Appendix F
Air Quality Report

AIR QUALITY MODELLING REPORT
JACKS GULLY ALTERNATIVE WASTE TECHNOLOGY FACILITY

March 2006

Prepared for
GHD Pty Ltd

by

Holmes Air Sciences
Suite 2B, 14 Glen St
Eastwood NSW 2122
Phone : (02) 9874 8644
Fax : (02) 9874 8904
Email : has@holmair.com.au

CONTENTS

1. INTRODUCTION 1
2. BACKGROUND TO THE STUDY 1
3. ESTIMATE OF AIR EMISSIONS 1
 3.1 Odour 1
 3.2 Oxides of nitrogen 3
4. AIR QUALITY GOALS 4
 4.1 Odour 4
 4.2 Oxides of nitrogen 6
5. EXISTING AIR QUALITY 6
 5.1 Odour 6
 5.2 Oxides of nitrogen 6
6. APPROACH TO ASSESSMENT 8
7. RESULTS AND DISCUSSIONS 9
 7.1 Odour impacts 9
 7.2 Oxides of nitrogen impacts 9
8. SUMMARY OF CONCLUSIONS 10
9. REFERENCES 10

TABLES

Table 1 - Odour Control Options - Odour Emissions (ou.m^3/s) 1

Table 2 - Emissions data as used by the model 3

Table 3 - Emissions data assumed for two 1 MW units 3

Table 4 - Odour performance criteria for the assessment of odour 5

Table 5 – Air quality goals for nitrogen dioxide 6

Table 6 – Annual monitoring data from the DEC's Camden monitoring station 7

Table 7 – Annual monitoring data from the DEC's Campbelltown monitoring station 8

Table 8 – Monthly monitoring data from the DEC's Macarthur monitoring station 8

FIGURES

Figure 1 Monthly maximum 1-hour concentrations of O_3 at the Camden monitoring station

Figure 2 Monthly maximum and average 1-hour concentrations of NO_2 at the Camden monitoring station

Figure 3 Monthly maximum 1-hour concentrations of O_3 Campbelltown monitoring station

Figure 4 Monthly maximum 1-hour concentrations of NO_2 at Campbelltown monitoring station

Figure 5 Predicted 99th percentile odour due to AWT facility (ou)

Figure 6 Predicted 99th percentile odour levels due to AWT facility and active tipping face (ou)

Figure 7 Predicted maximum 1-hour average NOx level from existing and proposed power generation units (micrograms per cubic metre)

Figure 8 Predicted annual average NOx level from existing and proposed power generation units (micrograms per cubic metre)

1. INTRODUCTION

This report has been prepared by Holmes Air Sciences for GHD who are acting on behalf of WSN Environmental Solutions. The report presents the results of a modelling study undertaken to assess the air quality impacts of the proposed Alternative Waste Technology Facility (AWT facility) to be located at Jacks Gully Waste and Recycling Centre. The report comprises details of the modelling undertaken and a comparison of the predicted impacts with the relevant air quality goals.

2. BACKGROUND TO THE STUDY

GHD have prepared an air quality assessment of the Jacks Gully AWT facility. As part of this assessment, Holmes Air Sciences has undertaken dispersion modelling of emissions of odour and oxides of nitrogen from the proposed operation. The results of this modelling are presented in full in this report and summarised in the GHD report.

Modelling was undertaken in accordance with The Department of Environment and Conservation (DEC formerly NSW EPA) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (**NSW DEC, 2005**) using CALPUFF and a wind field prepared by GHD using CALMET. Further details of the project are contained within the overall Environmental Assessment for the AWT facility.

3. ESTIMATE OF AIR EMISSIONS

The proposed AWT facility will process approximately 90,000 tonnes per annum of mixed municipal solid waste (MSW) and up to 30,000 tonnes per annum of green waste and biosolids. The MSW plant will employ a variety of material separation technologies, mechanical biological treatment processes and biological processes, to produce biogas for electricity production. The green waste plant will use tunnel-composting technology to produce high-grade compost. Once operational this facility will largely replace the existing landfilling operation and only residual non-putrescible waste will be landfilled.

The air emissions assessed in this report are odour from some of the existing sources on-site which will remain once the AWT is operational, and the AWT sources and green waste processing. Also assessed are oxides of nitrogen from the existing landfill gas and proposed biogas engines used for electricity generation on-site.

3.1 Odour

Table 1 summarises the odour sources emission rate and comments on the source of the data.

Table 1 - Odour Control Options - Odour Emissions (ou.m^3/s)

Odour Source	Emission Rate (ou.m^3/m^2.s)	Source / Comments	Total Emissions (ou.m^3/s)
Existing Sources			
Temporary Leachate Pond (Existing)	0.054	Jacks Gully WRC, Odour Audit, July 2001 – Average (URS 2004)	162
Leachate Pond 1 (Existing)	0.108	Jacks Gully WRC, Odour Audit,	73

		July 2001 – Average	
Leachate Pond 2 (Existing)	0.108	Jacks Gully WRC, Odour Audit, July 2001 – Average	52
AWT facility Sources			
AWTF Receival Hall		Under negative pressure and emissions controlled through biofilter	
Treatment / Processing Building ▪ Receival hall ▪ Low Clarifier ▪ High clarifier Biofilter	150 ou (concentration) Airflow 0.59 m^3/s	Under negative pressure and emissions controlled through biofilter Area of biofilter 60 m^2	88.5
External (to building) Sources ▪ Solids filter press ▪ Storage Bins	0.4 0.4	Based on GHD emission factors for sludge thickener at an STP Based on GHD emission factors for biosolids stockpiles (maximum figure adopted) at STP	18 5
Green waste Processing Sources			
Green waste Delivery Bays	0.1 (0.2 worst case)	ERM Report (ERM, 1997)	97.2
Green waste pre-treatment (conveyors, shredding)	0.1 (0.2 worst case)	ERM Report	9.4
Biosolids Delivery (biosolids pit enclosed)	0.043	Based on GHD emission factors for biosolids stockpiles at Cronulla STP	0.5
Product Storage	0.018 (0.036 worst case)	ERM Report (Adopted figure is based on "compost refinement" so is actually a conservative estimate as for Jacks Gully the product will be fully stabilised).	5.8
Biofilter[1]	150 ou (concentration) Airflow 8.2 m^3/s	Biofilter technology supplier Area of biofilter 440 m^2	1230
TOTAL			1748

The following controls are in place on the AWT Receival Hall and Treatment Building and the greenwaste processing sources. The AWT Receival Hall and Treatment Processing Building will be under negative pressure and the air emissions vented through a purpose-built biofilter of 60 m^2 diameter with an airflow rate of 0.59 m^3/s. It has been assumed for the purposes of this assessment that the concentration of odour in the air from the biofilter is 150 ou. The biofilter associated with the green waste processing has an area of 440 m^2 with an airflow of 8.2 m^3/s. It has been assumed that the odour concentration in the outlet air from the biofilter is also 150 ou.

Post 2007, once the AWT facility is operational, there will be the potential for an active tipping face for non-putrescible waste on the site. It has been assumed that this would occupy an area of 200 m^2 and an odour emission rate of 5 ou.m^3/m^2/s has been conservatively assumed. This odour emission rate is similar to fresh putrescible waste **(Holmes Air Sciences, 2003**).

3.2 Oxides of nitrogen

The emission conditions from the existing landfill gas power generation plant are summarised in **Table 2**. These have previously been assessed (**Holmes Air Sciences, 1998**) and are included in to provide a cumulate assessment with the proposed biogas generators.

Table 2 - Emissions data as used by the model

Number of exhaust stacks	1
Location (MGA)	291722 (E), 6227440 (N)
Base elevation (m)	113
Stack tip diameter (m)	0.35
Stack height (m)	10
Exit velocity (m/s)	35
Exit temperature (K)	755
Emissions rate per stack (g/s) NOx	0.75

It is proposed that the biogas generated by the proposed AWT facility will be used to fuel a 2 MW power generating facility. The emissions from a similar generator have been assessed at Eastern Creek (**Holmes Air Sciences, 2005**). The assumed emissions from two such units each of 1 MW capacity are summarised in **Table 3**.

Table 3 - Emissions data assumed for two 1 MW units

Unit number	Easting (MGA m)	Northing (MGA, m)	Height (m)	Diameter (m)	Base elevation (m)
1	292030	6227121	7	0.36	105
2	292030	6227129	7	0.36	105
Emission characteristics of each unit					
Emission temperature (deg K)				755	
Emission velocity (m/s)				35	
NOx emissions (g/s)				0.58	

4. AIR QUALITY GOALS

This section discusses the air quality goals that have been applied to this project.

4.1 Odour

Odour is measured using panels of people who are presented with samples of odorous gas diluted with decreasing quantities of clean odour-free air. The panellists then note when the smell becomes detectable. Odour in the air is then quantified in terms of odour units which is the number of dilutions required to bring the odour to a level at which 50% of the panellists can just detect the odour, defined as one odour unit. This process is known as olfactometry.

The determination of air quality goals for odour and their use in the assessment of odour impacts is recognised as a difficult topic in air pollution science. The topic has received considerable attention in the past five years and the procedures for assessing odour impacts have been refined considerably.

Odour impacts are determined by several factors, the most important of which are:

- the **F**requency of the exposure
- the **I**ntensity of the odour
- the **D**uration of the odour episodes
- the **O**ffensiveness of the odour and
- the **L**ocation of the source (the so-called FIDOL factor)

In determining the offensiveness of an odour it needs to be recognised that for most odours the context in which an odour is perceived is also relevant. Some odours, for example the smell of sewage, hydrogen sulphide, butyric acid, landfill gas etc., are likely to be judged offensive regardless of the context in which they occur. Other odours such as the smell of jet fuel may be acceptable at an airport, but not in a house, and diesel exhaust may be acceptable near a busy road, but not in a restaurant.

Whether or not an individual considers an odour to be a nuisance will depend on the FIDOL factors outlined above and although it is possible to derive formulae for assessing odour annoyance in a community, the response of any individual to an odour is still unpredictable. Odour goals need to take account of these factors.

The NSW DEC have developed a Draft Odour Policy (**NSW EPA, 2001**) which includes some recommendations for odour criteria. They have been refined by the DEC to take account of population density in the area. **Table 4** lists the odour certainty[1] thresholds, to be exceeded not more than 1% of the time, for different population densities.

---

[1] In the process of odour measurement, the odour certainty threshold is, by definition, the minimum concentration at which the panellist is <u>certain</u> they can detect the odour.

Table 4 - Odour performance criteria for the assessment of odour

Population of affected community	Odour performance criteria (nose response odour certainty units at the 99^{th} percentile)
Single residence (≤ ~2)	7
~10	6
~ 30	5
~ 125	4
~ 500	3
Urban (~ 2000)	2

The difference between odour goals is based on considerations of risk of odour impact rather than differences in odour acceptability between urban and rural areas. For a given odour level there will be a wide range of responses in the population exposed to the odour. In a densely populated area there will therefore be a greater risk that some individuals within the community will find the odour unacceptable than in a sparsely populated area. The goals assume that 7 odour units at the 99^{th} percentile would be acceptable to the average person, but as the number of exposed people increases there is a chance that sensitive individuals would be exposed. The goal of 2 odour units at the 99^{th} percentile is considered to be acceptable for the whole population.

The difference between odour goals is based on considerations of risk of odour impact rather than differences in odour acceptability between urban and rural areas. For a given odour level there will be a wide range of responses in the population exposed to the odour. In a densely populated area there will therefore be a greater risk that some individuals within the community will find the odour unacceptable than in a sparsely populated area. The goals assume that 7 odour units at the 99^{th} percentile would be acceptable to the average person, but as the number of exposed people increases there is a chance that sensitive individuals would be exposed. The goal of 2 odour units at the 99^{th} percentile is considered to be acceptable for the whole population. The population density in the area around the Jacks Gully site would not be equivalent to an urban environment. However as there are other odorous industries in the area there is the potential for a cumulative impact. On this basis the most stringent odour criterion of 2 ou has been applied to the project.

It is common practice to use dispersion models to determine compliance with odour goals. This introduces a complication because Gaussian dispersion models are only able to directly predict concentrations over an averaging period of three-minutes or greater. The human nose, however, responds to odours over periods of the order of a second or so. During a three-minute period, odour levels can fluctuate significantly above and below the mean depending on the nature of the source.

To determine more rigorously the ratio between the one-second peak concentrations and three-minute and longer period average concentrations (referred to as the peak to mean ratio) that might be predicted by a Gaussian dispersion model, the NSW DEC commissioned a study by **Katestone Scientific Pty Ltd (1995, 1998)**. This study recommended peak to mean ratios for a range of source types. The ratio is also dependent on atmospheric stability and the distance from the source. A summary table of these ratios is presented in **Appendix A.** In this case the peak to mean factors for area sources in the near field are relevant.

The NSW DEC Draft Odour Policy (**NSW EPA, 2001**) takes account of this peaking factor and the goals shown in **Table 4** are based on nose-response time.

4.2 Oxides of nitrogen

Table 5 lists the air quality goals for nitrogen dioxide noted by the DEC and National Environment Protection Measures (NEPM) that are relevant to this study. The primary air quality objective for most projects is to ensure that the air quality goals are not exceeded at any location where there is a possibility of human exposure.

Table 5 – Air quality goals for nitrogen dioxide

POLLUTANT	GOAL	AVERAGING PERIOD	AGENCY
Nitrogen dioxide (NO_2)	0.12 ppm or 246 $\mu g/m^3$	1-hour maximum[1]	NSW DEC, NEPM
	0.03 ppm or 62 $\mu g/m^3$	Annual mean	NSW DEC, NEPM

5. EXISTING AIR QUALITY

5.1 Odour

There are two other operations in the vicinity of Jacks Gully WRC, namely Camden Soil Mix - Glenlee Composting Operation to the southeast and Collins Greenwaste to the west. Both operations emit odour with some similarity to the proposed AWT facility and there is the potential for cumulative impacts.

An odour evaluation of the Glen Lee Composting Operating was undertaken by Australian Water Technologies in March 2001 (**AWT**, **2001**). This study was based on conservative odour modelling of the composting emissions with the 2 ou contour extending into Mt Annan and Narellan Vale. As will be seen later, the contribution which the proposed Jacks Gully AWT facility makes to odour is substantially smaller than this predicted impact and would not be discernable above the level of odour predicted. Because of this, no additional odour modelling has been undertaken to include this source but rather the most stringent criteria of 2 ou has been applied for the Jacks Gully AWT facility.

No information is available on the odour impacts of the Collins Greenwaste facility and again, a similar approach has been adopted in terms of the cumulative assessment, that is, a requirement for the Jacks Gully AWT facility to meet the most stringent air quality goals.

5.2 Oxides of nitrogen

This section provides background information on concentrations of nitrogen dioxide and ozone in the area. This information has been provided to assess the cumulative effect of the emissions of NO_x from the Jacks Gully site. Existing levels of nitrogen dioxide can be used as background concentrations. Levels of ozone provide a measure of the potential for emissions of oxides of nitrogen to be converted to nitrogen dioxide.

The DEC's Camden monitoring station measures ozone (O_3) and nitrogen dioxide (NO_2) concentrations as well as NO and NO_x. The site is an industry site operated by Pilkington (Australia) Ltd and located at Camden aerodrome. This site is situated to the south of the Hawkesbury basin in a residential/semi-rural area within the EPA's south-west Sydney region. The DEC ceased monitoring of NO_2 at the Camden monitoring site in September 2004. Ozone data is available from the site up to December 2001.

Table 6 presents the annual maximum 1-hour O_3 concentrations and annual average and maximum 1-hour average NO_2 concentrations measured at the Camden monitoring station. The highest 1-hour maximum O_3 concentration was 15.8 pphm which is above the DEC criteria of 10 pphm. The highest 1-hour maximum NO_2 concentration was 115 $\mu g/m^3$ which is within the DEC criteria of 246 $\mu g/m^3$.

Table 6 – Annual monitoring data from the DEC's Camden monitoring station

	O_3 (pphm)	NO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
	Annual maximum	Annual average	Annual maximum
1995	8.1	10.1	96
1996	9.6	9.6	96
1997	14.7	10.1	115
1998	11.3	10.1	94
1999	15.6	12.0	78
2000	13.9	11.8	76
2001	15.8	12.1	82
2002		13.5	92
2003		12.6	88
2004		11.8	80

Figure 1 shows the monthly maximum 1-hour average ozone concentration at Camden. The maximum ozone concentrations are highest during the summer months and lowest in winter. **Figure 2** shows the monthly average and maximum 1-hour NO_2 concentrations at Camden.

The DEC also has a monitoring site at Campbelltown, located off Farrow Street in an industry site operated by Pilkington (Australia) Ltd. since 1990. This site is situated in the south-west of the Sydney basin in a residential area. The monitoring station measures O_3 and NO_2, as well as NO, NO_x, and measured PM_{10} until 2004.

Table 7 presents the annual maximum 1-hour O_3 and NO_2 concentrations measured at the Campbelltown monitoring station. The highest 1-hour maximum O_3 concentration was 18.3 pphm which is above the DEC criteria of 10 pphm. The highest 1-hour maximum NO_2 concentration was 207 $\mu g/m^3$ which is within the DEC criteria of 246 $\mu g/m^3$.

Table 7 – Annual monitoring data from the DEC's Campbelltown monitoring station

Year	O_3 (pphm)	NO_2 ($\mu g/m^3$)
1995	7.9	144
1996	8.7	203
1997	18.3	207
1998	13.3	125
1999	14.9	141
2000	12.9	154
2001	15.2	146

Figure 3 and **Figure 4** show the monthly maximum 1-hour average ozone and NO_2 concentration at Campbelltown.

The DEC's Macarthur air quality monitoring site is located in the grounds of UWS Campbelltown Campus. This site is situated to the south of the Hawkesbury basin in a residential/semi-rural area within the EPA's south-west Sydney region. The Macarthur site was commissioned in October 2004. The monitoring station measures O_3, CO, SO_2, NO, NO_2 & NO_x, and fine particles.

Table 8 presents the monthly average, 1-hour maximum and 4-hour maximum O_3 concentrations and monthly average and 1-hour maximum NO_2 concentrations measured at the Campbelltown monitoring station. The highest 1-hour maximum O_3 concentration was 14.2 $\mu g/m^3$ which is above the DEC criteria of 10 pphm. The highest 4-hour maximum O_3 concentration was 12.6 pphm which is above the DEC criteria of 8 pphm. The highest 1-hour maximum NO_2 concentration was 121 $\mu g/m^3$ which is within the DEC criteria of 246 $\mu g/m^3$.

Table 8 – Monthly monitoring data from the DEC's Macarthur monitoring station

Month	O_3 (pphm)			NO_2 ($\mu g/m^3$)	
	Monthly average	1-hr maximum	4-hr maximum	Monthly average	1-hr maximum
November 2004	2.0	9.9	8.4	20.5	107
December 2004	2.0	6.7	5.8	14.4	84
January 2005	2.0	14.2	12.6	14.4	53
February 2005	2.2	9.1	8.2	18.5	105
March 2005	1.5	7.9	6.7	16.4	59
April 2005	1.4	6.2	5.9	28.7	100
May 2005	1.2	6.1	4.7	28.7	88
June 2005	1.2	4.1	3.9	32.8	121

6. APPROACH TO ASSESSMENT

The impacts of the odour emissions from the AWT and greenwaste facility and emissions of oxides of nitrogen from the power generation unit have been assessed with CALPUFF using the emissions data presented in **Table 2** and **Table 3** to predict concentrations of odour and oxides of nitrogen in the vicinity of the site.

7. RESULTS AND DISCUSSIONS

7.1 Odour impacts

Figure 5 presents the predicted concentrations of odour at the 99th percentiles due to the AWT facility alone. The 2 ou goal contour is contained within the site boundary to the north and extends to some extent into the industrial area to the south and what is currently vacant land to the southwest. There are no exceedances of the 2 ou goal in any existing or proposed residential areas.

At this stage there are no odour goals specifically for industrial areas. In residential areas, there is a potential for individuals to have 24-hour exposure to odour but this would not apply in industrial areas. Therefore it is reasonable to assume that a less stringent goal would apply. As discussed above, the DEC goals assume that 7 odour units at the 99th percentile would be acceptable to the average person. Therefore a level of 7 ou at offices should be acceptable in industrial areas where there is less opportunity for exposure. In fact the predicted odour at the main operations buildings at the T & J Fordham site and the SADA site to the south of Jacks Gully WRC meets the 2 ou goal.

Figure 6 presents the cumulative impact of the AWT facility and active tipping face on the landfill. Again the 2 ou contour is largely contained within the facility site to the north and the 7 ou is met at all office buildings in the industrial area to the south. There are minor differences in the contours near the AWT facility as the model for cumulative impact assessment was run using a coarser grid spacing.

As discussed in **Section 5.1** there is the potential for cumulative impacts of odour from the Camden Soil Mix operation to the southeast and the Collins Greenwaste operation to the west. The potential for cumulative impacts has been addressed by requiring that the AWT facility meet the most stringent odour criteria of 2 ou at the boundary adjacent to residential areas.

7.2 Oxides of nitrogen impacts

Figure 7 presents the predicted maximum 1-hour average concentrations of total oxides of nitrogen due to cumulative emissions of the existing power generation plant and the proposed 2 MW units associated with the AWT facility.

Maximum off-site concentrations are of the order of 50 $\mu g/m^3$ for total NO_x compared to the goal of 246 $\mu g/m^3$ for nitrogen dioxide. At the point of emission, the percentage of NO_2 in total NO_x is typically 5-10%. The remaining 90-95% nitric oxide (NO) is converted to NO_2 in the presence of oxidants such as ozone. If it is assumed conservatively that all of the NO_x is converted to NO_2 (in reality at locations close to the stack the conversion rate is more likely to be 20%) and this concentration is added to recent data monitored at either the DEC Camden, Campbelltown or Macarthur site where the maximum concentration since 2000 is 154 $\mu g/m^3$, the goal would still not be exceeded.

Figure 8 presents the annual average NO_x concentrations due to cumulative emissions of the existing power generation plant and the proposed 2 MW units associated with the AWT facility. The maximum off-site concentration is predicted to be less than 4 $\mu g/m^3$ compared with the annual goal of 60 μg/m3. The annual average NO_2 concentrations in the area are typically less than 20 $\mu g/m^3$. The annual goal is therefore not likely to be exceeded. It should also be noted that emissions from the existing power generator would be adding to the existing background concentration of NO_2.

8. SUMMARY OF CONCLUSIONS

The air quality impacts of the proposed AWT facility at Jacks Gully have been assessed using CALPUFF combined with representative emissions data of odour and oxides of nitrogen. It is concluded that the facility will have minimum impact on the surrounding area and will not cause exceedances of either the DEC's amenity criteria for odour or the health based criteria for nitrogen dioxide.

9. REFERENCES

AWT (2001)
"Odour Evaluation of the Glenlee Composting Operation for Camden Soil Mix Pty Ltd" prepared by Australian Water Technologies, March 2001

ERM Mitchell McCotter (1997)
"Composting Plant and Landfill at New Line Road Raymond Terrace": Environmental Impact Statement, ERM Mitchell McCotter for Bedminster Bioconversions (Australasia). Australia

Holmes Air Sciences, 1998
"Proposed Landfill Gas Power Generation Station at Jacks Gully, Sydney" December 1998.

Holmes Air Sciences, 2003
"Odour Audit Eastern Creek Stage 2", Prepared for NECS on behalf of WSN, December 2003.

Holmes Air Sciences, 2005
"Air Quality Assessment: Waste Service Proposed Landfill Gas Power Generation Plant
for Eastern Creek 2", January 2005.

Katestone Scientific, 1998
"Report from Katestone Scientific to Environment Protection Authority of NSW, Peak to Mean Ratios for Odour Assessments"

NSW EPA, 2001
"Draft Policy: Assessment and Management of Odour from Stationary Sources in NSW".

NSW DEC, 2005
"Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW", August 2005

URS, 2004
"Jacks Gully Waste Management Centre Odour Modelling" prepared for Waste Service NSW by URS April 2004

.

APPENDIX A
PEAK TO MEAN FACTORS

Peak-to-mean ratios

The following table shows recommended factors for estimating peak concentrations for different source types, stabilities and distances.

Table A1 – Factors for estimating peak concentration in flat terrain

Source Type	Pasquill-Gifford stability class	Near field i_{max}	Near field x_{max}	Near field P/M60	Far field I	Far field P/M60
Area	D	0.5	500 to 1000	2.5	0.4	2.3
	E,F	0.5	300 to 800	2.3	0.3	1.9
	A,B.C	0.5	500 to 1000	2.5	0.4	2.3
Line	D	1.0	350	6	0.75	6
	E,F	1.0	250	6	0.65	6
	A,B.C	1.0	350	6	0.75	6
Surface point	D	2.5	200	25	1.2	5 to 7
	E,F	2.5	200	25	1.2	5 to 7
	A,B.C	2.0	1000	12	0.6	3 to 4
Tall wake-free point	D	4.5	5 h	35	1.0	6
	E,F	4.5	5 h	35	1.0	6
	A,B.C	2.3	2.5 h	17	0.5	3
Wake-affected point	A - F	0.4	-	2.3	0.4	2.3
Volume	A - F	0.4	-	2.3	0.4	2.3

i_{max} maximum centreline intensity of concentration
x_{max} approximate location of i_{max} in metres
P/M60 P/M ratio for long averaging times (typically 1 hour), at a probability of 10^3
h stack height

FIGURES

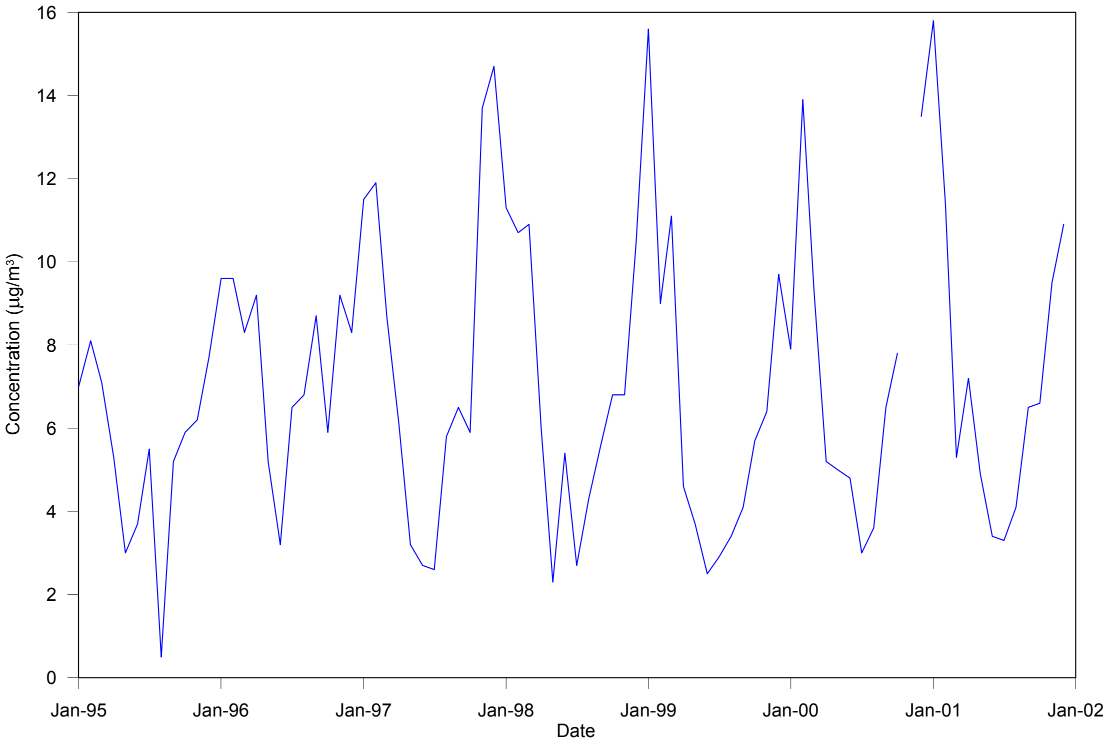


Figure 1 - Monthly maximum 1-hour concentrations of O_3 at the Camden monitoring station

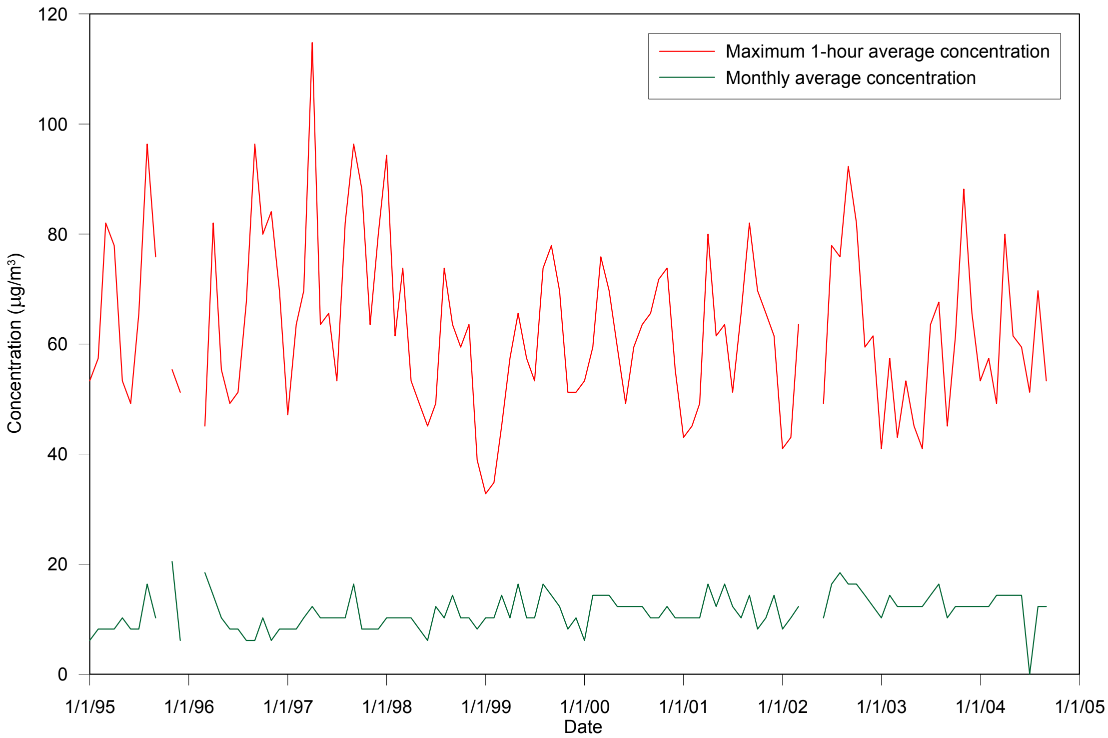


Figure 2 - Monthly maximum and average 1-hour concentrations of NO_2 at the Camden monitoring station

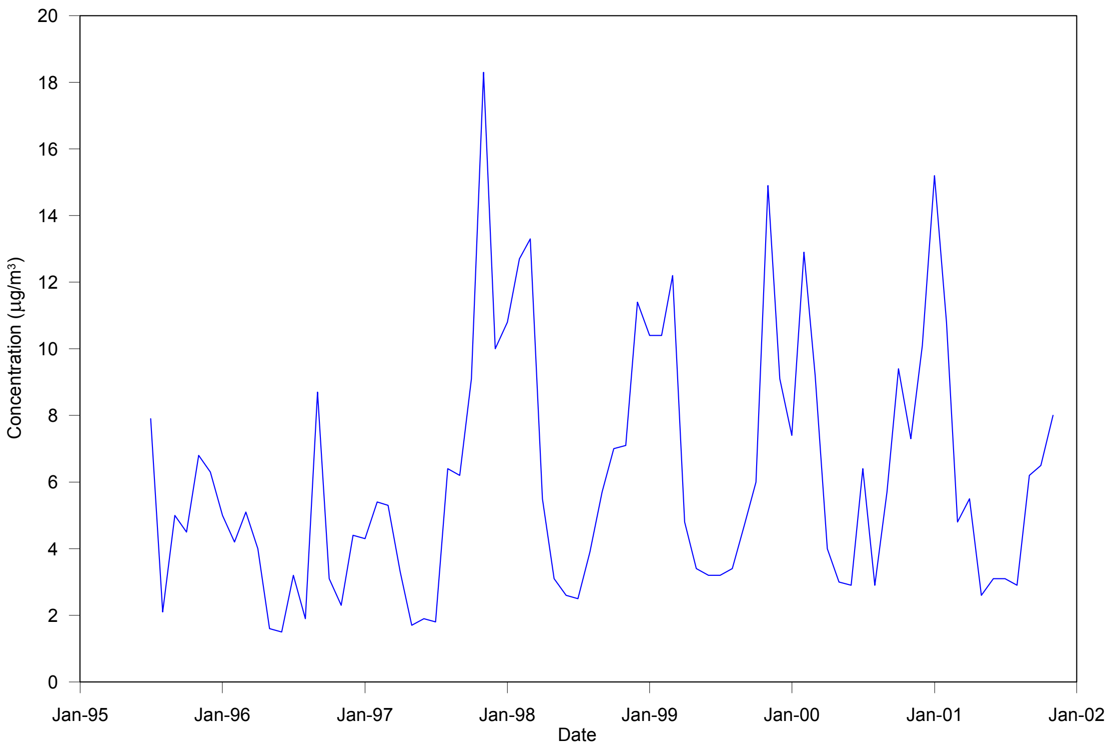


Figure 3 – Monthly maximum 1-hour concentrations of O_3 at Campbelltown monitoring station

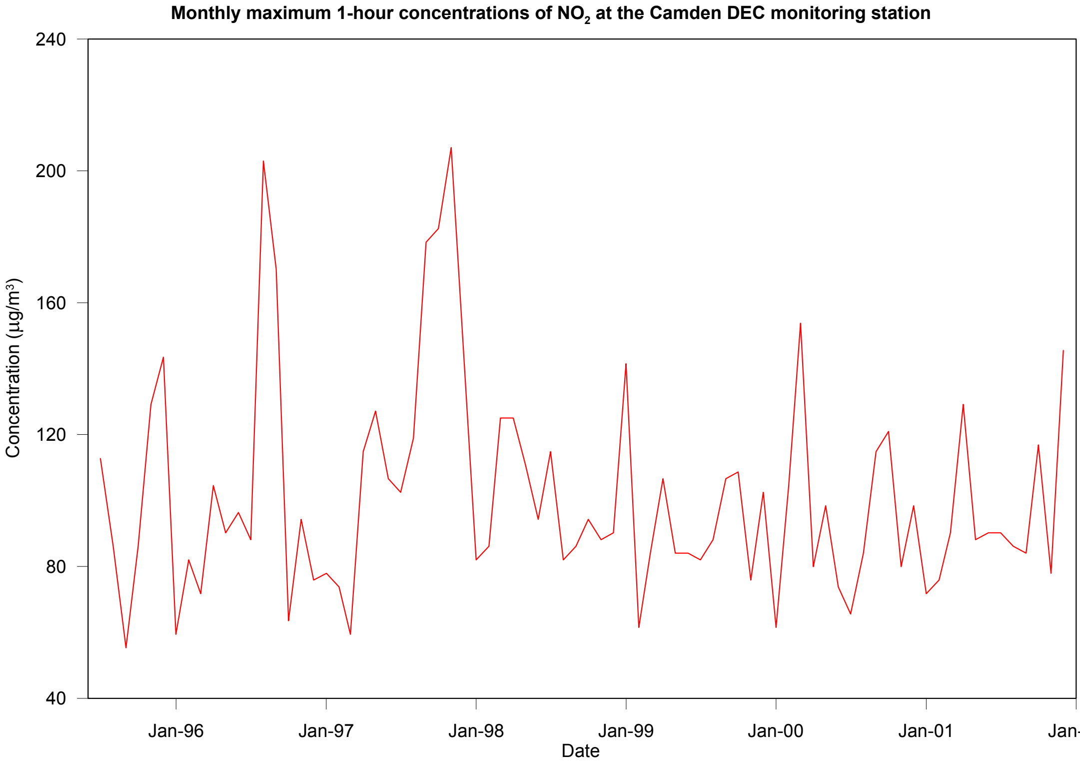
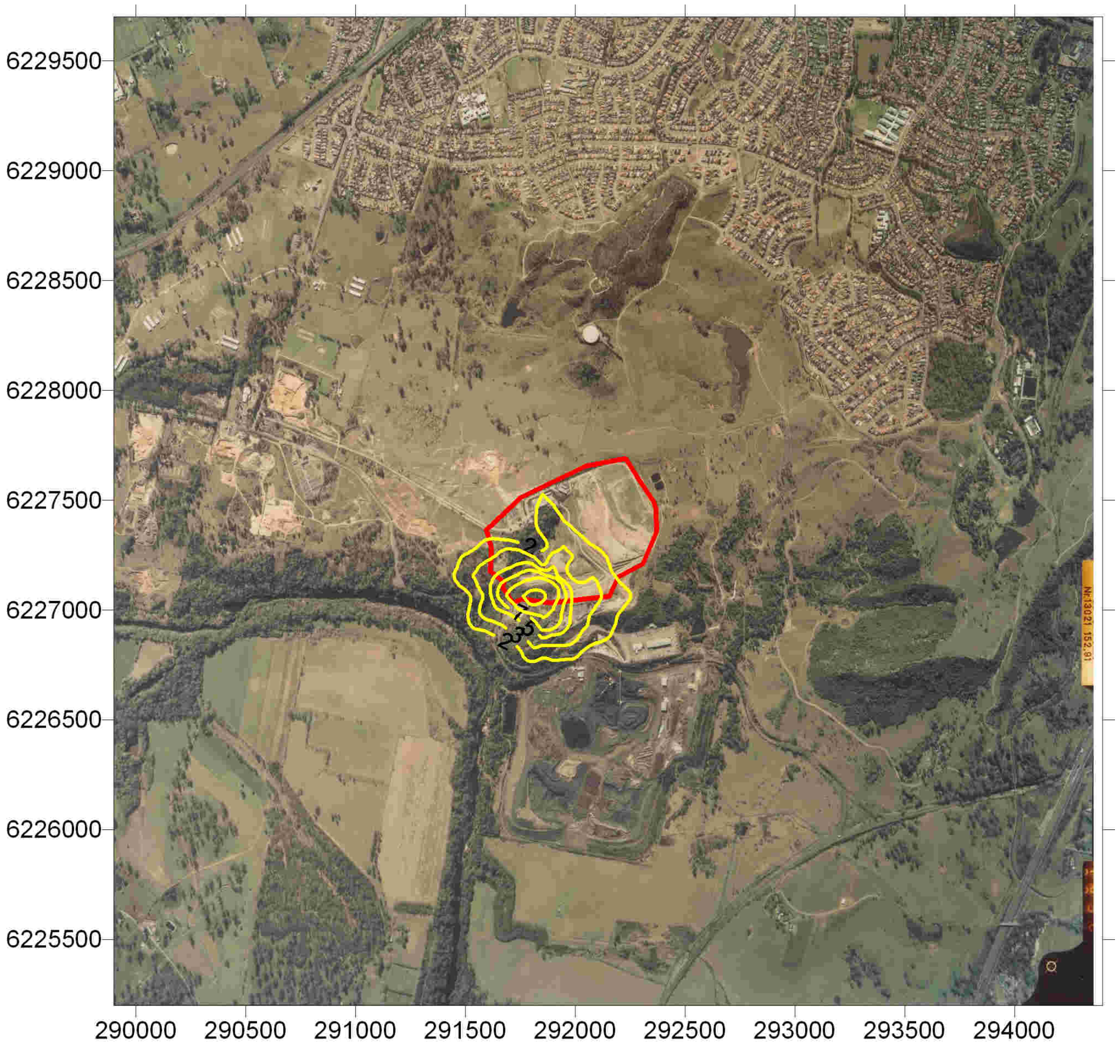
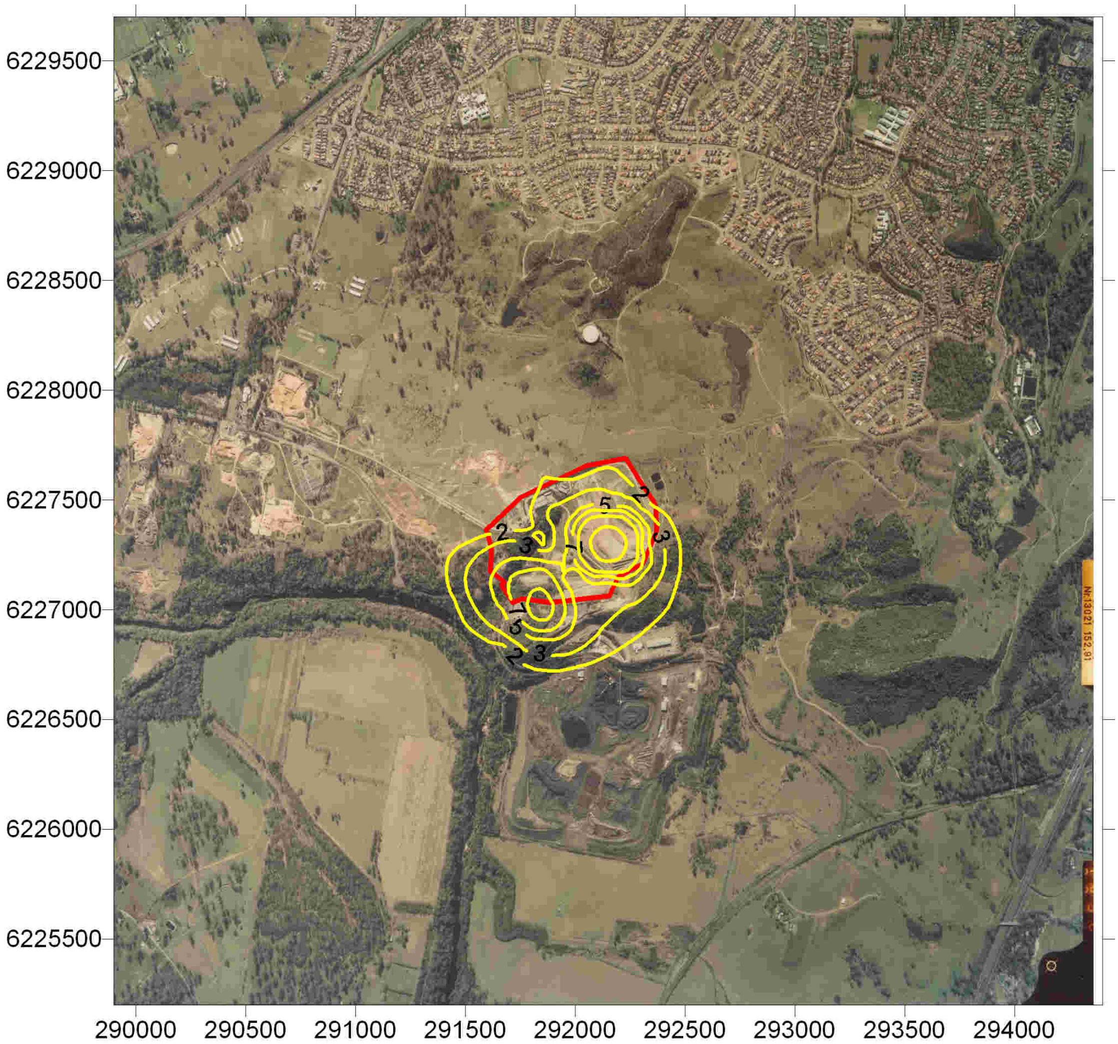


Figure 4 – Monthly maximum 1-hour concentrations of NO_2 at Campbelltown monitoring station



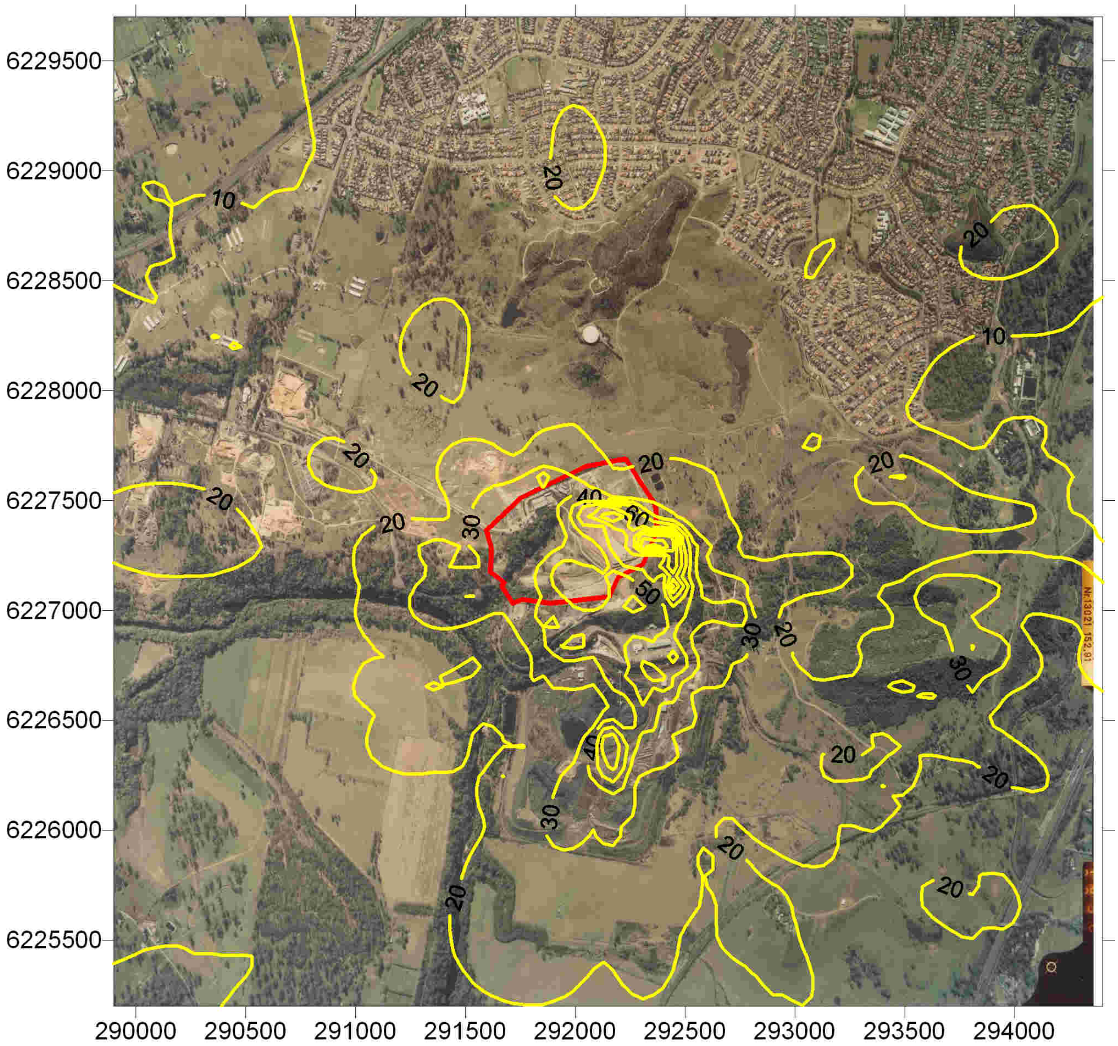
Predicted 99th percentile odour due to AWT facility
(ou)

Figure 5



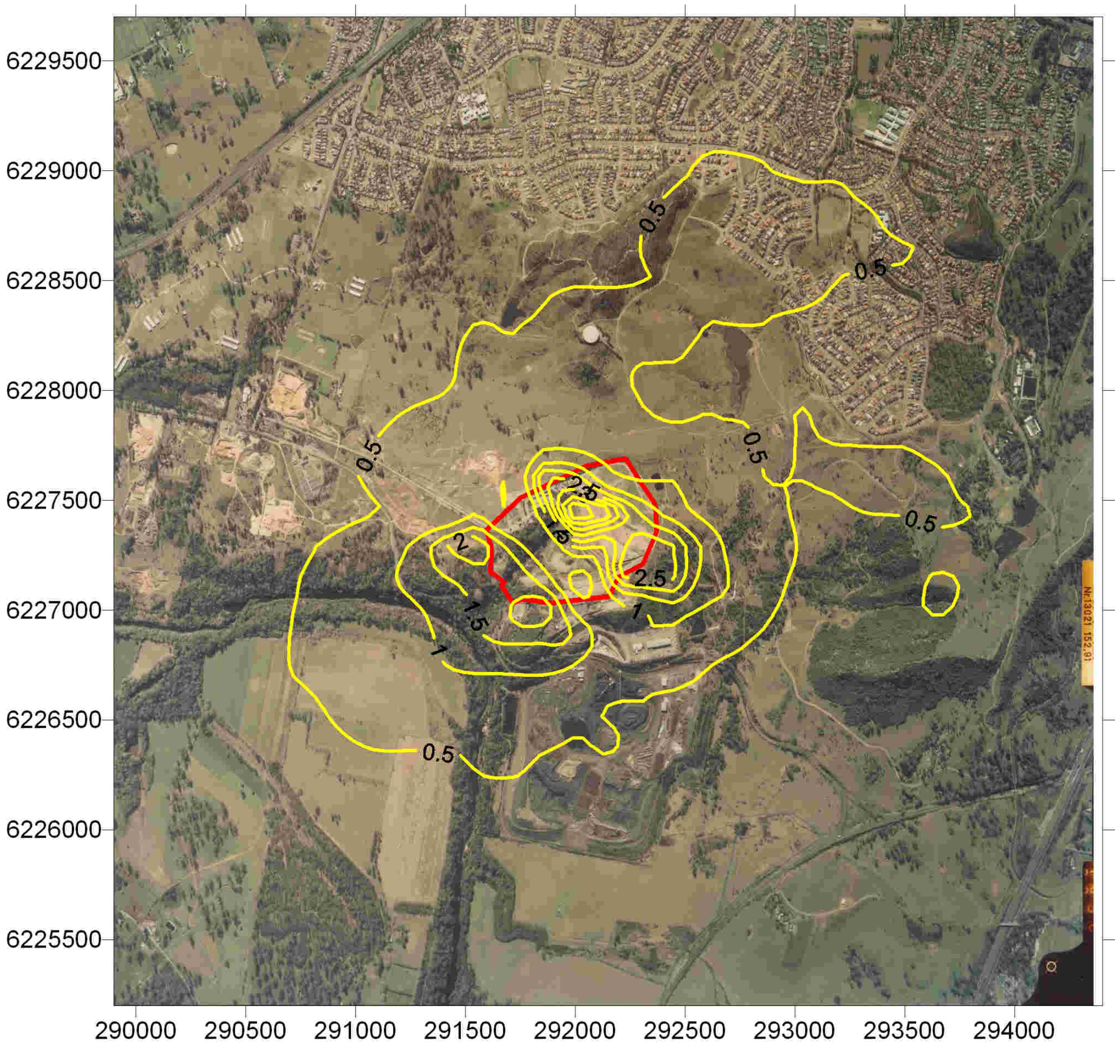
Predicted 99th percentile odour due to AWT facility and active tipping face
(ou)

Figure 6



Predicted maximum 1-hour average NOx level from existing and proposed power generation units
(micrograms per cubic metre)

Figure 7



Predicted annual average NOx level from existing and proposed power generation units
(micrograms per cubic metre)

Figure 8