

Appendix I:
Odour Impact Assessment

The Odour Unit



CAPITAL RECYCLING SOLUTIONS



Materials Recovery Facility and Rail Freight Terminal Odour Impact Assessment

Fyshwick, ACT

January 2018

Final 1.0

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GLOSSARY

ACT	Australian Capital Territory
ac/h	air changes per hour
AS/NZS 4323.3	Australian/New Zealand Standard 4323.3:2001 Stationary source emissions – Determination of odour concentration by dynamic olfactometry
BPIP	Building Profile Input Program
C&I	Commercial and Industrial Waste
CRS	Capital Recycling Solutions
EPA	Environment Protection Authority
IAC	impact assessment criteria
m	metre
m/s	metres per second
m²	square metre
m³/h	cubic metres per hour
m³/s	cubic metres per second
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
NSW	New South Wales
OER	odour emission rate, ou.m ³ /s
ou	odour units
ou.m³/t.s	OER per tonne emission factor
RFT	Rail Freight Terminal
TOU	The Odour Unit Pty Ltd
tpa	tonnes per annum
tpd	tonnes per day
tph	tonnes per hour

1 INTRODUCTION

1.1 BACKGROUND

The Odour Unit Pty Ltd (**TOU**) was commissioned in October 2017 by Capital Recycling Solutions (**CRS**) to carry out an odour modelling assessment of its proposed Material Recycling Facility (**MRF**) and Rail Freight Terminal (**RFT**) located at Fyshwick, ACT.

1.2 OBJECTIVES

The aim of the assessment is to determine an appropriate ventilation airflow for the MRF building and therefore stack configuration. To achieve this, the following components were undertaken as part of the assessment:

- Examine building dimensions, design and door openings to determine appropriate air changes required for the MRF building;
- Estimate a representative odour emissions inventory for the operations based upon past measurements taken from a Municipal Solid Waste (**MSW**) transfer station located in Sydney, but considering majority waste received is commercial and industrial (**C&I**) waste; and
- Use odour dispersion modelling as a design tool to determine the effect of mitigation measures in minimising the potential of odour nuisance upon the surrounding community, that is satisfy General Environmental Duty obligations described within *Part 3* of the Environment Protection Act 1997.

This report summaries the methodology, results and findings of the assessment.

2 PROPOSED MATERIAL RECYCLING FACILITY

2.1 SITE DESCRIPTION

The proposed CRS MRF and RFT comprises of a recycling facility building and a rail terminal to be located at 16 Ipswich Street, Fyshwick (Blocks 9 and 11, Section 8). The MRF would receive, sort, separate and recycle ACT MSW and C&I waste. By mid-2019, the MRF is proposed to process some 300,000 tonnes per annum (**tpa**) of which, 60,000 tpa (20%) is expected to be recovered for recycling. The MSW would generally be received and processed five days per week and C&I six days per week. CRS would export waste residues by rail directly to the Woodlawn Bioreactor by sealed waste ISO containers.

Waste would be delivered into the MRF shed of rectangular shape dimensioned approximately 92 metres (m) long by 74 m wide by 12 m high. Trucks would enter and exit through fast-action doorways located on the eastern side of the shed. The shed is proposed to be under full negative pressure, extracted at five air changes an hour (**ac/h**) with air discharged by stack located on the northwest quadrant of the shed. A site layout is shown in **Figure 2.1**. More conceptual design drawings are available in **Appendix A**.

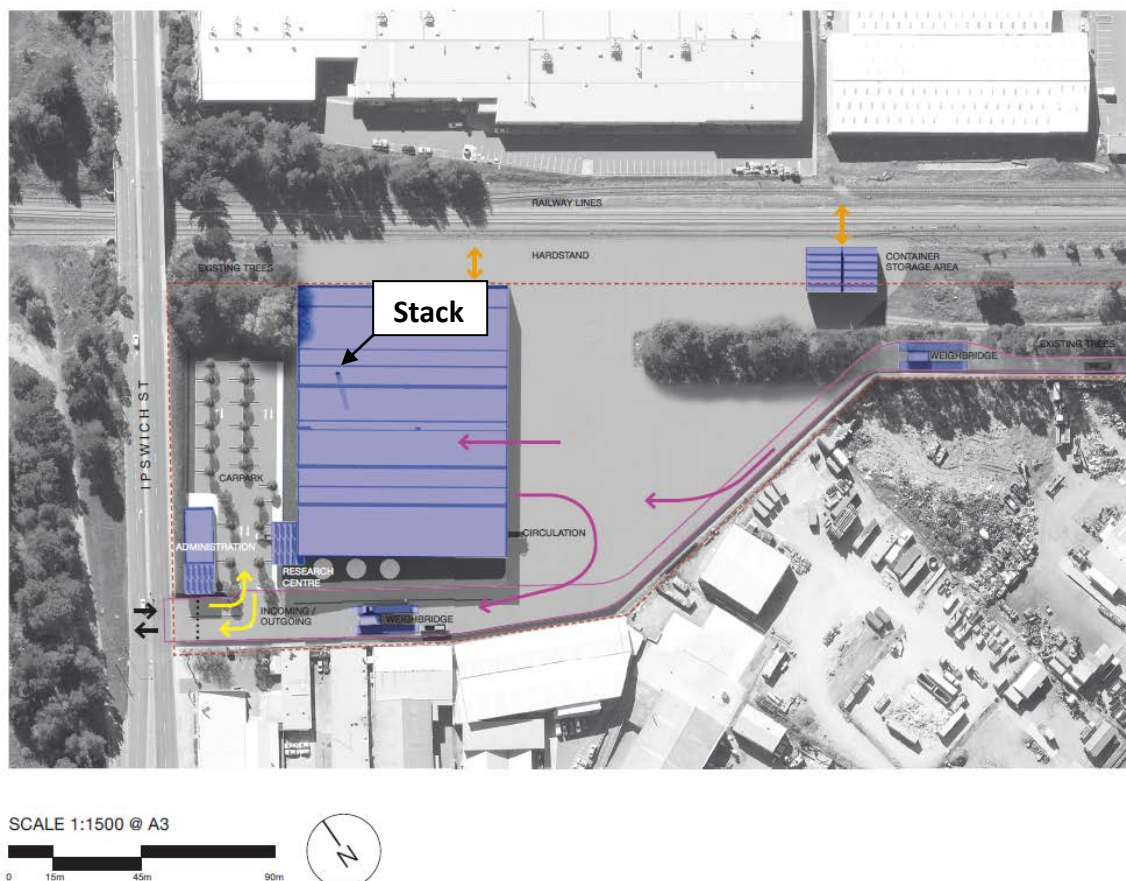


Figure 2.1 – CRS MRF site layout

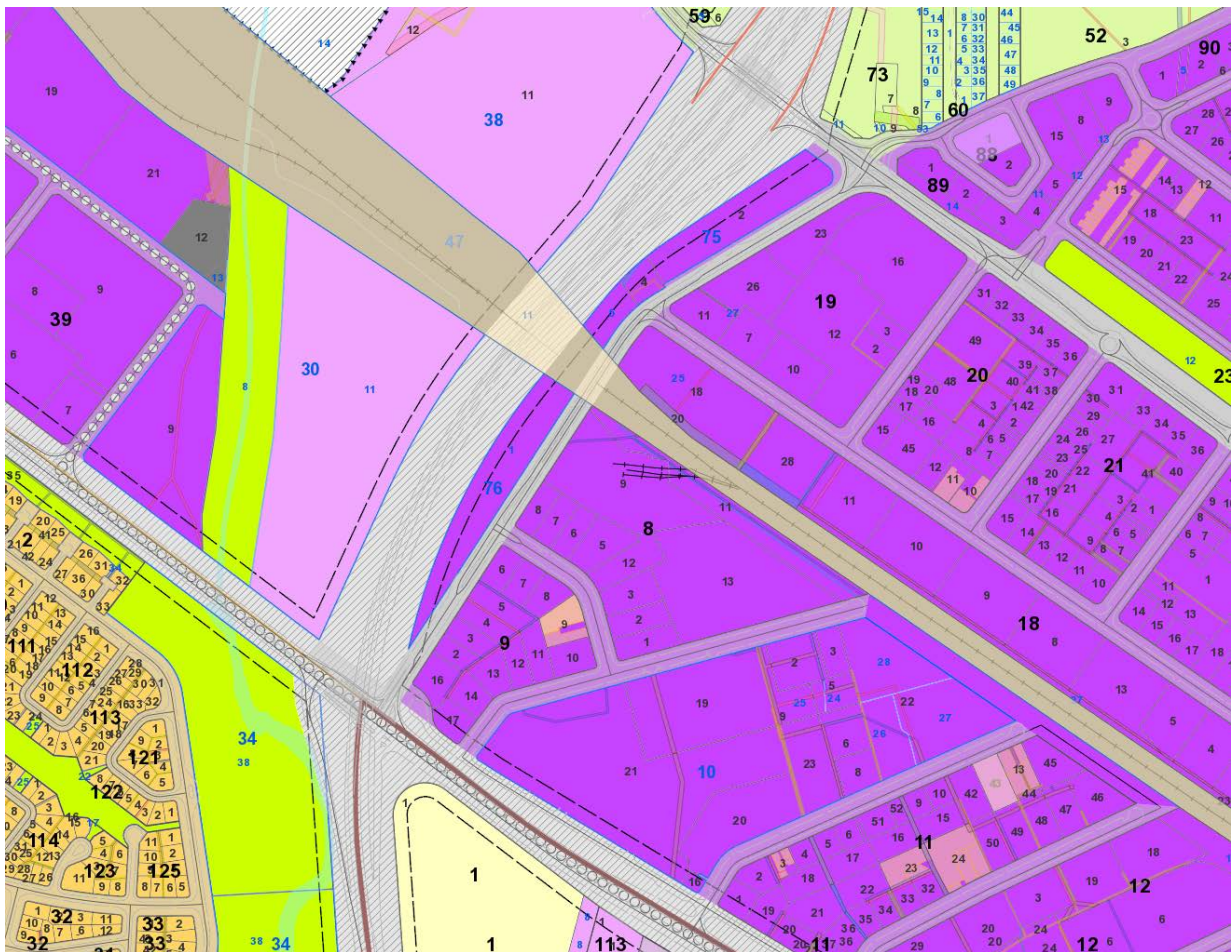


Figure 2.3 – Territory Plan overlay

2.3 PROPOSED SHED EXTRACTION SYSTEM

The proposed shed extraction system consists of the following key components:

- The shed structure would be fully enclosed and undergo an exchange of 5 air changes per hour, equivalent to a total airflow of approximately 410,000 cubic metres per hour (m^3/h).
- Trucks would enter and exit through fast-action doorways; some odour could escape when opened. CRS has indicated they would install deodoriser sprays that would activate when doors are opened to mitigate fugitive odours.
- The total airflow will be discharged via a single stack located 21 m above ground level and at a stack design discharge velocity of 20 metres per second (m/s).

3 ODOUR DISPERSION MODELLING METHODOLOGY

3.1 ACT LEGISLATIVE CONTEXT AND GUIDANCE

Regulatory authority guidelines for odorous impacts of gaseous process emissions are not designed to satisfy a 'zero odour impact criteria', but rather to minimise the nuisance effect to acceptable levels within the local community.

In the ACT, practicable and reasonable measures must be taken to prevent or minimise environmental nuisance (e.g. odour) to satisfy the General Environmental Duty obligations described within *Part 3* of the Environment Protection Act 1997. There is no specific odour impact assessment or dispersion modelling guidance for new developments in the ACT.

In the absence of guidance, the odour modelling and impact assessment for this project has been carried out in accordance with the methods outlined in the documents:

- NSW EPA, 2016, *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (hereafter referred to as **NSW EPA 2016 Methods**);
- NSW EPA, 2006, *Technical framework (and notes): assessment and management of odour from stationary sources in NSW* (hereafter referred to as the **NSW EPA 2006 Framework and Notes**); and
- Barclay and Scire, 2011, *Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'* (hereafter referred to as the **2011 CALPUFF Modelling Settings**).

The documents specify that the odour modelling for Level 3 impact assessments upon which this study has been conducted be based on the use of:

- 99.0th percentile dispersion model predictions;
- 1-hour averaging times with built-in peak-to-mean ratios to adjust the averaging time to a 1-second nose-response-time;
- The peak-to-mean ratios in the near and far-field for wake-affected point sources is 2.3;
- The near field distance is defined as typically 10 times the largest source dimension, either height or width; and

- The appropriate odour unit performance criterion, based on the population of the affected community in the vicinity of the development.

The impact assessment criteria (**IAC**) for complex mixtures of odours are designed to include receptors with a range of sensitivities. Therefore, a statistical approach is used to determine the acceptable ground level concentration of odour at the nearest sensitive receptor. This criterion is determined by the following equation outlined on page 35 of NSW EPA 2016 Methods:

$$IAC = \frac{\log_{10}(p) - 4.5}{-0.6} \quad \text{Equation 3.1}$$

where:

IAC = Impact Assessment Criterion (ou)

p = population

Based on **Equation 3.1**, **Table 3.1** outlines the odour performance criteria for six different affected population density categories, and is reproduced from NSW EPA 2016 Methods. It states that higher odour concentrations are permitted in lower population density applications.

Table 3.1 - Impact assessment criteria for complex mixtures of odorous air pollutants (nose response-time average, 99th percentile)

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU)
Urban Area ($\geq \sim 2000$) and/or schools or hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence ($\leq \sim 2$)	7.0

Source: Table 7.5 of the NSW EPA 2016 Methods

Based on the EPA classification of population densities presented in **Table 3.1** and the within an urban area, the IAC adopted for the Assessment is **2.0 ou (ground level concentration)**.

3.2 DISPERSION MODELLING

3.2.1 The Odour Dispersion Model

The odour dispersion modelling assessment was carried out using the CALPUFF Modelling System. The main system programs used were:

- CALPUFF - Version 7.2.1 (Level 150618)
- CALMET - Version 6.5.0 (Level 150223)
- CALPOST - Version 7.1.0 (Level 141010)

CALPUFF is a multi-layer, multi-species, non-steady-state puff dispersion model that is able to simulate the effects of time- and space-varying meteorological conditions on pollutant transport (EPA, 2016). CALMET is a meteorological model that produces three-dimensional gridded wind and temperature fields to be fed into CALPUFF (Atmospheric Studies Group (ASG), 2011). The primary output from CALPUFF is hourly pollutant concentrations evaluated at gridded and/or discrete receptor locations. CALPOST processes the hourly pollutant concentration output to produce tables at each receptor and contour plots across the modelling domain. The result is a summary of pollutant concentrations at various time averages and percentiles or a tally of hours where a pollutant has exceeded a pre-determined concentration (ASG, 2011). For further technical information about the CALPUFF modelling system refer to the document CALPUFF Modeling System Version 6 User Instructions (ASG, 2011).

The CALPUFF system can account for a variety of effects such as non-steady-state meteorological conditions, complex terrain, varying land uses, plume fumigation and low wind speed dispersion (EPA, 2016). CALPUFF is considered an appropriate dispersion model for air impact assessments, as outlined in the **NSW EPA 2016 Methods**, in one or more of 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, and
- inversion break-up fumigation conditions.

In the case of this assessment, CALPUFF was required in order to handle the moderate complexity of undulating terrain surrounding the MRF. The terrain may induce deflection or channelling of odour plumes. Also the high incidence of calm and

very light winds (30.7% annual frequency < 2.0 m/s) were likely to induce non-steady-state conditions such as accumulation of odour and/or downslope movement with drainage air flow.

For this study, the air contaminant was **odour** and ground level concentrations in odour units (**ou**) have been projected.

3.2.2 Geophysical and Meteorological Configuration

A CALMET hybrid three-dimensional meteorological data file for Fyshwick was produced that incorporated gridded numerical meteorological data supplemented with surface observation data, topography and land use over the domain area.

3.2.3 Terrain Configuration

Terrain elevations were sourced from 1 Second Shuttle Radar Topography Mission (SRTM) Derived Smoothed Digital Elevation Model (DEM-S). The SRTM data has been treated with several processes including but not limited to removal of stripes, void filling, tree offset removal and adaptive smoothing (Gallant, et al., 2011). The DEM-S was used as input into TERREL processor to produce a 20 km by 20 km grid at 0.20 km resolution. Coastline data was sourced from USGS Global Self-consistent Hierarchical High-resolution Shoreline (GSHHS) Database (Wessel & Smith, 2015). A map of the terrain including site and meteorological station is shown in **Figure 3.1**.

3.2.4 Land Use Configuration

Land use was sourced from the United States Geological Survey (USGS) Global Land Cover Characteristics Data Base for the Australia-Pacific Region (USGS, 1997). The data was used as input into CTGPROC processor to produce a 20 km by 20 km grid at 0.20 km resolution. A map of the land including site and meteorological station is shown in **Figure 3.2**.

3.2.5 Geophysical Configuration

The geophysical data file was created using the MAKEGEO processor. Land use data from CTGPROC and terrain data from TERREL was used as input to produce a 20 km by 20 km geophysical grid at 0.20 km resolution.

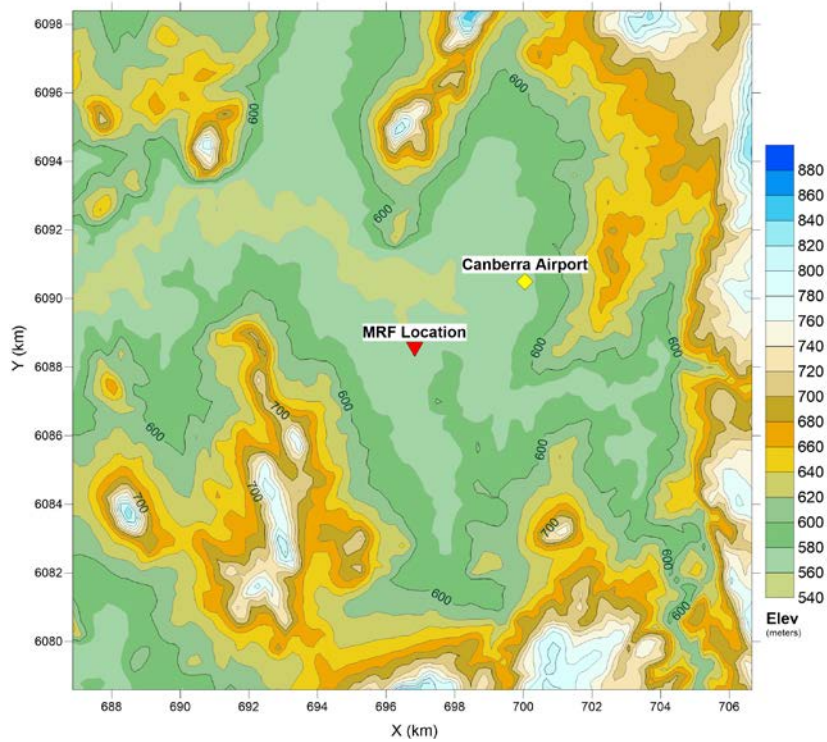


Figure 3.1 – Terrain dataset of Fyshwick and surrounds

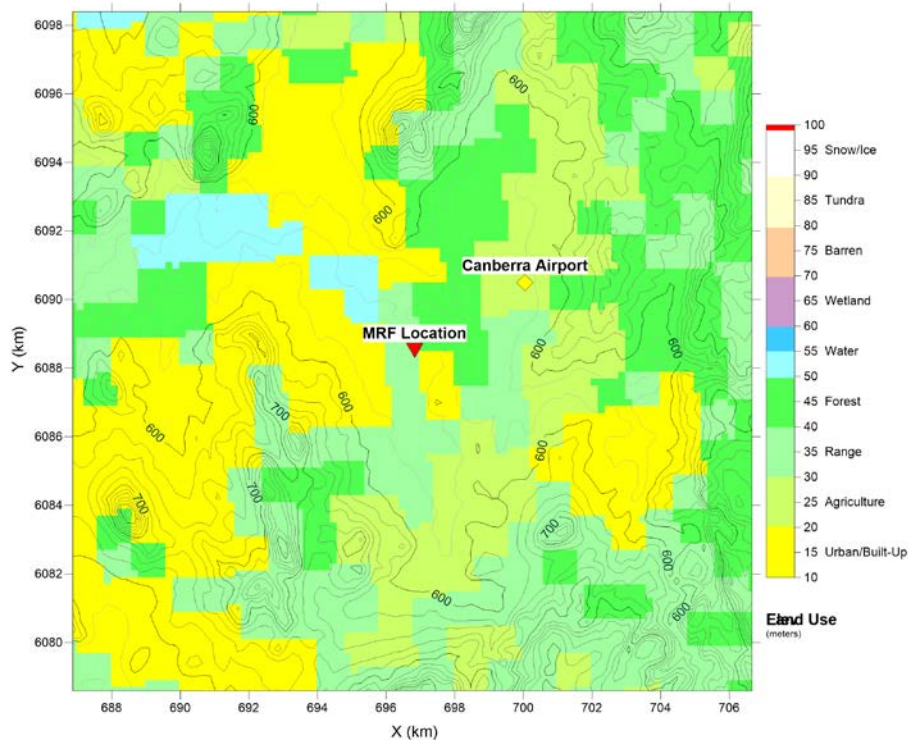


Figure 3.2 – Land use dataset of Fyshwick and surrounds

3.2.6 Meteorological Input Data

One-hour average observed meteorological surface data for 2014 was sourced from Canberra Airport maintained by Bureau of Meteorology (BOM). The BOM data was formatted into a generic format and was processed with SMERGE to produce a surface meteorological data file. A supplementary dataset from Tuggeranong (Isabella Plains) AWS was also incorporated into the CALMET run.

Numerical meteorological data was produced as a 3D data tile from The Air Pollution Model (v4.0.5) and processed it with CALTAPM (v7.0.0) into a suitable format. TAPM was run using multiple nested grids—at least three nests and 35 vertical levels. The nested grid resolutions were close to a ratio of three as possible. The innermost nest was 30 km by 30 km at 1 km resolution.

3.2.7 Meteorological Model Configuration

CALMET was run using the hybrid option that uses geophysical data, surface station data and upper air data. The data was used to initialise the diagnostic functions of the CALMET module to produce a full 3D meteorology data for input into CALPUFF. **Table 3.2** shows the key variables selected.

Table 3.2 – CALMET key variable fields													
Grid Configuration (WGS-84 UTM Zone 55S)													
166							NX Cells						
166							NY Cells						
0.15							Cell Size (km)						
293.263				6240.042				SW Corner (km)					
11							Vertical Layers						
ZFACE (m)	0	20	40	80	160	320	640	1000	1500	2000	2500	3000	
LAYER	1	2	3	4	5	6	7	8	9	10	11		
MID-PT (m)	10	30	60	120	240	480	820	1250	1750	2250	2750		
Critical Wind Field Settings													
Value	Found	Typical	Values										
TERRAD	5	None	Terrain scale (km) for terrain effects										
IEXTRP	-4	4,-4	Similarity extrap. of wind (-4 ignore upper stn sfc)										
ICALM	0	0	Do Not extrapolate calm winds										
RMAX1	5	None	MAX radius of influence over land in layer 1 (km)										
RMAX2	6	None	MAX radius of influence over land aloft (km)										
R1	2.5	None	Distance (km) where OBS wt = IGF wt in layer 1										
R2	3	None	Distance (km) where OBS wt = IGF wt aloft										

3.2.8 Meteorological Data Discussion

Observed 2014 BOM surface data was compared with longer term climate (2012 – 2016) from Canberra Airport to gauge how representative and suitable the year is for the purpose of air quality dispersion modelling. The annual wind roses (**Figure 3.3** and **Figure 3.4**) show very good agreement. The reported frequency of calms (< 0.5 m/s) was at 5.3% and very light winds (0.5 – 2 m/s) occurring 25.3% of the time – a total frequency of 30.7%. Both monthly average (**Figure 3.5**) and diurnal temperature (**Figure 3.6**) profiles for the long term and 2014 are in very good agreement except for marginally warmer months of January, February and November. Diurnal mixing heights and stability class frequencies are shown in **Figure 3.7** and **Figure 3.8** respectively. Poor for odour dispersion are stable calm night-time conditions, represented by the F-class, occurring 16.8% of the hours during 2014.

SURF.DAT: Station ID = 94926

Height = 10.00 m; [Jan 1, 2014 - 01:00:00 to Jan 1, 2015 - 00:00:00 (UTC+1000)]

Annual(Jan to Dec): Total Periods = 8760; Valid Periods = 8756 (100%); Calm Wind Periods = 525

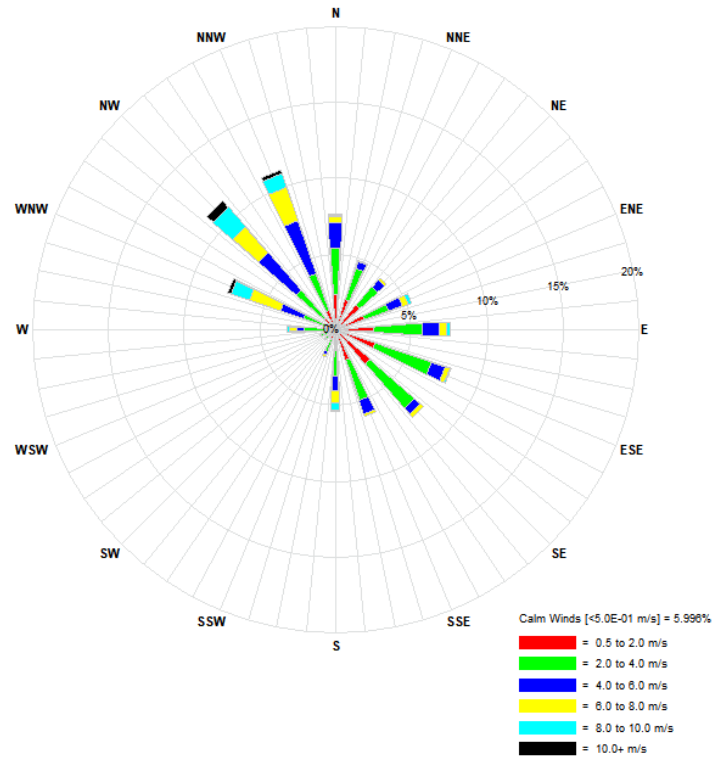


Figure 3.3 – Annual wind rose for Canberra Airport 2014

SURF.DAT: Station ID = 94926

Height = 10.00 m; [Jan 1, 2012 - 01:00:00 to Jan 1, 2017 - 00:00:00 (UTC+1000)]

Annual(Jan to Dec): Total Periods = 43848; Valid Periods = 43602 (99.4%); Calm Wind Periods = 2328

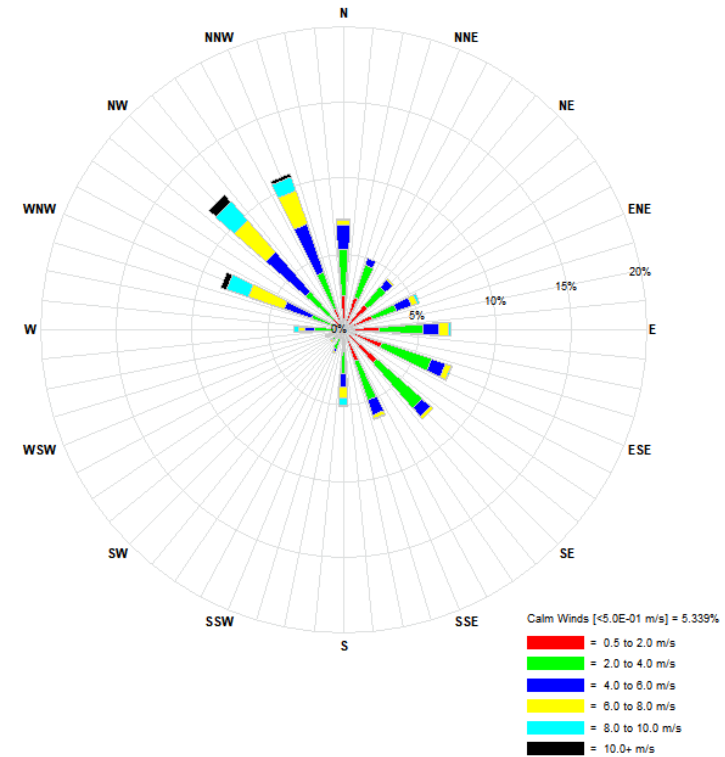


Figure 3.4 – Annual wind rose for Canberra Airport 5-years

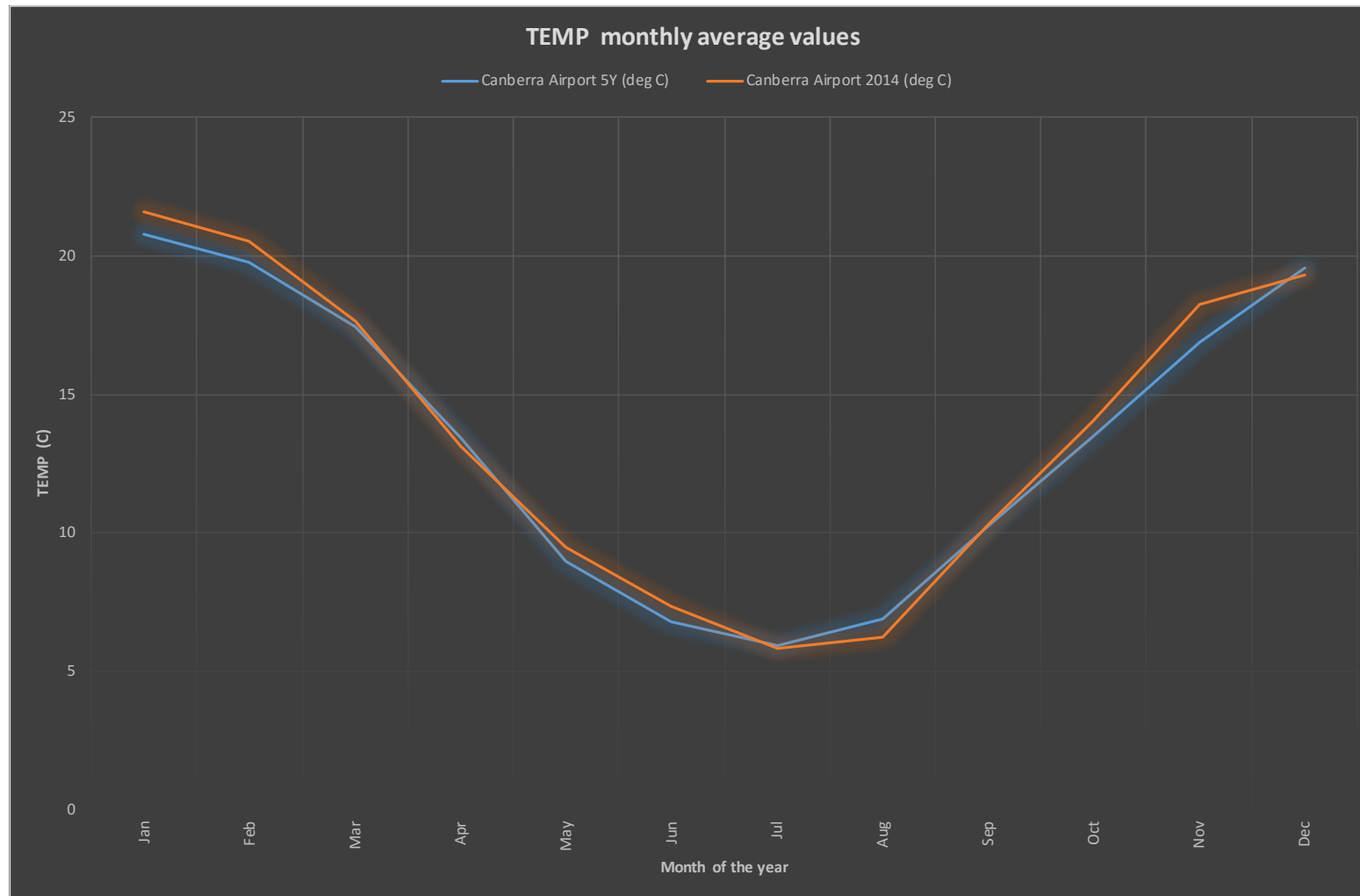


Figure 3.5 – Monthly average temperatures for Canberra 2014 and 5-years

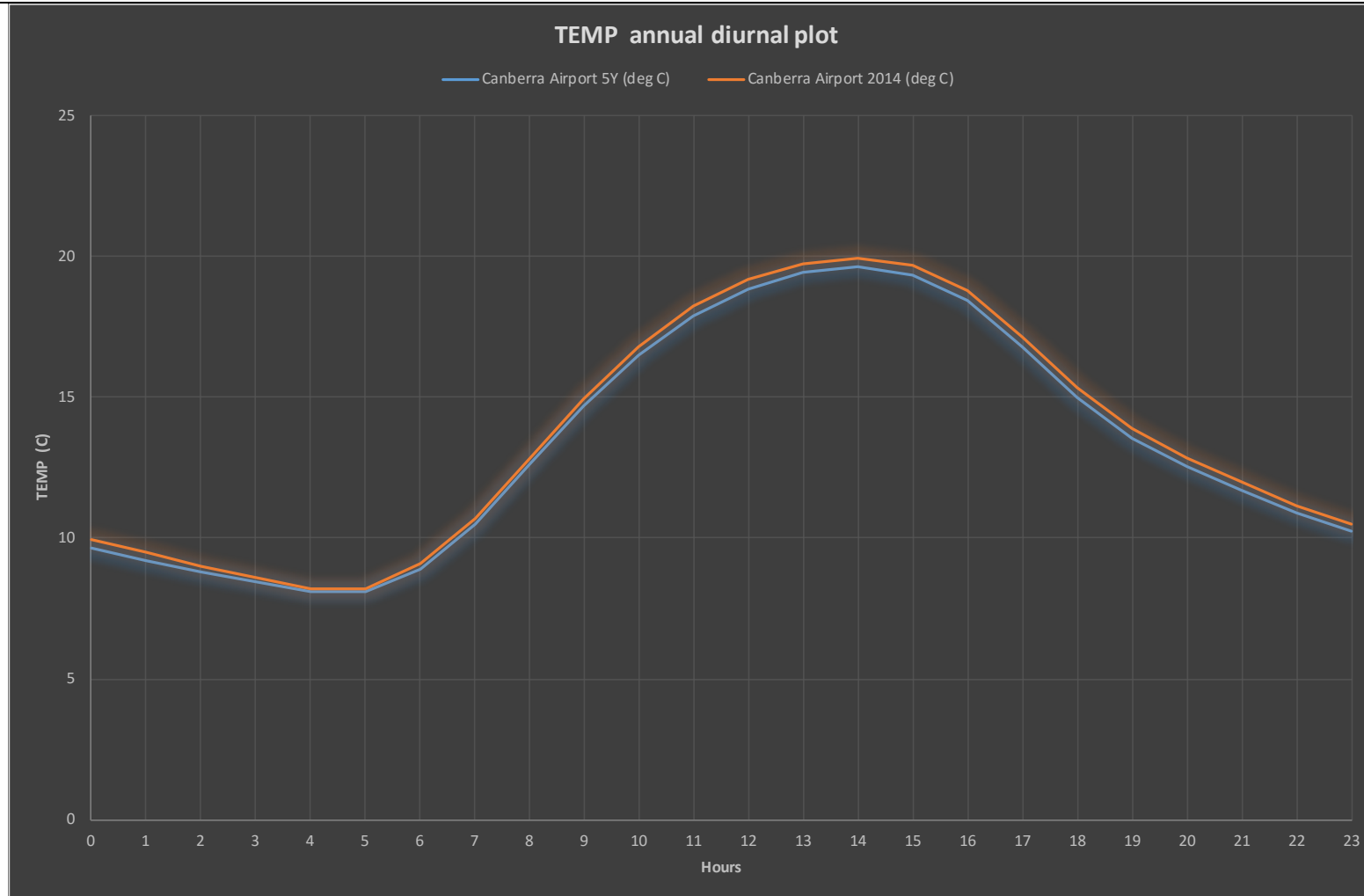


Figure 3.6– Annual diurnal temperature for Canberra 2014 and 5-years

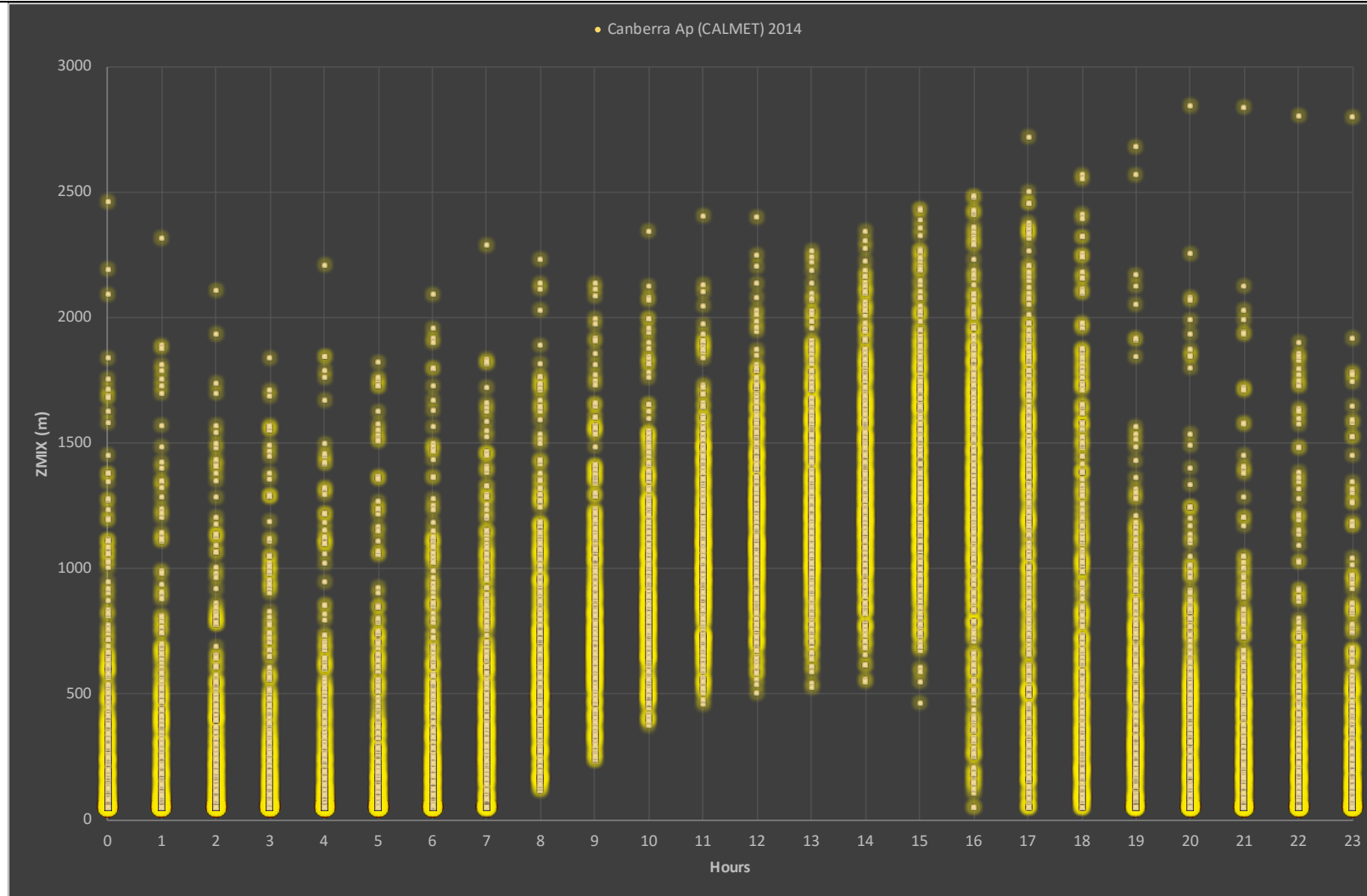


Figure 3.7 – Annual X-Y scatter plot diurnal mixing height for Canberra Ap (CALMET) 2014

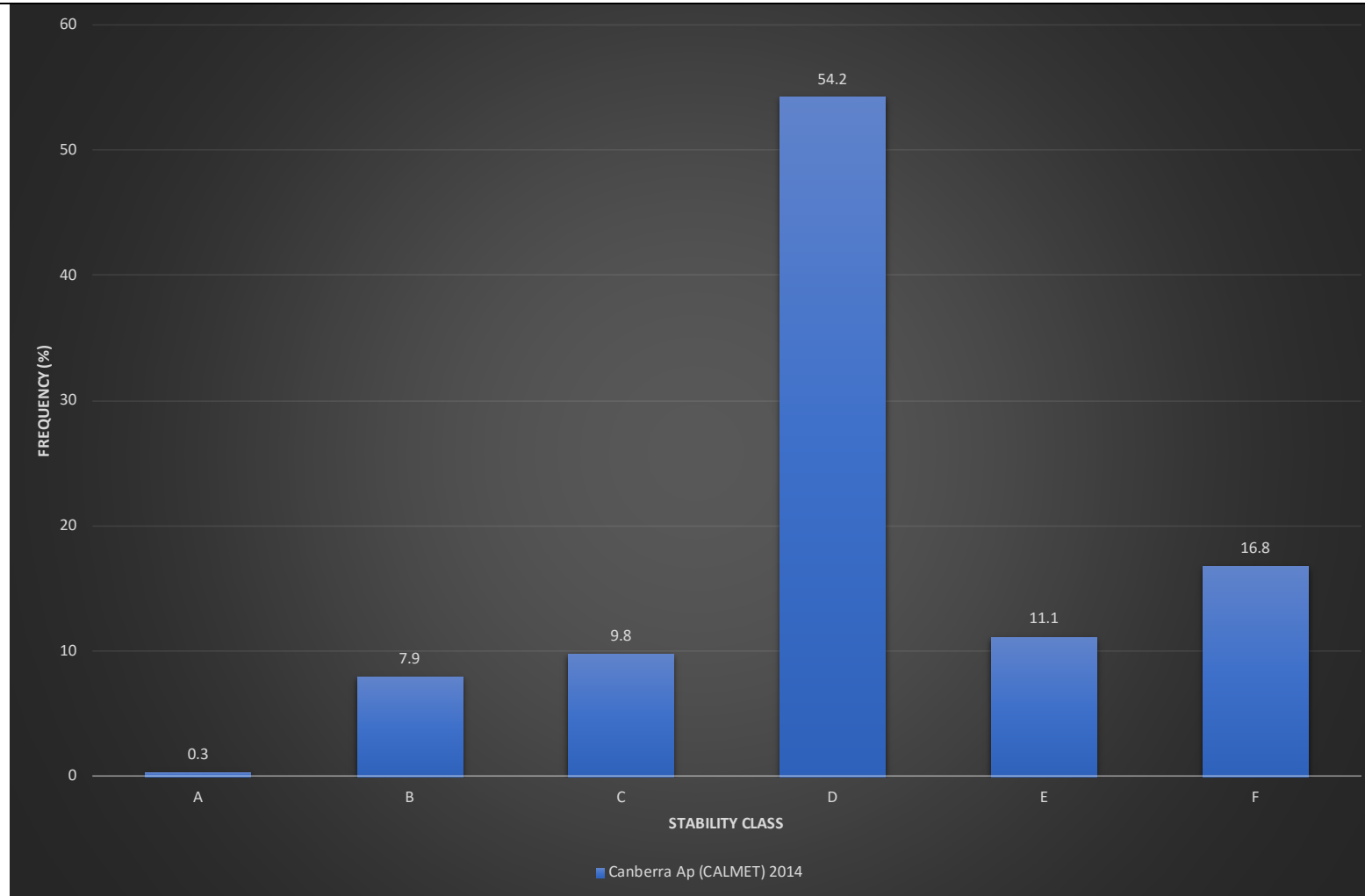


Figure 3.8 – Annual stability class frequency for Canberra Ap (CALMET) 2014

3.2.9 CALPUFF Computational Domain and Receptor Configuration

The computational domain was set at 6.4 km by 6.4 km centred over the MRF. A receptor grid was created with a 2.4 km by 2.4 km by 0.025 km spacing centred over the MRF.

3.2.10 CALPUFF Source Configuration, Emission Rates and BPIP

Full odour source configurations, emission rate and BPIP details are available in **Appendix B**.

3.2.11 CALPUFF Model Options

CALPUFF default model options were set except for the following as recommended in *Table A-4* contained and explained within *Barclay and Scire (2011)*:

- Dispersion coefficients (MDISP) = dispersion coefficients from internally calculated sigma v, sigma w using micrometeorological variables (2);
- Probability Density Function used for dispersion under convective conditions (MPDF) = Yes (1); and
- Minimum turbulence velocities sigma v for each stability class over land and water (SVMIN) = 0.2 m/s for A, B, C, D, E, F (0.200, 0.200, ... , 0.200).

Further model configurations are available in **Appendix B**.

3.3 ODOUR DISPERSION MODELLING SCENARIOS

The following scenarios were modelled:

- **Scenario 1a** – Benchmark design: Odour mitigation by stack dispersion at discharge concentration (Odour Emission Rate – **OER**) of 200 ou (22,800 ou.m³/s) and a nominal additional fugitive emission of 5% from MRF shed fast-action doors, from 6am to 10pm, seven days per week. This scenario is considered to be the most realistic estimate of odour emissions from the plant. The continuous 5% fugitive emission is likely to be conservative, given the intermittent fast-acting doors and negative pressure conditions when doors are closed.;
- **Scenario 1b** – Sensitivity test: Odour mitigation by stack dispersion at discharge concentration (OER) of 200 ou (22,800 ou.m³/s) and a nominal additional fugitive emission of 10% from MRF shed fast-action doors, from 6am to 10pm, seven days per week. This scenario examines the possible impact from 10% fugitive emissions, arising from sub-optimal door management or similar; and

- **Scenario 2** – Theoretical sensitivity test: all waste emissions (22,800 ou.m³/s) uncontained and released as fugitive from the MRF shed, from 6am to 10pm, seven days per week. This scenario examines the odour impacts that would occur if the entire process operations were carried out in an uncontained manner (i.e. outdoors). It is provided for reference only, and to show the odour impact mitigation achieved by the proposed facility.

All modelling scenarios assume activities and significant emissions are restricted to the operational hours of 6am to 10pm daily. It also makes use of an MSW odour emission factor of to determine maximum stack discharge odour concentration and maximum waste levels allowable inside shed.

3.3.1 Odour Emissions Factor

The odour emissions inventory for the operations was derived from an odour emissions factor based upon past measurements of actual emissions taken from an MSW transfer station located in Sydney. The result of the odour testing and air flow measurements was used to calculate the odour emission factor (OER per tonne – **ou.m³/t.s**) based on the amount of waste within the transfer station building used for the assessment is summarised in **Table 3.3**. It should be noted that that facility processed only MSW.

Table 3.3 – Summary of stack measurements and odour testing results.

Mean Odour Conc ⁿ (ou)	Stack Diameter (m)	Mean Stack Gas Temp (°C)	Mean Stack Gas Exit Velocity (m/s)	Mean Stack Gas Flowrate (m ³ /s)	Tonnes of MSW inside transfer building (Tonnes)	Odour emission factor per tonne of waste (ou.m ³ /t.s)
320	2.64	21.4	16.0	88.7	250	113.5

The odour emissions were measured directly from within the extraction stack in preference to collection from stockpiles using an Isolation Flux Chamber. The Isolation Flux Chamber method is known to inherently give significantly lower emission rate values compared with more direct measurement techniques.

3.3.2 Waste Profiles

The MRF is proposed to process 300,000 tpa of waste by 2020. The waste is forecast comprise some 90,000 tpa MSW (30%) five days per week and some 210,000 C&I (70%) six days per week. For conservatism, seven days per week receipt and processing between the hours of 6 am to 10 pm for both waste types has been

considered in the modelling. The typical waste profiles for ACT MSW, ACT C&I and the MRF 30/70 combination are shown in **Table 3.4**.

In TOU's experience, food and organics fractions account for the bulk of the odour potential within the waste. C&I contains 22% of food and organics (including garbage bags with 10.4% food/organics content) compared to MSW (including nappies), therefore, a direct relationship has been assumed to estimate an odour emissions factor for C&I, which is 25.1 ou.m³/t.s, this would require confirmation. A weighted average was used to estimate the MRF 30%/70% blend of MSW and C&I respectively, which is 51.8 ou.m³/t.s. These factors are intended to be used to inform approximate waste volumes types within the MRF shed, before a stack concentration of 200 ou is exceeded. All factors would require confirmation by testing once the MRF is operational.

3.3.3 Waste Volumes and Odour Emissions Inventory

With the OER per tonne factors, the maximum volume of each waste type allowable within the MRF shed can be approximated, which is available in **Table 3.5**. A daily waste volume rate of 965 tonnes per day (**tpd**) for 311 days per year is expected to be received comprising of 346 tpd MSW that would arrive predominantly during the morning shift (6am to 2 pm). The MSW is not expected to exceed 100 tonnes within the MRF shed at any one time. The MRF would process 84 tonnes per hour (**tph**) and can containerise residues at a maximum of six containers per hour (168 tph). The C&I would be delivered and processed across the day and evening. The MSW and the food and waste component of the C&I would be processed daily in at least 11.5 hours over a 16 hour operational day. Therefore, no more than 200 tonnes MSW should be within the MRF shed at any one time.

For conservatism, a maximum stack discharge concentration of 200 ou has been selected assuming no more than 200 tonnes of only MSW would be contained within the MRF shed. For comparison, it is approximated that 953 tonnes of C&I and 462 tonnes of the average MRF 30/70 blend could be contained within the MRF shed and not have the maximum stack discharge concentration of 200 ou exceeded (refer to Table 3.5). The mixed waste composition and volumes would evolve throughout the day, building up throughout the morning, stabilising throughout the day and tapering off into the evening—within the bounds of the MSW and C&I profiles.

For the modelling scenarios, it has been assumed that the maximum stack discharge concentration (OER) of 200 ou (22,800 ou.m³/s) would occur during all operational hours, seven days per week. The 200 ou maximum discharge concentration was found through trial and error with preliminary modelling runs using various stack concentrations. The various OER parameter combinations tested are shown in **Table 3.5**.

Table 3.4 – ACT and MRF projected waste profiles 2019/20

ACT MSW PROFILE (113.5 ou.m ³ /t.s)				ACT C&I PROFILE (inc C&D avg) (25.1 ou.m ³ /t.s)				MRF 30/70 BLEND (51.8 ou.m ³ /t.s)			
#	Type	Fraction (%)	Volume rate (tpa)	#	Type	Fraction (%)	Volume rate (tpa)	#	Fraction (%)	Volume rate (tpa)	Notes.
1	Paper	13.3	12,103	1	Paper	8.4	17,640	1	9.9	29,743	
2	Food	37.7	34,307	2	Food	7.7	16,170	2	16.8	50,477	
3	Organics	13.4	12,194	3	Organics	2.7	5,670	3	5.9	17,864	
4	Textiles	4.9	4,459	4	Textiles	2	4,200	4	2.9	8,659	
5	Glass	4.1	3,730	5	Glass	1.9	3,990	5	2.6	7,720	
6	Plastic	10.6	9,646	6	Plastic	6	12,600	6	7.4	22,246	
7	Liquidpaperboard	0.3	273	7	Elect/Insulation	0.6	1,260	7	0.5	1,533	Combined
8	Nappies	6.1	5,552	8	Garbage Bags	21.7	45,570 ^{*1}	8	17.0	51,122 ^{*1}	Combined
9	Metals	2.5	2,275	9	Metals	1.1	2,310	9	1.5	4,585	
10	Hazardous	0.5	455	10	Hazardous	0.5	1,050	10	0.5	1,505	
11	Inerts	2.4	2,184	11	Inerts	38.9	81,690	11	27.8	83,874	
12	Other	4.2	3,822	12	Wood	8.5	17,850	12	7.7	21,672	Combined
TOTAL			91,000	TOTAL			210,000	TOTAL		301,000	

^{*1} Garbage Bags considered dry waste – 10.4% assumed putrescible based on overall food/organics fraction (i.e. 4,739 tpa).

Table 3.5 – Odour emissions inventory by waste type

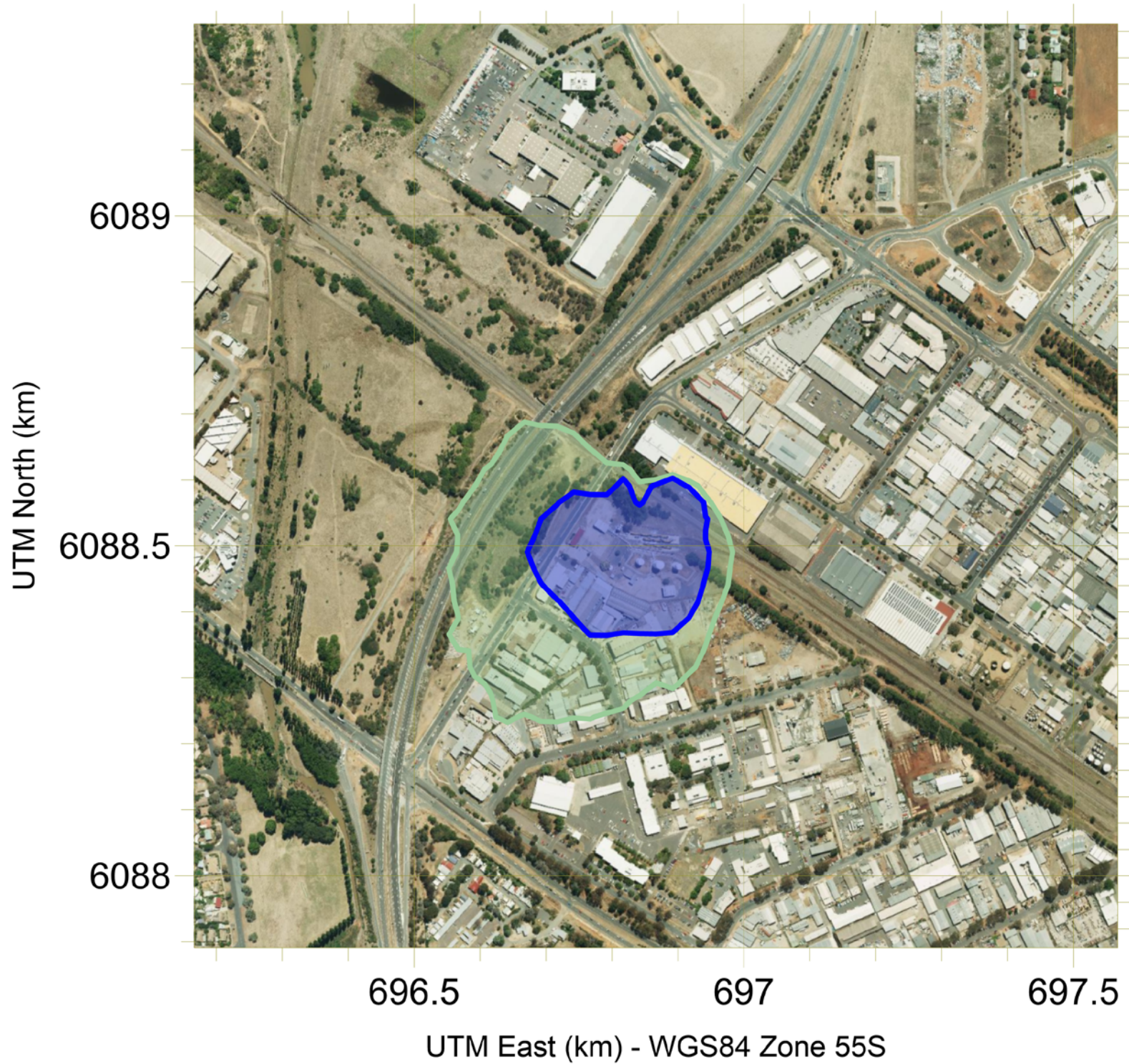
OER parameters					ACT MSW (113.5 ou.m ³ /t.s)	ACT C&I (25.1 ou.m ³ /t.s)	MRF 30/70 (51.8 ou.m ³ /t.s)
Stack conc (ou)	Flow rate (m ³ /s)	Stack OER (ou.m ³ /s)	Fugitive 5% OER (ou.m ³ /s)	TOTAL OER (ou.m ³ /s)	Waste in shed (t)	Waste in shed (t)	Waste in shed (t)
100	114	11,400	570	11,970	105	477	231
150	114	17,100	855	17,955	158	715	346
200	114	22,800	1,140	23,940	211	953	462
250	114	28,500	1,425	29,925	264	1,192	577
300	114	34,200	1,710	35,910	316	1,430	693
350	114	39,900	1,995	41,895	369	1,668	808
400	114	45,600	2,280	47,880	422	1,906	924

Table note: each waste type column is calculated with the assumption that it is the only type present within the MRF shed. Each column is exclusive and does not add with the other (i.e. do not add MSW, C&I and/or MRF 30/70 together).

4 ODOUR DISPERSION MODELLING RESULTS

The odour dispersion modelling results are as follows:

- **Figure 4.1 - Scenario 1a** – Most realistic scenario: Odour mitigation by stack dispersion at discharge concentration (Odour Emission Rate – **OER**) of 200 ou (22,800 ou.m³/s) and a nominal additional fugitive emission of 5% from MRF shed fast-action doors, from 6am to 10pm, seven days per week;
- **Figure 4.1 - Scenario 1b** – Sensitivity test: Odour mitigation by stack dispersion at discharge concentration (OER) of 200 ou (22,800 ou.m³/s) and a nominal additional fugitive emission of 10% from MRF shed fast-action doors, from 6am to 10pm, seven days per week; and
- **Figure 4.2: Scenario 2** – Theoretical sensitivity test: all waste emissions (22,800 ou.m³/s) uncontained and released as fugitive from the MRF shed, from 6am to 10pm, seven days per week.

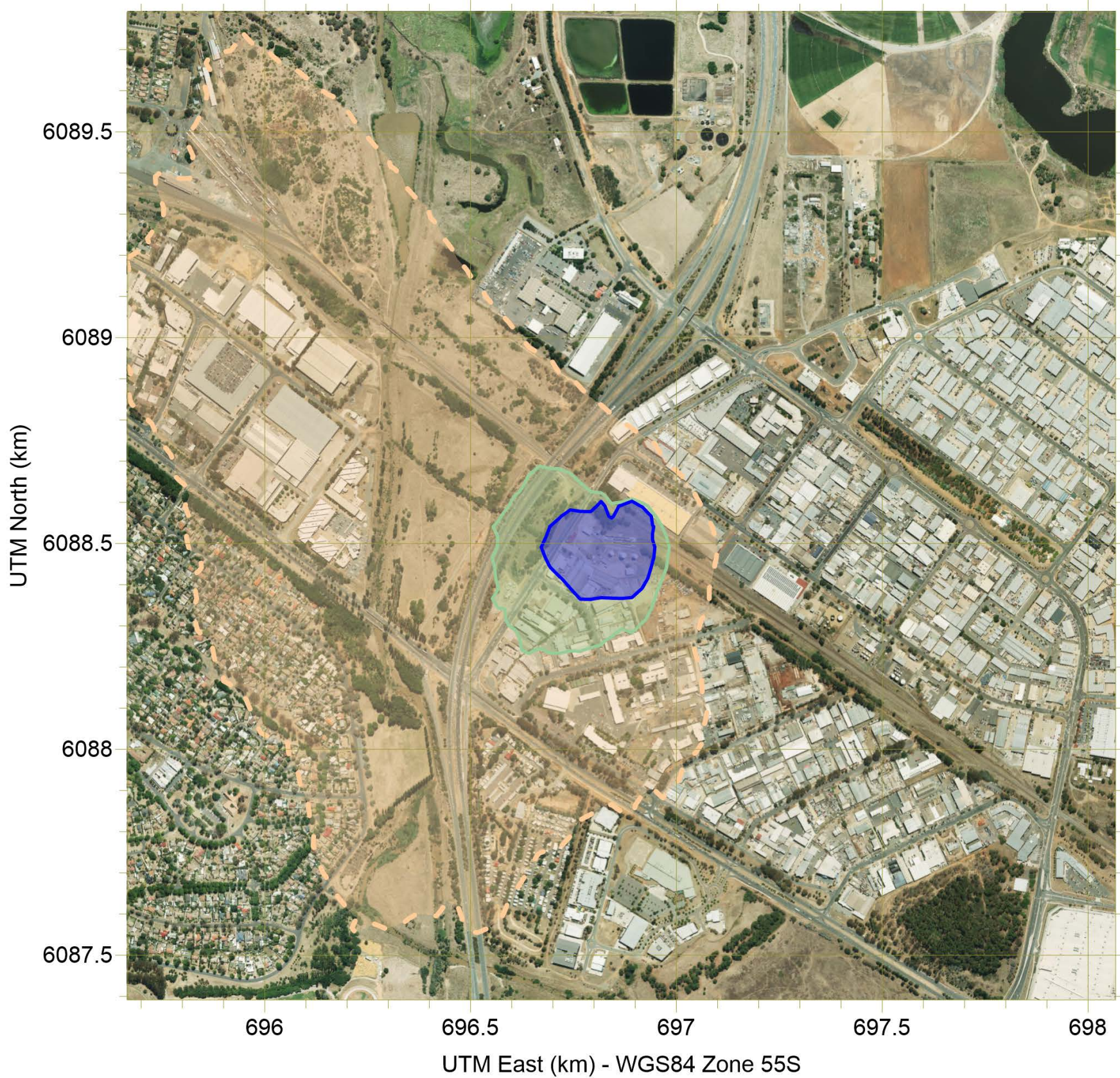


Capital Recycling Solutions Materials Recovery Facility, Fyshwick ACT

All scenarios: Stack discharge OER (conc.) = 22,800 ou.m³/s (200 ou)
 Fugitive OER (%): --- 1,140 ou.m³/s (5%) --- 2,280 ou.m³/s (10%)

All contours 2 ou (99%, 1-sec)

Figure 4.1 – Scenario 1: Stack discharge concentration of 200 ou (22,800 ou.m³/s) plus fugitive emission of (a) Benchmark 5% and (b) Sensitivity Test 10%



Capital Recycling Solutions Materials Recovery Facility, Fyshwick ACT

All scenarios: Stack discharge OER (conc.) = 22,800 ou.m³/s (200 ou)

Fugitive OER (%): - - - - 1,140 ou.m³/s (5%) - - - - 2,280 ou.m³/s (10%)

Uncontained scenario OER: - - - - 22,800 ou.m³/s

All contours 2 ou (99%, 1-sec)

Figure 4.2 – Scenario 2: Theoretical sensitivity test – all waste emissions (22,800 ou.m³/s) uncontained

5 FINDINGS AND CONCLUSIONS

5.1 FINDINGS

CRS has proposed to fully enclose its future MRF operations and discharge odour emissions via a stack.

Based on conceptual design, waste types, waste volumes, estimated fugitive emissions, and past measurements taken from an MSW transfer station located in Sydney; an odour emissions inventory was developed for the assessment and the subsequent dispersion modelling. The following findings are made in relation to odour impact reflected in **Scenario 1**:

- The proposed discharge stack projections were compared with the 2 ou (99%, 1 s) ground level odour impact criterion under the following conditions:
 - Full enclosure of the MRF tipping area within a shed under negative pressure, air extracted to the discharge stack;
 - An air exchange of the shed enclosure of at least 5 ac/h;
 - A design airflow of 410,000 m³/h;
 - The total airflow will be discharged via a single stack located 21 m above ground level and at a stack design discharge velocity of 20 m/s;
 - Trucks would enter and exit through fast-action doorways; some odour could escape when opened. Two scenarios were considered: additional fugitive emissions of +5% and +10% of the stack OER;
 - It is predicted that +5% fugitive emissions would result in compliance with the odour impact criterion within the site boundary. This scenario best represents the proposed facility;
 - It is predicted that +10% fugitive emissions would result in the 2 ou compliance concentration to the boundary of the mixed use industrial zone, but have no likelihood of adverse impacts beyond the industrial area.
- The NSW EPA 2 ou (99%, 1-sec) odour criterion for sensitive urban areas is a conservative benchmark for this assessment. In TOU's opinion, the mixed use industrial zone would be less sensitive and would almost certainly tolerate higher odour exposure.

- A maximum of 211 tonnes of only MSW could be present within the MRF shed, and still achieve the above projections;
- It is anticipated that MSW would arrive and be containerised during the morning shift (6am to 2pm). C&I would form the bulk of material within the MRF shed during the afternoon shift (2pm to 10pm);
- It is estimated that C&I could be nearly five times less odorous. A maximum of 953 tonnes of only C&I could be present within the MRF shed; and
- Based on a 30%/70% blend of MSW and C&I, a maximum of 462 tonnes could be present within the MRF shed.

The modelling, that the findings were drawn upon, was layered with conservatism including:

- The stack discharge concentration was set at a maximum of 200 ou for all operational hours. The actual mixed waste composition and volumes would evolve throughout the day—within the bounds of the MSW and C&I profiles and volumes; and
- The modelled operational hours of 6 am to 10 pm, seven days per week. Actual operational hours are expected to be five days per week for MSW and six days per week for C&I processing. This results in further conservatism in the above projections.

5.2 SENSITIVITY TEST – ALL WASTE EMISSIONS RELEASED AS FUGITIVE

The sensitivity test was run as a reference to gauge the effectiveness of the stack dispersion measure compared with a naturally ventilated option. The results show that substantial improvements would be achieved using stack dispersion for odour mitigation.

5.3 CONCLUDING REMARKS

Based on the odour criterion on 2 ou (99%, 1 s), this assessment has found that no adverse odour impacts at sensitive places are likely for the proposed plant operation. Modelling indicates near full compliance with our self-nominated odour IAC of 2 ou (99%, 1 s) derived from NSW EPA, which, in the absence of ACT guidance, we believe is consistent with no environmental nuisance.

The modelling is based on actual odour emissions from a similar NSW plant processing only MSW, but with adjustments to the emission rates to account for the presence of less odorous C&I waste in the combined waste stream to the facility. It is

also based on an allowance of 5% odour emissions from fugitive (uncontained) sources, such as leakage through doorways where all have been assumed in the modelling to be opened during operational hours, when in practice the opening time would be very brief with the building fully sealed at all other times. Given the conservative air exchange rate (5 ac/h) and the use of fast-acting doors, TOU considers the 5% fugitive odour emission factor to be very conservative.

As such, the assessment concludes that the proposed full enclosure of the MRF tipping area within a building maintained under negative pressure and with air discharged via a stack represents practicable and reasonable mitigation measures that should prevent environmental odour nuisance, satisfying ACT General Environmental Duty obligations.

REPORT SIGNATURE PAGE

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CAPITAL RECYCLING SOLUTIONS

Materials Recovery Facility and Rail Freight Terminal Odour Impact Assessment

Fyshwick, ACT

January 2018

Appendices



Appendix A: Material Recycling Facility Conceptual Drawings



Appendix B: Model source, emission and BPIP configurations

Visual Impact Assessment

Canberra Materials Recovery Facility and Rail Freight Terminal

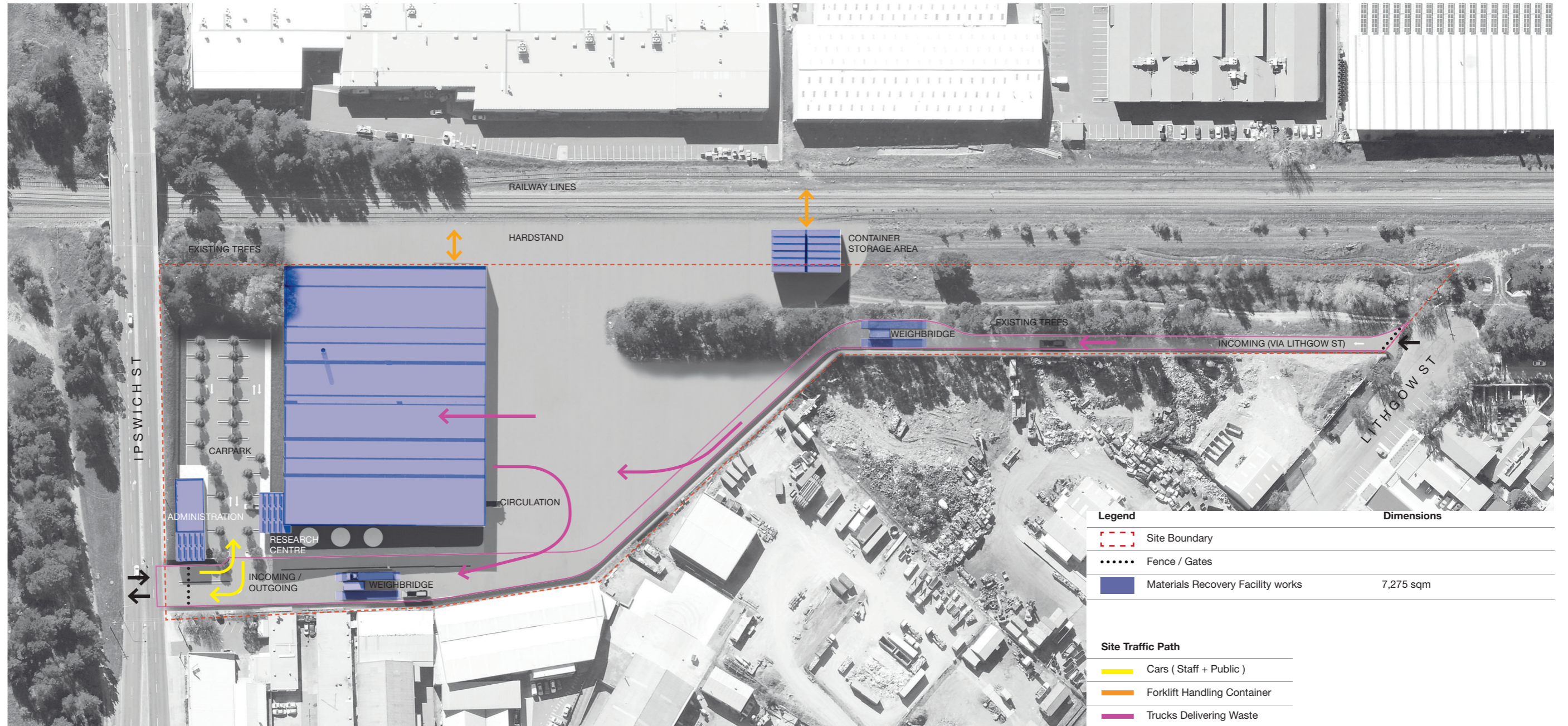
16 Ipswich Street, Fyshwick

December 2017

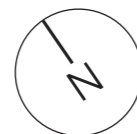
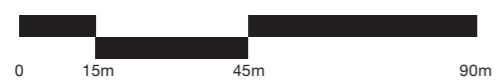


Advanced Waste Management

MATERIALS RECOVERY FACILITY



SCALE 1:1500 @ A3



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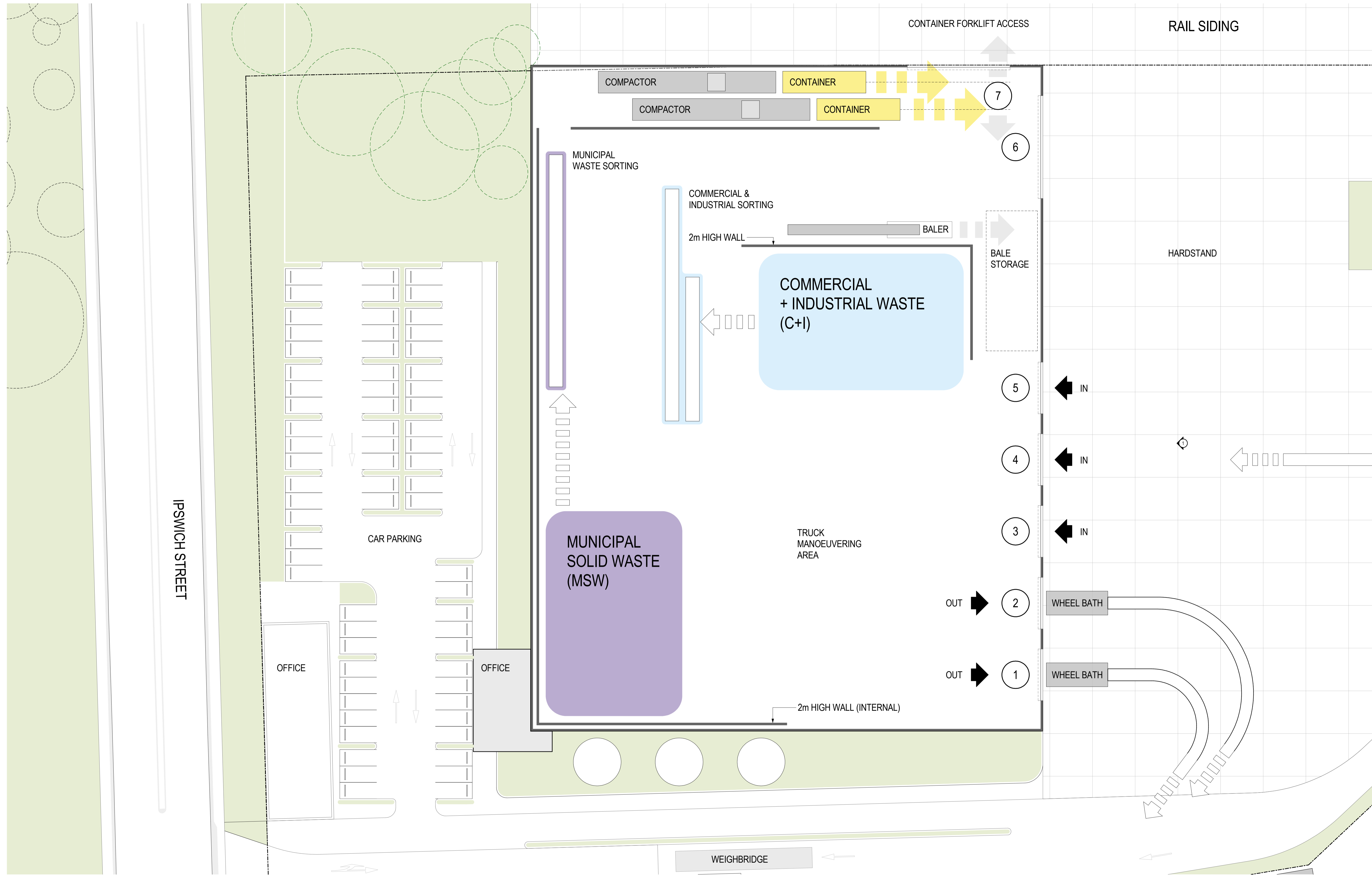


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PRELIMINARY

Revisions / **DRAFT**

22/11/2017 9:02:17 AM

Project / **Materials Recovery Facility**
Ipswich St, Fyshwick, ACT 2609

Drawing / **CONCEPT LAYOUT**

Project No. / **216228** Date / **11/20/17**

Author / **BW**

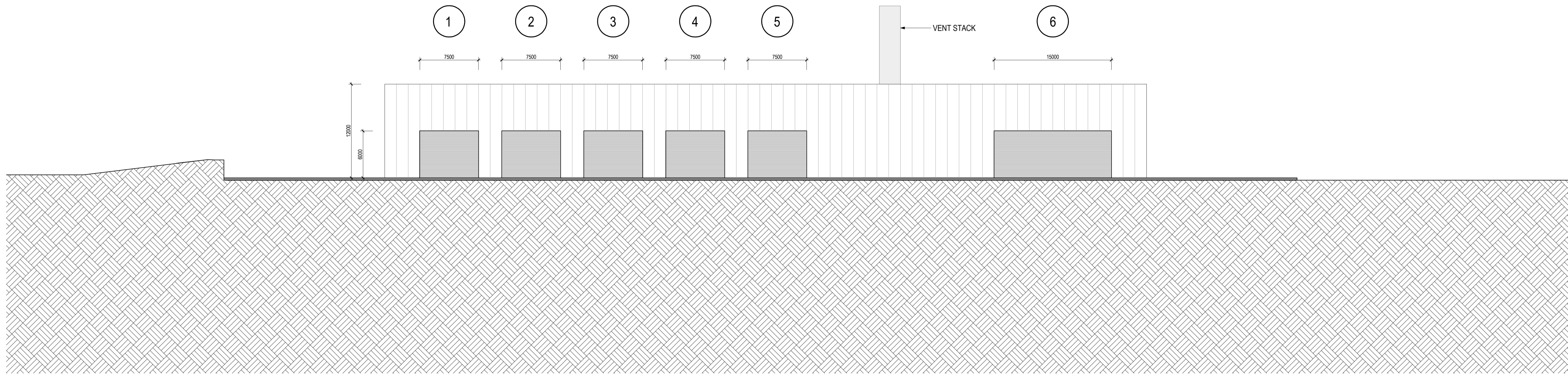
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Drawing No. / **SK01.01**

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22/11/2017 9:02:18 AM

Project / **Materials Recovery Facility**
Ipswich St, Fyshwick, ACT 2609

Drawing / **ELEVATION - DIAGRAM**

Project No. / **216228** Date / **11/21/17**

Author / **BW**

Scale: @ A1 / **1 : 250**

Drawing No. / **SK02.01**

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DATE : 11/22/2017

TIME : 16: 9: 2

Fyshwick WTE

=====
BPIP PROCESSING INFORMATION:
=====

The P flag has been set for preparing downwash related data for a model run utilizing the PRIME algorithm.

Inputs entered in METERS will be converted to meters using a conversion factor of 1.0000. Output will be in meters.

The UTMP variable is set to UTM. The input is assumed to be in UTM coordinates. BPIP will move the UTM origin to the first pair of UTM coordinates read. The UTM coordinates of the new origin will be subtracted from all the other UTM coordinates entered to form this new local coordinate system.

The new local coordinates will be displayed in parentheses just below the UTM coordinates they represent.

Plant north is set to 0.00 degrees with respect to True North.

=====
INPUT SUMMARY:
=====

Number of buildings to be processed : 1

BLDG1 has 1 tier(s) with a base elevation of 568.00 METERS

BUILDING NAME	TIER NUMBER	BLDG-TIER NUMBER	TIER HEIGHT	NO. OF CORNERS	CORNER X	COORDINATES Y
BLDG1	1	1	12.00	4	696772.00	6088494.00 meters
					(0.00	0.00) meters
					696826.00	6088572.00 meters
					(54.00	78.00) meters
					696887.00	6088530.00 meters
					(115.00	36.00) meters
					696833.00	6088452.00 meters
					(61.00	-42.00) meters

Number of stacks to be processed : 1

STACK NAME	STACK BASE	STACK HEIGHT	STACK X	COORDINATES Y
------------	------------	--------------	---------	---------------

STK_01 568.00 21.00 METERS
 696820.00 6088539.00 meters
 (48.00 45.00) meters

The following lists the stacks that have been identified as being atop the noted building-tiers.

STACK		BUILDING		TIER	
NAME	NO.	NAME	NO.	NO.	
STK_01	1	BLDG1	1	1	

Overall GEP Summary Table
 (Units: meters)

StkNo: 1 Stk Name:STK_01 Stk Ht: 21.00 Prelim. GEP Stk.Ht: 65.00
 GEP: BH: 12.00 PBW: 74.15 *Eqn1 Ht: 30.00
 *adjusted for a Stack-Building elevation difference of 0.00
 No. of Tiers affecting Stk: 1 Direction occurred: 34.75
 Bldg-Tier nos. contributing to GEP: 1

Source Name	X Coord.	Y Coord.	Stack Height	Base Elev.	Stack Diam.	Exit Veloc.	Exit Temp.	Building Downwash	Platform Height	Vertical Momentum Flux Factor
(12 chars.)	(km)	(km)	(m)	(m)	(m)	(m/s)	(K)	(0., 1., or 2.)	(m)	(0. or 1.)
STK_01	696.82	6088.539	21	568	2.7	20	273.15	1	0	1

Source Name	X Coord.	Y Coord.	Effect. Height	Base Elev.	Init. Sigma Y	Init. Sigma Z
(12 chars.)	(km)	(km)	(m)	(m)	(m)	(m)
VOL_01	696.828	6088.513	6	568.3	19.5	5.6