direct sludge back to the aerobic digesters. The dewatering process is not described here as the existing dewatering equipment is designed for the 23 ML/d WRP influent flow rate.

**Option 3: Sonication Pre-Treatment Option** – Construct one new anaerobic digester (mesophilic) similar to the existing digester, upgrade the existing mesophilic digesters and provide ultrasonic pre-treatment to feed sludge to the digesters.

**Process Description**

![Figure 3-5. Process Schematic of Digestion with Sonication Pre-Treatment](image)

The TWAS at a 6% solids concentration would be pumped to an ultrasonic reactor via two existing TWAS pumps (1 duty + 1 standby). Only 30% of the TWAS would pass through the ultrasonic reactor, while 70% would be fed directly to the existing digesters. After passing through the ultrasonic reactor, the other 30% of the TWAS would also be fed to the existing mesophilic digesters.

The existing mesophilic digesters would be configured to operate in parallel. Digested sludge from these primary digesters would be collected in a new sludge chamber, and pumped to a new mesophilic digester of the same size as the existing digesters through two new sludge transfer pumps (1 duty + 1 standby). These three mesophilic digesters would be called ‘gas phase digesters’ as most of the gas production would occur in these digesters.
For operational flexibility and digester maintenance, the pumping arrangement for the sonicated sludge would be such that any two of the three gas phase digesters could be operated in parallel. Further, the intermediate sludge transfer pumps should be sized such that primary-digested sludge can be pumped directly into the digested sludge FAT for dewatering. These arrangements would be necessary to take any one of the gas phase digesters out of service for maintenance. Preliminary process design calculations have shown that with sonication prior to the mesophilic digesters, only one new mesophilic digester would be required, together with the space provided for one of the two future digesters.

The digested sludge from the secondary digester would be collected in the existing digested sludge FATs and then dewatered through the existing dewatering equipment that is sized for a 23 ML/d WRP influent flow rate. The dewatering process is not described here.

### 3.4.2 Selection of the preferred option

Preliminary process design work was carried out for the three short-listed options to develop process unit sizes and site layouts and predict process performance (volatile solids destruction (VSD), gas production, heating requirements and the volumes of dewatered biosolids requiring disposal).

A Multi-Criteria Analysis (MCA) workshop was then held to identify the preferred digestion option for West Camden WRP. Eleven non-cost technical, social and environmental criteria were used. Weightings were assigned to each criterion and scores for each option were determined by group consensus.

Table 3-3 summarises the assigned weighting for each main category and criterion

#### Table 3-3. Criteria and Weightings

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>62.1</td>
</tr>
<tr>
<td>Process performance</td>
<td>10.6</td>
</tr>
<tr>
<td>Proven technology</td>
<td>15.2</td>
</tr>
<tr>
<td>Operability and Maintainability</td>
<td>12.1</td>
</tr>
<tr>
<td>Reliability</td>
<td>15.2</td>
</tr>
<tr>
<td>Nutrient load on main plant</td>
<td>7.6</td>
</tr>
<tr>
<td>Constructability</td>
<td>1.5</td>
</tr>
<tr>
<td>Environmental</td>
<td>10.6</td>
</tr>
<tr>
<td>Greenhouse gas emissions</td>
<td>7.6</td>
</tr>
<tr>
<td>Construction environmental impacts such as spoil generation, truck and car movements</td>
<td>3.0</td>
</tr>
<tr>
<td>Social</td>
<td>27.3</td>
</tr>
<tr>
<td>OH &amp;S</td>
<td>15.2</td>
</tr>
<tr>
<td>Odour Impacts</td>
<td>7.6</td>
</tr>
<tr>
<td>Biosolids truck movements</td>
<td>4.5</td>
</tr>
</tbody>
</table>
Workshop attendees assigned a score to each option against each criterion based on a scoring system ranging from 1 to 5, with 1 reflecting very poor compliance with the criterion and 5 reflecting very good compliance with the criterion.

**Final Non-Cost Scores and Sensitivity Analysis**

The normalised scores for each option for the non-cost criteria are presented in Table 3-4 below.

<table>
<thead>
<tr>
<th>Category</th>
<th>Weighting</th>
<th>Option 1 - Acid Phase Digestion</th>
<th>Option 2 - Anaerobic/Aerobic with Acid Phase Digestion</th>
<th>Option 3 - Sonication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>62</td>
<td>3.86</td>
<td>3.61</td>
<td>3.80</td>
</tr>
<tr>
<td>Environmental</td>
<td>11</td>
<td>4.18</td>
<td>4.76</td>
<td>4.66</td>
</tr>
<tr>
<td>Social</td>
<td>27</td>
<td>3.86</td>
<td>3.51</td>
<td>4.17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>3.89</td>
<td>3.70</td>
<td>3.99</td>
</tr>
</tbody>
</table>

Table 3-4 shows that Option 3 involving sonication was identified as the most preferable digestion option in terms of non-cost criteria. Option 1 was identified as the next preferable digestion option, and Option 2 was the least preferable.

These scores were used with cost to determine the preferred digestion option.

**Cost Considerations and Confirmation of the Preferred Option**

Two methods were used to determine the preferred digestion option taking both cost and non-cost criteria into consideration:

- value for money
- establishment of financial criteria and weighting their importance against non-cost criteria.

Using these methods, Option 3 was identified as the most preferable digestion option, followed by Option 1. In all cases, Option 2 was identified as the least preferable digestion option.

Although the MCA identified Option 3 as the preferred option, the data used in the assessment of Option 3 was mostly based on information provided by suppliers. Since this information could not be verified and there were no successfully operating sonication installations that could be checked, Sydney Water carried out a pilot trial and further investigation of the sonication option. The pilot trial did not comprehensively prove the benefits of this technology claimed by the supplier.

Thus Option 1, acid phase pre-treatment, was selected as the preferred digestion option. This process is proven and has been in operation for many years at a number of North American wastewater treatment plants.
3.5 The preferred option

The preferred option for upgrading and amplifying biosolids treatment at West Camden WRP is to upgrade and amplify the existing gas phase digestion capacity and add new facilities to pre-treat the waste activated sludge (WAS) by acid phase digestion.

By separating the two primary anaerobic digestion phases, hydrolysis and acid formation and methane formation, the digestion process would become more stable and ideal conditions would be provided for each suite of micro-organisms.

More methane would be produced during digestion and this gas would be used to heat the digesters. Any surplus digester gas would be burnt in the waste gas burner. Using the digester gas to heat the digesters would partly offset the plant's demand for natural gas for digester heating.

The dewaterability of the digested sludge would be improved and the potential for odour generation would be decreased.

Section 4 describes the project that has been developed from the preferred option.
4. Description of the project and activities

4.1 Scope of works and construction sequencing

The biosolids treatment upgrade and amplification project would be carried out at West Camden WRP (Figure 4-1).

The increased biosolids treatment capacity would be achieved by:

- providing pre-treatment to the digester feed sludge
- increasing the capacity of the existing digesters
- providing adequate digester capacity for the increased future load.

The main elements of the project are outlined below and indicative locations for the new facilities are shown in Figure 4-2.

Construction would occur in the following sequence:

- upgrade the existing digester heating and mixing components where it can be done without decommissioning the digesters
- construct one gas phase anaerobic digester, one sludge transfer pumping station and two acid phase digesters
- decommission, clean, refurbish and fit out the mixing system components of the two existing digesters, one digester at a time.

The construction sequence is discussed in more detail in Sections 4.3.1 to 4.3.3.

4.2 Components of the project

4.2.1 Temporary Upgrade of Existing Digesters

New hydraulic mixing pumps, hot water pumps, related pipework and heat exchangers would be installed in the existing digesters without decommissioning them. This would immediately improve mixing in the digesters but not provide the ideal mixing and heating that the final digester modification would provide.

This work would provide the plant with the capacity to process sludge up to 2014.
4.2.2 New Works

The following new facilities would be built:

- a heat exchanger that would heat sludge prior to it being fed to the acid phase digesters
- one gas phase anaerobic digester and two acid phase mesophilic digesters. The gas phase digester would be a 13 m diameter concrete tank with a floating roof, the same height as the existing digester. New mixing and heating equipment (heat exchanger, macerators, sludge circulation pumps and hot water pumps) would be provided for this tank.

The two acid phase digesters would be smaller concrete tanks and would have their own sludge circulation pumps, macerators, hot water pumps and heaters

- a 500 kW hot water heater to provide 100% standby capacity for the existing heater
- a sludge transfer pumping station. This pumping station would transfer sludge between the digesters and the FAT. The pumping station would be built adjacent to the acid phase digesters and would consist of two steel silos with conical bottoms with a total height of about 4.5m in a bunded area of about 10.1 m x 4.6 m
- a waste gas burner and stack. The new waste gas stack would be the same height as the existing gas stack, about 3 to 4 m. The new waste gas burner would burn the digester gas from the acid phase digesters and work as a duty standby for the existing waste gas burner.
- a two storey digester control building. The lower floor would house the sludge pumps and the upper floor would house the new heater, hot water pumps, heat exchangers and control room. The new control room would be about 11 m x 15 m and would be of concrete and brick construction. The control building would be located between the existing digesters and new gas phase digester. The top level of this building would be lower than the digester roof level.
- associated pipework, electrical and control works.

4.2.3 Refurbishment of Existing Digesters

Once the new works have been commissioned and proven, each of the existing digesters would be taken off line sequentially, cleaned, refurbished and fitted out with a new mixing system.
Figure 4-1: West Camden WRP

Main entrance to West Camden WRP

Ferguson Lane

Dedicated entrance for the contractor delivering the biosolids upgrade and amplification

Sheathers Lane

Existing digesters

Project work site. See Figure 4-2 for more details.

Oxidation ponds

West Camden WRP Biosolids Treatment Upgrade and Amplification project

Review of Environmental Factors
Figure 4-2: Biosolids Treatment Upgrade and Amplification project work site at West Camden WRP

New waste gas stack
New digester heat exchanger
New sludge transfer pumping station
New digester control room
New anaerobic digester
New acid phase digester

West Camden WRP Biosolids Treatment Upgrade and Amplification project
Review of Environmental Factors
4.3 Project activities

4.3.1 Pre-construction

- set up site: establish site sheds, waste collection points, hot works and chemical storage areas, layout area, trafficable roads with parking, stockpiling and disposal areas
- remove one weeping willow tree (to the east of the existing digesters) to allow the construction of a new access road
- install temporary fencing and access, including temporary roads
- establish sediment and erosion controls
- prepare ground
- install site drainage and stormwater
- manage traffic as required.

4.3.2 Improvements to optimise the existing digesters' capacities

- construct new concrete slabs and lean-to for the new heat exchangers, sludge pumps, and macerators
- decommission and remove existing heat exchangers
- install the new heat exchangers, sludge pumps, and macerators
- connect new equipment to the digesters.

4.3.3 New Works

- construct any retaining walls
- construct new control building
- install new switchboard
- power – apply for increased load from the electricity provider, install and connect the new switchboard to the existing transformer and install underground electrical conduits between the switchboard and future structures
- natural Gas – connect to the existing natural gas supply
- potable Water – install a tie-in and connect to the existing water supplies
- reclaimed Effluent - install a tie-in and connect to the existing site-wide ring main
- compressed air - connect to the existing site-wide pneumatic line
- backfill and compact service installations
- excavate and pour foundations
- construct two acid phase digesters, including mechanical and electrical equipment, and controls
- construct one gas phase digester, including mechanical and electrical equipment, and controls
- construct new waste gas stack
4.3.4 Refurbishment of Existing Digesters

- take one of the existing digesters off-line once the new gas phase digester and acid phase pre-treatment digesters have been commissioned
- empty and clean this digester. A specialist digester-cleaning contractor would be engaged to do this work. The contractor would prepare a project-specific Construction Environmental Management Plan (CEMP) for this work and this would be reviewed and endorsed by Sydney Water before the work commences. This CEMP would also contain appropriate mitigation measures for this work at West Camden WRP
- refurbish the digester
- put the refurbished, existing gas phase digester into operation and carry out performance proving
- take the second existing digester off line and empty, clean and refurbish it once the first existing digester has demonstrated stable performance.

4.3.5 Commissioning

The project would be commissioned once the facilities and equipment have been built and tested.

4.3.6 Post-construction

- dismantle the site, site sheds, waste collection points, hot works and chemical storage areas, layout area, trafficable roads with parking, stockpiling and disposal areas
- dispose of, re-use or redistribute waste.
4.4 Materials and equipment

The following equipment would be used during construction:

- excavators
- cranes, elevated work platforms and scaffolding
- compactors and rollers
- welding equipment
- concrete trucks and other heavy duty trucks
- chemical, delivery, heavy duty and light trucks
- waste removal trucks.

The following materials would be used during construction:

- concrete for civil structures
- galvanised steel for structural steel work
- stainless steel and aluminium for associated work
- steel, acrylonitrile butadiene styrene (ABS) and copper pipes
- bricks
- glass wool for insulation.

4.5 Worksite, access and vehicle movements

Construction vehicles would gain access to the plant and work site via their own dedicated entrance off Ferguson Lane, which is off Sheathers Lane, Camden.

Site sheds and amenities would be located within a designated work site within the plant.

Vehicular movements would be defined prior to the start of construction and enforced during construction to ensure a safe working environment.

4.6 Workforce and timeframes

About 10 people work at the plant during the day. Construction would require a workforce of about 10 to 20 people a day.

Construction working hours would be from 7 am to 6 pm Monday to Friday and 8 am to 1 pm on Saturday.

Although construction is anticipated to extend over a 104 week period, most of the noisy construction work would occur during the first half of this period.

Construction is anticipated to commence in 2012 and continue until June 2014.

Operating hours would be no different from the plant’s current operating hours. Night work is a standard requirement at the plant.
4.7 Changes to the project

If the scope of works or construction methods described in this document change following the awarding of the contract, the Sydney Water Project Manager must consult the Sydney Water Project Environmental Representative on whether a supplementary environmental impact assessment needs to be prepared. The Sydney Water Environmental Management System (EMS) document *Environmental Assessment Procedure SWEMS 0019* sets out the requirements for environmental impact assessment.

4.8 Landscaping

A landscape plan would be prepared for the work site. This plan would identify the final finishes and plantings for the site and specify where these are to be placed. Finishes and plantings would be designed to be low-maintenance.
5. Existing environment, potential impacts and mitigation measures

This section describes the existing environment and identifies and assesses the potential environmental impacts from the construction and operation of the project. The specific mitigation measures that would be implemented to minimise any potential environmental impacts are identified.

5.1 Water Quality

5.1.1 Existing Environment

The West Camden WRP discharges into an unnamed tributary of Matahil Creek. This waterway is located about 0.3 km to the east of the plant. Matahil Creek flows into the Nepean River.

Stormwater runoff within the plant is collected and pumped to the head of works for treatment prior to its discharge to Matahil Creek. In extreme wet weather conditions stormwater may overflow the plant’s collection system and be discharged to Matahil Creek via the council stormwater system.

5.1.2 Assessment of Construction Impacts

Pollutants discharged in construction runoff can affect water quality in waterways. Water quality in local waterways can be affected by activities such as:

- the erosion of disturbed surfaces and pollution of waterways by sediment lost from these surfaces
- trucks carrying soil away from work sites on their tyres. Soil dropped on local roads can then be washed into the stormwater drainage system
- the disposal of untreated water resulting from the dewatering of excavated areas
- accidental spills and leaks of fuels, chemicals or other pollutants.

The implementation of safeguards and containment measures would reduce the risk that these activities would impact on the water quality of nearby waterways. For instance, sediment controls would be placed around the worksite prior to work commencing and would be maintained daily to ensure there are no adverse impacts on the water quality of nearby waterways during construction.

5.1.3 Assessment of Operational Impacts

No impacts on the water quality of nearby waterways are expected from the operation of the project.

5.1.4 Mitigation Measures

Water quality impacts during construction and operation would be minimised by the following mitigation measures:
Construction Measures

- erosion and sediment control measures will be established before work begins and maintained in effective working order throughout the duration of the works, and until the site has been stabilised
- sediment and erosion control devices will be inspected daily and immediately after rainfall to ensure their effectiveness over the entire duration of the project. Any damage to erosion and sediment controls will be rectified immediately
- no excavation would take place in or immediately after heavy rainfall
- stockpiles would be covered or bunded
- any dewatering required from excavations would only be undertaken following water quality testing to ensure appropriate limits are met prior to any discharge
- measures will be taken to prevent work vehicles and machinery tracking soil/sediments from work sites to roadways and footpaths
- all chemicals and fuels would be stored within designated bunded areas
- a spill kit would be maintained on-site at all times for the clean up of any chemical/fuel spills.

5.2 Flora and Fauna

5.2.1 Existing Environment

The vegetation at West Camden WRP includes several remnant Grey Box (*Eucalyptus moluccana*) trees around the fringes of the undeveloped areas of the plant, particularly to the immediate north of the main entrance to the plant (see Figure 4-1). Grey Box is associated with the critically endangered ecological community Cumberland Plain Woodland listed under the NSW TSC Act. This community is also listed as Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest under the Commonwealth EPBC Act.

Several mature Black She-Oak (*Allocasuarina littoralis*) and Grey She-Oak (*Casuarina glauca*) trees occur near the edge of the oxidation ponds on the northern side of Sheathers Road.

There are no remnants of the endemic shrub layer or groundcover beneath these trees. The ground layer consists of introduced grasses and weeds.

The vegetation on the banks and surrounds of the oxidation ponds on the south eastern boundary of the plant consists of weed species such as Purple Top (*Verbena bonariensis*), Fennel (*Foeniculum vulgare*), Lantana (*Lantana camera*) and Castor Oil Plant (*Ricinus communis*). Occasional sedge plants such as *Cyperus eragrostis* may be found along the pond edges.

The rest of the plant is covered by lawns composed of introduced grasses and weeds.

One weeping willow tree is located to the east of the existing digesters. Willows are declared a Noxious Weed under the *Noxious Weeds Act 1993* and are notifiable under this Act.

No threatened flora or fauna are known to occur near the project.
5.2.2 Assessment of Construction Impacts

Construction is expected to have only minimal impacts on terrestrial flora and fauna.

The existing weeping willow tree would be removed to allow for a new access road to the project. The willow is a declared noxious weed species and its removal would not be an environmental issue.

5.2.3 Assessment of Operational Impacts

It is unlikely that there would be any impacts on terrestrial flora and fauna during operation.

5.2.4 Mitigation Measures

Any impacts on flora and fauna during construction and operation would be minimised through the following mitigation measures:

### Construction Measures

- Noxious weeds should be removed and disposed of by a suitably qualified contractor
- The Weed Control Plan prepared for the West Camden WRP Stage 2 Upgrade and Amplification Project should be followed (CHBMWATER, 2008)
- Materials, plant, equipment and stockpiles will not be placed in a manner that results in damage to surrounding native vegetation
- Work vehicle access will be restricted to designated work areas and existing formed access tracks/roadways
- The tyres of construction vehicles will be cleaned before they leave the work site to minimise off-site transport of weed species if the vehicles transit through weed infested areas
- If any damage occurs to vegetation outside of the nominated work site (as shown in the CEMP), the Sydney Water Project Manager and Sydney Water Project Environmental Representative will be notified so that appropriate remediation strategies can be developed.

### Operational Measures

- Noxious weeds should be removed and disposed of by a suitably qualified contractor
- The Weed Control Plan prepared for the West Camden WRP Stage 2 Upgrade and Amplification Project should be followed (CHBMWATER, 2008)
- Maintenance of planted trees for visual screening is required.

5.3 Non-Indigenous Heritage

5.3.1 Existing Environment

The West Camden WRP site has been extensively disturbed during previous works.

West Camden WRP is not listed on any heritage registers or planning instruments and no non-indigenous heritage items or sites have been identified near the plant or its access roads.

5.3.2 Assessment of Construction Impacts

It is very unlikely that there would be any heritage impacts during construction.
The work site would be located on a previously disturbed area. It is unlikely that this site would contain any undiscovered, potential archaeological deposits.

There are no nearby non-indigenous heritage items or sites that could be potentially affected by the project. No traffic or delivery routes pass any listed items or sites.

5.3.3 Assessment of Operational Impacts

Operation is not expected to affect any non-indigenous heritage items.

5.3.4 Mitigation Measures

No specific non-Indigenous mitigation measures are required.

5.4 Indigenous Heritage

5.4.1 Existing Environment

A search of the Aboriginal Heritage Information Management System (AHIMS) found no listed Aboriginal sites within or near the West Camden WRP.

One relic (an isolated stone artefact) and an archaeologically sensitive area were found adjacent to the work site for the Stage 2 upgrade and amplification project (Sydney Water, 2001).

The project would be carried out on a previously disturbed area on the far side of the plant from the sensitive area.

5.4.2 Assessment of Construction Impacts

It is very unlikely that the project would affect any identified Aboriginal sites or artefacts.

Furthermore, given the high degree of past disturbance at the work site, it is unlikely that the project would uncover any previously unidentified Aboriginal sites or artefacts.

5.4.3 Assessment of Operational Impacts

Operation of the project is not expected to affect any non-indigenous heritage items or sites.

5.4.4 Mitigation Measures

Any potential impacts resulting from the unexpected discovery of Aboriginal objects during construction would be minimised through the following mitigation measure:

**Construction Measures**

- If any Aboriginal objects are uncovered during construction, work would stop immediately, the Sydney Water Project Environmental Representative would be contacted, and the OEH would be informed in accordance with section 91 of the *National Parks and Wildlife Act 1979*. Aboriginal ‘objects’ must be managed in accordance with an approved permit under section 87 or section 90 of the *National Parks and Wildlife Act 1979*.
5.5 Air Quality

5.5.1 Existing Environment

Air quality

Air quality in the Camden area is mainly influenced by the interaction between pollutants and the prevailing regional weather conditions. Motor vehicles are the main source of air-polluting emissions in the area is motor vehicles.

The Camden Basin is a relatively shallow depression that limits the dispersion of low level emissions. Air in the basin becomes extremely stable at night and remains trapped until there is a change sufficient enough to modify the airflow in the basin and allow the air to disperse.

A wind rose using meteorological data collected at the West Camden WRP site between 1992 and 1995 is presented in Figure 5-1. This Figure indicates that most of the wind flow experienced at the plant is from a south to south-westerly direction along the valley where the plant is located.

The digester gas is typically composed of methane and carbon dioxide with traces of sulphur based gases such as hydrogen sulphide and methyl mercaptan (thiol).

The gases produced by the anaerobic digesters are combusted in a waste gas burner. The flare produced by this burner oxidises most of the flammable gases generated by the digesters and releases the combustion products into the atmosphere. As this flare is hot it quickly rises up into the atmosphere and disperses before any ground level impacts can occur. The combustion products are far less odorous than the original compounds and do not cause odour issues in the local area.

Dust is not an issue for the current operation of the plant because most of the ground is covered by concrete, bitumen or grass.

Odour

The OEH ‘no nuisance’ odour criterion for urban areas, and/or schools and hospitals, is 2 Odour Units (OU) on a 99th percentile basis, ie for 99% of the time (DECC, 2006), over a 1 second average.

The current odour impact of West Camden WRP was modelled using AUSPLUME 6.0¹ and is shown in Figure 5-2. The OEH ‘no nuisance’ odour criterion line is shown in white. The boundary of the Sydney Water land is shown in red.

This Figure shows that any potential for ‘nuisance’ odours is mostly confined within the Sydney Water land.

The complaints record for West Camden WRP is presented in Table 5-1. Only five odour complaints were received in the 12 years between 1999 and 2010.

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of complaints</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

¹ AUSPLUME Version 6.0 is an air modelling software
5.5.2 Assessment of Construction Impacts

The project has the potential to impact upon air quality in the surrounding area, primarily through the generation of dust during construction. Dust could be generated through earthworks, construction traffic and wind erosion of exposed surfaces.

Adequate site management is required to ensure excess dust is not generated during dry and windy conditions.

Exhaust emissions from construction vehicles, generators and compressors are not expected to create significant odour problems.

There is potential for odours to be emitted from the old sludge during the digester cleaning process. This is unlikely because only digested sludge (which has already emitted most of its odours) would be removed. Furthermore, the actual emptying and cleaning activities would only occur within the digesters, which are enclosed facilities.

A specialist digester-cleaning contractor would be engaged to empty and clean the digesters. The contractor would prepare a project-specific CEMP for this work and this would be reviewed and endorsed by Sydney Water before the cleaning commences. This CEMP would also contain appropriate mitigation measures for this work at West Camden WRP.

5.5.3 Assessment of Operational Impacts

Odour emissions during operation must fall within the air quality requirements established in the Protection of the Environment Operations Act 1997.

Operation has the potential to impact upon air quality in the surrounding area, primarily through odour emissions.

An odour modelling assessment was carried out for this project using the methodology presented in the OEH document, Technical Framework—Assessment and management of odour from stationary sources in NSW (DECC, 2006). The assessment found that the project would not have any extra odour impacts beyond those shown in Figure 5-2 for the plant. This means that any potential for ‘nuisance’ odours is mostly confined within the Sydney Water land.

The new waste gas burner would perform similarly to the existing waste gas burner. Although more methane would be produced by the anaerobic digesters, it would either be used to heat them or burnt and flared to the atmosphere. Only a small amount of the methane generated during the acid phase digestion would be unsuitable for heating the digesters.

There would be no risk to air quality from the digester operations during a power failure. Digester operation is not affected by minor power outages and an emergency generator would be connected to the plant’s power supply system to provide power for essential services during a major power failure.

Dust is unlikely to be an issue during operation once the work site has been stabilised, landscaped and planted in accordance with a landscape plan.
5.5.4 Mitigation Measures

Any air quality impacts during construction and operation would be minimised through the following mitigation measures:

**Construction Measures**

- dust generation would be monitored throughout construction. Mitigation measures such as water spraying would be immediately employed when excessive dust is recorded
- all emission controls on work vehicles would comply with OEH requirements. Vehicles would not be left idling when not required
- excavation will be minimised as far as possible
- stockpiling of excavated spoil and fill will be minimised
- all loads of excavated material, soil, fill and other waste material transported to or from the work site will be kept covered at all times during their transportation
- odour monitoring would be undertaken once the project is commissioned to confirm there are no extra odour impacts
- a CEMP will be prepared by the digester cleaning contractor and reviewed and endorsed by Sydney Water before any digester cleaning commences. The CEMP will include specific mitigation measures for this work at West Camden WRP.

**Operational Measures**

- all biosolid loads transported away from the plant would be covered to prevent any odours escaping from the vehicles
- any odour complaints will be immediately addressed in accordance with Sydney Water’s Customer Complaint Resolution Policy.
No observations were missing.
Wind flow is FROM the directions shown.
Rings drawn at 5% intervals.
Calms included at center.

Figure 5-1. Wind rose using meteorological data collected at the West Camden WRP

<table>
<thead>
<tr>
<th>DIR</th>
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<tbody>
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<td>0.00</td>
</tr>
<tr>
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<td>1.73</td>
<td>2.39</td>
<td>1.07</td>
<td>0.08</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>NE</td>
<td>1.46</td>
<td>1.70</td>
<td>1.55</td>
<td>0.92</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>ENE</td>
<td>0.95</td>
<td>0.94</td>
<td>1.10</td>
<td>0.44</td>
<td>0.00</td>
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</tr>
<tr>
<td>E</td>
<td>0.74</td>
<td>1.04</td>
<td>0.98</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ESE</td>
<td>0.89</td>
<td>1.09</td>
<td>1.30</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>SE</td>
<td>1.57</td>
<td>1.18</td>
<td>1.54</td>
<td>0.62</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>SSE</td>
<td>3.79</td>
<td>1.57</td>
<td>1.37</td>
<td>0.66</td>
<td>0.05</td>
<td>0.00</td>
</tr>
</tbody>
</table>

TOTAL OBS = 24336  MISSING OBS = 0

<table>
<thead>
<tr>
<th>DIR</th>
<th>0.5</th>
<th>1.54</th>
<th>3.09</th>
<th>5.14</th>
<th>8.23</th>
<th>10.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>7.33</td>
<td>2.06</td>
<td>1.19</td>
<td>0.46</td>
<td>0.07</td>
<td>0.00</td>
</tr>
<tr>
<td>SSW</td>
<td>4.85</td>
<td>2.32</td>
<td>1.20</td>
<td>0.47</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>SW</td>
<td>2.41</td>
<td>2.52</td>
<td>2.31</td>
<td>0.88</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>WSW</td>
<td>1.55</td>
<td>1.91</td>
<td>2.30</td>
<td>1.22</td>
<td>0.09</td>
<td>0.00</td>
</tr>
<tr>
<td>W</td>
<td>1.09</td>
<td>1.05</td>
<td>0.92</td>
<td>0.62</td>
<td>0.07</td>
<td>0.02</td>
</tr>
<tr>
<td>WNW</td>
<td>0.90</td>
<td>0.50</td>
<td>0.34</td>
<td>0.19</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>NW</td>
<td>0.98</td>
<td>0.49</td>
<td>0.34</td>
<td>0.06</td>
<td>0.00</td>
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</tr>
<tr>
<td>NNW</td>
<td>1.27</td>
<td>0.98</td>
<td>0.23</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

CALM OBS = 4018  PERCENT CALM = 16.51
Figure 5-2. Current odour impact of West Camden WRP as modelled using AUSPLUME 6.0 (07/03/2011)

Odour impact of West Camden WRP as modelled using AUSPLUME 6.0
5.6 Soils, Topography, Contamination and Groundwater

5.6.1 Existing Environment

Soils

Soils in the Camden area are associated with the Blacktown Soils Landscape. This landscape consists of texture contrast soils of shallow loams overlying moderately deep hard-setting clay loam, mottled strongly pedal clays and plastic clays (Bannerman and Hazleton, 1990).

The West Camden WRP is underlain by the Wianamatta Group, which consists of Ashfield shale (laminite and dark grey siltstone) and Bringelly Shale (shale, with occasional calcareous claystone, laminite and coal).

The Blacktown soil landscape is regarded as having salinity at depth, however the floodplain landform reduces the potential for saline outbreaks by allowing free drainage across the area.

Topography

The plant is situated on the side of a moderately sloping hill and is about 80 m above sea level. The surrounding area is generally flat to the east and gently undulating to the west. There are levees around the plant that have been built for flood mitigation purposes.

Groundwater

Although the depth of the water table under the plant has not been measured the plant's elevated position above the floodplain indicates groundwater depths are likely to exceed 10 m (Sydney Water, 2001).

The water table has been recorded at a depth of 36 m in the closest registered well, located south of the plant at the corner of Druitt Lane and Cawdor Road.

Contamination/ Acid sulphate soils

No contaminated soils, potential acid sulphate (PASS) or acid sulphate soils have been identified at the plant.

Asbestos containing materials have been identified in some buildings at West Camden WRP (Arnold Noel & Associates Pty Ltd, 2009). None of these buildings are located near the work site.

Salinity

No saline soils have been identified at the plant.
5.6.2 Assessment of Construction Impacts

Soils

Only minor soil disturbance and excavation is required for the project. Excavation would be required for:

- the new anaerobic digester
- the new control building
- the two new acid phase digesters
- the sludge transfer pump station
- the various pipelines.

It is estimated that about 1,600 m$^3$ of spoil would be excavated during the project (CH$_2$MHill, 2009a). Most of the excavation would be required for the construction of the new digesters.

Spoil would be re-used on-site where possible. Excess spoil would be classified and disposed of in accordance with the OEH Waste Classification Guidelines (DECC, 2008). Any contaminated spoil would be disposed of to a landfill licensed to take such waste.

There is potential for soil erosion and transport of soil via runoff from the work area. The work site would be managed to prevent sediment transport to the local waterways.

Groundwater, contamination, acid sulphate soils, salinity

It is unlikely that soil salinity, contaminated soils or rising groundwater would be encountered during construction.

The project is not expected to affect any building identified as containing asbestos material.

5.6.3 Assessment of Operational Impacts

Impacts on soils are expected to be minor during operation as the work site would be stabilised, landscaped and planted in accordance with a landscape plan.

The operation of the project is not expected to affect any building identified as containing asbestos material.

5.6.4 Mitigation Measures

Any soil, contamination or groundwater impacts during construction would be minimised through the following mitigation measures:

<table>
<thead>
<tr>
<th>Construction Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>excess spoil excavated during the works would need to be classified in accordance with the Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes (NSW EPA 1999) prior to any off-site disposal at a suitably licensed waste facility</td>
</tr>
<tr>
<td>equipment, plant and materials will be situated in designated lay-down areas where they are least likely to cause erosion</td>
</tr>
<tr>
<td>stockpiles of soils or fill are to be monitored and managed to prevent dust, erosion and sediment runoff</td>
</tr>
<tr>
<td>excavated soil would be re-used in the backfilling where possible to minimise the need for disposal</td>
</tr>
<tr>
<td>disturbed areas will be finished and planted in accordance with the landscape plan prepared for the project</td>
</tr>
</tbody>
</table>

West Camden WRP Biosolids Treatment Upgrade and Amplification project

Review of Environmental Factors
### Construction Measures

<table>
<thead>
<tr>
<th>work site</th>
</tr>
</thead>
<tbody>
<tr>
<td>site inductions for all workforce and site staff would include measures for identifying potentially contaminated soils and PASS/ASS.</td>
</tr>
<tr>
<td>if any previously unidentified contaminated soils or ASS/PASS are found during construction, works would cease until soil testing and additional mitigation measures are put in place</td>
</tr>
<tr>
<td>any groundwater encountered during excavations would be appropriately tested and treated prior to disposal</td>
</tr>
<tr>
<td>before work is undertaken in any building previously identified to contain asbestos a Destructive Hazardous Materials Inspection should be undertaken as per AS (Australian Standards) 2601:2001, <em>The Demolition of Structures</em></td>
</tr>
<tr>
<td>if any suspected asbestos materials are encountered during construction, work must cease immediately and the material must be analysed for the presence of asbestos.</td>
</tr>
</tbody>
</table>

### 5.7 Flooding

#### 5.7.1 Existing Environment

The Camden region is located within the Upper Nepean River catchment and has a history of flooding. Land adjacent to the Nepean River and its tributaries is prone to flooding following periods of prolonged heavy rainfall within the catchment.

Most of the plant, including the digesters, is located above the 1:100 year flood level. The oxidation ponds are located below this level.

Non-structural measures such as flood forecasting, warnings and incident planning are incorporated into the existing Incident Management Plan for the plant.

#### 5.7.2 Assessment of Construction Impacts

Localised flooding may occur on the work site during heavy rainfall and construction could be affected. Measures would be implemented to minimise effects on construction.

#### 5.7.3 Assessment of Operational Impacts

None of the existing or new biosolids treatment facilities would be affected by flooding because they would be located above the 1 in 100 year flood level.

#### 5.7.4 Mitigation Measures

Any flooding impacts during construction and operation would be minimised through the following measures:

<table>
<thead>
<tr>
<th>Pre-construction/Construction Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>the new biosolids treatment facilities at the West Camden WRP will be built above the 1 in 100 year flood levels</td>
</tr>
<tr>
<td>the plant’s existing stormwater system would be extended to collect runoff from the work site</td>
</tr>
</tbody>
</table>
5.8 Waste Management and Chemical Use

5.8.1 Existing Environment

Waste

The WARR Act aims to:
‘ensure that resource management options are considered against a hierarchy of the following order:

i) avoidance of unnecessary resource consumption;
ii) resource recovery (including reuse, reprocessing, recycling and energy recovery);
iii) disposal’.

It also aims to:
‘Minimise the consumption of natural resources and final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste’.

Sydney Water’s Waste Minimisation Plan (Sydney Water, 2009) and Waste Minimisation Procedure (Sydney Water, 2008) provide specific actions, responsibilities and timeframes for achieving continual improvement in waste minimisation.

Grit and screenings produced at the West Camden WRP are composted at a resource recovery centre.

The plant also recycles paper and other commingled recyclables from the administration building. Other waste, including putrescible waste and garbage, is sent to an OEH licensed landfill for disposal.

Chemicals

The DP&I’s Applying SEPP 33 (Consultation Draft) (DoP, 2008) provides criteria against which potential industrial development must be assessed to determine if the proposed work is potentially hazardous or potentially offensive. These criteria specify threshold limits for the quantities of hazardous material to be stored and the level of transportation of these materials to determine whether a Preliminary Hazard Analysis (PHA) is required.

SEPP 33 applies if a proposal for an industrial development requires consent or approval under Part 3A or Part 4 of the EP&A Act. As this project is being assessed under Part 5 of the Act, a PHA is not required.

West Camden WRP currently stores a variety of chemicals for use in the wastewater and biosolids treatment processes. These include:

• ferric chloride, for removing phosphorous and preventing the generation of hydrogen Sulphide (H₂S) and odours
• alum, for coagulating the suspended solids in the secondary treated wastewater
• sodium hypochlorite, for chlorinating (ie disinfecting) the secondary treated wastewater
• sodium bisulphite, for dechlorinating (ie removing excess chlorine) the disinfected wastewater before it is discharged into a tributary of Matahil Creek
• polymer, for flocculating the alum and assisting the biosolids dewatering.

The plant holds a WorkCover Dangerous Goods licence to store and handle dangerous goods in approved quantities.
Chemical storage is a ‘scheduled activity’ under the PoEO Act and chemical storage is covered by the West Camden EPL.

5.8.2 Assessment of Construction Impacts

Waste

Construction would generate waste such as concrete, metal, spoil and asphalt.

Waste produced during construction would be managed in accordance with the ecologically sustainable development hierarchy and in accordance with Sydney Water’s Waste Minimisation Plan (Sydney Water, 2009) and Waste Minimisation Procedure (Sydney Water, 2008).

Where appropriate, waste materials would be re-used on site. If this is not possible, re-use opportunities would be sought off-site. Materials that cannot be re-used or recycled off-site would be disposed of appropriately.

Records and proof of disposal receipts would be kept for monitoring, reporting and audit purposes.

Chemicals

Limited quantities of chemicals such as fuel, oil, grease, paint and solvents would be stored on the work site for use during construction. Their storage would be in accordance with AS (Australian Standards) 1940:2004.

5.8.3 Assessment of Operational Impacts

Waste

Waste management during operation would be in accordance with the ecologically sustainable development hierarchy and Sydney Water’s Waste Minimisation Plan (Sydney Water, 2009) and Waste Minimisation Procedure (Sydney Water, 2008).

Biosolids generated at the plant would continue to be beneficially re-used.

Chemicals

Although a PHA is not required for the project Sydney Water has assessed whether the SEPP33 screening threshold for chemical storage would be exceeded during operation.

The SEPP 33 screening threshold for chemical storage would not be exceeded during operation because there would be no need for increased chemical storage.

Polymer is the only chemical that would be used in greater quantities during operation. It is anticipated that polymer use would increase from the current 8 tonnes a year to about 12.5 tonnes a year. The extra polymer would be used during the biosolids dewatering process. Polymer is not a dangerous good.

The plant’s dangerous goods licence would not need to be amended.
5.8.4 Mitigation Measures

Any waste and chemical impacts during construction and operation would be minimised through the following measures:

**Construction Measures**

- a sufficient number of suitable receptacles for general waste, hazardous waste and recyclable materials will be provided for waste disposal on site, including sufficient bins to allow separation of wastes for recycling
- waste streams will be sorted to maximise the recycling potential and minimise disposal costs
- materials purchasing should favour products that avoid waste generation
- all waste is to be recycled. If recycling is inappropriate, waste is to be removed to a waste disposal depot
- all general garbage from the work site will be disposed of at the end of each day to reduce the risk of odour attracting rats or other animals to the work area
- all waste material and disposal activities will be undertaken in accordance with the provisions of the PoEO Act, the WARR Act, Sydney Water's Waste Minimisation Program and the OEH Waste Classification Guidelines (NSW DECC, 2008)
- any fuel, lubricant or hydraulic fluid spillages will be collected using absorbent material and the contaminated material will be disposed of at a licensed waste depot
- the Contractor undertaking the works is to maintain a waste and materials tracking log during the construction period of all materials imported and exported from the work site. Monthly reports are to be supplied to Sydney Water
- waste disposal dockets and receipts are to be kept for all materials removed from the work site for auditing purposes
- all hazardous chemicals will be stored and used in accordance with the requirements of the Dangerous Goods Act 1975 and WorkCover
- a spill kit will be kept on-site at all times
- chemicals are to be decanted in a nominated sealed area.

5.9 Biosolids

5.9.1 Existing Environment

The nutrient rich sludge (biosolids) from the digester operations is recycled. Once dewatered, the biosolids is transported off-site for use as a fertiliser and soil enrichment product.

The plant currently produces about 5,100 tonnes of biosolids a year, as wet biosolids (with a moisture content of 78%) (Sydney Water 2011b).

5.9.2 Assessment of Construction Impacts

Construction would not affect biosolids production.
5.9.3 Assessment of Operational Impacts

Sydney Water’s *Biosolids Strategy* predicts that biosolids production would increase to about 8,480 tonnes a year by 2021-22, based on a 5% increase per year (Sydney Water 2011). This increase would result from the future population growth within the West Camden wastewater catchment.

All the biosolids produced at the plant during operation would be beneficially re-used.

5.9.4 Mitigation Measures

No specific biosolids mitigation measures are required.

5.10 Energy Use and Greenhouse Emissions

5.10.1 Existing Environment

Sydney Water is committed to being carbon neutral by 2020. Sydney Water also recognises that global warming is a significant risk to the environment and is committed to ensuring that its operations achieve outstanding environmental sustainability.

The existing digesters produce some methane gas and this is used in a hot water heater to heat the digesters. Any surplus gas is burnt in the waste gas burner.

Energy use at the plant totalled 4,800 MWh in 2010-11. This was a small fraction of Sydney Water’s total operational energy use and was 3.5% less than for the previous year.

5.10.2 Assessment of Construction Impacts

Construction equipment is expected to use minimal energy. Minimal Greenhouse emissions are expected during construction.

5.10.3 Assessment of Operational Impacts

Operation is predicted to increase the plant’s energy use by about 196 MWh, or 4% (CH2MHill, 2009a).

However, this increase in energy use would be partly offset by the energy derived from burning the methane produced within the new gas phase digesters.

5.10.4 Mitigation Measures

Energy use and greenhouse emissions during construction and operation would be minimised through the following measures:

<table>
<thead>
<tr>
<th>Pre-construction/Construction Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• all new components of the project would be procured through a process that incorporates criteria consistent with Sydney Water’s Environmental Policy (Sydney Water, 2007) and other obligations</td>
</tr>
<tr>
<td>• the designer would be required to identify all practical measures for reducing on-site energy consumption during operation, prior to finalising the detailed design of the project. Where practicable, such measures would be incorporated into the design and be operational at the time of commissioning</td>
</tr>
<tr>
<td>• Work vehicles and machinery will not be left running or idling when not in use.</td>
</tr>
</tbody>
</table>
5.11 Noise and Vibration

5.11.1 Existing Environment

The EPL for West Camden does not include noise limits. The OEH uses the PoEO Act to regulate noise in NSW and has published the *Interim Construction Noise Guidelines* (DECCW, 2009) for assessing noise.

The plant and its surrounding environment are dominated by natural sounds from the surrounding bush and farmland and intermittent traffic noise from nearby roads. Road traffic on Sheathers Road and Cawdor Road is the main source of ambient noise immediately adjacent to the plant.

Intermittent noise emissions are also generated by small aircraft using Camden Aerodrome which is located about 1 km to the north of the plant.

Noise monitoring was carried out following the completion of the Stage 2 upgrade and amplification project to verify the predicted operational noise impacts (Table 5-2).

The nearest potentially sensitive noise receivers to the plant are residential properties located on Ferguson Lane to the north (about 700 m away), Werombi Road (within the Camden Grove Estate) to the west (about 700 m away), The Old Oaks Road to the south (about 500 m away) and Little Street to the east (about 1 km away) in the Camden township centre (see Figure 5-2).

Table 5-2: Background Noise Levels measured at West Camden WRP after the completion of the Stage 2 upgrade and amplification

<table>
<thead>
<tr>
<th>Monitoring location</th>
<th>Background noise levels (night time) measured in June/July 2009¹ - L_{A90} [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location A – 56 Ferguson Lane</td>
<td>33</td>
</tr>
<tr>
<td>Location B – 25 Werombi Road</td>
<td>32</td>
</tr>
<tr>
<td>Location C – 1 Little Street</td>
<td>31</td>
</tr>
</tbody>
</table>

¹ CHBMWATER (2009) *West Camden STP Stage 2 Amplification and Upgrade - Project Noise Report*

Sydney Water has recently received two noise complaints. One was from Little Street, Camden and the other from Grassmere, located within the Camden Grove Estate.

The noise survey triggered by these complaints has found that noise emissions from the plant have increased during night time since the previous survey in June/July 2009 (PCC&D, 2011). Sydney Water will confirm these increased night time noise levels and implement suitable noise mitigation measures, as required. This work is not part of this project.
5.11.2 Assessment of Construction Impacts

There is potential for nearby residents to be affected by construction noise impacts associated with the following activities:

- vehicular movements
- unloading of equipment and materials
- transportation of waste and excavated spoil from the site
- erection of scaffolding and concrete form work
- cement pouring
- hammering and welding
- drilling
- use of excavators and loading of trucks
- use of sawcutters to cut concrete
- cranes lifting equipment
- compactors.

Construction would occur on a work site located within the West Camden WRP and is anticipated to extend over a 104 week period. However, most of the noisy construction work would occur during the first half of this period, from about June 2012 to June 2013. As not all noisy activities would occur at the same time, noise emissions may vary, depending on the activity underway and the weather at the time.

All work would be undertaken in accordance with the OEH Interim Construction Noise Guidelines (DECCW, 2009). The recommended standard construction working hours have been adopted and the noise management levels and application methods for residences described in the Guidelines (see Table 5-3) would be applied, as required.
### Table 5-3: Construction noise management levels and application methods for residences (DECCW, 2009)

<table>
<thead>
<tr>
<th>Time of day</th>
<th>Management level L$_{Aeq}(15\ min)$</th>
<th>How to apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended standard hours</td>
<td>Noise affected RBL + 10 dB.</td>
<td>The noise affected level represents the point above which there may be some community reaction to noise</td>
</tr>
<tr>
<td>Monday to Friday: 7 am to 6 pm</td>
<td></td>
<td>• where the predicted or measured L$_{Aeq90}, (15\ min)$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</td>
</tr>
<tr>
<td>Saturday: 8 am to 1 pm</td>
<td></td>
<td>• The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</td>
</tr>
<tr>
<td>No work on Sunday or public holidays.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside recommended standard hours</td>
<td>Noise affected RBL + 5dB</td>
<td>• Strong justification would typically be required for works outside the recommended standard hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The proponent should apply all feasible and reasonable work practices to meet the noise affected level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Section 7.2.2 of the Guidelines gives guidance on negotiating agreements.</td>
</tr>
</tbody>
</table>

Construction noise is unlikely to significantly affect the surrounding residential receivers due to their distance from the plant (500-1000 m) and the nature of the construction works.

Vibration impacts are not anticipated because rock breaking is unlikely to be used.

#### 5.11.3 Assessment of Operational Impacts

The OEH *NSW Industrial Noise Policy* (NSW EPA, 2000) sets out intrusive and amenity criteria for operational noise. Intrusive noise is defined as noise that intrudes above the background level by more than 5 dB(A).

The relevant, recommended noise criteria for protecting the amenity of a suburban area from industrial noise are listed in Table 5-4.
Table 5-4: Recommended amenity criteria – suburban area (NSW EPA, 2000)

<table>
<thead>
<tr>
<th></th>
<th>Period of day/day of week</th>
<th>Acceptable noise level (L_{Aeq})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residence - daytime</td>
<td>7 am – 6 pm, Monday to Saturday 8 am – 6 pm, Sundays and Public Holidays</td>
<td>55 dB(A)</td>
</tr>
<tr>
<td>Residence - evening</td>
<td>6 pm – 10 pm</td>
<td>45 dB(A)</td>
</tr>
<tr>
<td>Residence - night time</td>
<td>Remaining periods</td>
<td>40 dB(A)</td>
</tr>
<tr>
<td>Commercial premises</td>
<td>When in use</td>
<td>65 dB(A)</td>
</tr>
<tr>
<td>Industrial premises</td>
<td>When in use</td>
<td>70 dB(A)</td>
</tr>
<tr>
<td>Hospital ward</td>
<td>External</td>
<td>50 dB(A)</td>
</tr>
</tbody>
</table>

It is anticipated that project operational noise levels would be within the recommended residential noise criteria at the nearest residential receivers during neutral meteorological conditions. On the odd occasion, during adverse weather, noise levels would increase.

5.11.4 Mitigation Measures

Any noise impacts during construction and operation would be minimised through the following measures:

**Construction Measures**

- work and deliveries will only occur during the following times: Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm. No construction work or deliveries will occur on Sundays or public holidays, unless approved by Sydney Water.
- plant or machinery will not be permitted to ‘warm-up’ near residential dwellings before the nominated working hours.
- any noise complaints will be addressed immediately in accordance with Sydney Water’s Customer Complaint Resolution Policy.
- surrounding residences and businesses will be given reasonable notice of the project (including proposed start date, work methods and works duration) in accordance with Sydney Water’s community liaison and notification policies.

**Operational Measures**

- noise emissions from the operation of the plant after the completion of the biosolids treatment upgrade and amplification would comply with the NSW Industrial Noise Policy (NSW EPA, 2000).
- monitoring will be undertaken within 6 months and 12 months after commencement of operations to confirm the noise criteria have been achieved. Additional noise mitigation measures would be implemented should monitoring indicate noise levels exceed the amenity criteria.
Figure 5-3: Background noise monitoring locations
5.12 Visual Amenity

5.12.1 Existing Environment

The plant is located to the west of the Camden township, across a small floodplain. The floodplain is the dominant landscape in the vicinity with gently undulating terrain to the west.

The plant is moderately screened from outside views by scattered remnant vegetation and levee banks. Scattered mature Eucalypts line the verges of Ferguson Road, to the west, and Sheathers Lane, to the south; these trees also help to obscure external views into the plant.

The existing waste gas burner stack is well shielded from the Camden township by the digesters and other structures.

5.12.2 Assessment of Construction Impacts

It is unlikely there would be any visual impacts during construction. This is because the project would be totally contained within the plant.

5.12.3 Assessment of Operational Impacts

The new biosolids treatment facilities, including the new waste gas burner and stack, would be built above the ground. Thus there is some potential for a visual impact outside the plant.

The new waste gas burner stack would be the same height (4 to 5 m) as the existing stack and located next to it.

Any views to these structures from nearby residents would be obscured by intervening vegetation and existing plant structures.

The landscape plan prepared for the work site would include extra screening for the plant.

5.12.4 Mitigation Measures

Any visual impacts during operation would be minimised through the following mitigation measures:

<table>
<thead>
<tr>
<th>Construction Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• restore the work site immediately following the completion of construction</td>
</tr>
<tr>
<td>• extra trees will be planted along the plant’s north-western and south-western boundaries to provide extra screening for the plant from the nearest residents</td>
</tr>
</tbody>
</table>

5.13 Traffic and Access

5.13.1 Existing Environment

West Camden WRP is located to the west of the Camden township, off Sheathers Lane and Ferguson Lane. Access to the plant is gained via the Camden Bypass, Burragorang Road, Cawdor Road and Sheathers Lane (see Figure 2-2). This route largely avoids the main commercial and residential areas of Camden.

Sheathers Lane carries moderate volumes of traffic. Camden Council recorded an average of 4,071 vehicles a day using this road in 1998 (Sydney Water, 2001).
Traffic generated by the plant includes staff vehicles, chemical delivery trucks, waste disposal trucks and biosolids trucks.

Currently, there are about three to four loads of biosolids taken away from the plant each week.

5.13.2 Assessment of Construction Impacts

It is expected that there would be an extra ten to twelve car movements and five to six truck movements to and from the plant each day during peak construction periods when activities such as excavation, concrete delivery and spoil transport off site are occurring.

Construction vehicles would use the same access route as that currently used by operational vehicles but would have their own dedicated entrance to the plant from Ferguson Lane (see Figure 4-1).

The project would not substantially increase traffic volumes on these roads.

Sufficient parking is available at the plant to accommodate all construction vehicles and so no surrounding streets would be required for parking.

5.13.3 Assessment of Operational Impacts

There would be no increase in routine traffic associated with the operation and maintenance of the project.

There would be a small increase in the frequency of deliveries to the plant of the polymer used in the biosolids dewatering process.

There would also be an increase in the biosolids transported away from the plant. It is anticipated that there would be six to seven loads of biosolids taken away from the plant each week by 2022-23.

5.13.4 Mitigation Measures

Any traffic impacts during construction would be minimised through the following mitigation measures:

<table>
<thead>
<tr>
<th>Construction Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• pre-and post construction dilapidation surveys would be undertaken of any local roads within 1 km of West Camden WRP used during construction to identify the roads that Sydney Water should repair. Provide copies of the reports to the relevant road authority</td>
</tr>
<tr>
<td>• materials would be delivered during standard working hours avoiding school drop off and pick up hours between 8 am to 9.30 am and 2.30 am to 4 pm, where possible</td>
</tr>
<tr>
<td>• prior consultation with council and notification to the residents will be given if any materials need to be delivered after standard working hours</td>
</tr>
<tr>
<td>• construction vehicles within the WRP would be required to stay on formed roads or designated lay-down areas</td>
</tr>
<tr>
<td>• workforce parking would be provided within the plant to prevent parking on surrounding streets</td>
</tr>
<tr>
<td>• truck movements to and from the plant would be coordinated so that no truck queuing occurs on surrounding streets</td>
</tr>
<tr>
<td>• tracking of mud or dirt onto public roads from trucks exiting the worksite would be prevented with the use of a sealed access point, rumble grid and road sweeping as required</td>
</tr>
</tbody>
</table>
5.14 Cumulative impacts

There may be other projects carried out at West Camden WRP at the same time as this project. Sydney Water would ensure that each Project Manager is informed of the safeguards and mitigation measures for all concurrent projects, to ensure that the safeguards documented (throughout this REF) are implemented. Consequently, no significant cumulative impacts are anticipated to result from the project.

Sydney Water is not aware of any other major projects near the Camden township that could occur at the same time as the project and thus be potentially adversely affected by the project.
6. Environmental Management

6.1 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) would be prepared for endorsement by Sydney water prior to the commencement of construction. The CEMP would include the following:

- a brief description of the existing environment
- a brief description of the project
- details of the construction staging and timetable
- details of the construction activities and equipment to be used
- specific environmental issues and objectives
- the project’s organisational structure
- the roles and responsibilities of key project team members
- construction environmental management requirements incorporating, as a minimum, the mitigation measures identified in Section 6.3 below.
- environmental reporting requirements
- the customer and stakeholder consultation and communication to be undertaken
- the approvals and licences required
- training requirements
- the complaints handling and dispute resolution procedures
- emergency planning and response procedures
- the monitoring, inspections and auditing to be undertaken
- how non-conformances and corrective actions would be addressed.

Sub-contractors would be required to refer to the CEMP and prepare environmental work method statements (EWMS) that provide details of how the construction activities would comply with the CEMP. The EWMS would describe the methods and safeguards to be adopted to mitigate potential environmental impacts during construction and would be accompanied by plans showing sensitive areas and the location of environmental controls.
6.2 Operational Environmental Management

Sydney Water would review and amend its existing Wastewater Integrated Management System to incorporate the changes to the plant’s facilities and treatment processes resulting from this project. The following procedures, guidelines and requirements may change:

- site incident procedures
- chemical storage and handling procedures
- the plant's WorkCover licence
- unit process guidelines
- maintenance requirements
- standard safety procedures
- standard operating procedures at the plant.

6.3 Summary of mitigation measures

<table>
<thead>
<tr>
<th>Water Quality - Construction Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>erosion and sediment control measures will be established before work begins and maintained in effective working order throughout the duration of the works, and until the site has been stabilised</td>
</tr>
<tr>
<td>sediment and erosion control devices will be inspected daily and immediately after rainfall to ensure their effectiveness over the entire duration of the project. Any damage to erosion and sediment controls will be rectified immediately</td>
</tr>
<tr>
<td>no excavation would take place in or immediately after heavy rainfall</td>
</tr>
<tr>
<td>stockpiles would be covered or bunded</td>
</tr>
<tr>
<td>any dewatering required from excavations would only be undertaken following water quality testing to ensure appropriate limits are met prior to any discharge</td>
</tr>
<tr>
<td>measures will be taken to prevent work vehicles and machinery tracking soil/sediments from work sites to roadways and footpaths</td>
</tr>
<tr>
<td>all chemicals and fuels would be stored within designated bunded areas</td>
</tr>
<tr>
<td>a spill kit would be maintained on-site at all times for the clean up of any chemical/ fuel spills.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flora and Fauna – Construction Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noxious weeds should be removed and disposed of by a suitably qualified contractor</td>
</tr>
<tr>
<td>The Weed Control Plan prepared for the West Camden WRP Stage 2 Upgrade and Amplification Project should be followed (CHBMWATER, 2008)</td>
</tr>
</tbody>
</table>
• materials, plant, equipment and stockpiles will not be placed in a manner that results in damage to surrounding native vegetation

• work vehicle access will be restricted to designated work areas and existing formed access tracks/roadways

• the tyres of construction vehicles will be cleaned before they leave the work site to minimise off-site transport of weed species if the vehicles transit through weed infested areas

• if any damage occurs to vegetation outside of the nominated work site (as shown in the CEMP), the Sydney Water Project Manager and Sydney Water Project Environmental Representative will be notified so that appropriate remediation strategies can be developed.

### Flora and Fauna – Operational Measures

• noxious weeds should be removed and disposed of by a suitably qualified contractor

• the Weed Control Plan prepared for the West Camden WRP Stage 2 Upgrade and Amplification Project should be followed (CHBMWATER, 2008)

• maintenance of planted trees for visual screening is required.

### Indigenous Heritage – Construction Measures

If any Aboriginal objects are uncovered during construction, work would stop immediately, the Sydney Water Project Environmental Representative would be contacted, and the OEH would be informed in accordance with section 91 of the *National Parks and Wildlife Act 1979*. Aboriginal ‘objects’ must be managed in accordance with an approved permit under section 87 or section 90 of the *National Parks and Wildlife Act 1979*.

### Air Quality – Construction Measures

• dust generation would be monitored throughout construction. Mitigation measures such as water spraying would be immediately employed when excessive dust is recorded

• all emission controls on work vehicles would comply with OEH requirements. Vehicles would not be left idling when not required

• excavation will be minimised as far as possible

• stockpiling of excavated spoil and fill will be minimised

• all loads of excavated material, soil, fill and other waste material transported to or from the work site will be kept covered at all times during their transportation

• odour monitoring would be undertaken once the project is commissioned to confirm there are no extra odour impacts

• a CEMP will be prepared by the digester cleaning contractor and reviewed and endorsed by Sydney Water before any digester cleaning commences. The CEMP will include specific mitigation measures for this work at West Camden WRP.

### Air Quality - Operational Measures – West Camden WRP

• all biosolid loads transported away from the plant would be covered to prevent any odours escaping from the vehicles

• any odour complaints will be immediately addressed in accordance with Sydney Water’s Customer
Complaint Resolution Policy.

Soils, Contamination and Groundwater – Construction Measures

- excess spoil excavated during the works would need to be classified in accordance with the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes* (NSW EPA 1999) prior to any off-site disposal at a suitably licensed waste facility
- equipment, plant and materials will be situated in designated lay-down areas where they are least likely to cause erosion
- stockpiles of soils or fill are to be monitored and managed to prevent dust, erosion and sediment runoff
- excavated soil would be re-used in the backfilling where possible to minimise the need for disposal
- disturbed areas will be finished and planted in accordance with the landscape plan prepared for the work site
- site inductions for all workforce and site staff would include measures for identifying potentially contaminated soils and PASS/ASS.
- if any previously unidentified contaminated soils or ASS/PASS are found during construction, works would cease until soil testing and additional mitigation measures are put in place
- any groundwater encountered during excavations would be appropriately tested and treated prior to disposal
- before work is undertaken in any building previously identified to contain asbestos a Destructive Hazardous Materials Inspection should be undertaken as per AS (Australian Standards) 2601:2001, *The Demolition of Structures*
- if any suspected asbestos materials are encountered during construction, work must cease immediately and the material must be analysed for the presence of asbestos.

Flooding Pre-construction/Construction measures

- the new biosolids treatment facilities at the West Camden WRP will be built above the 1 in 100 year flood levels
- the plant’s existing stormwater system would be extended to collect runoff from the work site

Waste Management and Chemical use – Construction Measures

- a sufficient number of suitable receptacles for general waste, hazardous waste and recyclable materials will be provided for waste disposal on site, including sufficient bins to allow separation of wastes for recycling
- waste streams will be sorted to maximise the recycling potential and minimise disposal costs
- materials purchasing should favour products that avoid waste generation
- all waste is to be recycled. If recycling is inappropriate, waste is to be removed to a waste disposal depot
- all general garbage from the work site will be disposed of at the end of each day to reduce the risk of odour attracting rats or other animals to the work area
- all waste material and disposal activities will be undertaken in accordance with the provisions of the PoEo Act, the WARR Act, Sydney Water’s Waste Minimisation Program and the OEH Waste Classification Guidelines (NSW DECC, 2008)
- any fuel, lubricant or hydraulic fluid spillages will be collected using absorbent material and the contaminated material will be disposed of at a licensed waste depot
- the Contractor undertaking the works is to maintain a waste and materials tracking log during the
construction period of all materials imported and exported from the work site. Monthly reports are to be supplied to Sydney Water

- waste disposal docket and receipts are to be kept for all materials removed from the work site for auditing purposes
- all hazardous chemicals will be stored and used in accordance with the requirements of the Dangerous Goods Act 1975 and WorkCover
- a spill kit will be kept on-site at all times
- chemicals are to be decanted in a nominated sealed area.

**Energy Use and Greenhouse Emissions – Pre-construction/Construction Measures**

- all new components of the project would be procured through a process that incorporates criteria consistent with Sydney Water’s Environmental Policy (Sydney Water, 2007) and other obligations
- the designer would be required to identify all practical measures for reducing on-site energy consumption during operation, prior to finalising the detailed design of the project. Where practicable, such measures would be incorporated into the design and be operational at the time of commissioning
- Work vehicles and machinery will not be left running or idling when not in use.

**Noise – Construction Measures**

- work and deliveries will only occur during the following times: Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm. No construction work or deliveries will occur on Sundays or public holidays, unless approved by Sydney Water.
- plant or machinery will not be permitted to ‘warm-up’ near residential dwellings before the nominated working hours.
- any noise complaints will be addressed immediately in accordance with Sydney Water’s Customer Complaint Resolution Policy.
- surrounding residences and businesses will be given reasonable notice of the project (including proposed start date, work methods and works duration) in accordance with Sydney Water’s community liaison and notification policies

**Operational Measures**

- noise emissions from the operation of the plant after the completion of the biosolids amplification and upgrade would comply with the NSW Industrial Noise Policy (NSW EPA, 2000)
- monitoring will be undertaken within 6 months and 12 months after commencement of operations to confirm the noise criteria have been achieved. Additional noise mitigation measures would be implemented should monitoring indicate noise levels exceed the amenity criteria.

**Visual Amenity – Construction Measures**

- restore the work site immediately following the completion of construction
- extra trees will be planted along the plant’s north-western and south-western boundaries to provide extra screening for the plant from the nearest residents

**Traffic and Access – Construction Measures**

- pre-and post construction dilapidation surveys would be undertaken of any local roads within 1 km of West Camden WRP used during construction to identify the roads that Sydney Water should repair. Provide copies of the reports to the relevant road authority
• materials would be delivered during standard working hours avoiding school drop off and pick up hours between 8 am to 9.30 am and 2.30 am to 4 pm, where possible

• prior consultation with council and notification to the residents will be given if any materials need to be delivered after standard working hours

• construction vehicles within the WRP would be required to stay on formed roads or designated lay-down areas

• workforce parking would be provided within the plant to prevent parking on surrounding streets

• truck movements to and from the plant would be coordinated so that no truck queuing occurs on surrounding streets

• tracking of mud or dirt onto public roads from trucks exiting the worksite would be prevented with the use of a sealed access point, rumble grid and road sweeping as required
7. **Project Justification**

7.1 **Social and economic factors**

This project would allow the biosolids treatment capacity at West Camden WRP to be upgraded and amplified to match the plant’s new wastewater processing capacity. When this project is complete, all facilities at the plant would be able to cater for future population growth within the West Camden wastewater system to the year 2021-22.

Local community amenity may be affected during construction by increases in traffic on local roads, noise and dust emissions.

Any potential impacts on the community during construction would be short-term and minimised through the implementation of the mitigation measures outlined in Section 6.3 of this REF.

No extra odour impacts are expected during operation. However, potential operational impacts would include increased operational traffic and increased energy and chemical use by the plant.

Although the project could have some adverse impacts, the benefits outweigh these impacts.

7.2 **Biophysical factors**

Negative biophysical impacts during construction would include some soil disturbance. The implementation of the mitigation measures outlined in Section 6.3 of this REF would minimise any potential erosion and sedimentation impacts during construction.

7.3 **Ecological sustainability**

Sydney Water aims to ensure that its corporate direction is consistent with the Australian Government’s goal for Ecologically Sustainable Development (ESD), which is ‘development that improves the quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends’ (Ecologically Sustainable Development Steering Committee 1992).

Sydney Water’s Environmental Policy commits Sydney Water to conduct all its activities in accordance with the principles of ESD. In addition, the project must be considered in accordance with the four principles of ESD as outlined in section 6(2) of the Protection of the Environment Administration Act 1991 (as amended by the PoEO Act), and Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

The principles of ESD have been applied to the project as described below.
Precautionary principle

The objective of this principle is to reduce the chance of serious environmental problems even if we are not sure that these problems will occur. This REF identifies potential environmental impacts, assesses their impact and then identifies appropriate mitigation measures to minimise any potential impact. In doing this, Sydney Water is adopting the precautionary principle in assessing the impacts of its activities.

Intergenerational equity

The objective of this principle is to reduce the effects of activities on the environment that the community – present and future – relies upon to meet its needs and expectations. The project would increase the biosolids treatment capacity at the West Camden WRP to cater for future population growth to the year 2021-22.

Conservation of biological diversity

The objective of this principle is to maintain and enhance the range of native plants and animals and the health of natural areas. Sydney Water has designed the project so that biological diversity is not impacted and ecological integrity is maintained.

Improved valuation and pricing of environmental resources

The aim of this principle is to improve the way we evaluate environmental costs and benefits, and apply this information in our decision-making processes. The preferred option would minimise impacts on environmental resources.

7.4 Achievement of project objective

As outlined in Section 3.1 of this REF the objective of this project is to upgrade and amplify the biosolids treatment capacity of West Camden WRP to match the plant’s new wastewater processing capacity.

This objective must be achieved while:

- ensuring stable digester operation and minimising upsets such as foaming and odour problems in the digesters
- ensuring the biosolids product continues to meet the Grade ‘B’ or better stabilisation requirements described in the OEH biosolids guidelines for the use and disposal of biosolids products (NSW EPA, 1997)
- maintaining Sydney Water’s ability to re-use all biosolids.

The project described in this REF is expected to achieve this objective by:

- providing pre-treatment to the digester feed sludge
- increasing the capacity of the existing digesters
- providing adequate digester capacity for the increased future load.
Conclusion

The West Camden WRP Biosolids Treatment Upgrade and Amplification project has the potential to impact the surrounding environment.

Potential construction impacts include:
- noise
- dust
- construction traffic.

Potential operational impacts include:
- increased operational traffic
- increased energy and chemical use by the plant.

When this project is complete, all facilities at the plant would be able to cater for future population growth within the West Camden wastewater system to the year 2021-22.

This REF has identified and assessed the short and long-term impacts of the project on the environment and identified mitigation measures to minimise any potential impacts.

With the implementation of the mitigation measures summarised in Section 6.3 of this REF, the project is unlikely to have a significant adverse environmental impact. Accordingly, no environmental impact statement or further environmental assessment is required.

The contractor would prepare a CEMP prior to the commencement of construction, for endorsement by Sydney Water. This CEMP would incorporate the mitigation measures and requirements outlined in this REF.

Sydney Water would review and amend its existing Wastewater Integrated Management System to incorporate the operational changes to the plant’s facilities and treatment processes resulting from this project.
References


AS 2601 (2001) The Demolition of Structures Australian Standards


CHBMWATER (2008) Landscape Design Plan, West Camden STP Upgrade and Amplification


CH2MHiIl (2009a) West Camden STP Biosolids Treatment Upgrade and Amplification Vol. 1 Options Report


DECC (2005) Approved Method for the Modelling and Assessment of Air Pollutants in New South Wales, Department of Environment and Climate Change


DECC (2007) Threatened Species Database Records, Department of Environment and Climate Change


DUAP (1999) Is an EIS Required? NSW Department of Urban Affairs and Planning


Ecologically Sustainable Development Steering Committee (1992) National Strategy for Ecologically Sustainable Development

NSW EPA (1997) Biosolids Guidelines, NSW Environment Protection Authority


Panel of Experts, Enviroquip, Inc. (1998), Dr. John Novak, Virginia Polytechnic Institute as presented in Aerobic Digestion Workshop Vol. II

PCC&D (2011), *Assessment of Environmental Noise from West Camden Water Recycling Plant*, Pollution Control Consultancy and Design


Sydney Water (2008) *Waste Minimisation Procedure (SWEMS0040.00)*

Sydney Water (2009) *The Waste Minimisation Plan (SWEMS0040.01)*


Sydney Water (2011a) *Annual Report 2010*

Sydney Water (2011b) *Biosolids Strategy*
Appendix 1  Clause 228 Checklist
Clause 228 of the *Environmental Planning and Assessment Regulation 2000* lists the factors to be taken into account when the likely impact of an activity on the environment is being considered. The following Table summarises Sydney Water's consideration of these factors for this project.

<table>
<thead>
<tr>
<th>Clause 228 Factor</th>
<th>REF Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any environmental impact on a community</td>
<td>Local community amenity may be affected during construction by increases in traffic on local roads, noise and dust. Local community amenity may be affected during operation by increase operational traffic. Implementation of the mitigation measures identified in this REF would minimise any potential impacts on the community. Construction s not expected to have a significant environmental impact on the community.</td>
</tr>
<tr>
<td>A transformation of a locality</td>
<td>Construction and operation are unlikely to transform the nature of the locality. The project would be built within the West Camden WRP which already accommodates wastewater assets. The proposed assets would be in line with the existing assets. No transformation of the overall visual footprint is expected when the project is viewed from external vantage points.</td>
</tr>
<tr>
<td>Any environmental impact on the ecosystem of a locality</td>
<td>The project would be built within the West Camden WRP in a previously disturbed area. The impact of the project on flora and fauna is assessed in Section 54.2 of this REF. The project is not expected to have any adverse impact on flora, fauna or ecosystems.</td>
</tr>
<tr>
<td>A diminution of the aesthetic, recreational, scientific or other environmental quality or value of a locality</td>
<td>The project would be constructed within the West Camden WRP. Although construction and operation may affect local community amenity it would not diminish the aesthetic, recreational, scientific or other environmental quality of the area.</td>
</tr>
<tr>
<td>Any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations</td>
<td>The project would be located within the existing water recycling plant. Therefore the project is not considered likely to affect a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.</td>
</tr>
<tr>
<td>Any impact on the habitat or any protected or endangered fauna (within the meaning of Section 98 of the <em>National Parks and Wildlife Act 1974</em>)</td>
<td>All native fauna are protected under the <em>National Parks and Wildlife Act 1974</em>. The potential impact of the project on fauna has been assessed in Section 5.2 of this REF. The project occurs within previously disturbed areas of the plant that are not suitable habitat for protected fauna. The project would not impact on the habitat of protected fauna.</td>
</tr>
<tr>
<td>Any endangering of any species of animal or plant or other form of life, whether living on land, in water or in the air</td>
<td>The flora and fauna investigations undertaken for the project did not identify that the project would endanger any species of plant or animal.</td>
</tr>
<tr>
<td>Any long-term effects on the environment</td>
<td>The implementation of the mitigation measures and safeguards identified in the REF would ensure that there would be no long-term effects on the environment.</td>
</tr>
<tr>
<td>Any degradation of the quality of the environment</td>
<td>The implementation of the mitigation measures identified in the REF would minimise the risk of environmental degradation.</td>
</tr>
<tr>
<td>Any risk to the safety of the environment</td>
<td>The implementation of the mitigation measures identified in the REF would minimise any risk to the safety of the environment.</td>
</tr>
<tr>
<td>Any reduction in the range of beneficial uses of the environment</td>
<td>The project would not reduce the range of beneficial uses of the environment surrounding the plant.</td>
</tr>
<tr>
<td>Any increased demands on resources (natural or otherwise) that are, or are likely</td>
<td>The materials to be used in construction are generally small in quantity and readily available. No limited resources are likely to be affected.</td>
</tr>
<tr>
<td>Clause 228 Factor</td>
<td>REF Finding</td>
</tr>
<tr>
<td>-------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>to become, in short supply</td>
<td></td>
</tr>
<tr>
<td>Any pollution of the environment</td>
<td>There is potential for nearby waterways to be polluted during construction. There is also potential for noise pollution during construction and operation and air pollution during operation. These potential impacts would be minimised through the implementation of the mitigation measures outlined in this REF.</td>
</tr>
<tr>
<td>Any environmental problems associated with the disposal of waste</td>
<td>Wastes generated by the project would be managed in accordance with the principles in the waste management hierarchy. Opportunities for waste avoidance, local re-use and recycling would be addressed as part of the CEMP to be prepared for construction.</td>
</tr>
<tr>
<td>Any cumulative environmental effect with other existing or likely future activities</td>
<td>The implementation of the project would not have any cumulative environmental effects with other existing or likely future activities.</td>
</tr>
<tr>
<td>Any impact on coastal processes and coastal hazards, including those under projected climate change conditions</td>
<td>The project would not impact on coastal processes or coastal hazards, including those under projected climate change conditions.</td>
</tr>
</tbody>
</table>
Appendix 2 Digestion Options
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do nothing</td>
<td>The existing digestion capacity at the WRP would be retained</td>
<td>No cost to Sydney Water</td>
<td>The digestion capacity will not be able to match the expected growth in the catchment after 2014</td>
</tr>
<tr>
<td>Pre-treatment by acid phase digestion</td>
<td>Acid-gas phased anaerobic digestion involves separating the two primary anaerobic phases, acid formation and methane formation, to benefit the overall stabilisation process. This option involves the addition of acid phase digestion prior to the mesophilic digesters already operating at West Camden WRP.</td>
<td>• Increased volatile solids destruction (VSD)</td>
<td>• Higher capital costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced cake total solids residual</td>
<td>• Gas leakage from the acid-phase reactor can create odour problems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Less foaming</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Higher gas production and increased gas quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improved dewatering characteristics</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• May produce a Grade ‘A’ biosolids product</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Significant operating history.</td>
<td></td>
</tr>
<tr>
<td>Pre-treatment by sonication</td>
<td>Sonication uses the application of ultrasonic waves to cause cavitation at a micro scale. This results in high shear forces which break cell walls and release the cellular material, making the sludge more readily digestible. Sonication is able to provide increased VSD and associated benefits. Due to its relatively small footprint and overall simplicity, ultrasound cavitation in various proprietary forms has become a popular commercial solution for wastewater applications.</td>
<td>• Small footprint</td>
<td>• Higher capital costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increased gas production</td>
<td>• Sonication processes have limited exposure at full scale in Australia/New Zealand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lower viscosity</td>
<td>• The equipment costs are relatively high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced filamentous foaming</td>
<td>• Increased dewatering polymer consumption but offset against fewer total solids.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increased VSD</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increased digester loading and stability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low operational cost (replacing horns every 18 months)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improved dewaterability.</td>
<td></td>
</tr>
<tr>
<td>Pre-treatment by The Cambi process uses high temperature</td>
<td>The Cambi process uses high temperature</td>
<td>• Large increase in VSD</td>
<td>Complexity</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
<td>Advantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Cambi       | (up to 165 °C) and high pressure (up to 11 bar) to break down cellular structures, resulting in a pasteurised and more readily digestible sludge. Cambi systems have been implemented successfully at wastewater plants in Britain, Europe, the United States, Asia, and Australia. | • Increased gas production  
• Lower viscosity  
• Reduced filamentous foaming  
• Increased digester loading and stability  
• Better sludge dewaterability. | • The capital costs are very high  
• High energy requirements  
• High nutrient return in centrate stream. |
| Pre-treatment crown biogest | The Crown Biogest system utilises a homogeniser and very high pressure (approximately 12 bar). The sludge is first exposed to a macerator and mixer which results in a homogenous sludge with a smooth consistency. Then the sludge is passed through a high pressure nozzle. This causes cavitation which results in a disintegrated sludge that is more readily digestible. | • Increased VSD  
• Increased gas production  
• Lower viscosity  
• Reduced filamentous foaming  
• Increased digester loading and stability. | • Higher capital costs  
• Complex  
• Increased polymer usage. |
| Pre-treatment microsludge | MicroSludge is a pre-treatment process used on thickened waste secondary sludge (TWSS), generally followed by conventional mesophilic anaerobic digestion. It utilises alkaline pre-treatment to weaken the cell walls of TWSS, mechanical shear to reduce the particle size and homogenization to provide an enormous sudden pressure change to burst or “lyse” the cells. | • Substantially increased rate and extent of VSD  
• Corresponding increase in methane production  
• Increased dewaterability  
• Reduced biosolids volumes to dispose of  
• Small footprint  
• Option for meeting Grade ‘A’ biosolids requirements (with pre-pasteurization of the primary solids or post- | • Higher capital costs  
• Proprietary process  
• Very limited full-scale experience, with teething problems experienced during early operation  
• Chemical use may be high, depending upon the sludge characteristics  
• Limited or no long term historical data at full scale plants. |
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| Mesophilic digestion | Mesophilic anaerobic digestion, which is currently used at West Camden WRP, is a common sludge stabilisation process that involves operating anaerobic digesters at temperatures ranging from 30 °C to 38 °C with a retention time of at least 15 days. This conventional type of anaerobic digestion provides an environment in the anaerobic digestion tank that maintains optimum conditions for methane-forming bacteria. | • Able to produce a Grade 'B' biosolids product  
• Existing process at West Camden WRP. | • Foaming problems  
• Sludge can be odorous due to poor VSD and increased bioavailability of proteins created during fermentation  
• Natural gas required to supplement digester gas for digester heating  
• Methane-producing bacteria are slow-growing and prone to process upset. |
| Recuperative thickening | Digested sludge has lower total suspended solids (TSS) than the feed sludge. For this reason, if sludge is taken from the secondary digester and recuperatively thickened, inert fluid is removed from the flow and the SRT in the digesters is increased, thus optimising the use of the existing digester volume. The increased SRT is able to provide more VSD and gas production and therefore results in improved digester performance. Recuperative thickening combined with macerators and the required pumping would expose the sludge to shear which increases the amount of bio-available protein in the sludge and reduces viscosity. However because the digesters operate at a high | • Slightly more effective use of the current digesters  
• Small footprint  
• The existing thickening centrifuges could be used for recuperative thickening. | • Little benefit in terms of digestion capacity  
• Higher capital costs. |
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|        | percent solids, improved digester mixing may be required. | • Increased VSD and gas production  
• Reduced foaming  
• Smaller reactor volume required for same level of solids destruction  
• Achieves greater pathogen destruction and may produce a Grade ‘A’ biosolids product  
• Reduces odours  
• Improved gas quality  
• Absorbs shock loading better than single-stage processes  
• Operates well at a wide variety of SRT for each phase. | • Higher capital costs  
• Sensitivity to changes in temperature and VS loading  
• Increased scaling potential in the thermophilic reactor due to high temperatures  
• Higher ammonia levels produced  
• Odorous biosolids produced during first phase  
• Higher energy requirements. |
| Temperature phased anaerobic digestion | Temperature phased anaerobic digestion (TPAD) consists of a smaller thermophilic digester that operates with a short SRT (2.5 to 5 days) followed by a larger mesophilic digester with an SRT of 8 to 12 days. Because thermophilic reactions occur at higher rates than mesophilic reactions, equal VSD can be achieved with shorter SRTs. The majority of the treatment occurs during the first phase, including 80 to 90% of the volatile solids destruction and gas production, while the second phase provides additional polishing and deodorising. | • Increased VSD and gas production  
• Reduced foaming  
• Smaller reactor volume required for same level of solids destruction  
• Achieves greater pathogen destruction and may produce a Grade ‘A’ biosolids product  
• Reduces odours  
• Improved gas quality  
• Absorbs shock loading better than single-stage processes  
• Operates well at a wide variety of SRT for each phase. | • Higher capital costs  
• Sensitivity to changes in temperature and VS loading  
• Increased scaling potential in the thermophilic reactor due to high temperatures  
• Higher ammonia levels produced  
• Odorous biosolids produced during first phase  
• Higher energy requirements. |
| Anaerobic/aerobic digestion with acid phase digestion pre-treatment | The combination of anaerobic digestion followed by aerobic digestion takes advantage of the benefits of both forms of digestion. During the first anaerobic phase of digestion, material that is anaerobically biodegradable is destroyed and the fermentation processes makes material that was not previously aerobically biodegradable more aerobically biodegradable. | • Increased VSD  
• Reduced solids in digested sludge  
• Lower nutrient impact on the liquid stream process. | • Reduced dewaterability  
• Limited operating history at larger plants. |
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| Aerobic digestion              | Aerobic digestion is a common method of stabilisation for WAS only, but can also be used to stabilise mixtures of waste-activated or trickling filter sludge and primary sludge. Aerobic digestion involves digestion in completely mixed tanks under aerobic conditions at ambient temperatures for a period of 20 to 45 days (with 1.5%–2% solids concentration). | • Low nutrient return.                                                                      | • Typically can only be operated at 1.5% TS in the digester to ensure effective aeration  
• Poor sludge dewaterability (for example, 18% rather than 25%) leading to substantially higher sludge disposal costs 
• Larger space requirement 
• Potentially higher energy requirement. |
| Solar drying                   | A solar dryer uses evaporation to decrease the water content of sludge and prepare it for land application. Evaporation is facilitated through the use of a greenhouse-like structure in order to capture solar energy and increase the ambient air temperature over the biosolids. A moving rake-type system is used to churn and transport the biosolids along the length of the solar dryer. | • Low TSR  
• Simple but effective technology.                                                                 | • Significant odour risk  
• Can not produce Grade B biosolids  
• Requires a very large footprint which is not available at West Camden. |
| Autothermal thermophilic aerobic digestion (ATAD) | Autothermal thermophilic aerobic digestion (ATAD) represents a variation of both conventional and high purity oxygen aerobic digestion. In this process, the feed sludge is pre-thickened to provide a digester feed solids concentration of greater than 4%. The reactors are insulated to conserve the heat produced from the biological degradation of the organic solids by thermophilic bacteria. Thermophilic operating temperatures in insulated reactors are in the range of 45 °C to 70 °C without external supplemental heat | • The decrease in retention times to about 5 to 6 days to achieve volatile solids reduction of 30-50%, similar to conventional aerobic digestion  
• The greater reduction of bacteria and viruses as compared to mesophilic anaerobic digestion  
• When the reactors are well 
• Poor dewatering characteristics of ATAD biosolids per Dr. John Novak, Virginia Polytechnic Institute as presented in Aerobic Digestion Workshop Vol. II “Panel of Experts,” Enviroquip, Inc., et al., 1998  
• Higher odour risks  
• Lack of nitrification, and or denitrification as per Dr. Enos Stover, Stover and Associated, as presented in Aerobic Digestion Workshop Vol. II “Panel of Experts,” Enviroquip, Inc., et al., 1998 |
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<td>provided (other than the aeration and mixing devices located inside the vessels). Because of this phenomenon, the process is termed autothermal.</td>
<td>mixed and maintained at 55 °C and above, pathogenic viruses, bacteria, etc. can be reduced to below detectable levels.</td>
<td>Experts,” Enviroquip, Inc., et al., 1998 • High capital/operating costs • Foam control is required to ensure effective oxygen transfer.</td>
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Appendix 3 Sydney Water Project Manager’s Environmental Responsibilities
The Sydney Water Project Manager’s environmental management responsibilities are listed below:

- to ensure that the mitigation measures identified in Section 5 of this REF are incorporated into any contract or work specification as Special Conditions of Contract

- to ensure that a CEMP is prepared and endorsed by Sydney Water prior to work commencing. The minimum requirements to be met by the CEMP are those set out within the Sydney Water EMS document *SWEMS0026 Preparation of an EMP Procedure*

- to consult the Sydney Water Project Environmental Representative on whether a supplementary environmental impact assessment needs to be prepared if the scope of works or construction methods described in this document change following the awarding of the contract. The Sydney Water Environmental Management System (EMS) document *Environmental Assessment Procedure SWEMS 0019* sets out the requirements for environmental impact assessment.

- To consult with the Sydney Water Customer and Community Relations Representative on the development of a Community Liaison Plan for construction.