Report

Energy from Waste Facility – Odour Assessment

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EXECUTIVE SUMMARY

The Next Generation NSW Pty Ltd (TNG NSW) propose to construct and operate an Energy from Waste (EfW) facility (the 'Project') on land adjacent to the Genesis Xero Waste facility, located at Honeycomb Drive, Eastern Creek, approximately 36 km west of the Sydney CBD.

The development involves the construction and operation of an Electricity Generation Plant, which will allow for unsalvageable and uneconomic residue waste from the Genesis Xero Material Processing Centre (MPC) and Waste Transfer Station (WTS) (referred to as the 'Genesis Facility') to be used for generation of electrical power.

In June 2014 Pacific Environment completed an air quality and greenhouse gas assessment for the Project (**Pacific Environment, 2014**) which provided a qualitative assessment of odour from the Project. The EPA has since requested that a stand-alone odour impact assessment is completed for the Project, of which is the purpose of this technical study.

Fuel (waste) is proposed to arrive to the facility in covered trucks or via an enclosed conveyor from the Genesis Facility. All waste storage and unloading is to take place within the tipping hall building, which is kept at negative pressure with air extracted from the building to be used as excess air in the boiler.

Odour emissions for the facility were based on odour monitoring that was completed for the Genesis facility in January, 2014. Cumulative odour emissions from the Genesis Facility were also investigated.

The results indicate that when the Project is considered both in isolation and combined with odour emissions from the Genesis Facility that the predicted 99th percentile odour concentrations would be below the 2 ou impact assessment criterion all of the sensitive receptors. The odour concentrations are predicted to be highest in the residential suburb of Minchinbury, but are anticipated to be just above the detection threshold (1 ou) and below the impact assessment criterion of 2 ou throughout the suburb.

In view of the dispersion modelling results it is anticipated that the operation of the Project would have no adverse impact on the local air environment in reference to odour.

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1 INTRODUCTION

The Next Generation NSW Pty Ltd (TNG NSW) propose to construct and operate an Energy from Waste (EfW) facility (the 'Project') on land adjacent to the Genesis Xero Waste facility, located at Honeycomb Drive, Eastern Creek, approximately 36 km west of the Sydney CBD.

The development involves the construction and operation of an Electricity Generation Plant, which will allow for unsalvageable and uneconomic residue waste from the adjacent Genesis Xero Material Processing Centre (MPC) and Waste Transfer Station (WTS) (referred to as the 'Genesis Facility') to be used for generation of electrical power.

In June 2017 Pacific Environment reissued the air quality and greenhouse gas assessment for the Project (*Energy from Waste Facility – Air Quality and Greenhouse Gas Assessment* **(Pacific Environment, 2017)** hereafter referred to as 'PE Air Report'). The PE Air Report provided a qualitative assessment of odour from the Project. The EPA subsequently requested that a stand-alone odour impact assessment is completed for the Project, which is the purpose of this technical study.

In May 2017 the meteorological file used in the dispersion modelling was updated to address peer review comments with respect to calm wind speeds within the AERMOD model. The odour modelling has therefore been amended to reflect the new meteorological file being referenced.

This assessment followed the procedures outlined in the NSW Environment Protection Authority's (EPA) document titled "Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW" (**NSW EPA, 2016**).

2 OVERVIEW OF THE FACILITY

The facility will operate a well-established technology known as a moving grate furnace. Waste is gravity fed onto the incinerator grate. The grate is continually moving thus promoting continuous mixing of the waste with the combustion air, extracted from the tipping hall and introduced from beneath the grate into the heart of the fire. Further air is injected just above the fire to promote mixing and complete combustion of the gases.

The Facility will operate 24 hours a day, 7 days a week, with occasional offline periods for maintenance. Over the entire year, it is assumed that the facility would be operational for a minimum of 8,000 hours as an annual average.

As set out in the Project Definition Brief **(Ramboll, 2017)** to maintain the planned generating capacity with the proposed Net Calorific Value (NCV) range the fuel requirement can vary from approximately 405,000 to 675,500 tpa with an optimum expected throughput of 552,500 tpa when the fuel waste on an annualised basis has an NCV of 12.3 MJ/kg

The facility is proposed to be constructed comprising the following:

Stage 1 – Construction and operation of the following plant and systems:

- Tipping Hall and fuel storage
- Waste Bunker
- Combustion Line 1
- Combustion Line 2
- Two independent boilers
- Flue Gas Treatment systems
- One stack
- One turbine

- One Air Cooled Condenser
- Associated auxiliary equipment
- Control room, workshop, offices and amenities
- Laydown Areas
- Two back up diesel generator.

This application seeks approval for Stage 1 (Combustion Lines 1 and 2) only of a future potential four combustion line system.

Some wastes would be delivered directly to the facility (by truck) with the remaining transferred from the existing Genesis Facility either via a covered electrically powered conveyor or by truck. The following waste fuel types are considered as the main sources of fuel for the facility.

- Chute Residual Waste (CRW) from the Genesis MPC
- Commercial and Industrial (C&I)
- Construction and Demolition(C&D)
- Floc waste from car and metal shredding
- Paper pulp
- Glass Recovery
- Garden Organics (GO)
- Alternative Waste Treatment (AWT)
- Material Recovery Facility waste (MRF waste) residual.

A general arrangement for the facility is shown in **Appendix A**.

A detailed technical description of the Project is provided in the PE Air Report.

2.1 Planning and Construction approval limited to Stage 1

Preliminary approval was previously sought by the Proponent for a two stage 4 line concept plan with the second stage [lines 3 and 4] having effectively 50% capacity of the two stages taken together .

The staged proposal based around a Facility engineered and designed to accommodate the second stage build met with community expressions of concern about size and scale.

In order to mitigate any confusion which may have had arisen in the community the proponent's response to submissions lodged in December 2016 made clear that the submission at that time was in respect only of a stage 1 application for approval.

The supporting reports and modelling by expert consultants however continued to reflect potential impacts on the environment, on amenity, on health and upon the community as if both stages of the facility had had been completed and were operational.

Accordingly, the proponent has made a request pursuant to Regulations under the EPAA legislation to formally amend its application to limit it only to an application for development consent for stage 1 only

3 LOCAL SETTING

The proposed EfW Facility is located at Eastern Creek, approximately 36 km west of the Sydney CBD and surrounded by the residential areas of Minchinbury, Mt Druitt and Rooty Hill to the north, Erskine Park to the east and Colyton to the northwest (shown in **Figure 3-1**).

The site which is accessed off Honeycomb Drive at Eastern Creek is surrounded by land owned by the Corporate Group Alexandria Landfill Pty Ltd, ThaQuarry Pty Ltd, Australand, Hanson, Jacfin, the NSW Department of Planning and Environment and Sargents.

The site and surrounding land is identified as part of the '*State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP)*' to be redeveloped for higher end industrial and employment uses over the next decade. The site has a total area of approximately 56 hectares including the Riparian Corridor, with a specific development area circa 9 hectares.

A sensitive receptor is defined as a location where people are likely to work or reside; and may include a dwelling, school, hospital office or public recreational area in addition to known or likely future locations (**NSW EPA, 2016**).Air quality impacts are assessed at the closest residential areas as shown, including particularly sensitive receptors such as schools and hospitals, as well as isolated semi-rural residential receptors off Burley Road to the southeast. The particularly sensitive receptors (schools, childcare centres), are listed in **Table 3-1**, and are located within the residential suburbs of Minchinbury and Erskine Park, shown in **Figure 3-1**. Also shown in **Figure 3-1** are the potential future receptors that may be located within the adjacent industrial estate that have also been assessed.

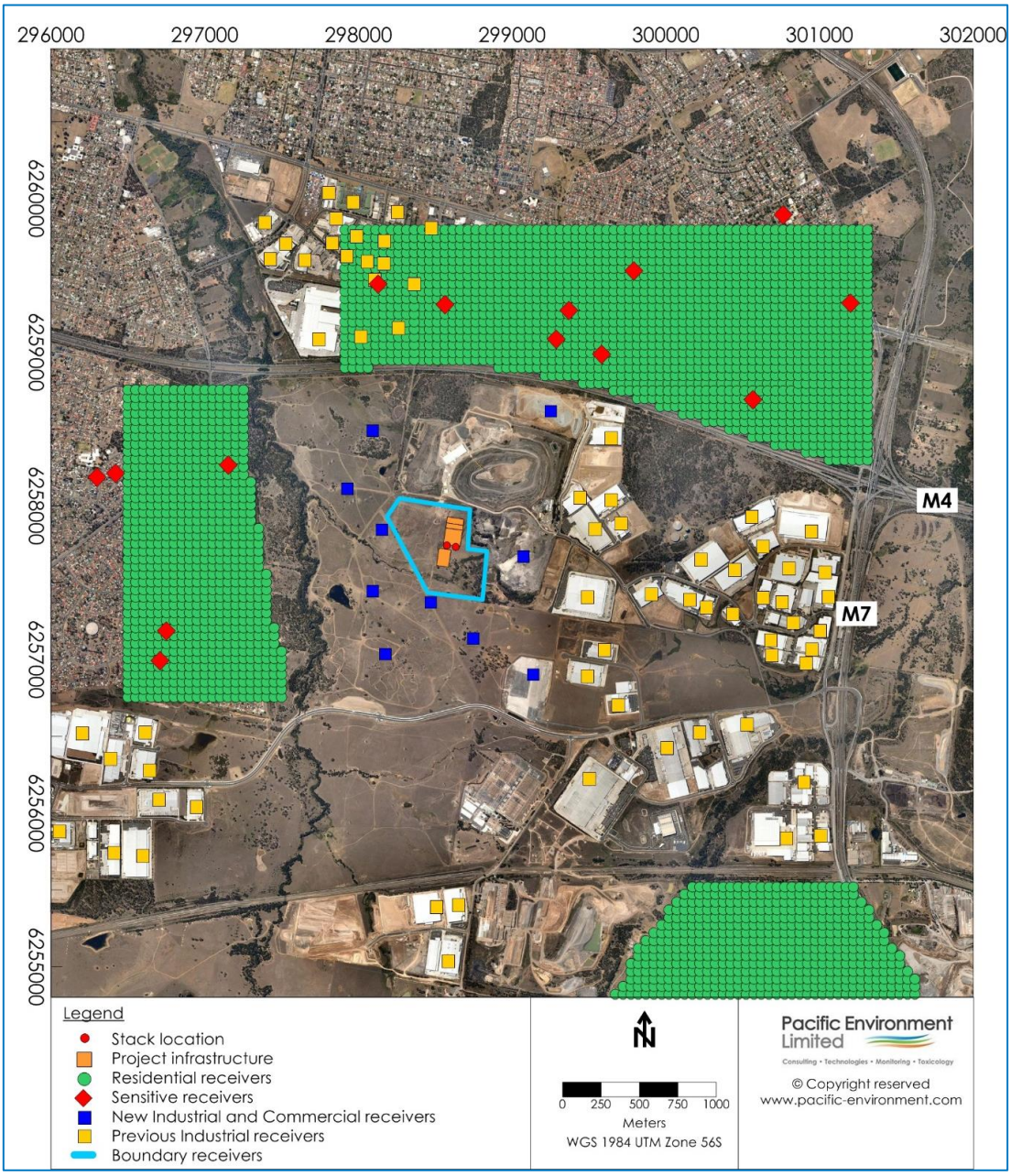

Figure 3-1: Local setting

Table 3-1: Sensitive receptor locations

Sensitive Receptor	Easting (m)	Northing (m)	Elevation (m)
James Erskine Primary School	296748	6257187	66
Erskine Park High School	296709	6256992	66
Clairgate Public School	296299	6258187	62
Minchinbury Public School	299287	6259084	64
Pinegrove Memorial Park Lawn Cemetery	300567	6258692	58
Sunny Patch Preparation School & Long Day Care Centre	297153	6258266	50
Eastern Creek Public School	301201	6259319	46
St Agnes Catholic High School	300761	6259894	74
All Areas Family Day Care Pty	299581	6258986	64
Maria Hawey Child Care Centre	299370	6259272	57
Jiminey Cricket Long Day Care	298562	6259310	54
White Bunny Child Care Centre	299792	6259530	68
LITTLESMARTIES	296419	6258212	58
Kidz Fun Factory	298128	6259445	46

4 LEGISLATIVE SETTING

4.1 Odour Assessment Criteria

4.1.1 Measuring Odour Concentration

There are no instrument-based methods that can measure an odour response in the same way as the human nose. Therefore "dynamic olfactometry" is typically used as the basis of odour management by regulatory authorities.

Dynamic olfactometry is the measurement of odour by presenting a sample of odorous air diluted to the point where a trained panel of assessors cannot detect a change between the odour free air and the diluted sample. The concentration is then doubled until the difference is observed with certainty. The correlations between the dilution ratios and the panellists' responses are then used to calculate the number of dilutions of the original sample required to achieve the odour detection threshold. The units for odour measurement using dynamic olfactometry are "odour units" (ou) which are dimensionless and are effectively "dilutions to threshold". The detectability of an odour (i.e. whether someone smells it or not) is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation. However, we note that the panellists used for this work are specially selected based on a reference odorant, n-Butanol.

The theoretical minimum concentration is referred to as the "odour threshold" and is the definition of 1 odour unit (ou). Therefore, an odour concentration of less than 1 ou would theoretically mean there is no odour.

4.1.2 Odour Performance Criteria

4.1.2.1 Introduction

The determination of air quality criteria 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 recent years and the procedures for assessing odour impacts using dispersion models have been refined considerably. There is still considerable debate in the scientific community about appropriate odour criteria as determined by dispersion modelling.

The EPA has developed odour criteria and the way in which they should be applied with dispersion models to assess the likelihood of nuisance impact arising from the emission of odour.

There are two factors that need to be considered:

1. What "level of exposure" to odour is considered acceptable to meet current community standards in NSW.

2. How can dispersion models be used to determine if a source of odour meets the criteria which are based on this acceptable level of exposure.

The term "level of exposure" has been used to reflect the fact that odour impacts are determined by several factors the most important of which are (the so-called FIDOL factors):

- 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.
- The **L**ocation of the source.

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 sulfide, 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.

In summary, 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 criteria need to take account of these factors.

4.1.2.2 Complex mixtures of odorous air pollutants

The "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (**EPA, 2016**) (Approved Methods) include ground-level concentration (glc) criterion for complex mixtures of odorous air pollutants. They have been refined by the EPA to take account of population density in the area. **Table 4-1** lists the odour glc criterion to be exceeded not more than 1% of the time, for different population densities.

The difference between odour criteria 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.

An odour criterion of 2 ou would apply to the built up areas around the facility in any further detailed assessment of proposed operations.

Table 4-1: Odour performance criteria for the assessment of odour

Population of affected community	Ground level concentration (ou)
≤ ~2	7
~10	6
~30	5
~125	4
~500	3
Urban (2000) and/or schools and hospitals	2

4.1.2.3 Peak-to-mean Ratios

It is common practice to use dispersion models to determine compliance with odour criteria. This introduces a complication because Gaussian dispersion models are only able to directly predict concentrations over an averaging period of 3-minutes or greater. The human nose, however, responds to odours over periods of the order of a second or so. During a 3-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 EPA commissioned a study by **Katestone Scientific Pty Ltd** (**1995, 1998**). This study recommended peak-to-mean ratios for a range of circumstances. The ratio is also dependent on atmospheric stability and the distance from the source. For this assessment we have assumed a peak-to-mean ratio of 2.5 and 2.3 for all stability classes for area sources and volume sources, respectively. A summary of the factors is provided in **Table 4-2**. The EPA Approved Methods take account of this peaking factor and the criteria shown in **Table 4-1** are based on nose-response time, which is effectively assumed to be 1 second.

Table 4-2: Factors for estimating peak concentrations on flat terrain

Source Type	Pasquil-Gifford stability class	Near field P/M60*	Far field P/M60
Area	A, B, C, D	2.5	2.3
	E, F	2.3	1.9
Line	A – F	6	6
Surface point	A, B, C	12	4
	D, E, F	25	7
Tall wake-free point	A, B, C	17	3
	D, E, F	35	6
Wake-affected point	A – F	2.3	2.3
Volume	A – F	2.3	2.3

*Ratio of peak 1-second average concentrations to mean 1-hour average concentrations

5 EXISTING ENVIRONMENT

5.1 Dispersion Meteorology

Air quality impacts are influenced by meteorological conditions, primarily in the form of gradient wind flow regimes, and by local conditions generally driven by topographical features and interactions with coastal influences, such as the sea breeze. The local dispersion meteorology for the site, in relation to wind speed and direction, have been reviewed based on the data available at nearby meteorological stations.

The Bureau of Meteorology (BoM) collects climatic information at the Horsley Park Equestrian Centre Automatic Weather Station (AWS), located approximately 6 km southeast of the site. The NSW Office of Environment and Heritage (OEH) operate a meteorological station at St Marys, located approximately 5 km west and at Prospect, located approximately 6 km east of the proposed EfW facility, respectively.

The closest site and most representative location in terms of land use and surface roughness is the OEH monitoring site at St Marys. A complete year of hourly meteorological data, collected at the St Marys station was used for modelling. The meteorological data for modelling are 98% complete.

Annual and seasonal wind roses for 2013 at St Marys are shown in **Figure 5-1**. The dominant annual winds are from the southern quadrant with a proportion also from the north-northwest. This pattern is similar in all seasons with summer also showing a proportion of winds from the southeast. The percentage calms (defined as wind speeds less than 0.5 m/s) are around 24.7%.

A detailed review of the year selected for modelling compared with five years of data, in addition to a long term trends analysis is provided in the PE Air Report **(Pacific Environment, 2017**).

In May 2017 the meteorological file used in the dispersion modelling was updated to address peer reviewer comments with respect to calm wind speeds within the AERMOD model. The input meteorological file was amended such that all calm winds were replaced with a 0.5 m/s wind speed. The odour modelling as part this this report has thus been amended to reflect the new meteorological file. A detailed description of the updated meteorology is provided in the PE Air Report.

Air dispersion models also require cloud cover and cloud height as input and the closest meteorological station recording these parameters is BoM Bankstown Airport AWS, located approximately 19 km southeast of the proposed EfW site.

Figure 5-1: Wind roses for St Marys (2013)

5.2 Existing Air Quality

The adjacently located Genesis Facility will give rise to odour of similar character to the Project. In January 2014, Pacific Environment completed an Odour Impact Assessment for the facility (**Pacific Environment, 2014**), under a requirement of the site's EPL. The odour assessment reviewed potential odour sources and found the most significant odour sources to be the active tipping face within the landfill void, the leachate sump and riser and the leachate treatment and SBR tanks.

Odour monitoring on these sources (see **Appendix B**) found the leachate sump to be the most significant of these (50 times higher than the other sources). Dispersion modelling of the leachate sump found that the most stringent odour criterion of 2 ou is not exceeded beyond the site boundary and does not encroach within 500 m of the nearest residences.

The character of the odour emissions are summarised below:

- Active tip face – oily, dusty and garbage.
- Leachate tank – garbage.
- Leachate riser - oily, grease, onion, garbage and sulphide.

5.3 Odour complaints history

The Genesis Facility has provided records of logged complaints relating to odour since the commencement of operations in June 2012 and is available up to November 2016 (**DADI, 2017**). The full odour complaints register is provided in **Appendix C**.

During the period between June 2012 and August 2017 the Genesis Facility has logged receiving five odour complaints. Subsequent to further investigation and inspection, four complaints were found to not have originated from the Genesis Facility but from other known odour sources in the area. The odour complaint in February 2013 was associated with the initial establishment of the Leachate Collection, Management and Discharge system which had been newly established in January 2013..

5.4 Site inspection

In May 2017 a site visit of the existing operations at the Genesis facility and the proposed EfW Facility was completed by Pacific Environment and Northstar Air Quality (the peer reviewer).

It was agreed that there was minimal odour generated within the existing waste receival hall of the Genesis facility, which handles a similar (non-putrescible) waste stream as proposed for the TNG facility.

The exception to this was during an inspection of the existing landfill void. At the point where the chute discharges material known as 'chute residual waste' (also proposed as a fuel for the TNG facility) there was a distinct odour. However, this odour was observed to dissipate within tens of metres, and is not anticipated to constitute an adverse odour at or beyond either the existing, or future, operational boundary.

6 ODOUR EMISSIONS

The facility will employ high speed roller doors for truck access to ensure fugitive odour emissions from within the building are minimised. All waste storage and unloading will take place within the tipping hall building, which is kept under negative pressure. Air extracted from the building is to be used as excess air in the boiler (i.e. potentially odorous air will ultimately be thermally oxidised). The primary air will be drawn from the tipping hall using a fan beneath the individual grate zones. It is anticipated that the primary air flow will range between 77,560 Nm^3/hour and 129,180 Nm^3/hour. The primary air flow will also be used to cool the grate. The air will then be drawn into the primary combustion zone and will ultimately undergo combustion and will then be released via the stack. As a result, the odorous compounds within the primary air will breakdown to simpler compounds that will pass through the various scrubbers and process to further remove contaminants from the air stream. There is potential for the release of relatively small volumes of odorous air to escape during the opening and closing of the roller doors even though it will be under negative pressure.

Emissions of individual odorous compounds would also be expected to be released from the stack of the EfW. These include ammonia (NH_3) hydrogen sulfide (H_2S), phenol, toluene and xylene. The respective individual odour emissions have been assessed in detail in the PE Air Report (**Pacific Environment, 2017**) and demonstrate compliance with all air quality criteria for all scenarios. On the basis of the above, individual odorous air quality metrics have not been assessed further in this assessment.

As the waste for the Project will be supplied by the adjacent Genesis Facility, it can be assumed that the character of the minimal odour identified within the MPC as a result of waste processing will be similar and has therefore been applied to the Project.

The odour concentrations and emission rates for the proposed facility are presented in **Table 6-2**. It has been assumed that the area of the roller door will be 25 m^2. An exit velocity of 0.1 m/s was adopted to account for the small volumes of air that escape tipping hall when the doors are open, while acknowledging that the building is designed to operate under negative pressure (with extracted air used as a feed to the furnace).

An assumption that fugitive air volumes of (25 x 0.1)=2.5m^3/s would escape from an opening kept under negative pressure is considered conservative.

The cumulative odour emissions from the Project are based on the odour monitoring competed for the Genesis Facility (**Pacific Environment, 2014**) (see **Section 5.2**) and are also shown in **Table 6-2** and **Table** 6-2 for volume and area sources, respectively The location of the modelled sources is shown in **Figure 6-1**. It is the intention that the TNG EfW facility divert some of the residual waste stream currently being landfilled at the Genesis facility. It is anticipated therefore that odour abatement through use of potentially odorous air in the EfW combustion process will in fact act to reduce potential odour sources within the bounds of the landfill area. The extent to which that abatement would be achieved has not been quantified as part of this assessment.

A list of all adopted assumptions in this assessment is provided in **Appendix D**.

Table 6-1: Odour emission rate and model parameters for volume sources

	Odour Concentration (OU)	Odour Emission Rate for volume source (OU.m^3/s)	Peak to mean ratio	Modelled Odour Emission Rate for volume source (OU.m^3/s)
Tipping hall	558	1,395	2.3	3,209

Table 6-2: Odour emission rates and model parameters for area sources

	Odour Concentration (OU)	Specific Odour Emission Rate (SOER) (OU.m³/m²/s)	Source area (m²)	Peak to mean ratio	Modelled Specific Odour Emission Rate (SOER) (OU.m³/m²/s)
Active tip face	558	0.3	1,344	2.5	0.7
Leachate tank (x 4)	362	0.2	4 x 19.6		0.5
Leachate riser	19,500	10.3	177		25.8

There are no emission from the stack therefore building wake effects were not included in the modelling.

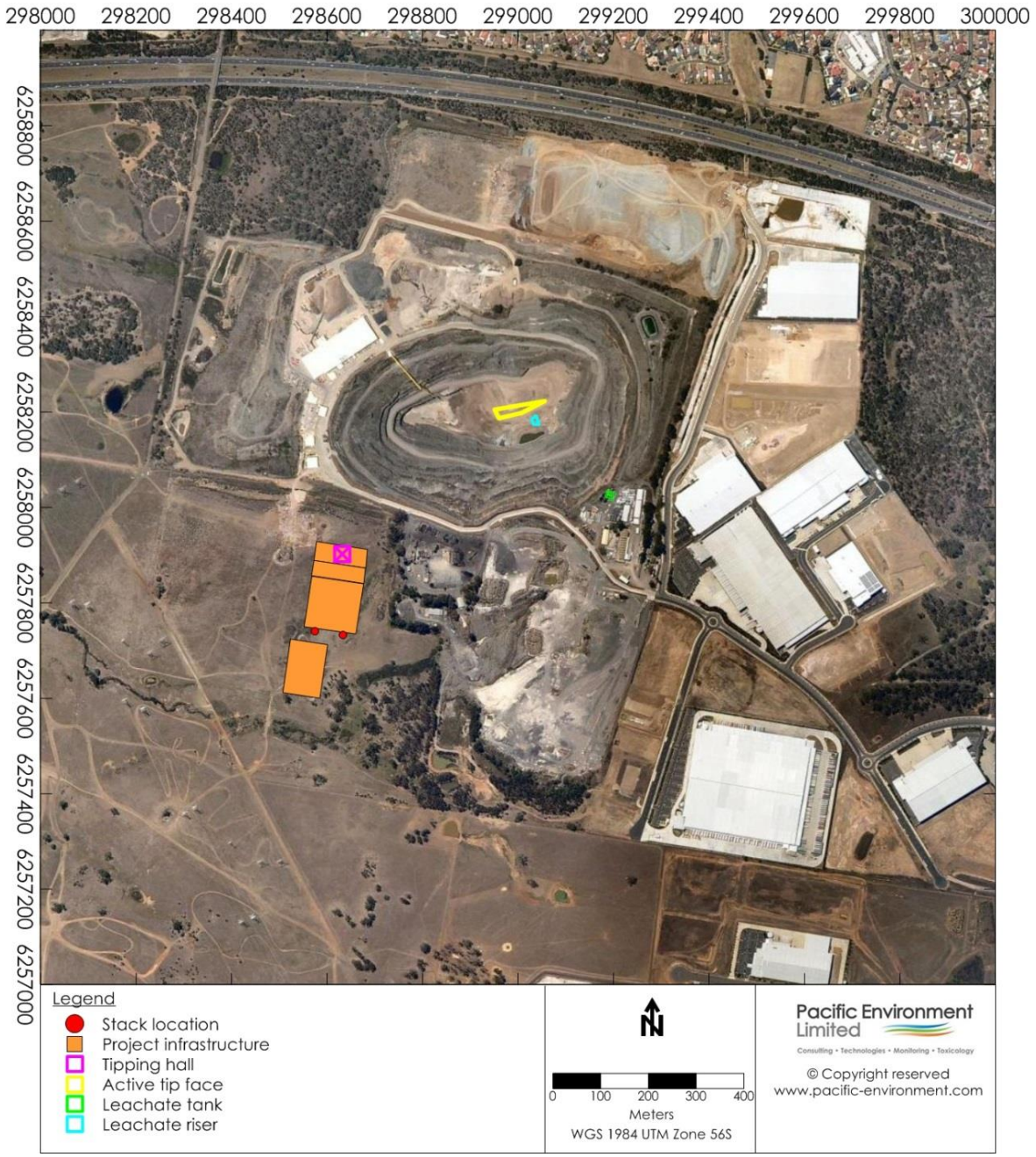

Figure 6-1: Location of modelled sources

7 MODELLING APPROACH

The overall approach to the assessment followed the Approved Methods using the Level 2 assessment methodology. The Approved Methods specify how assessments based on the use of air dispersion models should be completed. They include guidelines for the preparation of meteorological data to be used in dispersion models and the relevant air quality criteria for assessing the significance of predicted odour concentrations associated with the Project.

The air dispersion modelling conducted for this assessment was based on the advanced modelling system AERMET/AERMOD model.

7.1 Modelling System

7.1.1 Model overview

AERMOD was chosen as a suitable dispersion model due to the source type, location of nearest receiver and nature of local topography. AERMOD is the US EPA's recommended steady-state plume dispersion model for regulatory purposes. AERMOD replaced the Industrial Source Complex (ISC) model for regulatory purposes in the US in December 2006. Ausplume, a steady state Gaussian plume dispersion model developed by the Victorian EPA and frequently used in Australia for simple near-field applications is based on ISC, which has now been replaced by AERMOD. While AERMOD has not been explicitly listed as an approved model by the EPA in the Approved Methods, AERMOD has been used for a number of assessments that have been approved by NSW EPA (**Pacific Environment 2013a; 2013b**).

The AERMOD dispersion model is anticipated to be the most widely used dispersion model internationally, and has been the subject of many validation exercises to confirm its satisfactory performance for both calm conditions and tall stack applications using standard model validation data sets further discussed below.

7.1.2 Model justification

In NSW, practitioner expertise is allowed flexibility in the selection of the most appropriate model for a particular application. The NSW Approved Methods (**NSW EPA 2016**) specifies AUSPLUME (a steady state model), CALPUFF (non-steady state model) and TAPM (non-steady state model) as approved models for NSW applications. The Approved Methods specifies that AUSPLUME is not approved for the following applications:

- complex terrain, non-steady-state conditions
- buoyant line plumes
- coastal effects such as fumigation
- high frequency of stable calm night-time conditions
- high frequency of calm conditions
- inversion break-up fumigation conditions.

The above conditions for the use of a more complex non-steady state model (i.e. CALPUFF or TAPM) are not applicable for this Project. The Project site is located in flat terrain free from complex interactions from night time drainage flows as a results of significant terrain or the sea breeze when located in a coastal area. It is acknowledged that there is a prevalence of calm conditions in the area (30.9% in 2013) and this is addressed in detail within the AQ assessment report.

Industry wide, the steady-state option of AUSPLUME has been replaced by the AERMOD dispersion modelling system and is now approved for regulatory purposes in Victoria **(EPA Victoria, 2017)**.

The AERMOD model is also supported by the US EPA and is now the model of choice for nearfield (less than 50 km from an emission source) applications **(US EPA, 2017)**. Furthermore, the US EPA no longer

endorses CALPUFF as the preferred model for long range sources (greater than 50km from an emissions source) and is now considered a screening technique.

As part of the US EPA's process in endorsing AERMOD **Paine *et al.* (1998)** evaluated the use of AREMOD for a number of tall stack scenarios across the United States. **Paine *et al.* (1998)** identified that AERMOD generally has a tendency to over-predict across the range of databases that were evaluated. Apparent under predictions for annual averages were found likely to be artefacts of the low concentrations (close to the instrument thresholds) and the uncertainty in determining background concentrations that need to be subtracted from the reported total concentrations.

7.1.1 Model inputs

Terrain data was sourced from NASA's Shuttle Radar Topography Mission Data (1 arc second [~30m] resolution) and processed to create the necessary input files.

Meteorological data from St Marys was used for compilation of the surface file. A detailed discussion on this dataset is provided in **Section 5.1** and the PE Air Report (Section 8).

AERMET requires surface and upper air meteorological data as input. Wind speed, wind direction, temperature, relative humidity and sea level pressure were source from the EPA St Marys meteorological station. Cloud cover and cloud height were sourced from the BoM Bankstown Airport AWS. In the absence of upper air sounding data for the area, upper air parameters were calculated using the upper air estimator (UAE) within the Lakes Environment AERMOD View software package. The use of the UAE in AERMOD is further discussed in Section 8.2.1 of the PE Air Report.

Appropriate values for three surface characteristics are required for AERMET as follows:

- Surface roughness, which is the height at which the mean horizontal wind speed approaches zero, based on a logarithmic profile.
- Albedo, which is an indicator of reflectivity of the surface.
- Bowen ratio, which is an indicator of surface moisture.

Values of surface roughness, albedo and Bowen ratio were determined based on a review of aerial photography for a radius of 3 km centred on the EPA St Marys station. Default values for cultivated land and urban areas were chosen over two sectors across this area.

8 RESULTS

The dispersion modelling results for the 1 second (nose response) average 99th percentile odour ground level concentrations (GLCs) for the Project in isolation and in combination with odour emissions from the Genesis Facility are presented in **Table 8-1.** The results are presented for the predicted concentrations at the sensitive receivers detailed in **Table 3-1**. Detailed results for all receptors shown in **Figure 3-1** are provided in **Appendix E**.

The corresponding contour plots of the predicted 99th percentile odour concentrations are presented **Figure 8-1** and **Figure 8-2**.

The results indicate that when the Project is considered in isolation and combined with odour emissions from the Genesis Facility that the predicted 99th percentile odour concentrations would be below the 2 ou impact assessment criterion all of the sensitive receptors (including those assessed in **Appendix E**).

Review of the contour plots shows that the potential for spread of the odour plume is greatest to the north, and to a lesser extent the south, of the Project. The odour concentrations are predicted to be highest in the residential suburb of Minchinbury, but are anticipated to be just above the detection threshold (1 ou) and below the impact assessment criterion of 2 ou throughout the suburb.

Comparison of the odour contours between the Project in isolation (**Figure 8-1**) and combined with the Genesis Facility (**Figure 8-2**) show that there is little difference between the predicted odour impacts of the Project and the Project combined with the existing Genesis Facility. It can be inferred that of the two facilities the Project would be likely to be the greatest contributor to offsite odour concentrations.

It can be seen that the contributions from the Genesis Facility are centred at the pit and diminish quickly only a short distance from the pit. This is largely because the most significant existing odour sources that comprise the Genesis Facility are located within the pit with limited dispersion, resulting in the higher odour concentrations in this locality. Once the odour plume reaches ground level the odour plume is able to disperse more effectively.

Table 8-1: Summary of Predicted 99th percentile ground level concentrations of odour (ou)

Receptor	Project	Project + Genesis Facility
James Erskine Primary School	<1	<1
Erskine Park High School	<1	<1
Clairgate Public School	<1	<1
Minchinbury Public School	1	1
Pinegrove Memorial Park Lawn Cemetery	<1	<1
Sunny Patch Preparation School & Long Day Care Centre	<1	<1
Eastern Creek Public School	<1	<1
St Agnes Catholic High School	<1	<1
All Areas Family Day Care Pty	1	1
Maria Hawey Child Care Centre	1	1
Jiminey Cricket Long Day Care	1	1
White Bunny Child Care Centre	1	1
LITTLESMARTIES	<1	<1
Kidz Fun Factory	<1	<1

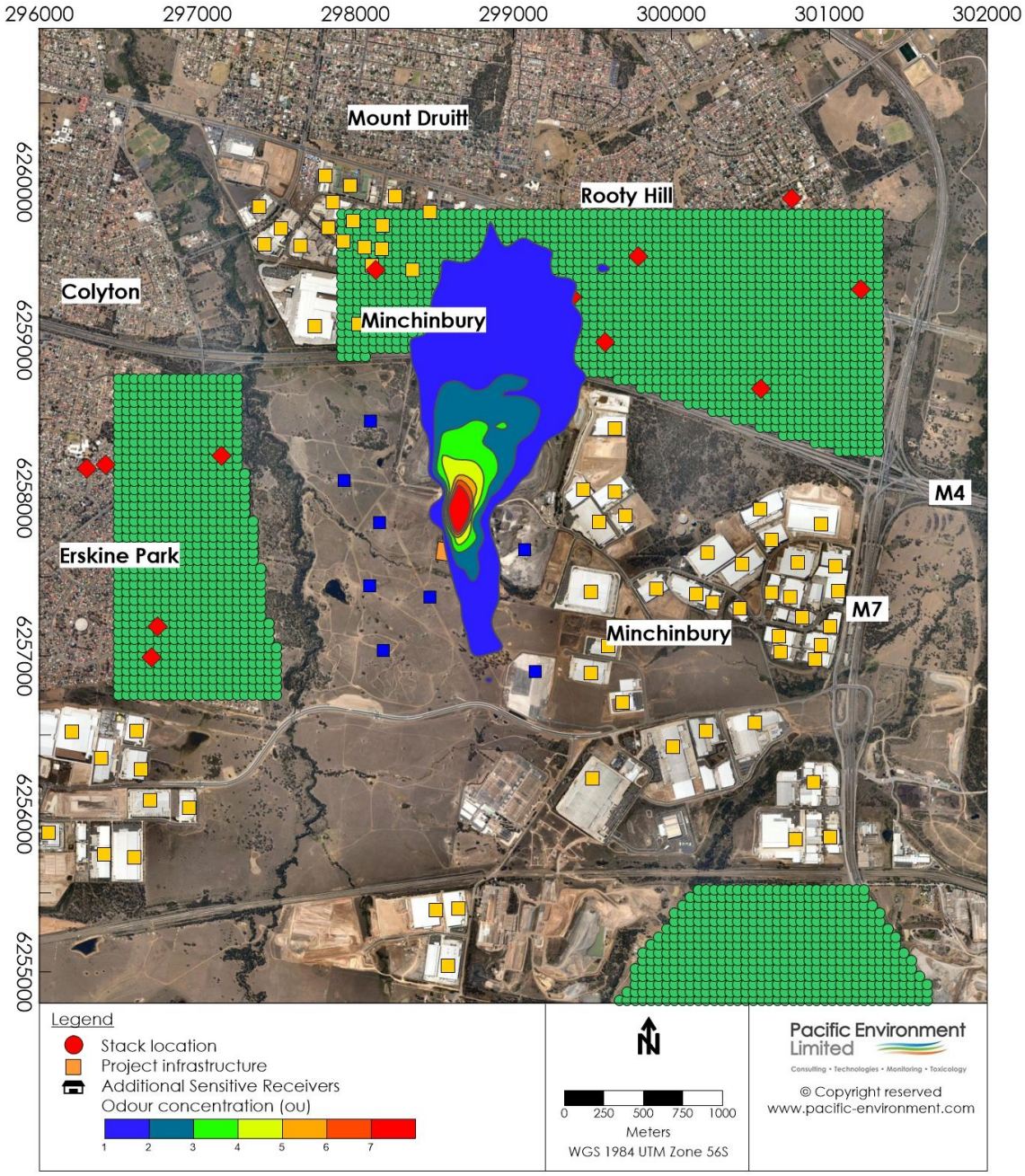

Figure 8-1: Predicted 1-hour average 99th percentile ground level odour concentrations from the Project

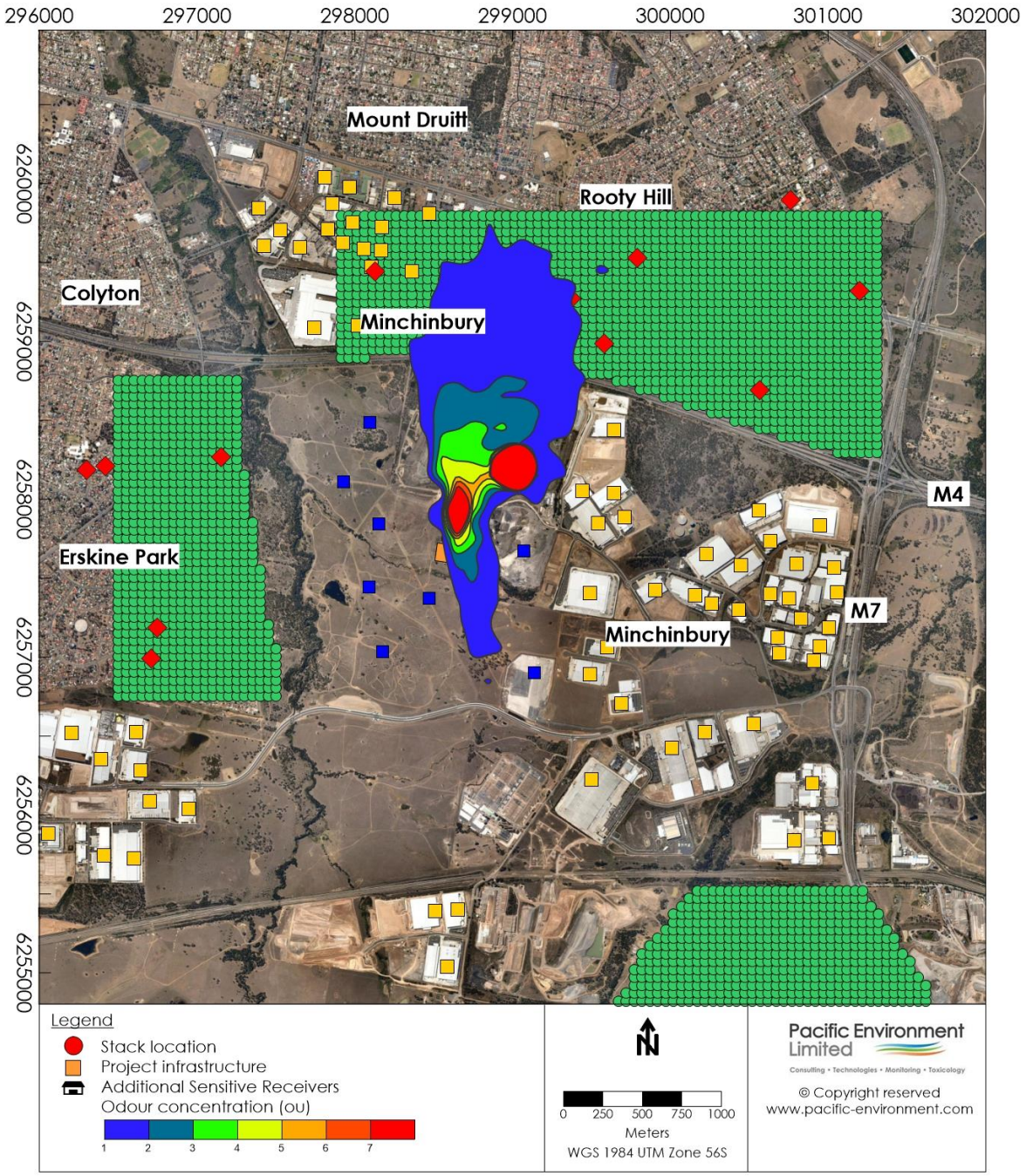

Figure 8-2: Predicted 1-hour average 99th percentile ground level odour concentrations from the Project in combination with odour sources from Genesis Facility

9 PLANT MANAGEMENT AND MITIGATION

Community and stakeholder concern has been raised related to the ability of the waste receival hall to contain fugitive (principally odour) emissions when the plant is under shut-down conditions (i.e. air is not being drawn to the furnaces, and the area may not thus be under negative pressure).

The plant consists of two lines, each of them in operation for at least 8,000 hours/year. For routine maintenance only one line is shut down at a time, the other remains in operation. Therefore air is extracted from the waste receival hall all year round. Even in case of an unplanned shut-down only one line has to be stopped, and thus it is highly unlikely that a problem occurs on both lines at the same time. Even if this would be the case the air extraction continues in order to cool down the furnace.

In addition, during maintenance the air flow remains to keep a slight under pressure in the system in order to prevent dust to escape from furnace and air pollution control system. As a result there will be no situation where air is not extracted from the waste receival hall / bunker.

Finally, it is highlighted that, given the proposed waste stream is non-putrescible, and in the main C&I / C&D waste, it is neither highly odorous nor likely to have any toxic emission to air.

The facility has the ability to be sealed using operable doors and louvres, and it anticipated that under any condition where negative pressure is not present in the receival hall, and odorous material is being stored, the operational air quality management plan for the facility would dictate that the area be sealed until such conditions change.

10 CONCLUSION

This odour assessment provides a quantitative assessment of potential odour impacts as a result of the proposed EfW facility. This report is an addendum to the PE Air Report (**Pacific Environment, 2017**).

Fuel (waste) is proposed to arrive to the facility in covered trucks or via an enclosed conveyor from the Genesis Facility. All waste storage and unloading is to take place within the tipping hall building, which is kept at negative pressure with air extracted from the building to be used as excess air in the boiler.

Odour emissions for the facility were based on recent odour monitoring that was completed for the Genesis facility in January, 2014. Cumulative odour emissions from the Genesis Facility were also investigated.

The results indicate that when the Project is considered in isolation and combined with odour emissions from the Genesis Facility that the predicted 99th percentile odour concentrations would be below the 2 ou impact assessment criterion all of the sensitive receptors. The odour concentrations are predicted to be highest in the residential suburb of Minchinbury, but are anticipated to be just above the detection threshold (1 ou) and below the impact assessment criterion of 2 ou throughout the suburb.

In view of the dispersion modelling results it is anticipated that the operation of the Project is not likely to result in an adverse impact on the local air environment in reference to odour.

11 REFERENCES

DADI (2017) Genesis Facility, Eastern Creek Complaints Register. Cited 8 August 2017. http://www.dadi.com.au/files/complaints-register.pdf

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Pacific Environment, 2017. Energy from Waste facility – Air Quality and Greenhouse Gas Assessment. August, 2017.

Katestone Scientific, 1995. The Evaluation of peak-to-mean ratios for odour assessments, Brisbane: Katestone Scientific .

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

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Standards Australia, 2001. AS4323.3 Determination of Odour Concentration by Dynamic Olfactometry. Sydney: Standards Australia.

Appendix A: GENERAL ARRANGEMENT OF EFW FACILITY


BS 13
WORKSHOP
BS 1
TIPPING
HALL
BS 2
WASTE
BUNKER 1
BS 3
BOILER
HOUSE 1
(EAST)
BS 4
F.G.T. 1
BS 4
F.G.T. 2
Phase 1
BS 2
WASTE
BUNKER 2
BS 4
F.G.T. 3
Phase 2
BS 6
TURBINE HALL 1
(EAST)
BS 7
AIR CONDENSED
COOLER
(EAST)
BS 6
TURBINE HALL 2
(WEST)
BS 7
AIR CONDENSED
COOLER
(WEST)
BS 12
OFFICE
B OUT WEIGHBRIDGE
C REFERENCE PLAN

Appendix B: ODOUR MONITORING RESULTS FROM GENESIS FACILITY

THE ODOUR UNIT

MEMORANDUM

TO: Ronan Kellaghan

COMPANY: Pacific Environment (Sydney)

CC:

FROM: Alex Schulz

DATE: 20 December 2013

COMPANY: The Odour Unit

JOB NO: N1867R

NO OF PAGES: 1

Including cover sheet

REPLY REQUIRED NO

ORIGINAL TO FOLLOW NO

SUBJECT: ODOUR CHARACTER RESULTS

Ronan,

Please find below the odour character results for the odour testing that was carried out 18/12/2013.

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Odour Character
Active Tip Face	SC13684	17/12/2013 13:15 hrs	18/12/2013 10:27 hrs	558	558	Oily, Dusty, Garbage
Leachate Tank	SC13685	17/12/2013 14:42 hrs	18/12/2013 10:55 hrs	362	362	Garbage
Leachate Riser	SC13686	17/12/2013 11:50 hrs	18/12/2013 11:21 hrs	19,500	19,500	Oily, Grease, Onion, Garbage, Sulphide

Appendix C: ODOUR COMPLAINTS HISTORY

GENESIS FACILITY, EASTERN CREEK
COMPLAINTS REGISTER (updated monthly)

Date of Complaint	Summary of Complaint Issues	Matter Investigated	Matter Resolved or Outstanding	Measures Taken	Date Measures Taken
30/11/2016	Nil	N/A	N/A	N/A	N/A
31/10/2016	Nil	N/A	N/A	N/A	N/A
30/09/2016	Nil	N/A	N/A	N/A	N/A
24/08/2016	**Odour** EPA received a call alleging that at approximately 10:30am there was a sewer like odour in Minchinbury.	Yes	Yes	The Licence-holder investigated practices at the site and confirmed (to the EPA) that the offensive odour in the area did not originate from the Genesis facility. Normal activities of recycling and landfilling non-putrescible waste, in accordance with EPL conditions were being undertaken but at a reduced volume due to the wet weather.	24/08/2016 to 25/08/2016
31/07/2016	Nil	N/A	N/A	N/A	N/A
30/06/2016	Nil	N/A	N/A	N/A	N/A
31/05/2016	Nil	N/A	N/A	N/A	N/A
30/04/2016	Nil	N/A	N/A	N/A	N/A
31/03/2016	Nil	N/A	N/A	N/A	N/A
29/02/2016	Nil	N/A	N/A	N/A	N/A
31/01/2016	Nil	N/A	N/A	N/A	N/A
31/12/2015	Nil	N/A	N/A	N/A	N/A
30/11/2015	Nil	N/A	N/A	N/A	N/A
31/10/2015	Nil	N/A	N/A	N/A	N/A
30/09/2015	Nil	N/A	N/A	N/A	N/A
31/08/2015	Nil	N/A	N/A	N/A	N/A
31/07/2015	Nil	N/A	N/A	N/A	N/A
27/06/2015	**Odour** After hours call to EPA @ 19h50 advising of	Yes	Yes	The Licence-holder investigated practices at the site on 27 and 28 June 2015 and	29/06/2015 to 09/07/2015

GENESIS FACILITY, EASTERN CREEK
COMPLAINTS REGISTER (updated monthly)

Date of Complaint	Summary of Complaint Issues	Matter Investigated	Matter Resolved or Outstanding	Measures Taken	Date Measures Taken
	overpowering smell, making caller and family feel unwell. Caller alleged it appeared to be coming from Dial-A-Dump. EPA officer reported odour on 28/06/2015 @ 19h30 in the vicinity of Eastern Creek and expressed view it may have been generated from the Genesis premises.			confirmed (to the EPA) that the offensive odour in the area did not originate from the Genesis facility. The Genesis facility was closed at the time of the complaint to the EPA environment line and on 23 June 2015. However, as part of the investigation, onsite security guards and independent parties entering and exiting the site preceding and post those dates have been contacted and confirmed no evidence of odour at the Genesis premises. One of the transport companies highlighted the offensive odour at the intersection of Old Wallgrove Road and Wallgrove Road Eastern Creek. No issues have occurred with the management of leachate at the Genesis Facility.	
31/05/2015	Nil	N/A	N/A	N/A	N/A
30/04/2015	Nil	N/A	N/A	N/A	N/A
31/03/2015	Nil	N/A	N/A	N/A	N/A
28/02/2015	Nil	N/A	N/A	N/A	N/A
31/01/2015	Nil	N/A	N/A	N/A	N/A
31/12/2104	Nil	N/A	N/A	N/A	N/A
30/11/2014	Nil	N/A	N/A	N/A	N/A
31/10/2014	Nil	N/A	N/A	N/A	N/A
30/09/2014	Nil	N/A	N/A	N/A	N/A
31/08/2014	Nil	N/A	N/A	N/A	N/A
02/07/2014	**Odour** After hours call to EPA @ 22h00 advising of pungent smell like rotting food coming across the landfill site in Eastern Creek. The wind direction is South Easterly and	Yes	Yes	On 7 July 2014 when Licence-holder was advised of complaint an investigation was undertaken which confirmed there has been no odour arising from the landfill. All dams, leachate tanks and the mulch area are	7/07/2014

GENESIS FACILITY, EASTERN CREEK
COMPLAINTS REGISTER (updated monthly)

Date of Complaint	Summary of Complaint Issues	Matter Investigated	Matter Resolved or Outstanding	Measures Taken	Date Measures Taken
	caller alleged it appears to be coming from Dial-A-Dump.			routinely inspected daily. South East of our site is another waste facility that accepts food however on this day there was no odour coming across our site.	
30/06/2014	Nil	N/A	N/A	N/A	N/A
31/05/2014	Nil	N/A	N/A	N/A	N/A
30/04/2014	Nil	N/A	N/A	N/A	N/A
31/03/2014	Nil	N/A	N/A	N/A	N/A
28/02/2014	Nil	N/A	N/A	N/A	N/A
31/01/2014	Nil	N/A	N/A	N/A	N/A
31/12/2013	Nil	N/A	N/A	N/A	NA/
30/11/2013	Nil	N/A	N/A	N/A	N/A
4/10/2013	**Shuddering** A Minchinbury Representative advised several residents in Barossa Drive, Minchin Drive and side streets off those roads had experienced shuddering in their homes the previous two nights between 9.30 pm and 10.30 pm.	Yes	Yes	Licence-holder investigated complaint and confirmed no major or extraordinary activity was undertaken on the site. Possibility of seismic activity in the area as reported in the media.	4/10/2013
30/09/2013	Nil	N/A	N/A	N/A	N/A
31/08/2013	Nil	N/A	N/A	N/A	N/A
31/07/2013	Nil	N/A	N/A	N/A	N/A
30/06/2013	Nil	N/A	N/A	N/A	N/A
31/05/2013	Nil	N/A	N/A	N/A	N/A
11-12/04/2013	**Odour** Local residents complain of a 'chemical-like' / 'garbage-like' odour in the St Clair and Erskine Park area on evening of 9 April 2013. EPA contact a number of facilities to	Yes	Yes	Licence-holder investigated complaint and confirmed (to EPA) that no odour of that description left the facility. Senior manager (local to the area) observed strong 'garbage-like' odours from another facility in the St	11-12/04/2013

GENESIS FACILITY, EASTERN CREEK
COMPLAINTS REGISTER (updated monthly)

Date of Complaint	Summary of Complaint Issues	Matter Investigated	Matter Resolved or Outstanding	Measures Taken	Date Measures Taken
	ascertain cause.			Clair area on the evening of 9 April 2013 not in the vicinity of the licence-holder's facility.	
31/03/2013	Nil	N/A	N/A	N/A	N/A
18/02/2013	**Odour** A Minchinbury Resident advised they had noticed an odour from Sydney Water sewer vent pipes following a heavy rain event and had been advised that it may be sewage from Genesis.	Yes	Yes	Investigated incident and reviewed leachate treatment practices.	18/02/2013
31/01/2013	Nil	N/A	N/A	N/A	N/A
31/12/2012	Nil	N/A	N/A	N/A	N/A
30/11/2012	Nil	N/A	N/A	N/A	N/A
30/09/2012	Nil	N/A	N/A	N/A	N/A
31/08/2012	Nil	N/A	N/A	N/A	N/A
31/07/2012	Nil	N/A	N/A	N/A	N/A
30/06/2012	Nil	N/A	N/A	N/A	N/A
31/05/2012	Nil	N/A	N/A	N/A	N/A
30/04/2012	Nil	N/A	N/A	N/A	N/A
31/03/2012	Nil	N/A	N/A	N/A	N/A
29/02/2012	Nil	N/A	N/A	N/A	N/A
31/01/2012	Nil	N/A	N/A	N/A	N/A
31/12/2011	Nil	N/A	N/A	N/A	N/A
30/11/2011	Nil	N/A	N/A	N/A	N/A
31/10/2011	Nil	N/A	N/A	N/A	N/A
30/09/2011	Nil	N/A	N/A	N/A	N/A
31/08/2011	Nil	N/A	N/A	N/A	N/A
31/07/2011	Nil	N/A	N/A	N/A	N/A
30/06/2011	Nil	N/A	N/A	N/A	N/A
31/05/2011	Nil	N/A	N/A	N/A	N/A
30/04/2011	Nil	N/A	N/A	N/A	N/A

GENESIS FACILITY, EASTERN CREEK
COMPLAINTS REGISTER (updated monthly)

Date of Complaint	Summary of Complaint Issues	Matter Investigated	Matter Resolved or Outstanding	Measures Taken	Date Measures Taken
31/03/2011	Nil	N/A	N/A	N/A	N/A
09/02/2011	**Noise** Minchinbury Resident advised LHBC of single loud banging noise in the early morning, sounded like dump truck door banging.	Yes	Yes	Review of site daily reports regarding construction progress. • Premises best described as building site with concrete pouring of footings and laying of drain pipes. No construction work undertaken after 6.00pm each work day Monday to Friday. • Site is locked and secured when Site personnel not present. • No waste is being received at premises.	10 February 2011 Email to Resident, as we were unable to reach them by telephone.
01/01/2011	Nil	N/A	N/A	N/A	N/A
31/12/2010	Nil	N/A	N/A	N/A	N/A
30/11/2010	Nil	N/A	N/A	N/A	N/A
31/10/2010	Nil	N/A	N/A	N/A	N/A
30/09/2010	Nil	N/A	N/A	N/A	N/A
31/08/2010	Nil	N/A	N/A	N/A	N/A
31/07/2010	Nil	N/A	N/A	N/A	N/A
30/06/2010	Nil	N/A	N/A	N/A	N/A
31/05/2010	Nil	N/A	N/A	N/A	N/A
30/04/2010	Nil	N/A	N/A	N/A	N/A
31/03/2010	**Noise** Minchinbury Resident advised Dept. of Planning this has been ongoing since Christmas.	Yes	Yes	Stage 1 works recommenced on LHBC site on or about 4 March 2010 with Contractors working strictly within approved operating hours; limited works undertaken prior to this date. Other site works in the neighbourhood have been ongoing since the New Year.	1 April 2010 Offer to Dept. of Planning for Site Manager to meet with complainant and facilitate site visit.
28/02/2010	Nil	N/A	N/A	N/A	N/A
31/01/2010	Nil	N/A	N/A	N/A	N/A

GENESIS FACILITY, EASTERN CREEK
COMPLAINTS REGISTER (updated monthly)

Appendix D: ASSUMPTIONS

ASSUMPTIONS

General

The Facility will operate 24 hours a day, 7 days a week, with occasional offline periods for maintenance. For the purposes of dispersion modelling, it has been assumed that the plant would be operating 8,760 hours per year.

The facility will employ high speed roller doors for truck access to ensure fugitive odour emissions from within the building are minimised.

All waste storage and unloading will take place within the tipping hall building, which is kept under negative pressure with air extracted from the building to be used as excess air in the boiler.

The air will then be drawn into the primary combustion zone and will ultimately undergo combustion and be released via the stack.

Emissions

Individual odour emissions would be released from the stack and have been assessed as part of the PE Air Report ((**Pacific Environment, 2017**).

It has been assumed that the area of the roller door will be 25 m^2.

An exit velocity of 0.1 m/s was adopted to account for the small volumes of fugitive air that may escape from the tipping hall when the doors are open and with the building operating under negative pressure.

As the waste for the Project will be supplied by the adjacent Genesis Facility, it is assumed that the character of the odour from the active tip face will be applicable to the Project.

Meteorology

A review completed within the PE Air Report **(Pacific Environment, 2017)** identified the calendar year 2013 as a representative year of meteorology for dispersion modelling with no anomalous wind patterns compared to the other years.

In 2017, the meteorological file was updated such that all calm wind speeds to set to 0.5 m/s.

Modelling

AERMOD was chosen as a suitable dispersion model due to the source type, location of nearest receiver and nature of local topography.

Terrain data was sourced from NASA's Shuttle Radar Topography Mission Data (1 arc second [~30m] resolution) and processed to create the necessary input files.

Values of surface roughness, albedo and Bowen ratio were determined based on a review of aerial photography for a radius of 3 km centred on the Office of Environment and Heritage St Marys automatic weather station. Default values for cultivated land and urban areas were chosen over two sectors across this area.

For this assessment we have assumed a peak-to-mean ratio of 2.5 and 2.3 for all stability classes for area sources and volume sources, respectively.

Results

An odour criterion of 2 ou is assumed to apply given that the site is located within the Sydney contiguous urban area.

Appendix E: ODOUR PREDICTIONS AT ALL RECEPTORS

Sensitive Receptor	Easting (m)	Northing (m)	1 hour Incremental OU 99th	1 hour Cumulative OU 99th
Maximum occurs at 299251, 6258615 (outside site boundary)			1.6	1.6
James Erskine Primary School	296748	6257187	0.0	0.0
Erskine Park High School	296709	6256992	0.0	0.0
Clairgate Public School	296299	6258187	0.0	0.0
Minchinbury Public School	299287	6259084	1.2	1.2
Pinegrove Memorial Park Lawn Cemetery	300567	6258692	0.1	0.1
Sunny Patch Preparation School & Long Day Care Centre	297153	6258266	0.1	0.1
Eastern Creek Public School	301201	6259319	0.1	0.1
St Agnes Catholic High School	300761	6259894	0.3	0.3
All Areas Family Day Care Pty	299581	6258986	0.8	0.8
Maria Hawey Child Care Centre	299370	6259272	1.1	1.1
Jiminey Cricket Long Day Care	298562	6259310	1.2	1.2
White Bunny Child Care Centre	299792	6259530	0.7	0.7
LITTLESMARTIES	296419	6258212	0.0	0.0
Kidz Fun Factory	298128	6259445	0.3	0.3
Closest receptors to the west (Erskine Park)	297450	6256754	0.1	0.1
	297500	6256754	0.1	0.1
	297450	6256804	0.1	0.1
	297500	6256804	0.1	0.1
	297450	6256854	0.1	0.1
	297500	6256854	0.1	0.1
	297450	6256904	0.1	0.1
	297500	6256904	0.1	0.1
	297400	6256954	0.0	0.0
	297450	6256954	0.1	0.1
	297500	6256954	0.1	0.1
	297400	6257004	0.0	0.0
	297450	6257004	0.1	0.1
	297500	6257004	0.1	0.1
	297400	6257054	0.0	0.0
	297450	6257054	0.1	0.1
	297500	6257054	0.1	0.1
	297400	6257104	0.0	0.0
	297450	6257104	0.1	0.1
	297400	6257154	0.0	0.0
	297450	6257154	0.1	0.1
	297400	6257204	0.0	0.0
	297450	6257204	0.1	0.1
	297400	6257254	0.0	0.0
	297400	6257304	0.0	0.0
	297350	6257354	0.0	0.0
	297400	6257354	0.0	0.0
	297350	6257404	0.0	0.0
	297400	6257404	0.0	0.0
	297350	6257454	0.0	0.0
	297400	6257454	0.0	0.0
	297300	6257504	0.0	0.0
	297350	6257504	0.0	0.0
	297400	6257504	0.0	0.0
	297300	6257554	0.0	0.0
	297350	6257554	0.0	0.0
	297400	6257554	0.0	0.0

Sensitive Receptor	Easting (m)	Northing (m)	1 hour Incremental OU 99th	1 hour Cumulative OU 99th
	297300	6257604	0.0	0.0
	297350	6257604	0.0	0.0
	297300	6257654	0.0	0.0
	297350	6257654	0.0	0.0
	297300	6257704	0.0	0.0
	297350	6257704	0.0	0.0
	297300	6257754	0.0	0.0
	297350	6257754	0.0	0.0
	297300	6257804	0.0	0.0
	297350	6257804	0.0	0.0
	297300	6257854	0.0	0.0
	297350	6257854	0.0	0.0
	297300	6257904	0.0	0.0
	297250	6257954	0.0	0.0
	297300	6257954	0.0	0.0
	297250	6258004	0.0	0.0
	297300	6258004	0.0	0.0
	297250	6258054	0.0	0.0
	297300	6258054	0.0	0.0
	297250	6258104	0.0	0.0
	297300	6258104	0.0	0.0
	297250	6258154	0.0	0.0
	297300	6258154	0.0	0.0
	297250	6258204	0.0	0.0
	297200	6258254	0.0	0.0
	297250	6258254	0.0	0.0
	297200	6258304	0.0	0.0
	297250	6258304	0.0	0.0
	297200	6258354	0.0	0.0
	297250	6258354	0.0	0.0
	297200	6258404	0.0	0.0
	297250	6258404	0.0	0.0
	297200	6258454	0.0	0.0
	297250	6258454	0.0	0.0
	297200	6258504	0.0	0.0
	297250	6258504	0.0	0.0
	297200	6258554	0.0	0.0
	297250	6258554	0.0	0.0
	297200	6258604	0.0	0.0
	297250	6258604	0.0	0.0
Closest receptors to the north (Minchinbury)	299461.5	6258797	1.0	1.0
	299511.5	6258797	0.9	0.9
	299561.5	6258797	0.8	0.8
	299611.5	6258797	0.7	0.7
	299661.5	6258797	0.6	0.6
	299711.5	6258797	0.6	0.6
	299761.5	6258797	0.6	0.6
	299811.5	6258797	0.6	0.6
	299211.5	6258847	1.6	1.6
	299261.5	6258847	1.4	1.4
	299311.5	6258847	1.1	1.1
	299361.5	6258847	1.1	1.1
	299411.5	6258847	1.1	1.1
	299461.5	6258847	1.0	1.0
	299511.5	6258847	0.9	0.9
	299561.5	6258847	0.8	0.8

Sensitive Receptor	Easting (m)	Northing (m)	1 hour Incremental OU 99th	1 hour Cumulative OU 99th
	299611.5	6258847	0.7	0.7
	298911.5	6258897	1.6	1.6
	298961.5	6258897	1.6	1.6
	299011.5	6258897	1.5	1.5
	299061.5	6258897	1.6	1.6
	299111.5	6258897	1.7	1.7
	299161.5	6258897	1.8	1.8
	299211.5	6258897	1.6	1.6
	299261.5	6258897	1.4	1.4
	299311.5	6258897	1.1	1.1
	299361.5	6258897	1.1	1.1
	299411.5	6258897	1.1	1.1
	298411.5	6258947	1.1	1.1
	298461.5	6258947	1.2	1.2
	298511.5	6258947	1.3	1.3
	298561.5	6258947	1.2	1.2
	298611.5	6258947	1.5	1.5
	298661.5	6258947	1.5	1.5
	298711.5	6258947	1.6	1.6
	298761.5	6258947	1.7	1.7
	298811.5	6258947	1.6	1.6
	298861.5	6258947	1.6	1.6
	298911.5	6258947	1.6	1.6
	298961.5	6258947	1.6	1.6
	299011.5	6258947	1.5	1.5
	298411.5	6258997	1.1	1.1
	300111.5	6258597	0.3	0.3
	300161.5	6258597	0.3	0.3
	300211.5	6258597	0.3	0.3
	299961.5	6258647	0.4	0.4
	300011.5	6258647	0.3	0.3
	300061.5	6258647	0.3	0.3
	300111.5	6258647	0.3	0.3
	300211.5	6258647	0.3	0.3
	299811.5	6258697	0.6	0.6
	299861.5	6258697	0.6	0.6
	299911.5	6258697	0.5	0.5
	299961.5	6258697	0.4	0.4
	300011.5	6258697	0.3	0.3
	300061.5	6258697	0.3	0.3
	299661.5	6258747	0.6	0.6
	299711.5	6258747	0.6	0.6
	299761.5	6258747	0.6	0.6
	299811.5	6258747	0.6	0.6
	299861.5	6258747	0.6	0.6
	299911.5	6258747	0.5	0.5
	299961.5	6258747	0.4	0.4
	300011.5	6258747	0.3	0.3
	298361.5	6258947	1.0	1.0
	298361.5	6258997	1.0	1.0
Industrial	297743	6259085	0.1	0.1
Industrial	298017	6259102	0.1	0.1
Industrial	298262	6259157	0.3	0.3
Industrial	298362	6259444	1.0	1.0
Industrial	298106	6259473	0.3	0.3
Industrial	297650	6259598	0.0	0.0

Sensitive Receptor	Easting (m)	Northing (m)	1 hour Incremental OU 99th	1 hour Cumulative OU 99th
Industrial	297391	6259845	0.0	0.0
Industrial	297425	6259607	0.0	0.0
Industrial	297528	6259706	0.0	0.0
Industrial	297827	6259711	0.0	0.0
Industrial	297923	6259624	0.0	0.0
Industrial	298057	6259589	0.2	0.2
Industrial	298165	6259576	0.5	0.5
Industrial	298169	6259723	0.5	0.5
Industrial	297988	6259754	0.1	0.1
Industrial	297855	6259871	0.1	0.1
Industrial	298473	6259809	0.7	0.7
Industrial	298254	6259912	0.6	0.6
Industrial	297964	6259979	0.2	0.2
Industrial	297807	6260039	0.1	0.1
Industrial	299645	6258440	0.5	0.5
Industrial	299645	6258037	0.5	0.5
Industrial	299709	6257886	0.1	0.1
Industrial	299541	6257851	0.1	0.1
Industrial	299441	6258055	0.4	0.4
Industrial	299490	6257405	0.1	0.1
Industrial	299906	6257425	0.2	0.2
Industrial	300157	6257390	0.1	0.1
Industrial	300263	6257339	0.1	0.1
Industrial	300447	6257583	0.1	0.1
Industrial	300228	6257651	0.1	0.1
Industrial	300560	6257928	0.1	0.1
Industrial	300633	6257735	0.1	0.1
Industrial	300948	6257833	0.0	0.0
Industrial	300802	6257591	0.0	0.0
Industrial	300633	6257403	0.1	0.1
Industrial	300755	6257374	0.1	0.1
Industrial	301037	6257567	0.0	0.0
Industrial	301057	6257410	0.0	0.0
Industrial	301003	6257186	0.0	0.0
Industrial	300950	6257066	0.0	0.0
Industrial	300910	6256975	0.0	0.0
Industrial	300682	6257126	0.1	0.1
Industrial	300691	6257026	0.1	0.1
Industrial	300831	6257241	0.0	0.0
Industrial	300436	6257299	0.1	0.1
Industrial	299601	6257064	0.2	0.2
Industrial	299490	6256891	0.1	0.1
Industrial	299689	6256705	0.2	0.2
Industrial	299501	6256224	0.2	0.2
Industrial	300008	6256426	0.2	0.2
Industrial	300219	6256526	0.1	0.1
Industrial	300529	6256577	0.1	0.1
Industrial	300899	6256202	0.1	0.1
Industrial	300786	6255839	0.1	0.1
Industrial	301006	6255854	0.1	0.1
Industrial	298652	6255402	0.0	0.0
Industrial	298508	6255389	0.0	0.0
Industrial	298584	6255037	0.0	0.0
Industrial	296204	6256521	0.0	0.0
Industrial	296614	6256526	0.0	0.0
Industrial	296388	6256355	0.0	0.0

Sensitive Receptor	Easting (m)	Northing (m)	1 hour Incremental OU 99th	1 hour Cumulative OU 99th
Industrial	296643	6256280	0.0	0.0
Industrial	296700	6256087	0.0	0.0
Industrial	296946	6256040	0.0	0.0
Industrial	296598	6255723	0.0	0.0
Industrial	296410	6255743	0.0	0.0
Industrial	296055	6255881	0.0	0.0
Industrial Facility (Fisher and Paykel)	299251	6258615	1.6	1.6
Commercial Land (Sargents)	298093	6258488	0.1	0.1
Commercial Land (Dept of Planning)	297926	6258109	0.1	0.1
Commercial Land (Dept of Planning)	298154	6257844	0.2	0.2
Commercial Land (Dept of Planning)	298091	6257443	0.1	0.1
Commercial Land (Dept of Planning)	298470	6257372	0.2	0.2
Commercial Land (Dept of Planning)	298175	6257034	0.1	0.1
Commercial Land (Dept of Planning)	298746	6257137	3.4	3.4
Industrial Facility (Hanson)	299072	6257670	0.4	0.4
Industrial Facility (Jacfin)	299136	6256900	0.4	0.4