



FINAL REPORT

REVIEW OF ADDITIONAL EAST LAKE – FYSHWICK STP ODOUR STUDY REPORTS

Lolita No 1 And Lolita No 2 Pty Ltd C/- Molonglo Group

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EXECUTIVE SUMMARY

Molonglo Group owns a site (hereafter "the Molonglo site") of more than 14 hectares in Fyshwick, ACT. The Molonglo Group has proposed to redevelop the Molonglo site as a highly sustainable eco village ('Fyshwick Eco Village') comprising approximately 200,000 m² of residential, community, commercial and retail activities.

This report follows on from the previous PAEHolmes Report ("Review of East Lake – Fyshwick STP Odour Study Reports Revision 1", job reference 6791 dated 19 April 2012). As requested by Molonglo Group, this report includes a review of the following documents, recently provided by ACTEW:

- ACTEW (2007) Proposed Methodology for Impact Assessment of Nuisance Odours in the ACT ("the ACTEW Odour Assessment Guidelines")
- CSS TEAM (2012) ACTEW Response To PAEHolmes Report On Fyshwick Odour Study
- Consulting Environmental Engineers (2012) Report on Clearance Zone for Fyshwick Sewage Treatment Plant ("the Fyshwick STP Clearance Zone Report").
- CSS Team (2012) Memo – FSTP Clearance Zone. G11/2078/1

Based on our review, we have made the following observations and conclusions:

- The ACTEW Odour Assessment Guidelines define the Molonglo site as a sensitive receptor and therefore it should be treated as such.
- ACTEW propose to increase the use of the maturation ponds at the Fyshwick Sewage Treatment Plant (STP) as facultative treatment and wet weather storage.
- Such a change in frequency / use will likely lead to odour emissions (and off-site impacts) higher than what is currently occurring.
- ACTEW have indicated that the use of the maturation ponds as facultative and wet weather storage will not have worse impacts than now, however this is yet to be demonstrated. Therefore the proposed changes may lead to higher impacts on the Molonglo Group site compared with the status quo.
- The higher emissions could lead to a situation where complaints may be lodged by the existing users of the Molonglo site.
- The buffer proposed by ACTEW may be insufficient for the proposed uses at the Fyshwick STP and may restrict the East Lake Development.
- If the use of the ponds continues as is, the buffer required may be less than that proposed by ACTEW.
- Although new modelling has been performed there are still potential issues with the modelling assessment used to define the buffers. Most noticeably the use of the facultative and wet weather storage ponds has not been modelled with realistic emission rate data. The significance of this is currently unknown.

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1 INTRODUCTION

Molonglo Group owns a site (hereafter, “the Molonglo site”) of more than 14 hectares in Fyshwick, a commercial and light industry suburb to the east of the South Canberra district. The site is of strategic importance - it is adjacent to the Central National Area, is 10 minutes by car from the City Centre, and is 5 minutes by car from the Airport - and has an outlook over the internationally significant Jerrabomberra Wetlands.

The Molonglo site is separated from the main Fyshwick industrial area by the grade separated Monaro Highway, which provides accessibility to the Molonglo site.

This report follows on from the previous PAEHolmes Report (“Review of East Lake – Fyshwick STP Odour Study Reports Revision 1”, job reference 6791 dated 19 April 2012). As requested by Molonglo Group, this report includes a review of the following key documents, recently provided by ACTEW:

- ACTEW (2007) Proposed Methodology for Impact Assessment of Nuisance Odours in the ACT
- CSS TEAM (2012) ACTEW Response To PAEHolmes Report On Fyshwick Odour Study
- Consulting Environmental Engineers (2012) Report on Clearance Zone for Fyshwick Sewage Treatment Plant (hereafter, “the Fyshwick STP Clearance Zone Report”).

An additional document was also reviewed:

- CSS Team (2012) Memo – FSTP Clearance Zone. G11/2078/1

Explicit comments on this latter document are not provided, since this document essentially is a synthesis of the previous three documents.

1.1 Scope

Molonglo Group has requested that this report identify the following:

- Errors or omissions in the above documents and underlying assumptions with particular regard to the guidelines and methodology adopted and their interpretation and application of relevant industry standards;
- Potential risks to both Molonglo Group’s existing operations and future intentions at Fyshwick; and
- Advice on the prudent steps to be taken to protect the Molonglo group’s existing and future interests in our Fyshwick assets.

2 DOCUMENT REVIEW

Our review of the recently supplied documents is below.

2.1 Proposed Methodology for Impact Assessment of Nuisance Odours in the ACT

The proposed methodology is a draft document as published in 2007 and consists of three sections, Part A – Odour Criteria, Part B – Computer Modelling of Odours and Part C – Application of Odour model predictions.

The Fyshwick STP Clearance Zone Report, produced by ACTEW’s odour consultant, states:

The odour criteria for the assessment of odorous sources are outlined in the document titled “Proposed Methodology for Impact Assessment of Nuisance Odours in the ACT” (ACTEW 2007), now known as the “ACTEW Odour Assessment Guidelines”.

On this basis, the above document is hereafter referred to as the ACTEW Odour Assessment Guidelines in this document.

Of significant relevance to the current scope, the document defines a sensitive receptor as:

The odour criteria listed above apply at sensitive receptors. A sensitive receptor is a residence, office, shop, restaurant or community building that is normally occupied. Where premises are not permanently occupied, a higher odour concentration may be allowed during periods with a reduced level of occupation.

The above definition is consistent with those used in other states. Based on the above, under the ACTEW Odour Assessment Guidelines, the Molonglo site should be classed as a sensitive receptor.

The odour criteria proposed in the ACTEW Odour Assessment Guidelines are shown in **Table 2.1** for the 99.9th percentile, 3 minute averaging time.

Table 2.1: Proposed ACT Criteria

Number of People	Criteria (ou)
High density	2
300 or more	3
50 or more	5
10 or more	6
Less than 10	7

Discussions with ACTEW and their consultant (Ian Wallis of Consulting Environmental Engineers) indicated that the ACT EPA are proposing that odour guidelines for the ACT (prepared by Ian Wallis of Consulting Environmental Engineers) will be produced, mirroring those adopted by the South Australian EPA. Further, it was suggested that in the interim, ACT EPA advice was that assessments defer to this document.

The South Australian Criteria (SAEPA, 2007) is summarised in **Table 2.2**.

Table 2.2: South Australian Criteria

Number of People	Criteria (ou)
2000 or more	2
350 or more	4
60 or more	6
12 or more	8
Less than 12	10

It is important to note that the odour criteria presented in the ACTEW Odour Assessment Guidelines are more stringent than the South Australian criteria with the exception of the high density criteria.

The odour criteria shown in **Table 2.1** (ACTEW) and **Table 2.2** (South Australia) are on the more stringent end of odour criteria used in Australia. Experience in Victoria and information provided to PAEHolmes has shown that the use of stringent odour criteria $C_{99.9, 3min} = 1-2$ odour

units (as used in Victoria) can result in unrealistically large odour buffers based on modelling. This has been confirmed at VCAT hearings where comment has been made on the excessive requirements even at $C_{99.9, 3\text{min}} = 5\text{ou}^{\text{a}}$.

With regard to the modelling methodology listed in the document, whilst this has not been updated since 2007, it is generally representative of current practice with the exception that modelling using AUSPLUME for odour studies is now typically performed using second-generation atmospheric dispersion models such as CALPUFF.

The ACTEW Odour Assessment Guidelines make some discussion on the use of Separation Distances (or Buffer Zones). Of relevance to the current review, the document notes that:

The buffer distance around major facilities, such as wastewater treatment plants or high strength emission sources, needs to be calculated on a case by-case basis.

The implication therefore is that default buffer distances are not suitable for such sources, and that buffer distances should be established using predictive techniques such as atmospheric dispersion modelling.

Finally, the ACTEW Odour Assessment Guidelines contain discussion on provisions for encroachment, notably:

Where developers or planners rezone or change land use inside the buffer zone, then it is their responsibility to recognise the need for, and contribute to, the implementation of additional odour treatment or other odour control technology that will allow the odour guidelines set out in this report to be achieved with a smaller buffer zone.

It is PAEHolmes understanding that Molonglo Group would be willing to discuss such an option with ACTEW, on any reasonable basis.

2.2 ACTEW Response to PAEHolmes Report On Fyshwick Odour Study

The ACTEW memo is dated on 25 May 2012 and looks at the Planning Context for the site as well as responds to issues identified in the PAEHolmes report including odour emission rate estimates, maturation pond odour, meteorological file issues, selection of model, odour standards, odours from within the Molonglo site and buffer zones.

2.2.1 Emissions

The PAEHolmes review focussed on work performed by CH2M-Hill consultants and concluded that the sampling campaign did not focus on normal operations, but was performed during atypical operations.

In response to this ACTEW concluded:

Finally, PAEH have made no allowance for the increase in odour emissions from the STP as flows and loads on the plant increase over the next decade.

And:

^a <http://www.austlii.edu.au/au/cases/vic/VCAT/2009/1637.html>

Based on extensive measurements of odour variability over time at various points in the Canberra sewerage system, ACTEW considers that measurements of odour emission rates are variable subject to a range of uncertainty. While it is interesting to speculate on the implications if odour emission rates are lower, it is also prudent to consider the implications for the times when odour emission rates are higher.

With regard to this, it is important to note that Section 2.3.2 of the CH2M-Hill Odour Mitigation Report notes:

The only odorous facilities at Fyshwick STP likely to be affected by increased flows are the inlet works and PST weirs. Due to the presence of an OCS at the inlet works, the emitted odour is not expected to change at this source. The emissions from the PSTs were evaluated for the various expected flows to determine the change to their specific odour emission rate (SOER)...The effect of the increased odour emissions from this source was negligible on the total plant odour impact at the 2ou impact level. Based on those results, the odour potential of the plant is not expected to be altered significantly due to increased plant flows in the future.

This appears to be a direct contradiction with comments made within this memorandum (and reinforced during a meeting between Molonglo Group, PAEHolmes, ACTEW and ACTEW's odour consultant held on 15 October 2012).

2.2.2 Maturation Ponds

At the time the PAEHolmes report was prepared, the information available to us indicated that the maturation ponds were used to hold treated effluent. During the abovementioned meeting with ACTEW (15 October 2012), information came to light which indicated that the maturation ponds to the north can be used for holding untreated effluent during wet weather. The relevance of this will be discussed below in **Section 2.3** with regard to the buffers required for the site.

Information in the memo indicates that the lagoons are actually facultative ponds, with high organic loading rates during typical operation.

This is somewhat inconsistent with a visit to the area by PAEHolmes staff on 15 October 2012, and the observations of CH2M-Hill during the testing phase (in the CH2M-Hill reports, there is no mention of facultative ponds).

Further, it is noted that odour inventory documented in Table 1 of the Fyshwick STP Clearance Zone Report makes no mention of facultative ponds, and instead refers to Maturation Ponds (using values consistent with CH2M-Hill's work).

A key factor with regard to emissions from the site is that it is planned that the northern ponds be used more often for wet weather storage. Wet weather storage involves bypassing treatment facilities, and discharging effluent directly into these ponds.

Adopting such a strategy has not been assessed quantitatively in any of the odour impact assessment work conducted to date (i.e. neither in the original CH2M-Hill report nor the Fyshwick STP Clearance Zone Report).

However, in the ACTEW memo, mention is made with regard to mitigating the ponds as to "not worse than a facultative lagoon". It is unclear as to how this will occur beyond aeration of the lagoons.

Such more frequent use is likely to significantly increase the emissions from the site, and would result in significantly larger odour footprint than shown in the Fyshwick STP Clearance Zone Report.

It is anticipated that such a proposal (to discharge untreated effluent directly to the northern ponds) would exceed the relevant odour criteria documented in **Table 2.1** and **Table 2.2** at the Molonglo site.

While this would necessarily require confirmation using accurate atmospheric dispersion modelling, if this is the case it is unclear how ACTEW would address these impacts at what is described within the ACTEW Odour Guidelines as a sensitive receptor.

Any such plant augmentation or change of use would typically require a comprehensive odour impact assessment which quantifies both existing and future impacts associated with the site. This has not yet been completed to a suitable standard.

ACTEW states that the maturation ponds are actually facultative, and the northern most ponds are likely to be used for wet weather storage in the future. It is our understanding that to date this management method has not necessarily occurred, and on this basis, the lack of odour complaints attributed to the Fyshwick STP is expected.

Based on this information (i.e. the use of maturation ponds to hold untreated effluent for extended periods or the ponds are actually facultative) ACTEW are correct in that the buffer could not be reduced for a modest cost as the emissions, compared to the current case, would increase significantly. This may lead to complaints in the future from existing land uses due to the increase in emissions.

Relevant buffer guidelines such as the Victorian AQ2/86 document (EPA Victoria, 1990) and the *DRAFT Guideline for Environment Management: Recommended separation distances for industrial residual air emissions* (EPA Victoria, 2012) list buffers to facultative ponds of 1,400m for a site with a treatment capacity of less than 20,000 EP and 2,200m for a plant with a treatment capacity above 20,000 EP but less than 50,000 EP. A buffer of 1,400 metres would extend well into existing residential areas, including the majority of the East Lakes development.

It is unclear why ACTEW have selected a buffer that allows the East Lake development (but not the Molonglo site) to become residential, without any modelling of facultative pond impacts or effluent storage impacts to support this.

2.2.3 Anomalies in the meteorological File

In the ACTEW memo, it was agreed that the meteorological file adopted by CH2M-Hill for odour modelling had abnormalities and a second file was prepared. The file appears to have been modified so that no values are below 0.5 m/s with approximately 5% of flows in a year below 1 m/s. In these ranges it is anticipated that the AUSPLUME dispersion model would likely over-predict impacts, particularly if a percentile such as the 99.9th (8th highest value in a year) is used to evaluate impacts. This is discussed further in **Section 2.3**.

2.2.4 Model Selection

In the PAEHolmes report, we provided comment with regard to the use of AUSPLUME at the site. In response to this the ACTEW memo suggests that a) AUSPLUME would apply well in the flat and open terrain such as Fyshwick and b) the odour criteria would need to be modified if another model was used.

With regard to the use of AUSPLUME, it is well known (and documented) that AUSPLUME is not suited to odour studies as the critical low wind speed events, and the influences of terrain are not incorporated in the model.

Firstly, AUSPLUME is based on the Gaussian plume equation. Using this equation, concentration is inversely proportional to wind speed. The validity of this assumption is limited where wind speeds are less than 1 m/s.

Secondly, the influence of terrain is critical with regard to odour impacts, particularly under night-time, low wind speed events, where katabatic drift occurs. AUSPLUME assumes steady state meteorology, which means that plumes from the Fyshwick STP would travel through the terrain in the area under light wind conditions. Given the undulation in the near-field topography, it is anticipated that night-time 'pooling' of odour (simulated by more advanced dispersion models) may likely reduce predicted off-site odour impacts. Further information on the limitations of AUSPLUME can be found in NZMfE (2004).

The second point made in the report was that if another model was used, the odour criteria would need to be revised. This is not the case. The CALPUFF modelling suite is used in all states and territories of Australia for odour impact assessment, without amending the odour criteria. Examples include Queensland (Queensland Government, 2004), New South Wales (NSW OEH, 2011) and South Australia (SAEPA, 2007).

2.2.5 Odour Standards are too Stringent

The ACTEW memo states that the criteria used by ACTEW are exactly the same as the SA Criteria. As shown in **Table 2.2** this is not the case.

Moreover, the ACTEW memo does not acknowledge that in Victoria, due to the restrictive nature of the odour criteria, which uses $C_{99.9\ 3\min} = 1$ ou, a new method has been proposed whereby $C_{99.9\ 3\min} = 1$ to 4 ou is defined as "low risk".

2.3 Report on Clearance Zone for Fyshwick Sewage Treatment Plant

The Fyshwick STP Clearance Zone Report was prepared by Consulting Environmental Engineers (CEE) and was dated 2012.

2.3.1 Background

The Fyshwick STP Clearance Zone Report provides a background to the operation of the Fyshwick STP and details recent improvements to the site. The population in the plants catchment was 17,500 in 2011 and is expected to increase to 29,400 persons in 2056.

The stated purpose of the Fyshwick STP Clearance Zone Report was to identify the odour footprint of the Fyshwick STP and to provide information for defining a Clearance Zone around the plant to avoid odour nuisance occurring in adjacent land. The report builds on work previously performed by CH2M-Hill (and subsequently reviewed by PAEHolmes).

2.3.2 Emissions

The emissions used in the assessment were based on the CH2M-Hill (2011) report as part of the East Lake – Fyshwick Odour Study – Odour Investigations Report. However, in contrast to the previous study, allowances have been made to account for increased flows, additional odour control and construction of new treatment units for the proposed advanced technology

treatment plant. The primary difference is that the emissions from the original CH2M-Hill report have been reduced as odour control has been placed on the flow splitter, which was established by CH2M-Hill as being responsible for 25% of the plant odour emissions.

Table 1 in the report summarises the emission data used. Emission rate data has been listed for the maturation ponds and wet weather storage lagoon. Notably, this latter source appears to have an odour emission rate one hundred fold lower than the former.

As noted above, it is not anticipated that these sources have been simulated as facultative ponds, and it is not clear why this is not the case, given their proposed use in this mode.

Insufficient information is provided to understand the (at first inspection arbitrary) odour emission rates awarded in Table 1 of the Fyshwick STP Clearance Zone Report. For example, it is not clear why a new plant, constructed 20 years from now, would have a larger odour emission inventory than the current plant (with CEE proposed odour controls). It is assumed that this is because of assumptions surrounding increased flows, which is inconsistent with conclusions made by CH2M-Hill, as reproduced in **Section 2.2.1**.

2.3.3 Meteorology

Recognising flaws in the CH2M-Hill meteorological file, CEE prepared an AUSPLUME format file for a three year period (April 2006 to February 2009) based on data collected at the Canberra Airport.

The wind roses shown in the CEE report are generally consistent with long term patterns as summarised on the Bureau of Meteorology website for the Canberra Airport.

A summary of relevant factors such as mixing height and wind speed profiles was not included. However, based on the wind roses, the lowest wind speed in the meteorological file was 0.5 m/s meaning that the dataset has been adjusted to this. This is common practice; however, as the wind rose range is 0.5-1 m/s for the lowest range, it is not clear to what extent the values have been adjusted.

2.3.4 Modelling

As with the CH2M-Hill Report, AUSPLUME was setup and run for the site and the data processed at the 99.9th percentile for a 3 minute averaging period. Details such as surface roughness and dispersion curves used have not been detailed.

There seems to be an inconsistency with regard to the modelling performed. Section 4.3 states that the 99.9th percentile is 8 hours per year at each location. As the meteorological file (detailed in Section 4.2 of the CEE report) covers 26,280 hours, the 99.9th percentile should actually be the 26th highest value. In simple terms, the predicted concentrations may indicate higher impact than what should have been reported.

2.3.5 Model outputs

The modelling shown in Figures 8 to 11 showed four different scenarios. In summary:

- Figure 8- Existing FSTP – $C_{99.9, 3\text{min}} = 2$ ou contour covers whole of Molonglo site. $C_{99.9, 3\text{min}} = 3$ ou contour covers approximately 1/3 of the site.
- Figure 9- Existing, Day time only – $C_{99.9, 3\text{min}} = 2$ ou contour does not touch Molonglo site.

- Figure 10- Predicted for Existing – With Odour Control – Impacts similar to Figure 8, however less impact to the North West (wetlands).
- Figure 11- Predicted with Advanced Treatment Plant - $C_{99.9, 3\text{min}} = 2$ ou contour covers whole of Molonglo site. $C_{99.9, 3\text{min}} = 3$ ou contour covers approximately 1/3 of the site.

As noted above, the scenarios above are unlikely to reflect operations where the maturation ponds are operated as facultative ponds, or where the ponds are operated as wet weather storage ponds.

If, as suggested, the ACT EPA wish to adopt South Australian odour criteria, it is suggested that performance against these criteria (as opposed to the ACTEW Odour Guidelines) should be explicitly shown in any modelling.

2.3.6 Proposed Clearance Zone

Based on the modelling described above, proposed buffers were detailed in Figure 13 of the CEE report. This figure is reproduced below in Figure 2-1.

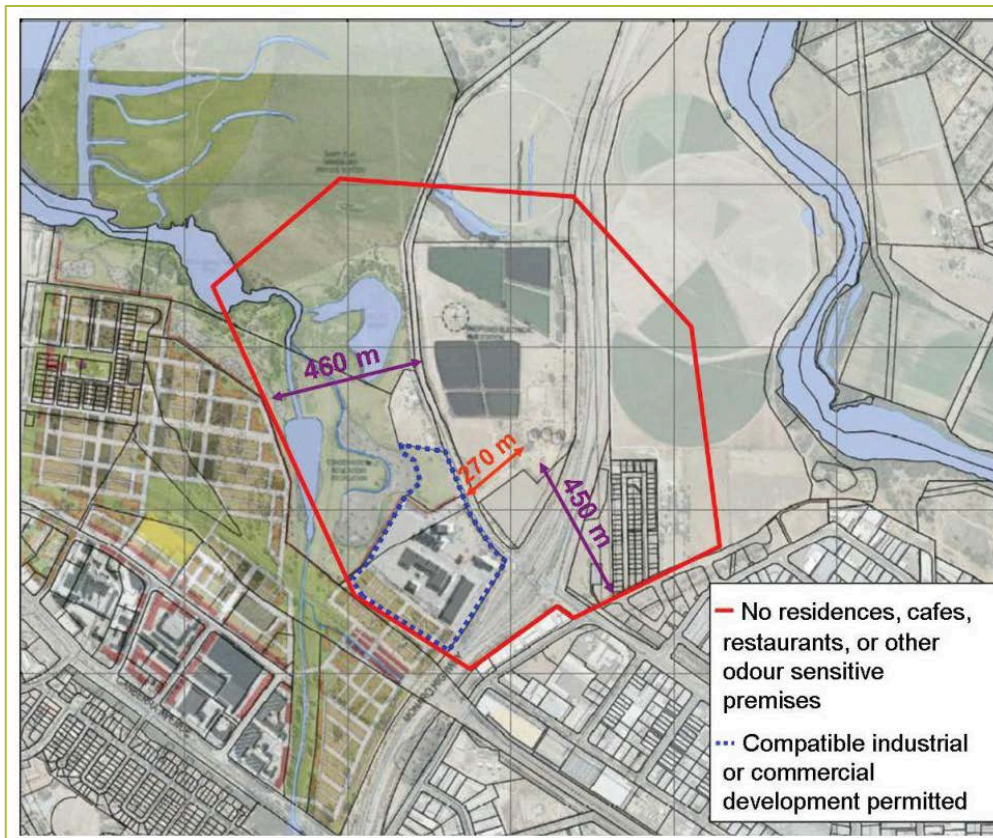


Figure 2-1: Proposed Buffers within the CEE Report

These buffers shown in **Figure 2-1** appear to have been based on the model outputs assuming lagoons used as maturation ponds, and not facultative ponds, as discussed above. It is concluded that insufficient detail is provided to support the creation of such a buffer.

3 POTENTIAL RISKS TO EXISTING AND FUTURE OPERATIONS

The use of the Fyshwick STP lagoons as facultative ponds does not appear to have been evaluated quantitatively in any modelling to date.

This presents the following key risk to the existing operations at the Molonglo site:

- Any storage of raw effluent in the northern lagoons is anticipated to significantly increase both odour emissions and off-site impacts.

Given that the current ACTEW proposal would seem to imply unacceptable impacts at the existing sensitive receptor, there is clearly a significant risk that this would jeopardise existing uses as well as future development at the site.

4 PROTECTION OF EXISTING AND FUTURE INTERESTS

It is recommended that the Molonglo Group engage ACTEW to provide a clear and unambiguous statement as to any proposed changes to activities at the Fyshwick STP that may affect existing amenity at the Molonglo site. This would entail transparent and site-specific odour dispersion modelling which has not been adequately provided to date.

Based on the information at hand, we understand that there have been no complaints attributed to the Fyshwick STP since prior to the purchase by the Molonglo Group therefore an accurate study is critical.

Only with further information can Molonglo Group evaluate the impact on its existing and future interests.

It is anticipated that with accurate modelling, Molonglo Group will have the necessary information to establish whether, consistent with the ACTEW Odour Guidelines, odour controls can be negotiated to reduce the area of predicted odour impact around the Fyshwick STP. Such a negotiation may thus allow for residential development.

In the event that ACTEW intend to render the Molonglo site's existing use (including cafeteria and office space) invalid, the options available to the Molonglo group may include ACTEW being approached to purchase or otherwise compensate Molonglo Group for the increase in emissions.

5 CONCLUSION

PAEHolmes have reviewed recently published relevant information with regard to the Fyshwick STP. This has included modelling methodology, emissions profiles, and the use of buffers around the Fyshwick STP.

The key outcome of the review is that the modelling and assessment performed by CH2M-Hill (and subsequently by CEE) is inconsistent with ACTEW's intention that:

- The maturation ponds will in reality be run as:
 - On the southern side of the site – facultative ponds not maturation ponds
 - On the northern side of the site – wet weather storage ponds (i.e. hold raw sewage during high rainfall events).

Further, it is proposed to increase the inflow in the future by approximately 40%. Contrary to work completed by CH2M-Hill on behalf of ACTEW, ACTEW are currently of the opinion that this will result in an (effectively linear) increase in odour emissions.

This discrepancy means that the modelling in the CH2M-Hill report is likely to be inconsistent with future operations at the site and the conclusions drawn with regard to the East Lake development may be incorrect. Moreover, the more recent modelling by CEE may also be inconsistent with the future operations at the site.

It is suggested that Molonglo Group engage ACTEW to provide a clear and unambiguous statement as to any proposed changes to activities at the Fyshwick STP that may affect existing amenity at the Molonglo site. This would entail transparent and site-specific odour dispersion modelling which has not been adequately provided to date.

6 REFERENCES

ACTEW (2007) Proposed Methodology for Impact Assessment of Nuisance Odours in the ACT

CSS TEAM (2012) ACTEW Response To PAEHolmes Report On Fyshwick Odour Study

Consulting Environmental Engineers (2012) Report on Clearance Zone for Fyshwick Sewage Treatment Plant (hereafter, "the Fyshwick STP Clearance Zone Report").

An additional document was also reviewed:

CSS Team (2012) Memo – FSTP Clearance Zone. G11/2078/1

CH2M-Hill, 2011a

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