



DIRECTOR SHIRE SERVICES REPORT

14 June 2005

DSS8	WEST KEMPSEY SEWAGE TREATMENT WORKS
FILE:	GRP

SUMMARY:

Reporting on the options for upgrading or replacing West Kempsey Sewerage Treatment Works.



Overview of the Treatment Works

The West Kempsey Sewage Treatment Works (STW) accepts and treats sewage from the Kempsey area including the CBD north of the Macleay River. This also includes the Aldavilla and Greenhill areas west of Kempsey.

The STW consists of a trickling filter plant and a series of four maturation ponds. There are two distinct trickling filter plants onsite, which were constructed in 1939 and 1966. There have been various upgrades since 1966, which have included construction of the maturation ponds; a new inlet works and a final trickling filter humus clarifier.

The trickling filter plant removes the majority of the organic and suspended solids material from the sewage. The effluent from the trickling filter plant is disinfected by retention in a series of four maturation ponds. The trickling filter and maturation ponds act together to achieve a degree of nitrogen removal.

Final treated effluent from the STW is pumped from the last Maturation Pond to the Macleay River.

The STW is situated on North St adjacent to the Warwick Park Racecourse. There are residential areas along North St as close as 200 m from the boundary of the treatment works. The inlet works where raw sewage is received is relatively close (250 m) to the nearest residences.

Overview of Issues with the Current STW

Given the close location of the STW to residential areas in West Kempsey, there has been a history of odour complaints from residents adjacent to the STW. The inlet works is believed to be the primary odour source, however odour will emanate from other parts of the STW.

As well as the odour issue, listed below are other deficiencies with the STW:

- The effluent produced from the STW regularly breaches the EPA Licence maximum suspended solids limit during summer. Algae growth occurs in the maturation ponds, which has the effect of increasing the effluent suspended solids level as effluent travels through the ponds. Algae levels are higher during summer periods where the majority of licence compliance issues are experienced.
- Key parts of the STW are below the 1 in 100 flood level and are subject to flooding. This includes the humus clarifier, sludge storage lagoons and maturation ponds. The final effluent pump station is above flood level, however it will be surrounded by floodwaters and will not be accessible in the event of a flood.
- The inlet structures (i.e. screening, transfer pump station and secondary plant bypass) are hydraulically limited, which prevents all storm water collected in the sewerage catchment from being conveyed to the STW. Currently, in extreme storms, part of the K6C Thompson St Pump Station flow needs to be pumped directly to the Macleay River.
- The brick walls on the 1939 trickling filter have significantly deteriorated and require renewal. Staff access for maintenance has had to be prevented for safety reasons.
- The covers on the 1939 anaerobic digesters have significantly corroded and require replacement.
- There are a number of OH&S issues with the STW, including a number of confined spaces which require regular entry, and a lack of hand rails and ladders around key parts of the trickling filter infrastructure.

West Kempsey STW Upgrade Strategy Report

Hunter Water Australia (HWA) was engaged by Macleay Water to develop future augmentation strategies for the West Kempsey STW. A report, in August 2004, assessed a range of future augmentation strategies for both the current West Kempsey STW and a Greenfield STW at a new site.

HWA, through hydraulic, process and condition assessment, identified the aforementioned deficiencies. Also future target effluent concentration limits for compliance with the EPA concentration and load-based limits were established based on the report planning horizon (i.e. 2023). This was used as a basis to develop upgrade strategies which were assessed based on the whole of life cost of each strategy (i.e. assessment of capital, operations and maintenance costs) and non-cost factors.

Upgrade Strategies Assessed

HWA assessed 12 STW upgrade strategies, which fell into the following two categories:

- Retain the existing STW and significantly upgrade it to meet the EPA effluent quality requirements and resolve odour, hydraulic, flood, asset and OH&S issues.
- Acquire a new site, construct a Greenfield STW and decommission and demolish the existing STW.

Construction of a new STW on the existing site was not considered feasible due to land constraints.

A preferred site had been previously identified by Council for a new STW, which includes a parcel of land to the north west of the existing STW and adjacent to the Warwick Farm Racecourse. The site is remote from existing residences and there is adequate land above the 1 in 100 flood level for a new STW.

The site is currently privately owned farming land and would need to be either purchased or resumed.

Presented in Table 1 are the estimated capital and Net Present Value (NPV) costs over 20 years. The NPV represents the whole of life costs for each strategy represented in current dollars and includes capital and long-term operations and maintenance costs. From this assessment construction of a Greenfield STW on the new site is a lower cost upgrade option.

Table 1: Comparison of Costs for Upgrade Strategies

Upgrade Strategy	Capital Cost	NPV – 20 years 7% discount rate
Existing site	\$12.4 M*	\$16.1 M*
Greenfield Site	\$9.4 M	\$13.7 M

* If flood mitigation works are not required the capital and NPV costs for the existing site are \$6.4 M and \$10.0 M respectively. It is unlikely that the EPA would accept a STW with structures, which are prone to inundation by flooding, and the higher capital cost of \$12.4 M is required to protect structures from flooding.

There are a number of non-cost factors, which are difficult to quantify in a cost assessment. These aspects are summarised in Table 2 below.

Table 2: Assessment of Non Cost Factors for the Upgrade Strategies

Upgrade Strategy	Upgrade the Existing STW	Greenfield STW
Odour	<p style="text-align: center;">?</p> <p>Significant works may be required to reduce odour to an acceptable level. There is a risk that odour may still be an issue after upgrade to the STWs proximity to a dense residential area.</p>	<p style="text-align: center;">✓</p> <p>Site is remote, new plant technology is less odorous</p>
Flood	<p style="text-align: center;">?</p> <p>Significant works are required to prevent inundation of structures.</p>	<p style="text-align: center;">✓</p> <p>Site is above 1 in 100 flood level</p>
Effluent Quality	<p style="text-align: center;">✓</p> <p>Quality limits can be achieved with the inclusion of a tertiary treatment plant installed after the existing maturation ponds</p>	<p style="text-align: center;">✓✓</p> <p>With a new STW, it is simpler to retrofit in future if EPA licence limits are tightened.</p>
Operability & OH&S	<p style="text-align: center;">?</p> <p>STW footprint is very large which makes operation difficult. Due to the design there will need to be confined space entry to some areas.</p>	<p style="text-align: center;">✓✓</p> <p>STW will have a small footprint and be highly automated. Operators' resources required to run the STW are expected to be lower than the existing STW.</p>
Visual Amenity	<p style="text-align: center;">?</p> <p>Site is close to residential areas and is very expansive.</p>	<p style="text-align: center;">✓</p> <p>Site is remote and more compact than the upgraded existing STW.</p>

There are a number of concerns with upgrading the existing STW, as outlined in Table 2, in relation to odour, flooding, operability and visual amenity.

A key consideration is odour management. Due to the close proximity of the STW to residential areas, significant expenditure will be required to minimise the odour release from various parts of the two trickling filter plants. This will involve covering key structures and treating the off gas to remove odorous compounds. Even with these odour mitigation measures it cannot be fully

certain that future odour complaints will not be received due to the close proximity of the STW to residents.

A Greenfield STW will have a significantly smaller footprint than the existing STW and will require less staff attendance. A significant benefit of a Greenfield STW is its ability to be upgraded in future to achieve tighter nutrient effluent quality limits, which is more difficult to achieve with the existing STW.

Summary

The existing STW is currently not meeting the EPA licence requirement for suspended solids and needs to be upgraded or replaced. There are also a number of other deficiencies which need to be addressed with any upgrade of the existing STW which include, the need to reduce odour emanating from the site, resolution of current hydraulic capacity limitations, parts of the STW are subject to flooding and structural and OH&S issues with a number of the assets.

It was identified that upgrading the existing STW was not preferred based on a consideration of cost and non-cost factors.

Pathway Forward

A master plan has been produced jointly by Macleay Water and HWA to procure the Greenfield STW and will include the following tasks:

1. Enter discussions with the land owner to acquire the site
2. Finalise the treatment process option selection for new STW
3. Complete a conceptual design of the preferred process option
4. Undertake the necessary environmental assessment for a new STW and the decommissioning and remediation of the existing site.
5. Complete detailed design of the new STW including a strategy to decommission and demolish the old STW. This will include the preparation of contract documentation.
6. Seek expressions of interest from contractor to construct the new STW
7. Release tender documents to short listed contractors & award tender
8. Construction project management
9. Commissioning

REPORT IMPLICATIONS:

▪ *Environmental*

Establishment of a new sewage treatment facility will provide a far higher degree of treatment of sewage in line with modern day expectations for discharge to the environment. The effluent quality will also be suitable for all types of reuse including use for domestic dual reticulation and public amenities. This would also reduce the volumes discharged to the environment. Odours will also be significantly reduced with the new technology.

▪ *Social*

The sewerage treatment facility would be located at a site, which would offer buffer zones to reduce the impacts of any noise or odour emissions from the plant.

▪ *Economic (Financial)*

Establishing a new plant on a Greenfield site offers the most cost effective solution in the long term whilst best addressing all ecological sustainability factors.

The 2005/06 Sewerage Fund budget has an allocation of \$400,000 to commence the project, including purchase of land, complete the conceptual design and carry out environmental assessments.

▪ *Policy or Statutory*

Establishing a new plant on a Greenfield site offers the solution most likely acceptable to the EPA.

▪ *Director's Review*

The recommended option provides the best solution for the Kempsey community and is endorsed by the findings of the recently completed IWCM Strategy. Council is urged to adopt the recommendation.

RECOMMENDATION:

1. That the concept of the design and construction of a Greenfield STW at the nominated new site and the decommissioning and demolition of the existing West Kempsey STW be approved.
2. That the above master plan for implementation of the project be adopted.
3. That the commencement of Items 1 to 4 of the above master plan be approved.

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DIRECTOR SHIRE SERVICES
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