THE ODOUR UNIT

VEOLIA

Veolia Australia & New Zealand

Woodlawn Bioreactor Facility Odour Modelling Study

Proposed Addition of ED3S to Leachate Management System

May 2016

Final Report

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1 INTRODUCTION

In April 2016, Veolia Australia & New Zealand (Veolia) engaged The Odour Unit Pty Ltd (TOU) to carry out an odour dispersion model study to evaluate the odour profile contribution and assess compliance against the New South Wales Environment Protection Authority (NSW EPA) odour performance criteria of the addition of the proposed Evaporation Dam 3 South (ED3S) System to the Leachate Management System (LMS) at the Woodlawn Bioreactor Facility located at Collector Road, Tarago, NSW (the Site). The basis for this additional pond system is to create the necessary supplementary reserve capacity for the storage of treated leachate from the LMS.

1.1 SCOPE OF WORKS

The scope of works for the odour dispersion model study consisted of:

- Sourcing and setting up the original odour dispersion model used in the *Environmental Assessment Woodlawn Expansion Report* dated August 2010 (EA). Some meteorology-based revisions to this model were necessary given the year that the model was completed (see **Section 3** for details);
- Inclusion of the proposed ED3S System into the EA odour dispersion model; and
- Odour dispersion modelling projection of the individual off-site odour impact from the inclusion of the proposed ED3S System. In addition, the cumulative off-site odour impact with the other modelled emission sources in the EA were undertaken to assess site-wide compliance with the relevant NSW EPA odour performance criterion.

The following report summarises the methodologies and results from the odour dispersion model of the proposed ED3S System addition to the LMS at the Site. Moreover, this modelling study report should be read in the context of the previously issued TOU letter report issued to Veolia on 30 October 2015 titled *Woodlawn Bioreactor Facility Odour Assessment Study – Addition of ED3S to Leachate Management System* (see **Appendix A**).

2 STUDY METHODOLOGY

2.1 PREVIOUS ODOUR ASSESSMENT STUDY

TOU's understanding of the proposed addition to the LMS is that Veolia intends to pump the stormwater currently in ED3S to Evaporation Dam 2 (ED2), thereby freeing up storage volume and natural evaporation capacity for treated leachate in ED3S System. In 2015, NSW EPA had requested an odour assessment of the proposed change to operation based on the odour emissions data from the 2015 Independent Odour Audit. Specifically, NSW EPA had confirmed at the time with Veolia that the following odour assessment methodology would be suitable (email dated 28 September 2015 from Veolia to TOU):

- *"Utilising data from existing treated leachate dams and extrapolate this to the new dam in order to quantify odour emission rates from ED3S;*
- *Comparing the data against the current odour emissions inventory developed for the site (as part of the annual odour audits); and*
- *Quantifying the impact as a percentile increase in comparison to the overall site emissions as well as the leachate pond system."*

Following that odour assessment study report, odour dispersion modelling was further requested by the NSW EPA to determine its compliance with the relevant NSW EPA odour performance criterion. This resulted in the need to source, setup, and carry out new modelling runs of the original EA odour dispersion model, developed by the former Heggies Pty Ltd, now operating as SLR Consulting, to evaluate the contribution and assess compliance of the proposed addition of ED3S to the LMS and other modelled emissions.

The previously issued odour assessment report from October 2015 is attached as **Appendix A** for reference purposes.

2.2 PROPOSED ADDITION OF ED3S TO LMS

TOU's understanding is that due to time constraints, Veolia is proposing to construct the leachate storage dam in two parts. Firstly, the ED3S-Southern partition (ED3S-S) liner will be constructed, which is separated via a breakwall from the main ED3S system. Survey data from Veolia, undertaken by LandTeam Australia Pty Ltd (LandTeam), indicate that the new ED3S-S partition pond will have a surface area between 2.30 ha at low water level, and 2.83 ha when full. (see **Appendix A - Attachment 1 - LandTeam Drawing No. 16800-437**).

The second part will involve pumping water from the ED3S to ED2 and then constructing the liner for the main ED3S system. Survey data for this dam indicates that it will have a maximum surface area of 8.94 ha see (**Appendix A - Attachment 2 - Woodlawn Bioreactor ED3S Information** for projected volumes and surface areas). The combined surface area of both dams (i.e. ED3S & ED3S-S) have been added for the purposes of this assessment, as will be shown later in **Table 2.1**). The details for the surveying work are contained in **Appendix A.**

2.3 REPRESENTATIVE ODOUR EMISSIONS DATA FOR THE ED3S SYSTEM

Previous odour audits in 2012 and 2013 conducted at the Site found elevated odour emissions from pond ED3N-1 (2012) and ED3N-2 (2013) due to insufficient treatment in the Leachate Aeration Dam system, a critical process component of the LMS. Improvements to this system saw a large decrease in odour emissions from all four ED3N ponds in 2014, following re-treatment of these liquids, to extremely low levels. These results, together with the 2015 audit results, are shown in **Appendix A - Attachment 3 - Odour Emissions Inventory Comparison Inventory & Odour Emissions Inventory 2015 Audit Excel Sheets**. It should be noted that the Specific Odour Emission Rate (SOER) values represent the measured rates of odour emission per square metre of exposed pond area ($ou.m^3/m^2/s$), while the Odour Emission Rate results represent the total odour emission rate determined for each source ($ou.m^3/s$).

The 2015 audit results show a slightly higher rate of odour emission from all four ED3N ponds, when compared with 2014, but still very low rates of odour emission for treated wastewater pond systems and well within the EA performance targets for the Site. These latest results, considered to be the expected quality of treated leachate generated by the current LMS, have been used to project emissions from pond ED3S, as shown in the **Table 2.1**. Note that the mean SOER result for the four ponds has been used in the modelling projections.

Table 2.1 - Projected Odour Emission Rates for ED3S			
ED3N System 2015			
Source ID	**Dam Surface Area (m^2)**	**SOER ($ou.m^3/m^2/s$)**	**OER ($ou.m^3/s$)**
ED3N-1	6,000	0.132	794
ED3N-2	5,500	0.145	797
ED3N-3	5,500	0.091	500
ED3N-4	25,000	0.269	6,720
ED3N Total	**42,000**	**0.159 (mean)**	**8,810**
Projected ED3S System			
ED3S	89,435	0.159	14,200
ED3S-S	28,330		4,510
ED3S Total	**118,000**		**18,700**

As per the previous TOU odour assessment report issued in October 2015, from a comparative analysis viewpoint, it can be seen that the projected odour emission increase from the conversion of ED3S-S to leachate storage and evaporation duties would increase the pond systems odour emission rate by 4,510 $ou.m^3/s$ (51%). If the combined ED3S system projected surface areas, the overall odour emission rate would increase by 18,700 $ou.m^3/s$, equivalent to a two-fold increase in odour emissions from the evaporation dam system. TOU considers this increase to be insignificant in the context of the distance of this odour source from potential receptors. This is consistent with the project modelling results (see **Section 4**). The relatively neutral odour character in the pond emissions (described as earthy/mildly ammoniacal) further supports our view that this source is benign and will not cause problems off-site. TOU would expect this state of affairs to continue provided that the LMS continues to be managed and operated effectively.

3 ODOUR DISPERSION MODELLING METHODOLOGY

3.1 NSW ODOUR CRITERIA AND DISPERSION MODEL GUIDELINES

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 of these emissions to a large range of odour sensitive receptors within the local community.

The odour impact assessment for this project has been carried out in accordance with the methods outlined by the documents:

- Environment Protection Authority, 2005, *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*;
- Environment Protection Authority, 2006, *Technical Framework (and Notes): Assessment and Management of Odour from Stationary Sources in NSW;* and
- Barclay & 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'.*

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:

- The 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;
- Odour emission rates multiplied by the peak-to-mean ratios as outlined in **Table 3.1**;
- The near field distance, defined typically as 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.

Table 3.1 - EPA peak-to-mean factors			
Source type	**Pasquill-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 wake-free 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
Source: Environment Protection Authority, 2005 – Table 6.1

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 (Environment Protection Authority, 2005, p. 37):

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

where,

IAC = Impact Assessment Criteria (ou)

***p* =** population

Based on **Equation 3.1**, **Table 3.2** outlines the odour performance criteria for six different affected population density categories. It states that higher odour concentrations are permitted in lower population density applications.

Table 3.2 - Odour Performance Criteria under Various Population Densities	
Population of affected community	**Odour performance criterion (ou)**
Urban Area (≥ ~2000)	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤ ~2)	7.0

Source: Environment Protection Authority, 2005 – Table 7.5

The original odour impact assessment (Heggies, 2010) had adopted the IAC of **6 ou** "*given the low number of sensitive receptor locations in the vicinity of the Woodlawn site*" (PAE Holmes, 2010). TOU has maintained consistency with this approach as conditions have not significantly changed.

3.2 ODOUR DISPERSION MODEL SELECTION

The odour dispersion modelling assessment was carried out using the CALPUFF System (Version 6.42). CALPUFF is a puff dispersion model that is able to simulate the effects of time- and three dimensional space-varying meteorological conditions on pollutant transport (Environment Protection Authority, 2005). CALMET is a meteorological model that produces three dimensional gridded wind and temperature fields to be fed into CALPUFF (Atmospheric Studies Group, 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. For further technical information about the CALPUFF modelling system refer to the document *CALPUFF Modeling System Version 6 User Instructions* (Atmospheric Studies Group, 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 (Environment Protection Authority, 2005). CALPUFF is considered an appropriate dispersion model for impact assessment by EPA in their document - *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales* 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 the this odour impact assessment, CALPUFF was required in order to handle the complexity of surrounding terrain features. Under calm and very light winds, non-steady-state conditions such as accumulation of odour and/or downslope movement with drainage air flow would almost certainly occur.

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

3.3 GEOPHYSICAL AND METEOROLOGICAL CONFIGURATION

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

3.3.1 Terrain configuration

Terrain elevations were sourced from 1 Second Shuttle Radar Topography Mission (SRTM) Derived Smoothed Digital Elevation Model (DEM-S). The SRTM data was 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 400 km^2 grid at 0.15 km resolution. A map of the terrain is illustrated in **Figure 3.1.**

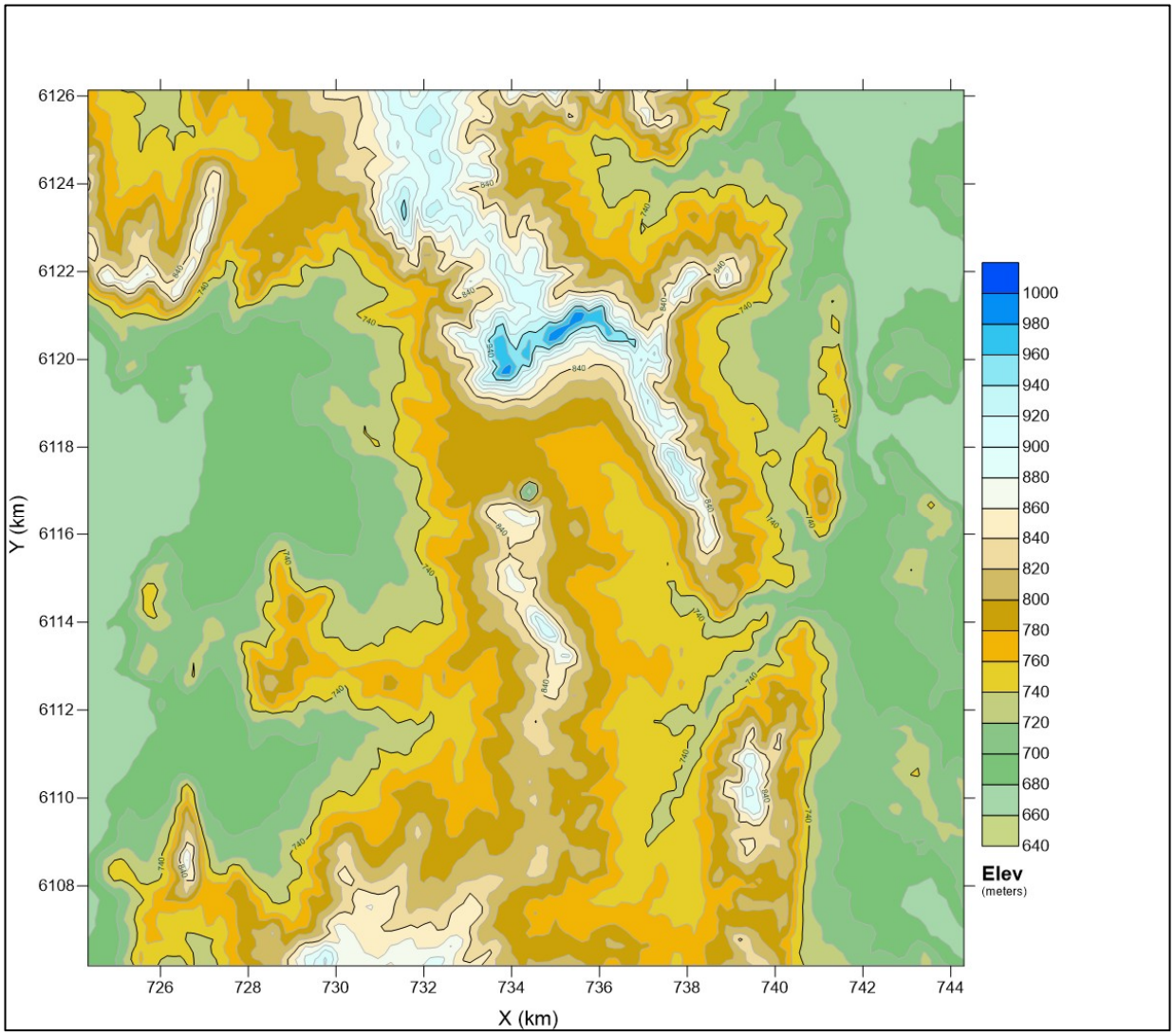

Figure 3.1 - Terrain map of Woodlawn and surrounds

3.3.2 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 400 km^2 grid at 0.15 km resolution. A map of the land use is illustrated in **Figure 3.2**.

3.3.3 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^2 geophysical grid at 0.15 km resolution.

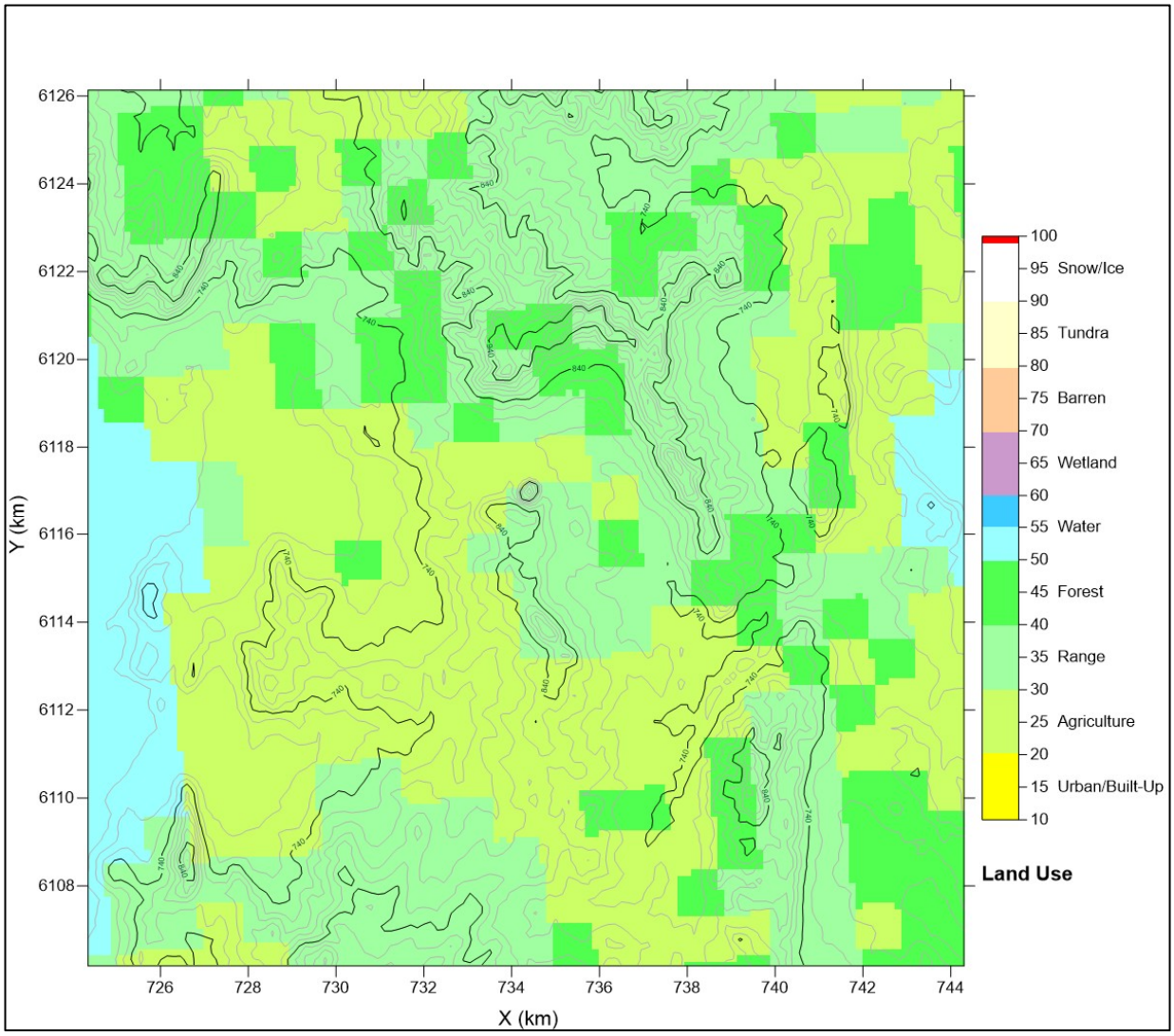

Figure 3.2 - Land use map of Woodlawn and surrounds

3.3.4 Meteorological configuration

3.3.4.1 Input data

One-hour average observed meteorological surface data for the latest representative year (2015) was sourced from Goulburn Airport maintained by Bureau of Meteorology (BOM). The location of Goulburn Airport surface station and other metadata are available in **Appendix B**. The BOM data was formatted into generic format and was processed with SMERGE to produce a surface meteorological data file.

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 centred over the Woodlawn site. TAPM innermost nest was 33 km by 33 km at 1 km resolution. The nested grid resolutions were close to a ratio of three as possible.

3.3.4.2 CALMET meteorological model configuration

CALMET was run using the hybrid option that uses geophysical data, surface station data from Bundaberg Airport and upper air data from the TAPM 3D data tile. 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 3.3** shows key variable fields selected.

3.3.4.3 Meteorological data analysis

Observed 2015 BOM surface data was compared with longer term climate (2011 – 2015) from Goulburn Airport to gauge how representative and suitable the year is for the purpose of air quality dispersion modelling. For reference, meteorological data was also extracted from the CALMET model for the location directly nearby the Woodlawn site office. The annual windroses for Goulburn Airport show very good agreement with west to northwest winds dominating (**Figure 3.3**) The Woodlawn windroses (**Figure 3.4**) show bias to lighter winds and greater frequency of east to south-easterly winds, perhaps due influences from the nearby valley and ridgelines. A more conservative bias is expected relative to the observations at Goulburn Airport.

Both monthly average (**Figure 3.5**) and diurnal temperature (**Figure 3.6**) profiles for the long term and 2015 are in very good agreement. Diurnal mixing heights and stability class frequencies over the Woodlawn site are shown in **Figure 3.7** and **Figure 3.8** respectively.

Table 3.3 - CALMET key variable fields												
Grid Configuration (WGS-84 UTM Zone 55S)												
134											**NX Cells**	
134											**NY Cells**	
0.15											**Cell Size (km)**	
724.277					6106.107						**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	4	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	6	None	MAX radius of influence over land in layer 1 (km)
RMAX2	8	None	MAX radius of influence over land aloft (km)
R1	3	None	Distance (km) where OBS wt = IGF wt in layer 1
R2	4	None	Distance (km) where OBS wt = IGF wt aloft

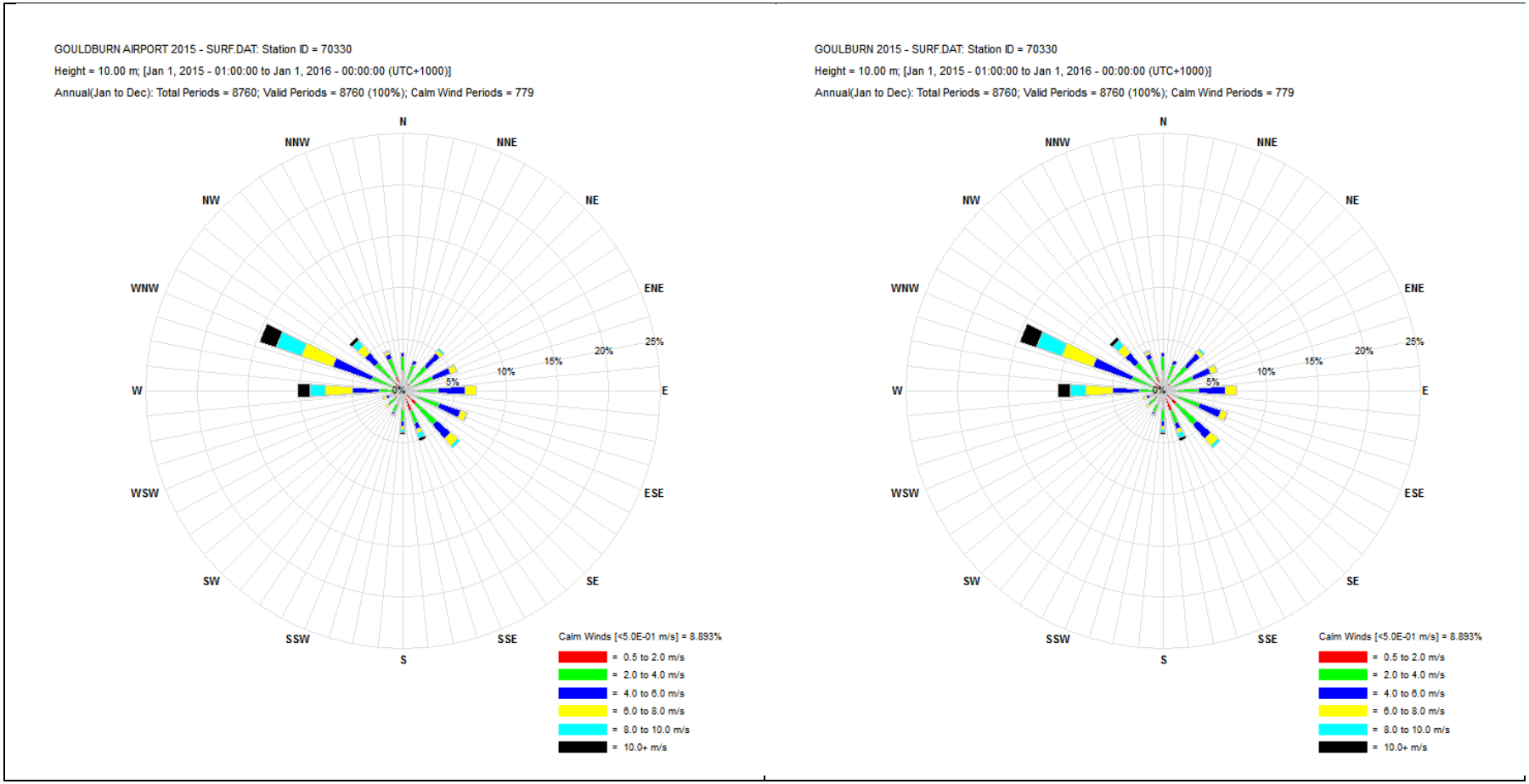

Figure 3.3 - Annual windroses for Goulburn Airport 5 years and 2015 only

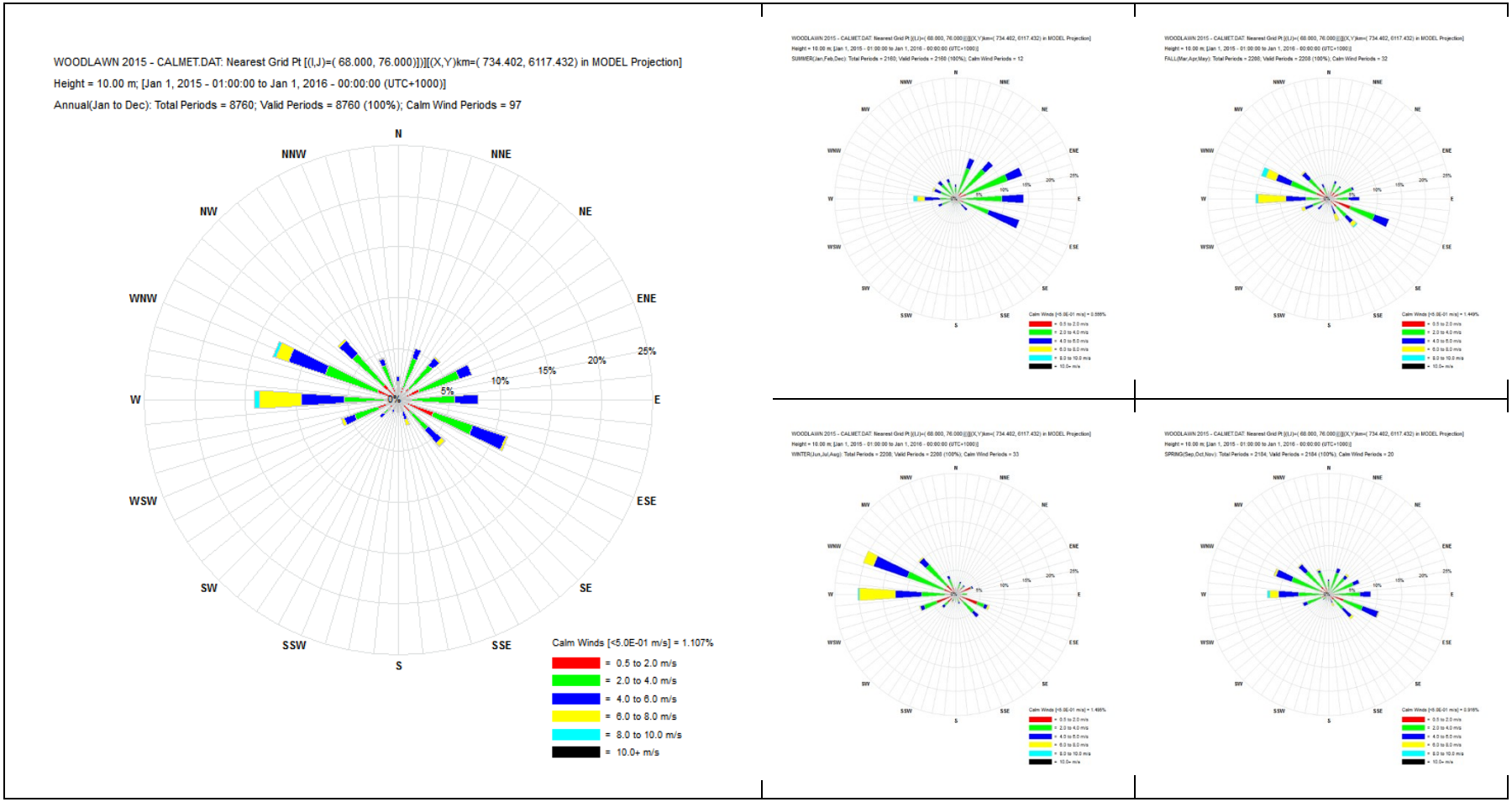

Figure 3.4 - Annual and seasonal windroses for Woodlawn 2015 (modelled)

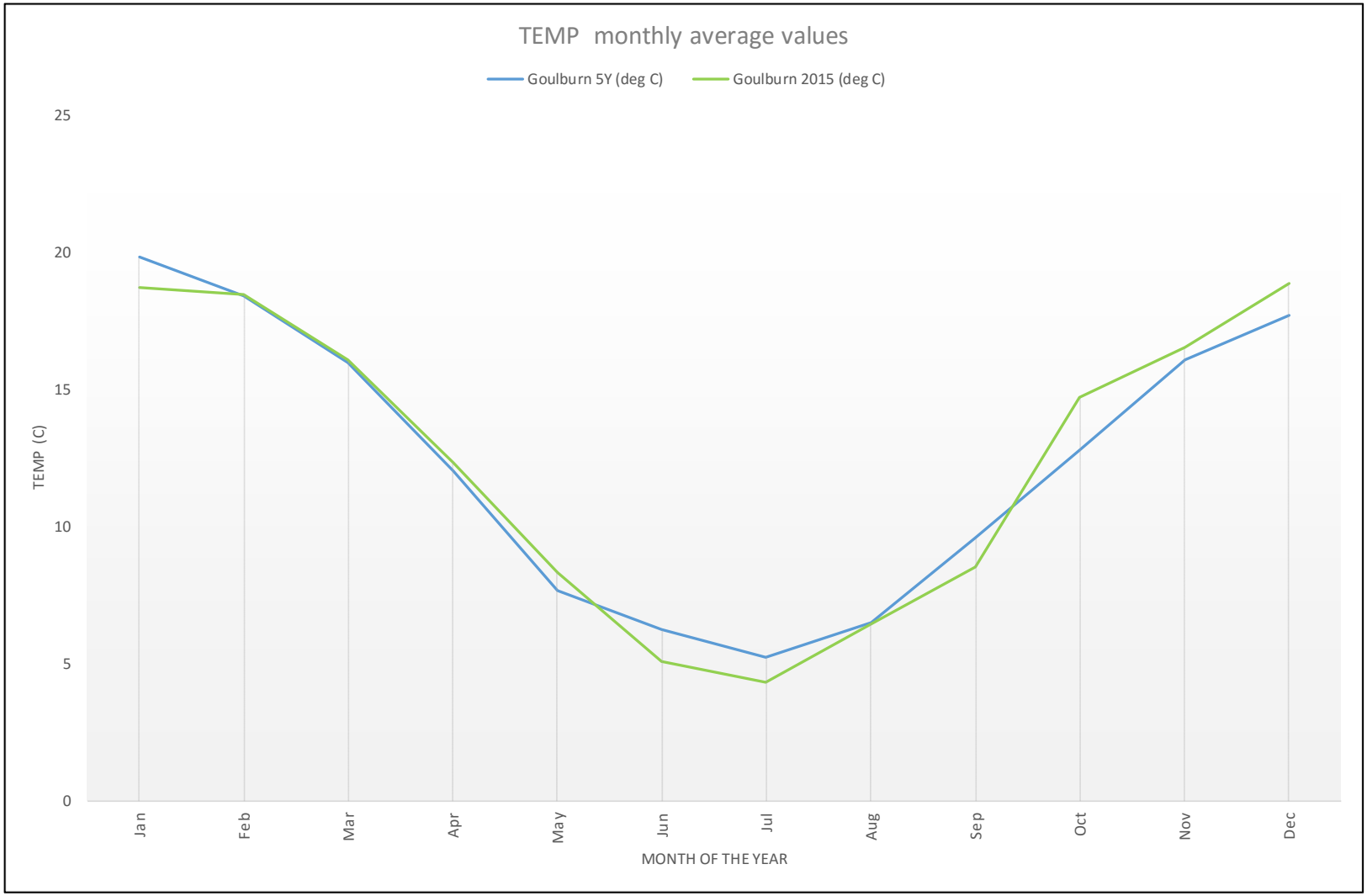

Figure 3.5 - Monthly average temperatures for Goulburn Airport 5 years and 2015 only

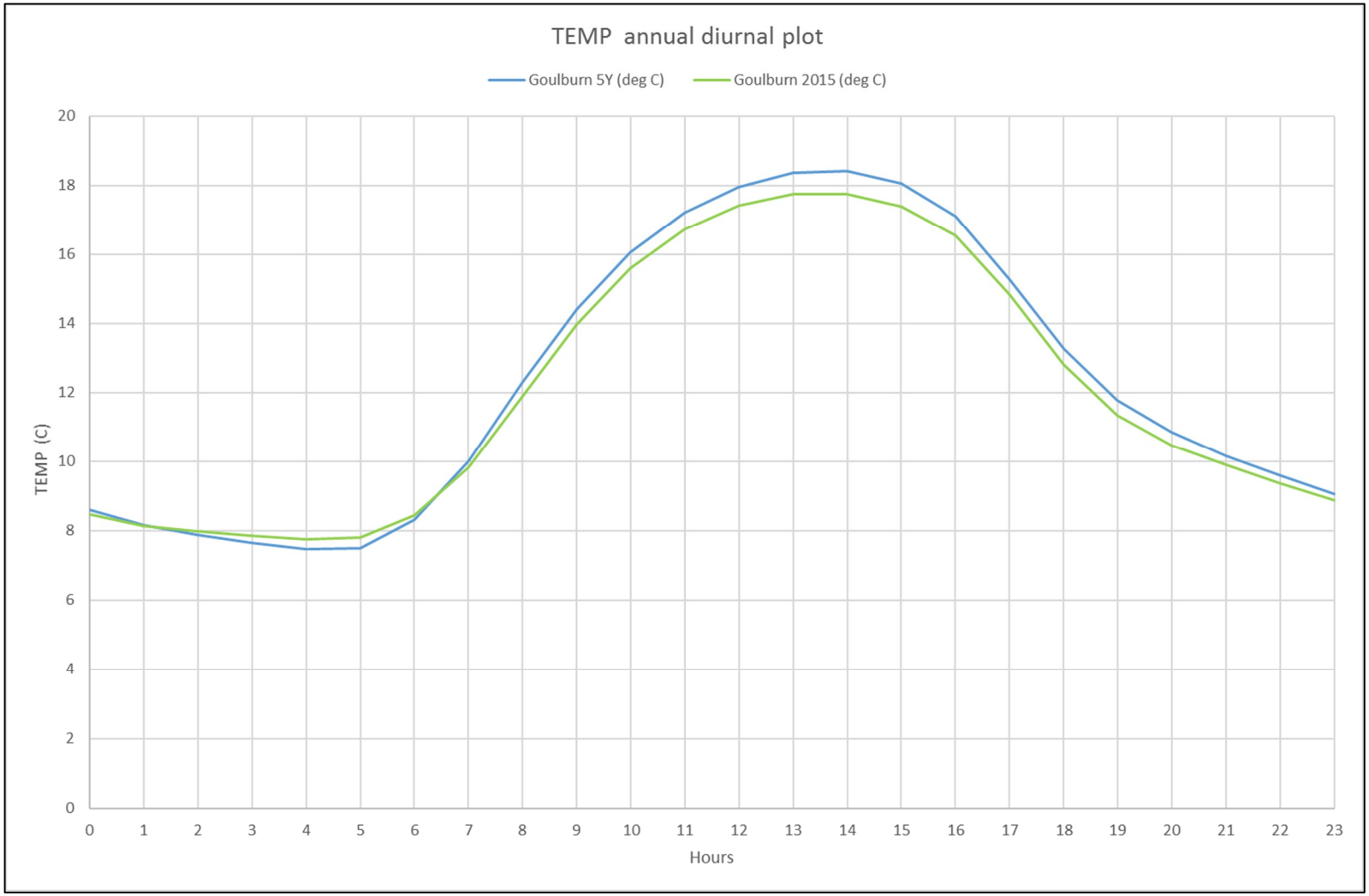

Figure 3.6 - Annual diurnal temperature for Goulburn Airport 5 years and 2015 only

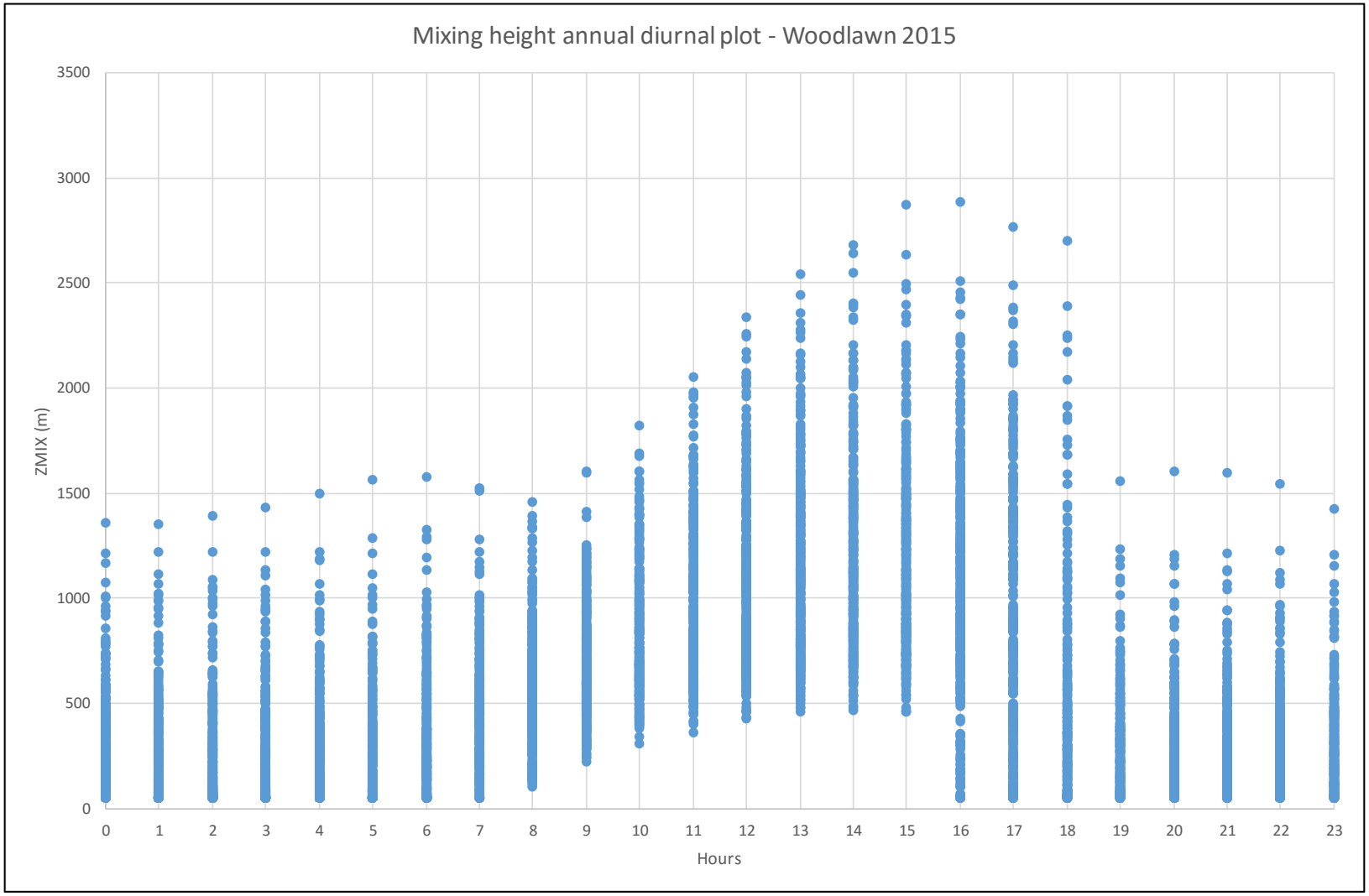

Figure 3.7 - Annual X-Y scatter plot diurnal mixing height for Woodlawn 2015 (modelled)

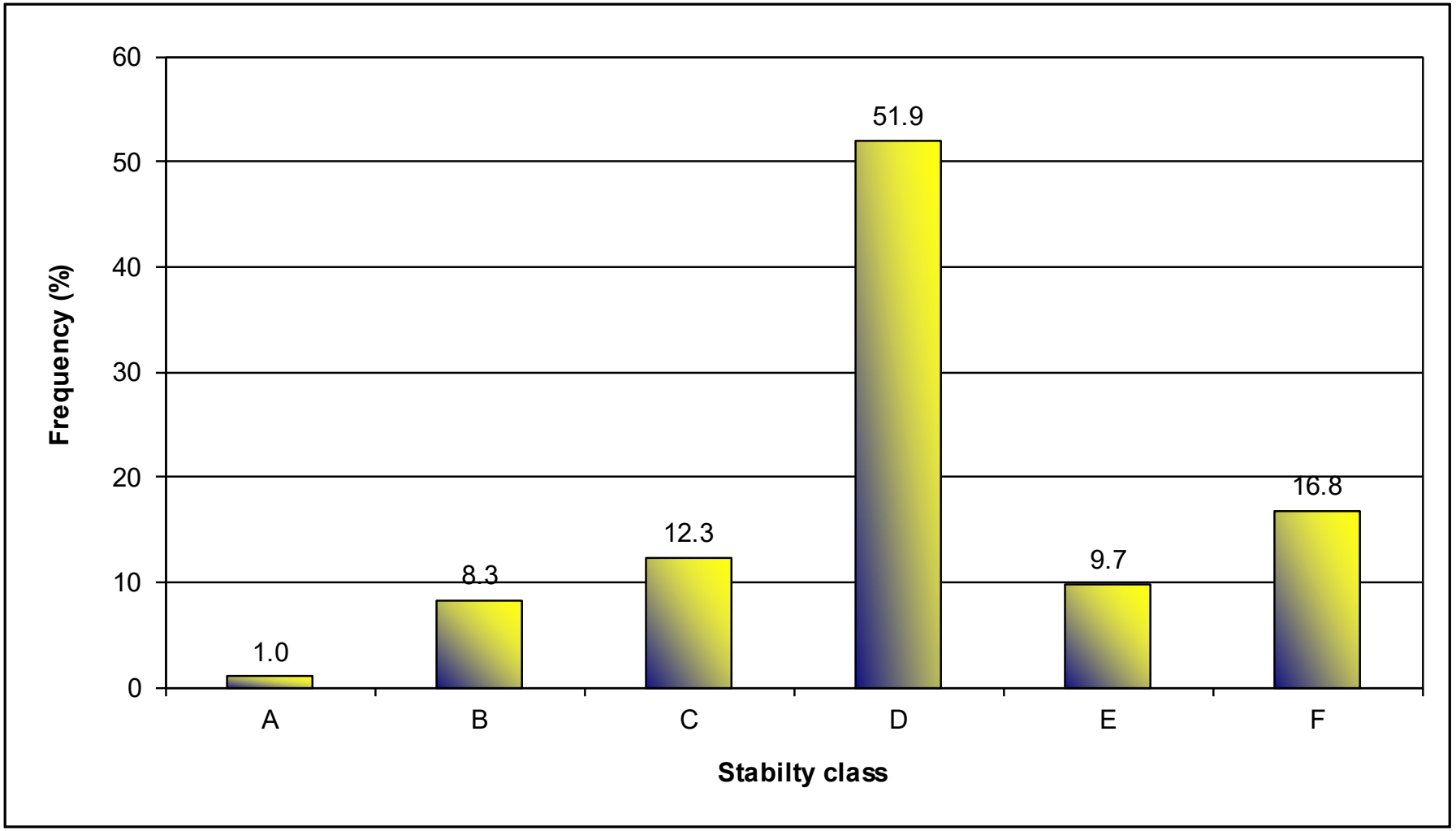

Figure 3.8 - Annual stability class frequency for Woodlawn 2015 (modelled)

3.4 CALPUFF DISPERSION MODEL CONFIGURATION

3.4.1 Computational domain

The computational domain was set to the same parameters as the meteorological domain.

3.4.2 Receptor configuration

Three groups of arbitrary discrete receptors were configured over the modelling domain. Four sensitive discrete receptors were placed at ground level at the same locations identified by the previous EA modelling (Heggies, 2010). A receptor grid was created with a fine resolution inner nest of 9.6 km by 9.6 km by 0.15 km spacing; and an outer nest of 19.35 km by 19.35 km by 0.45 km spacing.

3.4.3 Source Configuration and Emission Rates

See **Appendix C** for full odour source and emission rate configurations.

3.4.4 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).

3.5 MODELLING SCENARIOS

The following scenarios were simulated with CALPUFF:

1. Woodlawn EA 2010 emissions (Baseline) with updated meteorology.
2. ED3S-S only.
3. ED3S only.
4. ED3S-S and ED3S.
5. Baseline, ED3S-S and ED3S.

4 ODOUR DISPERSION MODELLING RESULTS

The odour dispersion modelling results are shown in the following plots that illustrate the isopleth of the projected ground level odour performance criterion:

- **Figure 4.1** – Projected ground level odour concentration contour plots for the baseline EA model (updated meteorology);
- **Figure 4.2** – Projected ground level odour concentration contour plots for ED3S-S only;
- **Figure 4.3** – Projected ground level odour concentration contour plots for ED3S only;
- **Figure 4.4** – Projected ground level odour concentration contour plots for ED3S-S & ED3S; and
- **Figure 4.5** – Projected ground level odour concentration contour plots for Baseline, ED3S-S and ED3S.

All modelling scenarios show clear compliance with the 6 ou ground level criterion, 99.0%, 1-sec averaging at the nearest sensitive receptors. Each contour plot has a table that shows the individual projected ground level concentrations at the nearest sensitive receptors for the modelled scenarios.

Please note that the modelled receptor location shown immediately north of the Woodlawn Bioreactor Facility is within the site boundary and is owned by Veolia. Therefore, for the purposes of this odour assessment, it is not considered to be a sensitive receptor location.

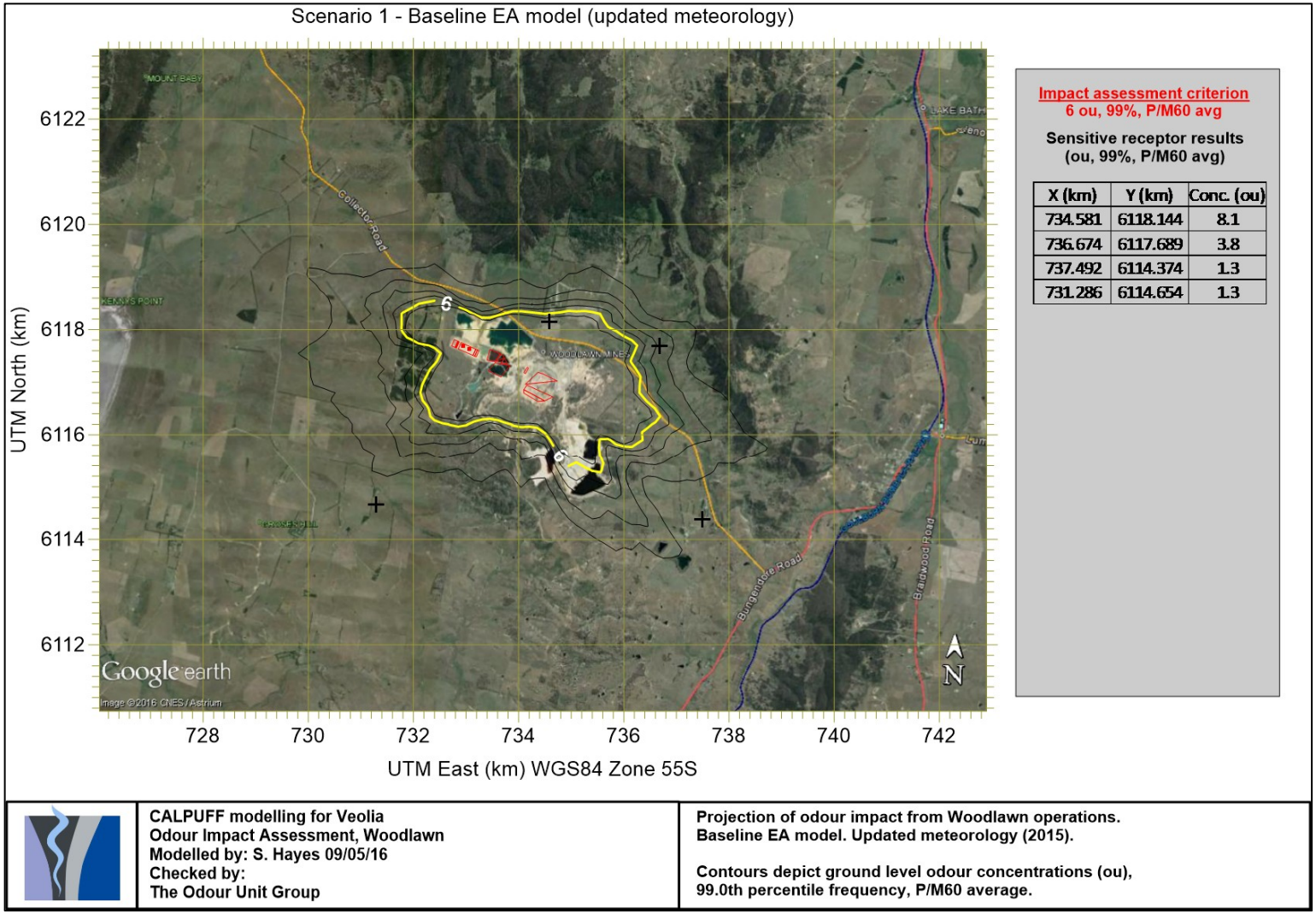

Figure 4.1 – Projected ground level odour concentration contour plots for the baseline EA model (updated meteorology)

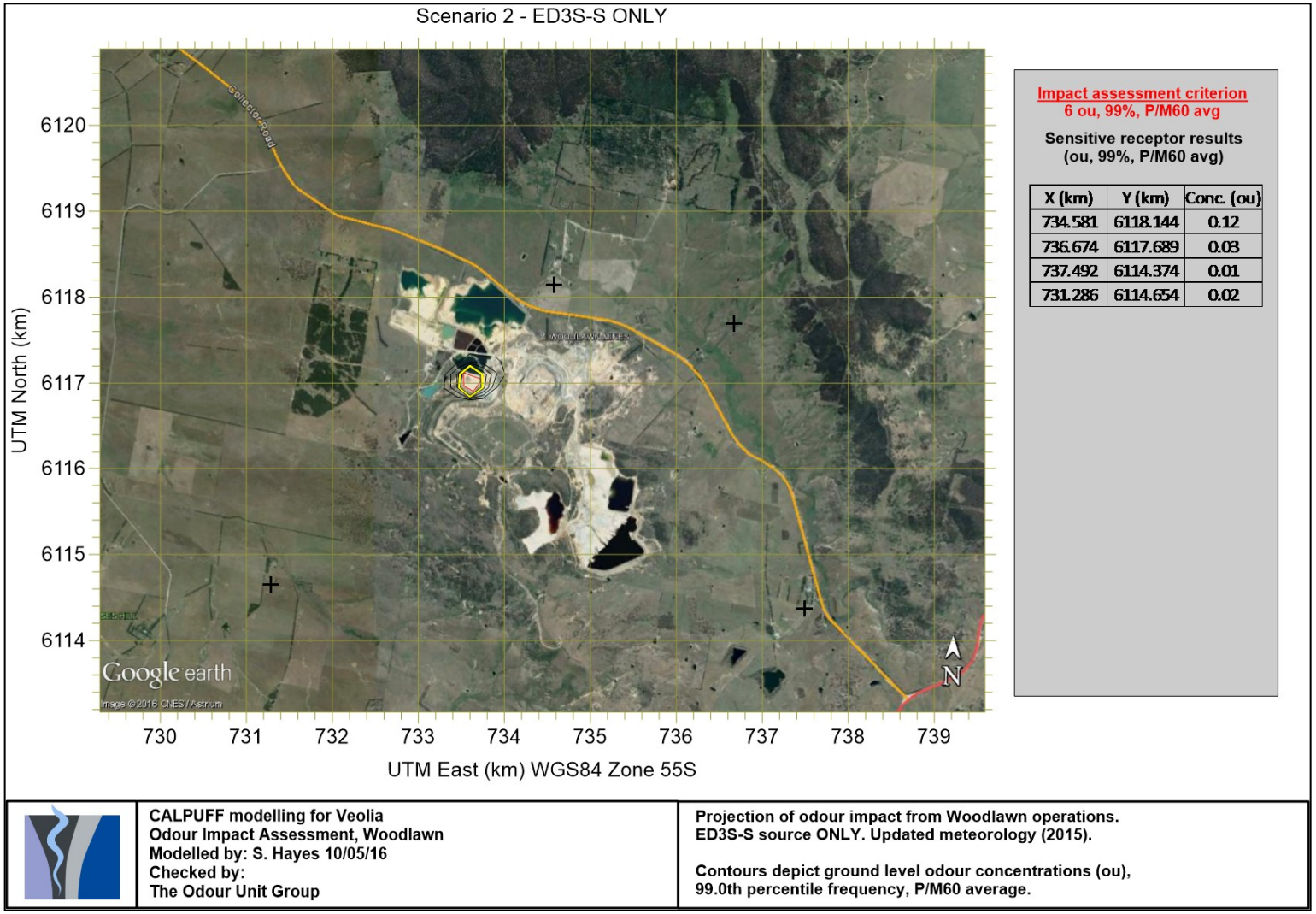

Figure 4.2 – Projected ground level odour concentration contour plots for ED3S-S only

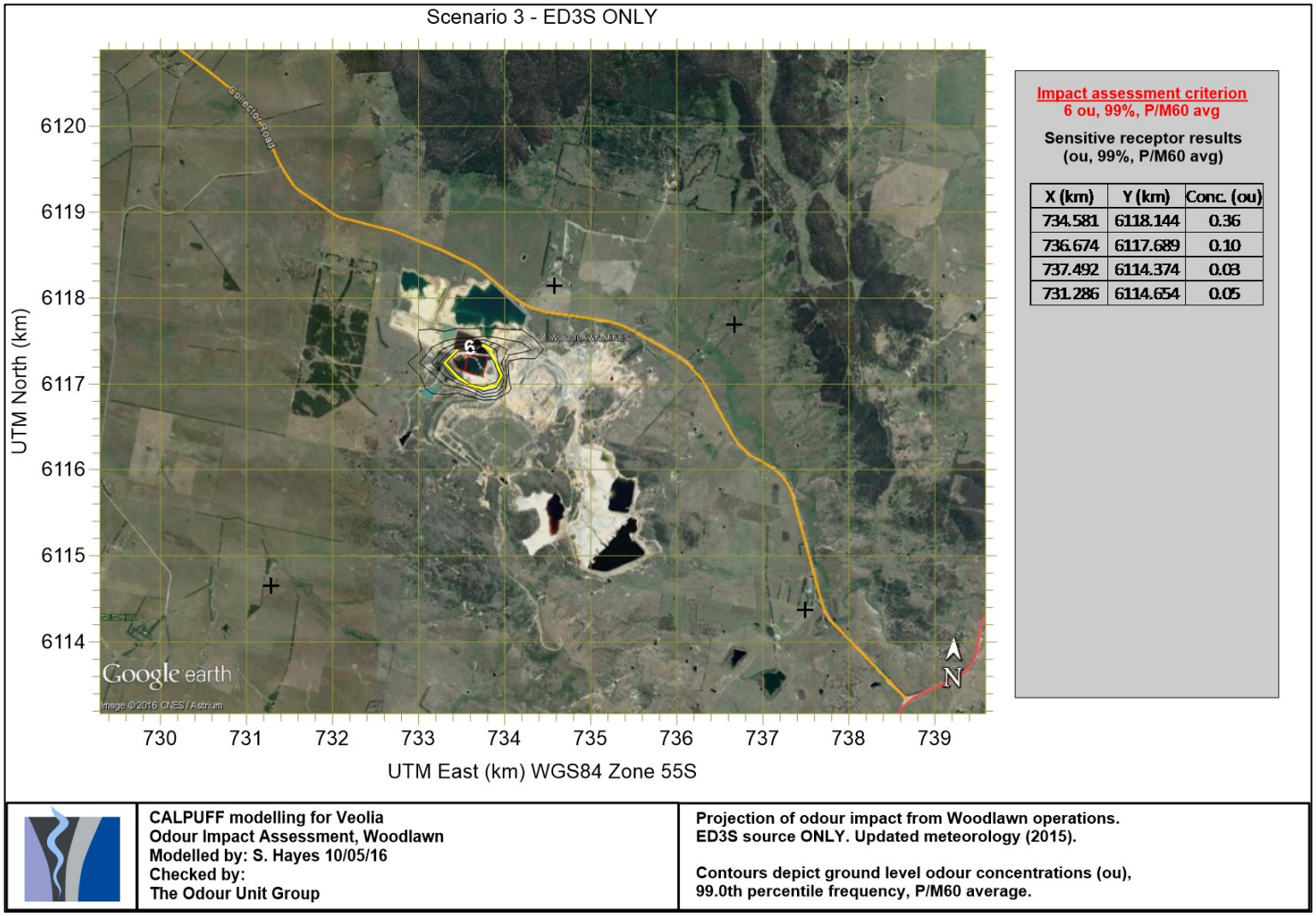

Figure 4.3 – Projected ground level odour concentration contour plots for ED3S only

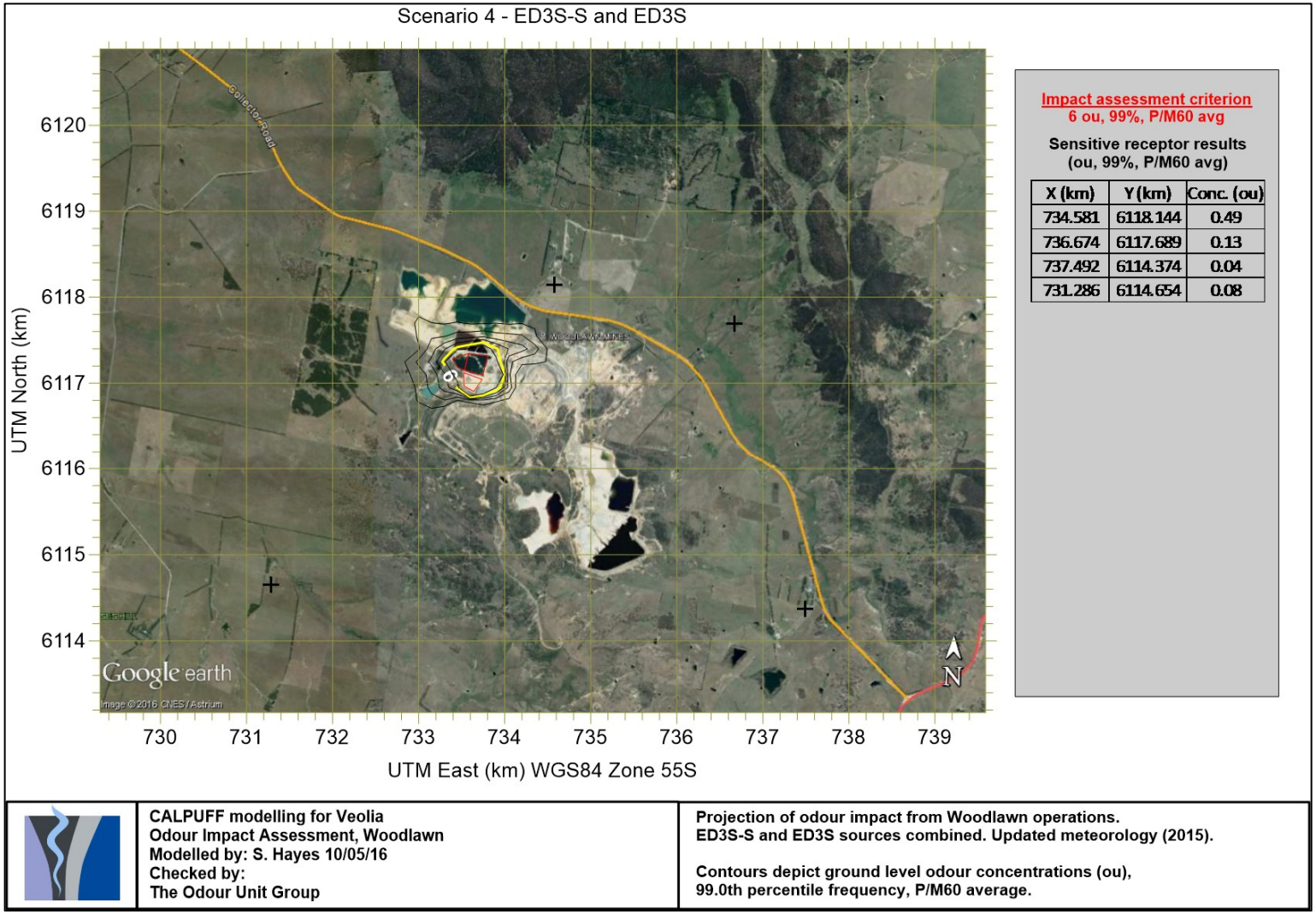

Figure 4.4 – Projected ground level odour concentration contour plots for ED3S-S & ED3S

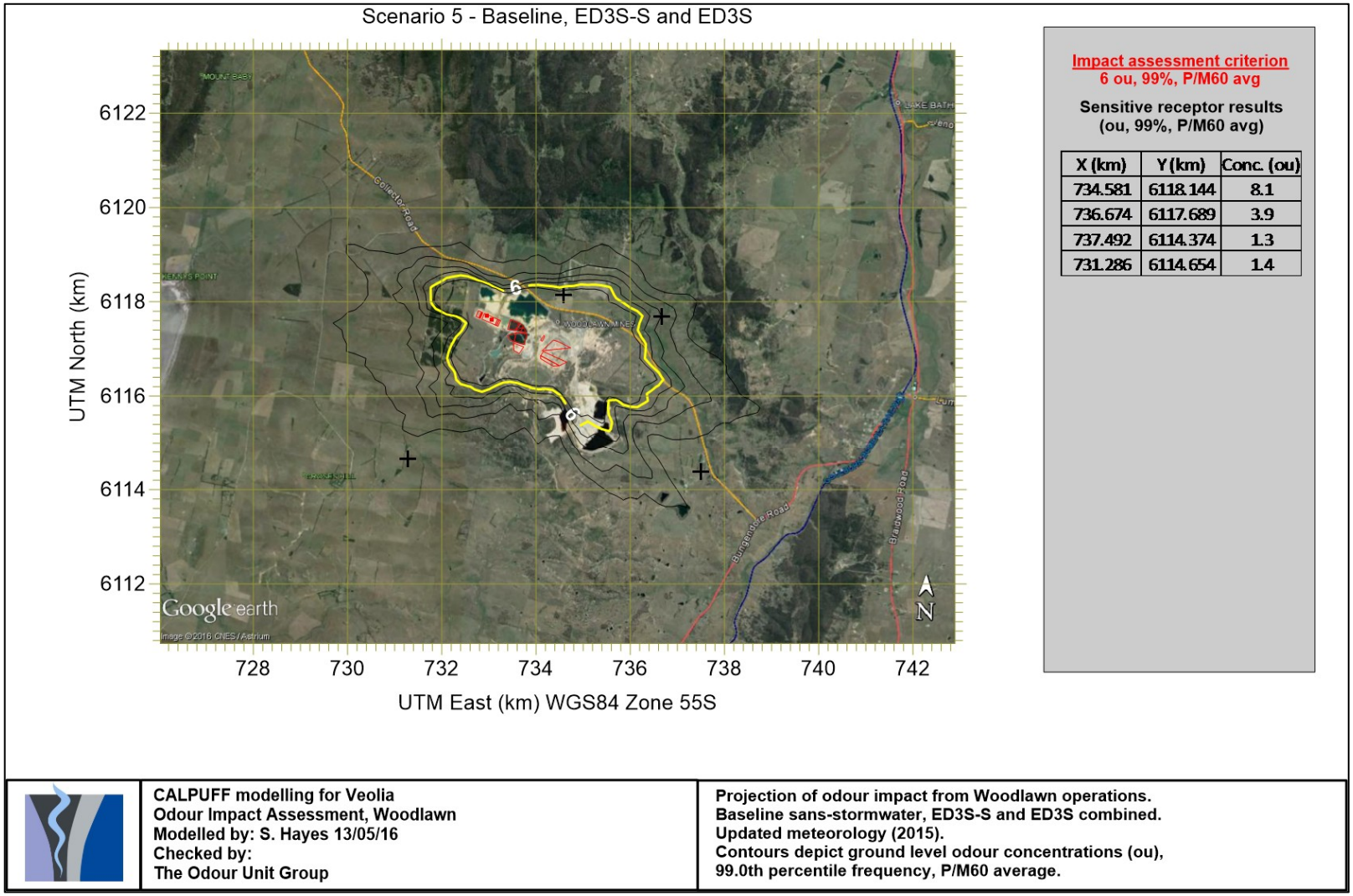

Figure 4.5 – Projected ground level odour concentration contour plots for Baseline, ED3S-S and ED3S

5 MODELLING STUDY FINDINGS & CONCLUSION

The aim of the odour dispersion modelling study was to assess compliance of the proposed addition of ED3S System to the LMS at the Woodlawn Bioreactor Facility against the NSW EPA odour performance criterion ground level concentration of 6 ou based on 1-hour averaging at the 99.0th percentile frequency at the nearest sensitive receptor. The modelling projection results demonstrate compliance with this criterion at the nearest sensitive receptor, and is consistent with the previous odour assessment study findings in October 2015 where negligible change to existing projected impacts were anticipated.

On this basis, it can be safely concluded that the use of the ED3S system for the storage of treated leachate will not result in any significant increase to off-site odour impacts, have negligible change on the existing surrounding off-site amenity, and is in compliance with the relevant NSW EPA odour performance criterion.

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6 REPORT SIGNATURE PAGE

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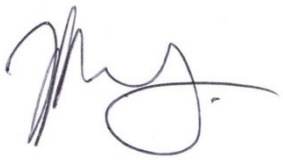

Terry Schulz
Managing Director

Michael Assal
Senior Engineer & Consultant

Steven Hayes
Senior Atmospheric Scientist & Consultant

Veolia Australia & New Zealand

Woodlawn Bioreactor Facility Odour Modelling Study

Proposed Addition of ED3S to Leachate Management System

May 2016

Appendices

THE ODOUR UNIT

VEOLIA

Veolia Australia & New Zealand

Appendix A:

Woodlawn Bioreactor Facility Odour Assessment Study – Addition of ED3S to Leachate Management System

(30 October 2015)

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Stephen Bernhart
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Rosehill, NSW 2142

30 October 2015

by email: stephen.bernhart@veolia.com

WOODLAWN BIOREACTOR FACILITY ODOUR ASSESSMENT STUDY – ADDITION OF ED3S TO LEACHATE MANAGEMENT SYSTEM

Dear Stephen,

As requested, The Odour Unit Pty Ltd (TOU) has reviewed the odour emissions data from the recent 2015 Odour Audit in the context of Veolia's proposal to incorporate the Evaporation Dam 3 South (ED3S) into the existing Woodlawn Leachate Management System, which is based on the storage and evaporation of treated leachate in the Evaporation Dam 3 North (ED3N) system. We have prepared this letter as a formal report on the findings of our investigation.

Our understanding of the proposed change is that Veolia proposes to pump the stormwater currently in ED3S to Evaporation Dam 2 (ED2), thereby freeing up storage volume and natural evaporation capacity for treated leachate in ED3S.

We also understand that the NSW Environment Protection Authority (NSW EPA) has requested an odour assessment of the proposed change to operation based on the odour emissions data from the October 2015 Odour Audit. Specifically, NSW EPA has confirmed with Veolia that the following odour assessment methodology would be suitable (emailed dated 28 September 2015 from Veolia to TOU):

- *Utilising data from existing treated leachate dams and extrapolate this to the new dam in order to quantify odour emission rates from ED3S;*
- *Comparing the data against the current odour emissions inventory developed for the site (as part of the annual odour audits); and*
- *Quantifying the impact as a percentile increase in comparison to the overall site emissions as well as the leachate pond system.*

The 2015 Odour Audit included ambient odour assessments immediately downwind of the Bioreactor and the ED3N system containing treated leachate, as well as far-field assessments

as distant as the Tarago Township. I personally carried out these field assessments. While the quantitative findings of the Odour Audit, with respect to the ED3N system, will be discussed later in this report, it was clearly evident that at no stage were the pond odours detectable beyond the site boundary. This is supported by the low odour emission rate results from the Odour Audit.

TOU's understanding is that due to time constraints, Veolia is proposing to construct the leachate storage dam in two parts. Firstly, the ED3S-Southern partition (ED3S-S) liner will be constructed, which is separated via a breakwall from the main ED3S system. Survey data from Veolia, undertaken by LandTeam Australia Pty Ltd (LandTeam), indicate that the new ED3S-S partition pond will have a surface area between 2.30 ha at low water level, and 2.83 ha when full (see **Attachment 1 - LandTeam Drawing No. 16800-437**).

The second part will involve pumping water from the ED3S to ED2 and then constructing the liner for the main ED3S system. Survey data for this dam indicates that it will have a maximum surface area of 8.94 ha (see **Attachment 2 - Woodlawn Bioreactor ED3S Information** for projected volumes and surface areas). The combined surface area of both dams (i.e. ED3S & ED3S-S) have been added for the purposes of this assessment, as will be shown later in **Table 1**).

Previous audits in 2012 and 2013 found elevated odour emissions from pond ED3N-1 (2012) and ED3N-2 (2013) due to insufficient treatment in the Leachate Aeration Dam system. Improvements to this system saw a large decrease in odour emissions from all four ED3N ponds in 2014, following re-treatment of these liquids, to extremely low levels. These results, together with the 2015 audit results, are shown in **Attachment 3 - Odour Emissions Inventory Comparison Inventory & Odour Emissions Inventory 2015 Audit Excel Sheets**. It should be noted that the Specific Odour Emission Rate (SOER) values represent the measured rates of odour emission per square metre of exposed pond area ($ou.m^3/m^2/s$), while the Odour Emission Rate results represent the total odour emission rate determined for each source ($ou.m^3/s$).

The 2015 audit results show a slightly higher rate of odour emission from all four ED3N ponds, when compared with 2014, but still very low rates of odour emission for treated wastewater pond systems. At the time of writing this report, Veolia was in the process of investigating this matter. The findings from that investigation will be reported in the 2015 Odour Audit Formal Report. The results have been used to project emissions from pond ED3S, as shown in the **Table 1.** Note that the mean SOER result for the four ponds has been used in the projection.

Table 1 - Projected Odour Emission Rates for ED3S			
ED3N System 2015			
Source ID	**Dam Surface Area (m^2)**	**SOER ($ou.m^3/m^2/s$)**	**OER ($ou.m^3/s$)**
ED3N-1	6,000	0.132	794
ED3N-2	5,500	0.145	797
ED3N-3	5,500	0.091	500
ED3N-4	25,000	0.269	6,720
ED3N Total	**42,000**	**0.159 (mean)**	**8,810**
Projected ED3S System			
ED3S	89,435	0.159	14,200
ED3S-S	28,330		4,510
ED3S Total	**118,000**		**18,700**

It can be seen that the projected odour emission increase from the conversion of ED3S-S to leachate storage and evaporation duties would increase the pond systems odour emission rate by 4,510 $ou.m^3/s$ (51%). If the combined ED3S system projected surface areas, the overall odour emission rate would increase by 18,700 $ou.m^3/s$, equivalent to a twofold increase in odour emissions from the evaporation dam system. TOU considers this increase to be insignificant in the context of the distance of this odour source from potential receptors. The relatively neutral odour character in the pond emissions (described as earthy/mildly ammoniacal) further supports our view that this source is benign and will not cause problems off-site. TOU would expect this state of affairs to continue provided that the Leachate Aeration Dam system continues to be managed and operated effectively.

The question of the relative magnitude of the proposed ED3S system emissions compared to overall site odour emissions is difficult to address quantitatively, given the disparate Bioreactor odour sources and the inherent difficulties in quantifying odour emissions using the odour sampling and testing techniques available to the audit team. The 2015 Odour Audit was able to determine that the odour emission rate from the active tipping face inside the Bioreactor was 45,100 $ou.m^3/s$ – well below the estimate in the original Environmental Assessment projection (292,000 $ou.m^3/s$). This reduction is largely due to a decrease in the active tipping area – minimising the active tipping face is one of the key performance indicators at the Woodlawn site as addressed in previous audits. It is TOU's judgement at this stage that fugitive odour emissions are likely to be comparable to the active tipping face emissions to the overall Bioreactor emissions.

On this basis, and assuming a Bioreactor emission rate of at least 100,000 m^3/s, it can be seen that the proposed utilisation of the ED3S system will add a maximum of 17% to overall site odour emissions, at full dam capacity.

On the basis of this assessment, it can be safely concluded that the conversion of ED3S system to leachate management duties will not result in any increase in odour impacts from the Woodlawn site.

Yours sincerely,

Terry Schulz
Principal & Managing Director

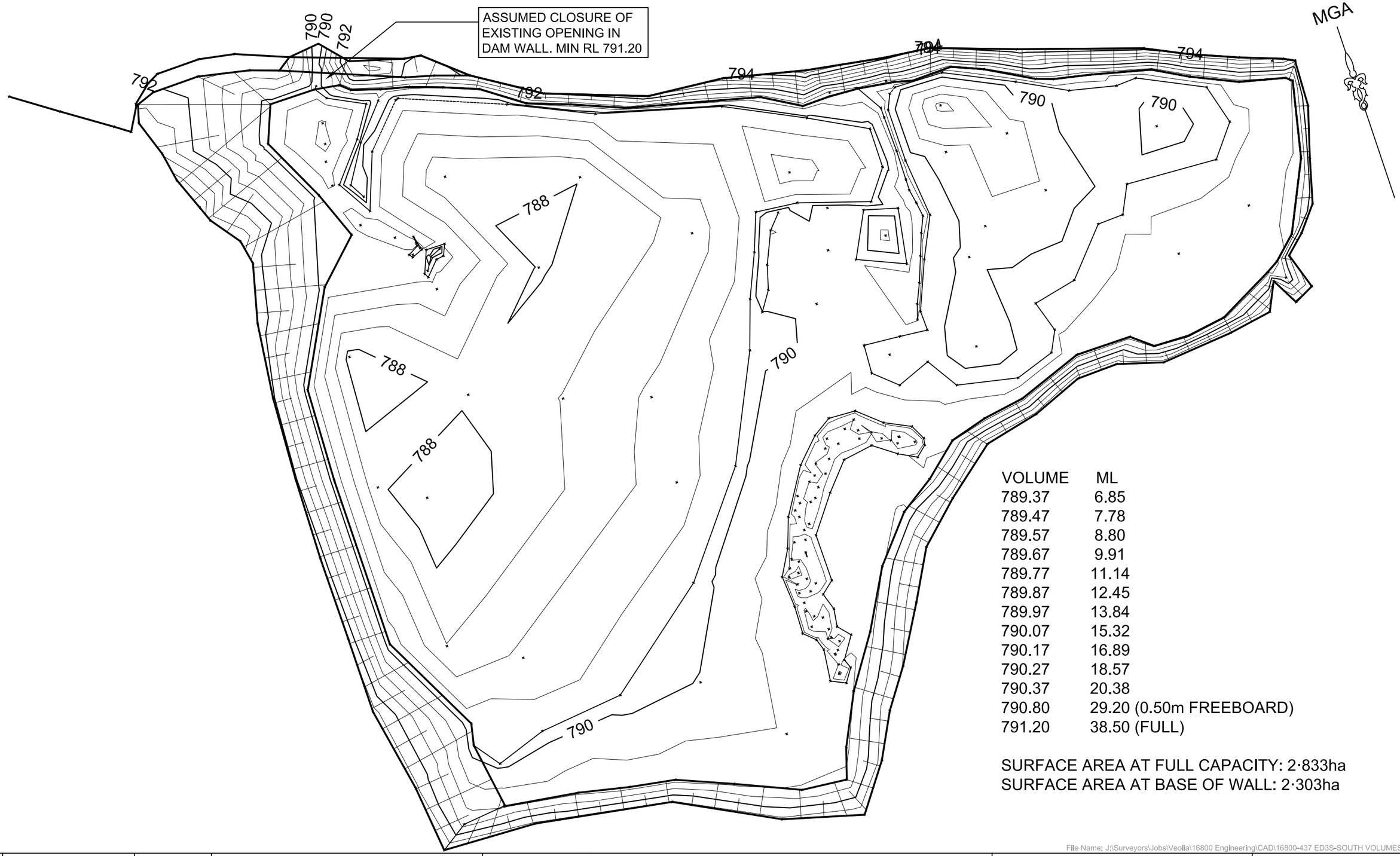
Attachments:

Attachment 1 – LandTeam Drawing No. 16800-437
Attachment 2 – Woodlawn Bioreactor ED3S Information
Attachment 3 - Odour Emissions Inventory Comparison Inventory & Odour Emissions Inventory 2015 Audit Excel Sheets

THE ODOUR UNIT

Attachment 1 –

LandTeam Drawing No. 16800-437



VOLUME	ML
789.37	6.85
789.47	7.78
789.57	8.80
789.67	9.91
789.77	11.14
789.87	12.45
789.97	13.84
790.07	15.32
790.17	16.89
790.27	18.57
790.37	20.38
790.80	29.20 (0.50m FREEBOARD)
791.20	38.50 (FULL)

SURFACE AREA AT FULL CAPACITY: 2·833ha
SURFACE AREA AT BASE OF WALL: 2·303ha

File Name: J:\Surveyors\Jobs\Veolia\16800 Engineering\CAD\16800-437 ED3S-SOUTH VOLUMES.dwg

ISSUE	AMENDMENT	DATE
A	INITIAL ISSUE	24/08/2015

SCALE 1:800

0 10 20 30 40 50

Metres

A3 SHEET

Liability limited by a scheme approved under Professional Standards Legislation.

VEOLIA ENVIRONMENTAL SERVICES

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ABN 35 300 283 592
Goulburn Office
36 Montague Street
Postal: PO Box 1040
GOULBURN NSW 2580
p: (02) 4821 1033
f: (02) 4821 7238
e: goulburn@landteam.com.au
w: www.landteam.com.au

VEOLIA ENVIRONMENTAL SERVICES

PLAN SHOWING STORAGE INFORMATION
EVAPORATION DAM 3 - SOUTH (SOUTHERN PARTITION)
WOODLAWN BIOREACTOR

DATUM: AHD | CONTOUR INTERVAL: 0.5m

DATE: 24/08/2015
SURVEYED: VAR
DRAWN: MK
CHECKED: JK
ISSUE: A

DRAWING No. 16800-437

Attachment 2 –

Woodlawn Bioreactor ED3S Information

WOODLAWN BIOREACTOR ED3S INFORMATION

DAM: ED3SOUTH

Minimun RL: 786.40

Minimum Wall Level: 791.00

Maximum Water Level: 790.50 (0.5m freeboard)

Water Level	Volume (m³)	Area (m²)
786.40	0.0	0.0
786.50	0.3	13.3
786.60	4.9	89.4
786.70	20.4	233.1
786.80	54.0	454.0
786.90	114.2	762.4
787.00	209.0	1147.3
787.10	346.1	1608.6
787.20	533.3	2147.6
787.30	778.4	2769.6
787.40	1090.1	3477.4
787.50	1476.8	4271.6
787.60	1947.9	5175.5
787.70	2515.2	6182.5
787.80	3187.7	7302.1
787.90	4000.4	9044.2
788.00	5020.0	11544.8
788.10	6329.9	14605.3
788.20	7928.4	17372.5
788.30	9812.0	20341.8
788.40	12000.8	23840.0
788.50	14493.3	26446.4
788.60	17266.1	29052.6
788.70	20304.1	31711.6
788.80	23618.9	34639.8
788.90	27232.4	37649.8
789.00	31149.5	40706.2
789.10	35381.0	43989.0
789.20	39958.1	47625.5
789.30	44921.4	51714.8
789.40	50315.7	56314.8
789.50	56191.0	61757.4
789.60	62669.6	67889.9
789.70	69609.4	73133.4
789.80	76868.5	75406.4
789.90	84392.4	77377.4
790.00	92145.4	79343.5
790.10	100124.3	81359.7
790.20	108332.8	83408.3
790.30	116767.1	85617.2
790.40	125427.2	87739.4
790.50	134275.9	89434.7

	Filling rates Low 1L/s	Average 1.5L/s	High 2L/s	Annual filling rate
	Volume (m³)			
Yr 1	31.6	47.3	63.1	
Yr 2	63.1	94.7	126.2	
Yr 3	94.7	142.0	189.3	
Yr 4	126.2	189.3	252.5	
Yr 5	157.8	236.7	315.6	
Yr 6	189.3	284.0	378.7	
Yr 7	220.9	331.4	441.8	
Yr 8	252.5	378.7	504.9	
Yr 9	284.0	426.0	568.0	
Yr 10	315.6	473.4	631.2	
Yr 11	347.1	520.7	694.3	
Yr 12	378.7	568.0	757.4	
Yr 13	410.2	615.4	820.5	
Yr 14	441.8	662.7	883.6	
Yr 15	473.4	710.0	946.7	
Yr 16	504.9	757.4	1009.8	
Yr 17	536.5	804.7	1073.0	
Yr 18	568.0	852.1	1136.1	
Yr 19	599.6	899.4	1199.2	
Yr 20	631.2	946.7	1262.3	
Yr 21	662.7	994.1	1325.4	
Yr 22	694.3	1041.4		
Yr 23	725.8	1088.7		
Yr 24	757.4	1136.1		
Yr 25	788.9	1183.4		
Yr 26	820.5	1230.7		
Yr 27	852.1	1278.1		
Yr 28	883.6	1325.4		
Yr 29	915.2			
Yr 30	946.7			
Yr 31	978.3			
Yr 32	1009.8			
Yr 33	1041.4			
Yr 34	1073.0			
Yr 35	1104.5			
Yr 36	1136.1			
Yr 37	1167.6			
Yr 38	1199.2			
Yr 39	1230.7			
Yr 40	1262.3			
Yr 41	1293.9			
Yr 42	1325.4			
	1357.0			

Attachment 3 –

Odour Emissions Inventory Comparison Inventory & Odour Emissions Inventory 2015 Audit Excel Sheets

Veolia Woodlawn Audit #4

Odour Emissions Comparison Inventory

Location	2015			2014			2013				2012			Environmental Assessment		
	Current Area (m^2)	TOU SOER ($ou.m^3/m^2/s$)	TOU OER - Current Area ($ou.m^3/s$)	2014 Area (m^2)	TOU SOER ($ou.m^3/m^2/s$)	TOU OER - 2014 Area ($ou.m^3/s$)	2013 Area (m^2)	TOU SOER ($ou.m^3/m^2/s$)	TOU OER 2012 Area ($ou.m^3/s$)	TOU OER - Current Area ($ou.m^3/s$)	2012 Area (m^2)	TOU SOER ($ou.m^3/m^2/s$)	TOU OER ($ou.m^3/s$)	SOER ($ou.m^3/m^2/s$)	OER ($ou.m^3/s$)	OER - 2015 Current Area ($ou.m^3/s$)
ED3N-1	6,000	0.132	794	6,000	0.017	104	6,000	0.30	2,100	1,800	7,000	394	2,760,000	8.8	61,600	52,800
ED3N-2 & 3	11,000	0.118	1,300	11,000	0.049	543	11,000	11.6	150,000	127,000	13,000	0.29	3,800	7.4	96,200	81,400
ED3N-2	5,500	0.145	797	5,500	0.066	365	5,500	20.1	131,000	111,000	6,500	0.21	1,350	n/a		
ED3N-3	5,500	0.091	500	5,500	0.032	178	5,500	0.2	1,010	852	6,500	0.37	2,430			
ED3N-4	25,000	0.269	6,720	25,000	0.023	575	25,000	0.0603	965	1,510	16,000	0.41	6,600	0.7	11,200	17,500
Active Tipping Face	6,000	7.509	45,100	6,000	4.28	25,700	6,000	3.04	121,000	18,200	40,000	8.36	334,000	7.3	292,000	43,800
Leachate Aeration Dam	5,000	0.276	1,380	5,000	0.026	129	5,000	0.323	646	1,620	2,000	0.46	920	3.6	7,200	18,000
Construction and Demolition Tip Face	900	0.326	294	500	n/a^	n/a	500	0.293	264	147	900	n/a	n/a	n/a	n/a	n/a
Storage Pond 7	n/a	n/a	n/a	n/a	n/m^^	n/a	n/a	n/m	n/m	n/m	1,200	85	102,000	n/m	n/m	n/m

^ non-existent in this audit
^^ non-existent
n/a = not applicable
n/m = not measured

Odour Emissions Inventory 2015 Audit

Client: Veolia (Australia & New Zealand)
Sampling Site: Woodlawn Bioreactor Facility
Project Number: N1806L.03 - Woodlawn Audit #4

Sample Location	TOU Sample Number	Odour Concentration (ou)	Specific Odour Emission Rate ($ou.m^3/m^2/s$)	Odour character	H_2S concentraton measurement in bag (ppm)
Evaporation Dam 3 North (ED3N) System					
Sample #1 - ED3N-4	SC15494	362	0.269	ammonical, dirt, soil	0.000
Sample #2 - ED3N-2	SC15495	197	0.145	ammonical, dirt, soil	0.000
Sample #3 - ED3N-1	SC15496	181	0.132	muddy, dirt	0.000
Sample #4 - ED3N-3	SC15497	118	0.091	muddy, dirt	0.000
Leachate Aeration Dam					
Sample #5 - Leachate Aeration Dam	SC15498	362	0.276	ammonical, dirt, soil	0.000
Active Tipping Area					
Sample #12 - Active Tipping Face Area: Soil Covered Final Layer (Point #1A)	SC15505	256	0.19	dirt, garbage	0.011
Sample #13 - Active Tipping Face Area: ConCover Secondary Layer (Point #1B)	SC15506	6,320	4.45	ammonical, garbage	0.026
Sample #14 - Active Tipping Face Area: Soil Covered (Point #2A)	SC15507	724	0.50	vanilla, gassy	0.000
Sample #15 - Active Tipping Face Area: ConCover (Point #2B)	SC15508	4,470	2.83	dirt, garbage	0.045
Sample #16 - Active Tipping Face Area: No cover (Point #3A)	SC15509	23,200	14.05	lime, sour, ammonical, garbage	0.60
Sample #17 - Active Tipping Face Area: No cover (Point #3B)	SC15510	27,600	17.11	ammonical, garbage	0.11
Sample #18 - Active Tipping Face Area: Freshly Waste (< 1 day old, Point #1)	SC15511	17,900	11.79	garbage	0.140
Sample #19 - Active Tipping Face Area: Freshly Waste (< 1 day old, Point #2)	SC15512	15,000	9.15	garbage	0.020
Waste Covered Area					
Sample #6 - Waste Covered Area: Normal Capping (Zone A between LE85 & SM13)	SC15499	181	0.127	sweet, fermented	0.000
Sample #7 - Waste Covered Area: Normal Capping (Zone A and parallel to LE99)	SC15500	558	0.388	sweet, fermented, pineapple, rotten egg, landfill gas	0.01
Sample #10 - Waste Covered Area: Biocovered Material Area (LE41)	SC15503	256	0.176	garbage, dirt, ammonical	0.004
Sample #11 - Waste Covered Area: Biocovered Material Area (LE57)^	SC15504	2,520,000	1,692.871	landfill gas, rotten egg	840
Sample #20 - Waste Covered Area: Normal Capping (Zone D - LE65)	SC15513	101,000	58.43	garbage, landfill gas, rotten, pineapple	n/m
Sample #21 - Waste Covered Area: Biocovered Material Area (Zone D - LE65)	SC15514	3,120,000	1,765.44	landfill gas, rotten egg, pineapple, garbage	180
Construction and Demolition Area					
Sample #8 - Construction and Demolition Area: Active Tipping Face (Point #1)	SC15501	431	0.299	sweet, fermented, pineapple, rotten egg, landfill gas	0.025
Sample #9 - Construction and Demolition Area: Active Tipping Face (Point #2)	SC15502	512	0.353	garbage, pineapple	n/m

n/m = not measured

^ estimated at 3,000 ou per 1 ppm of H_2S (i.e. mean of 2,000 - 4,000 ou per 1 ppm of H_2S)

Veolia Australia & New Zealand

Appendix B:

Bureau of Meteorology Basic Climatological Station Metadata – Goulburn Airport

(Complied 26 November 2015)

Australian Government
Bureau of Meteorology

Basic Climatological Station Metadata

Current status

Metadata compiled: 26 NOV 2015

Station: GOULBURN AIRPORT AWS

Bureau of Meteorology station number: 070330
Bureau of Meteorology district name: Sthn Tablelands Gburn-Monaro
State: NSW

World Meteorological Organization number: 95716
Identification: YGLB

Network Classification: National Benchmark Network for Agrometeorology
Station purpose: Synoptic, Aeronautical
Automatic Weather Station: Almos

Current Station Location				
Latitude	**Decimal**	-34.8085	**Hour Min Sec**	34°48'31"S
Longitude	**Decimal**	149.7312	**Hour Min Sec**	149°43'52"E
Station Height	640 m	**Barometer Height**	640.8 m	
Method of station geographic positioning			GPS	

Year opened: 1988
Status: Open

Station summary

No summary for this site has been written as yet.

Historical metadata for this site has not been quality controlled for accuracy and completeness. Data other than current station information, particularly earlier than 1998, should be considered accordingly. Information may not be complete, as backfilling of historical data is incomplete.

Australian Government
Bureau of Meteorology

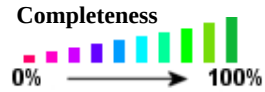
Basic Climatological Station Metadata

Current status

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Observation summary

The table below indicates the approximate completeness of the record for individual element types within the Australian Data Archive for Meteorology. For elements not listed see the note below.



DAILY DATA HOLDINGS

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	SINGLE DAYS MISSED	FULL MONTHS MISSED
MAXIMUM AIR TEMPERATURE	JUL 1990	OCT 2015	95.9	372	0
MAXIMUM WIND GUST SPEED	JUN 2003	OCT 2015	98.8	53	0
WIND RUN ABOVE 10 FEET	JUN 2003	OCT 2015	98.7	57	0
RAINFALL	JUN 1994	NOV 2015	94	N/A	N/A

HOURLY DATA HOLDINGS - from 1 to 24 observations per day

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	FREQUENCY average daily	SINGLE DAYS MISSED	FULL MONTHS MISSED
AIR TEMPERATURE	AUG 1989	OCT 2015	97.7	8.6	61	0
DEW POINT	AUG 1989	OCT 2015	97.4	8.6	64	0
MEAN SEA LEVEL PRESSURE	SEP 1995	OCT 2015	98.4	8.9	42	0
TOTAL CLOUD AMOUNT	AUG 1995	OCT 2015	8.3	5.4	111	217
WIND SPEED	AUG 1989	OCT 2015	97.7	8.6	59	0

Historical metadata for this site has not been quality controlled for accuracy and completeness. Data other than current station information, particularly earlier than 1998, should be considered accordingly. Information may not be complete, as backfilling of historical data is incomplete.

Prepared by the Bureau of Meteorology.
Contact us by phone on (03) 9669 4082, by fax on (03) 9669 4515, or by email on climatedata@bom.gov.au

Basic Climatological Station Metadata

Current status

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

THERE ARE NO RAINFALL INTENSITY DATA HOLDINGS

ONE-MINUTE DATA HOLDINGS

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	FREQUENCY average daily	SINGLE DAYS MISSED	FULL MONTHS MISSED
ALL ELEMENTS	SEP 2010	NOV 2015	99.1	1427.4	N/A	0

HALF-HOURLY DATA HOLDINGS

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	FREQUENCY average daily	SINGLE DAYS MISSED	FULL MONTHS MISSED
ALL ELEMENTS	JAN 1989	NOV 2015	72.1	34.6	N/A	2

THERE ARE NO UPPER-AIR EDT DATA HOLDINGS

Holdings calculated up to 01 Nov 2015

The % complete figure is the completeness of observations averaged over all months of record, for the given station and observation type, taking gaps into account. For hourly holdings, the completeness is relative to the maximum number of daily observations for the site each month, and is therefore an estimate. For daily holdings, the completeness figure shown is exact.

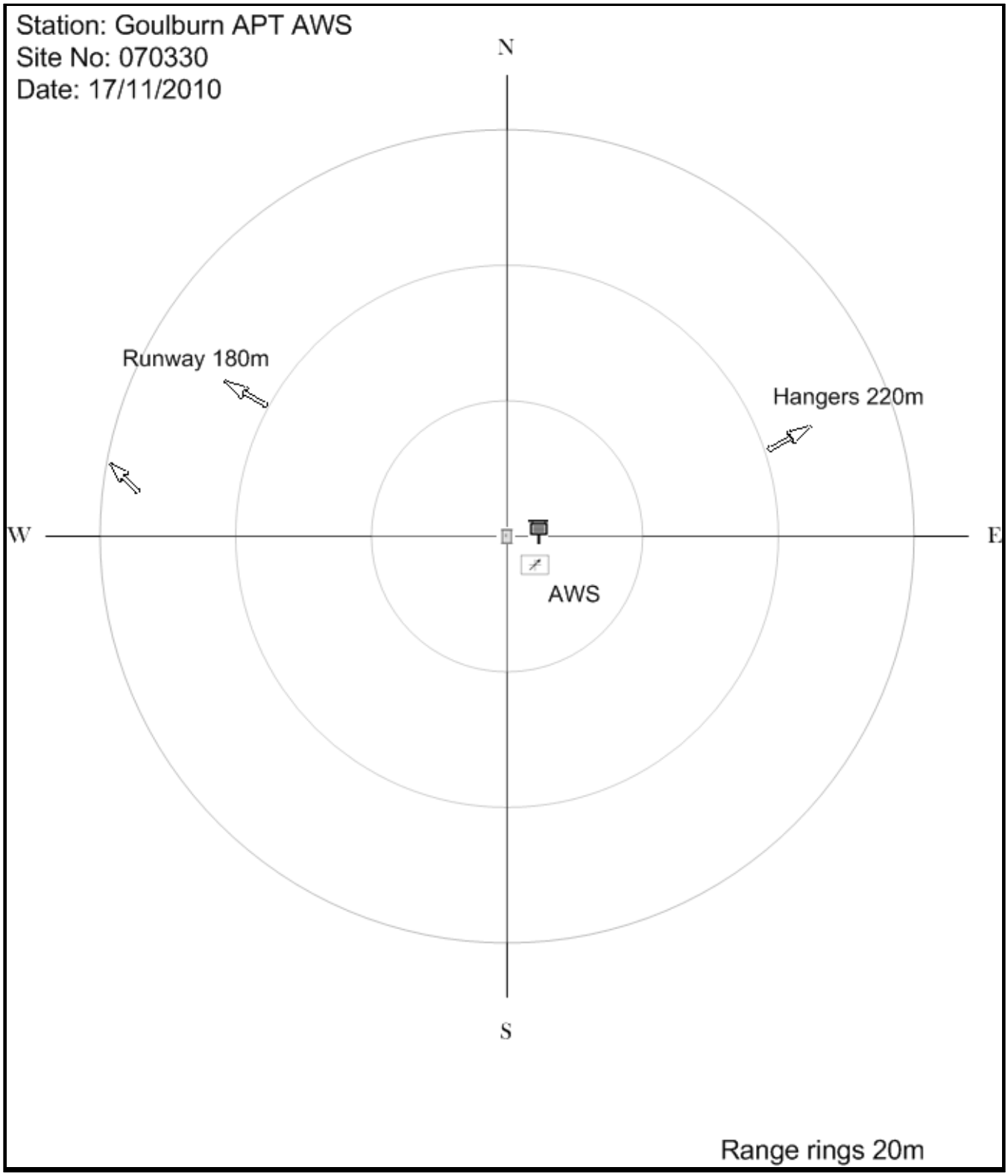
The single days missed figure is the total number of days for which no observation was received, not including full missed months. The full months missed figure is the total of full month gaps over the period of record. Where an element is not included assumptions can generally be made about availability, and the list to use has been suggested below.

Unlisted element	Listed element to use
Minimum air temperature	Maximum air temperature
Wet bulb temperature	Dew point
Soil temperature at 20, 50 & 100cm	10cm soil temperature
Relative humidity	Dew point
Minimum temp. of water in evaporimeter	Evaporimeter - max water temp
Visual observations eg. weather, visibility	Total cloud amount
Sea related observations	Sea state

Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Instrument Location and Surrounding Features
17/11/2010(most recent)



Historical metadata for this site has not been quality controlled for accuracy and completeness. Data other than current station information, particularly earlier than 1998, should be considered accordingly. Information may not be complete, as backfilling of historical data is incomplete.

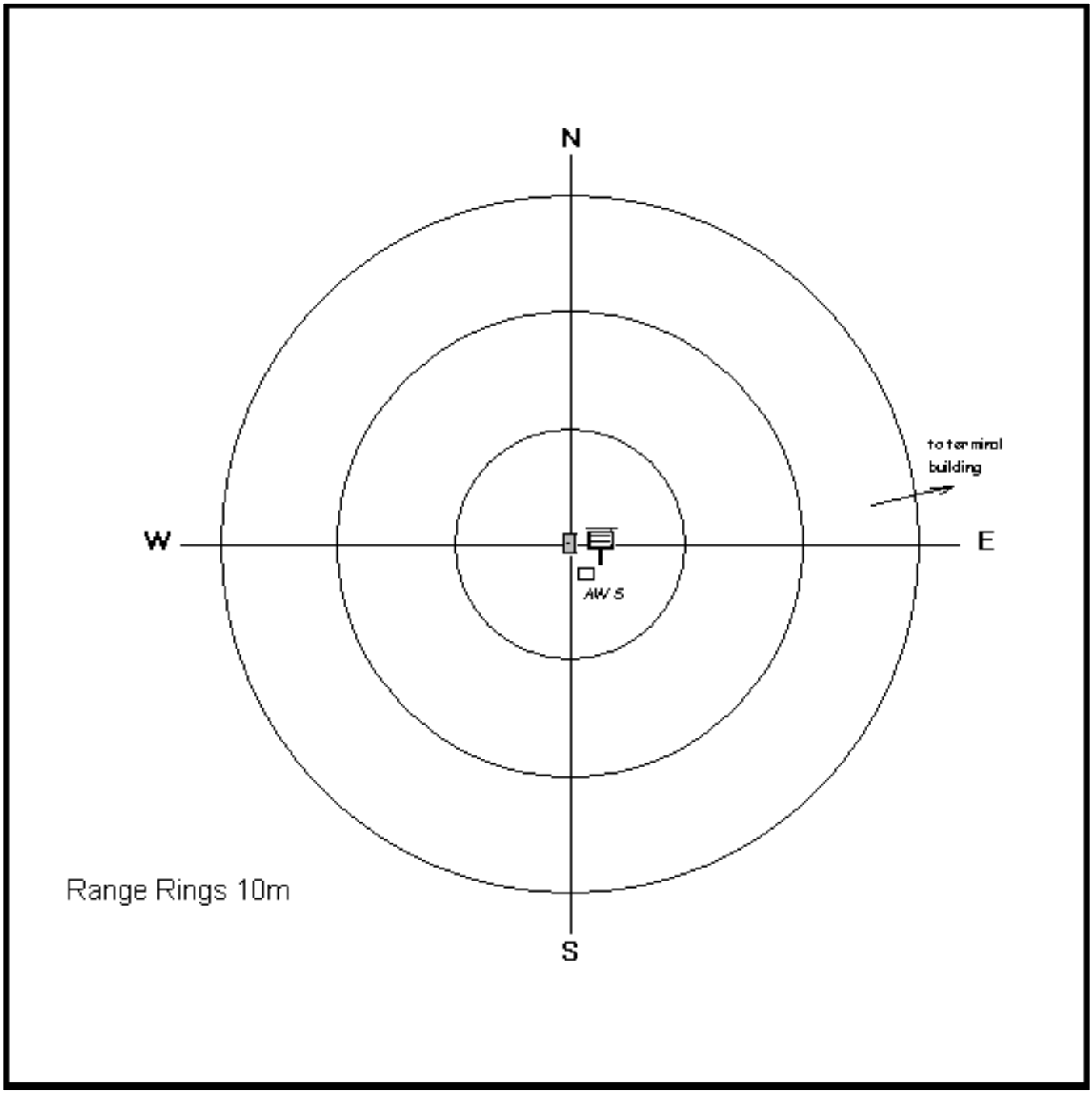
Extended Climatological Station Metadata

All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Instrument Location and Surrounding Features

26/03/2007



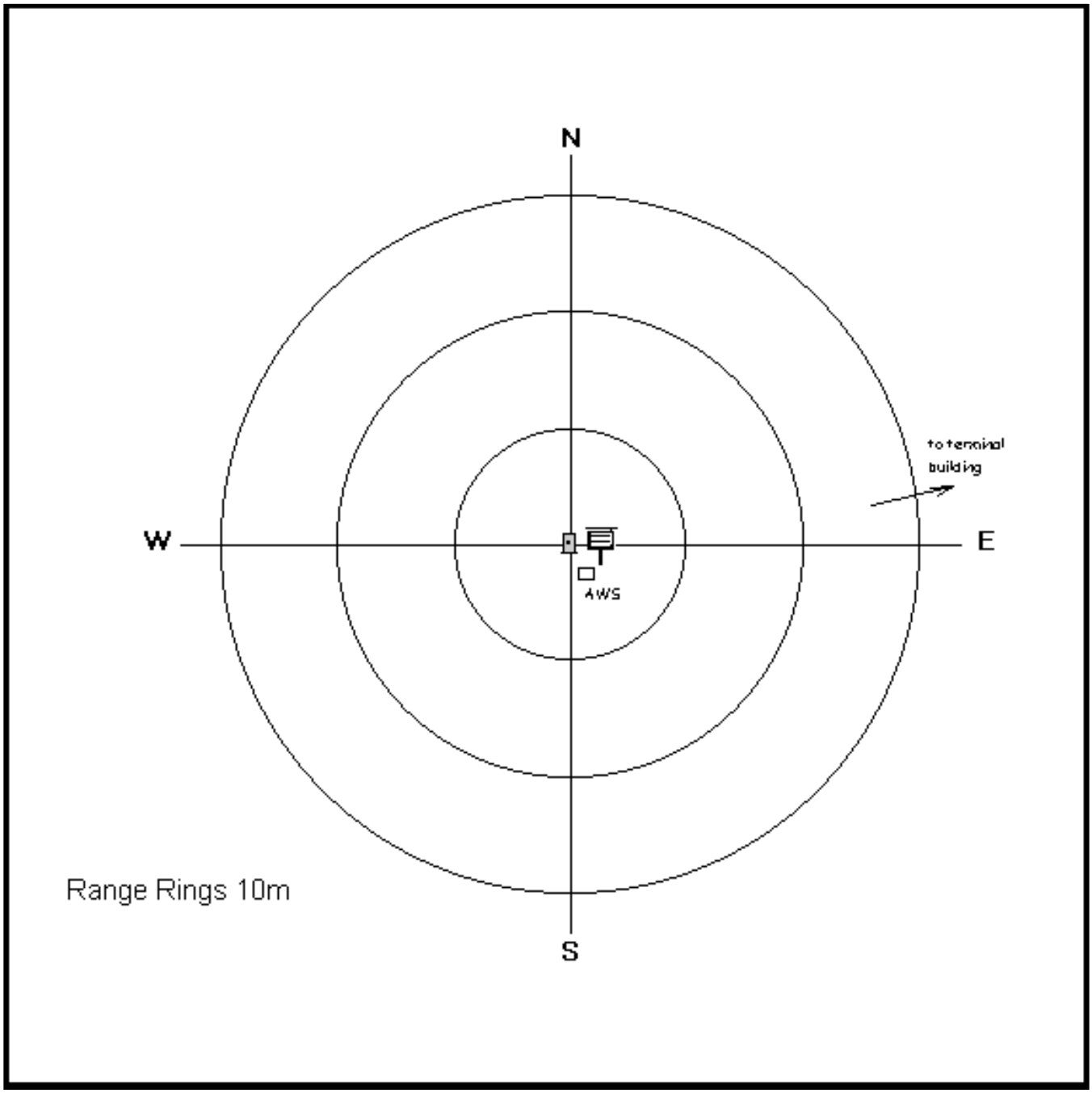
Extended Climatological Station Metadata

All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Instrument Location and Surrounding Features

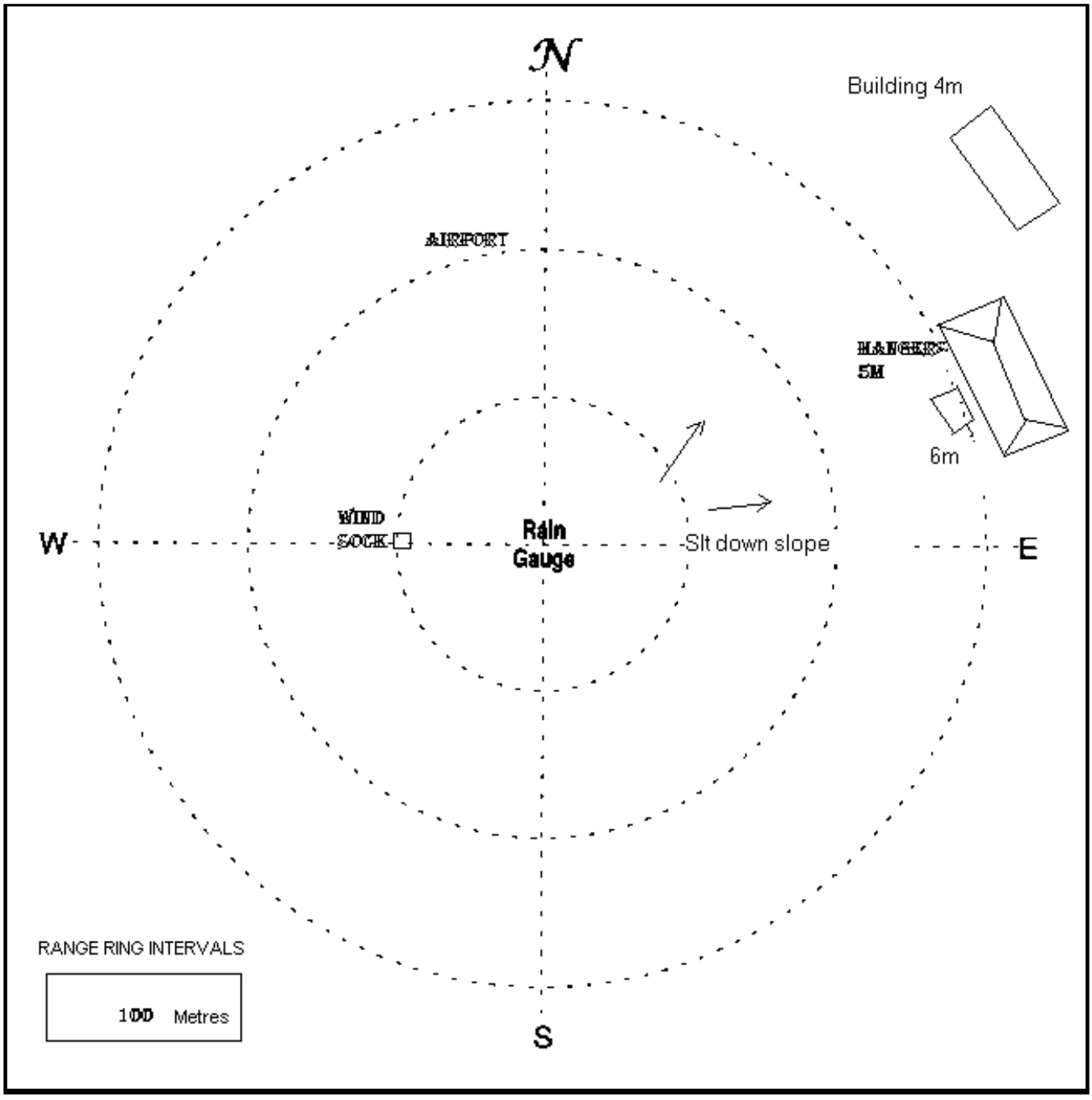
13/11/2002



Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

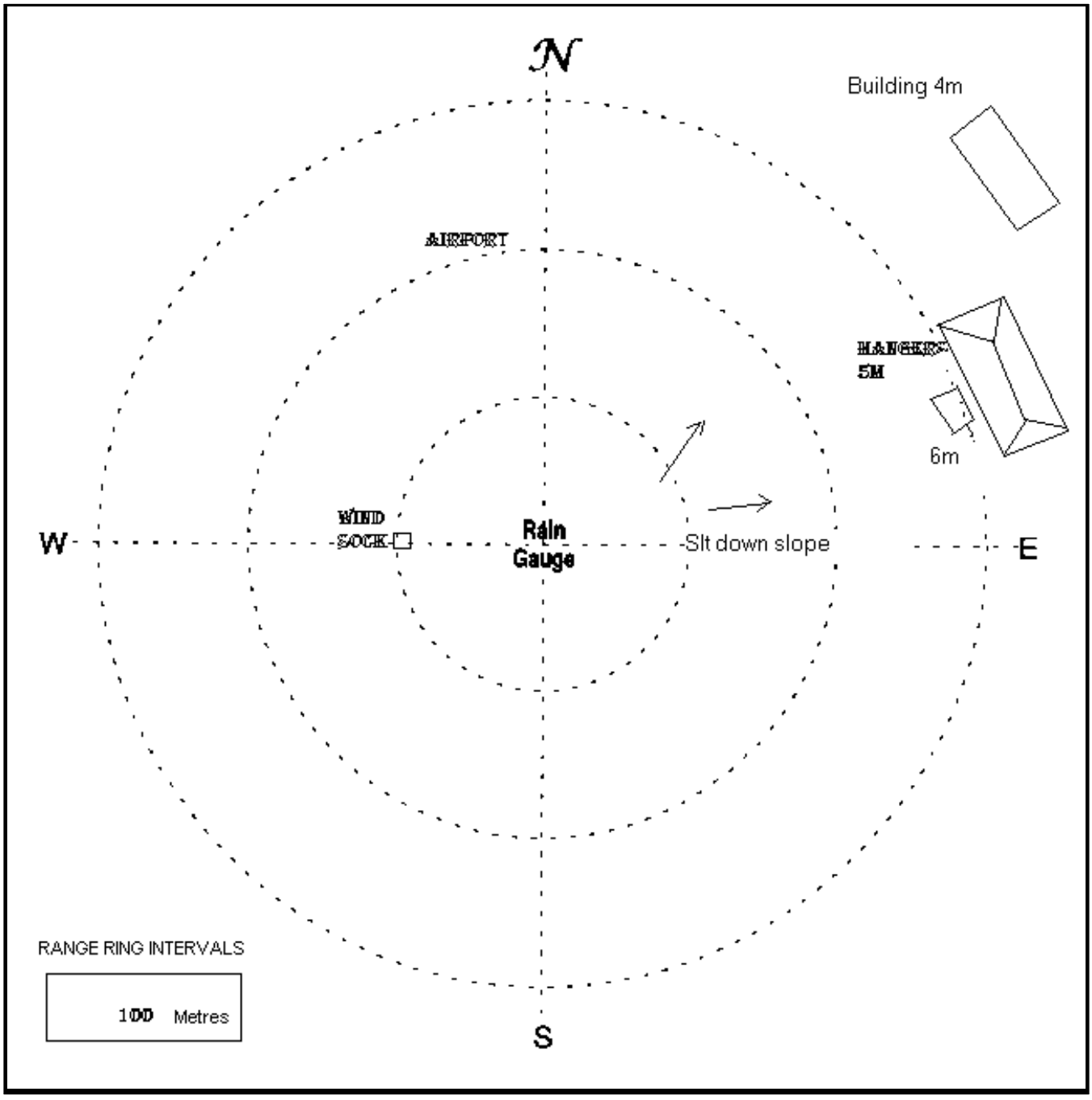
Instrument Location and Surrounding Features
27/03/2001



Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Instrument Location and Surrounding Features
09/03/1998



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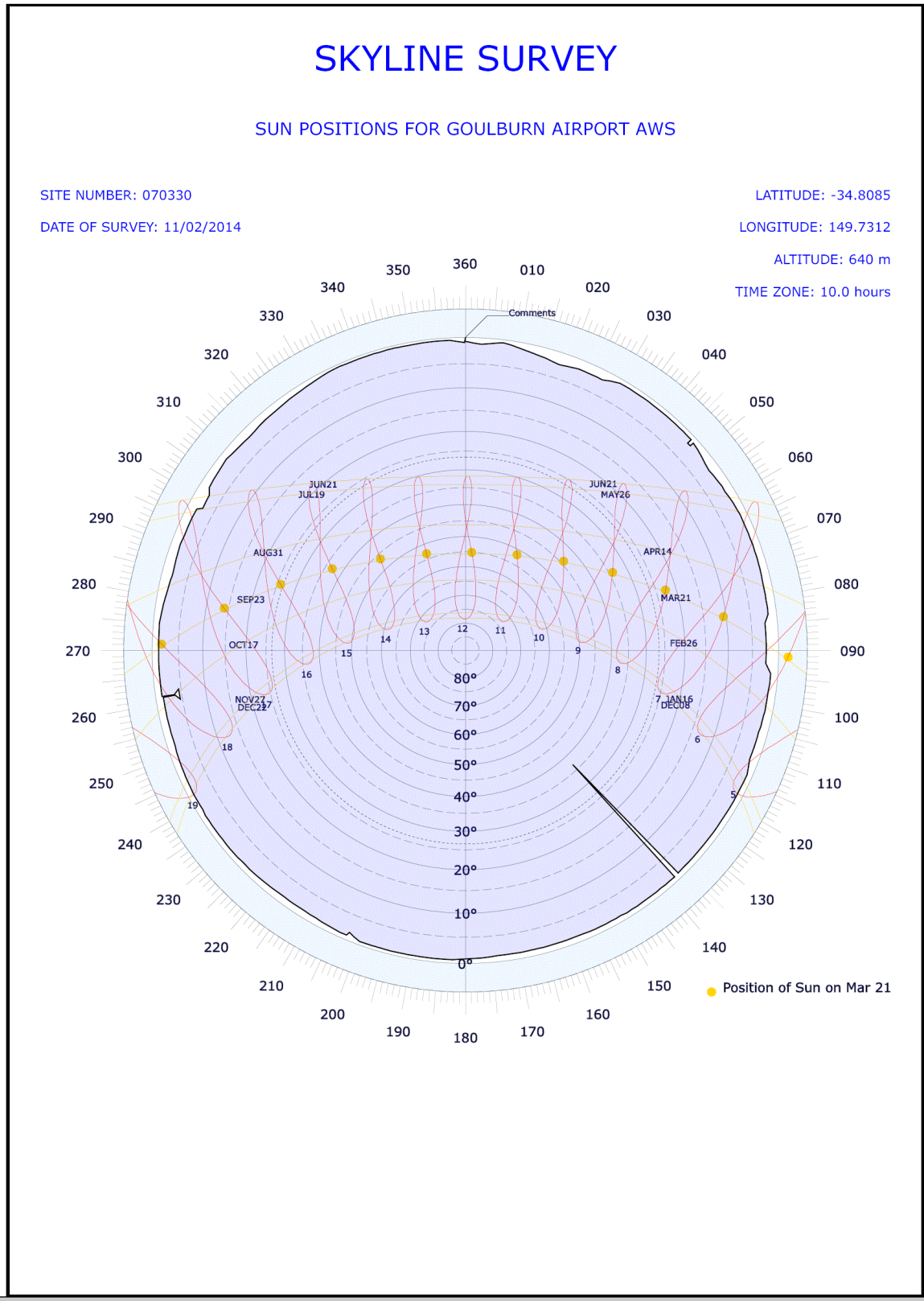
Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Skyline Diagram
11/02/2014(most recent)

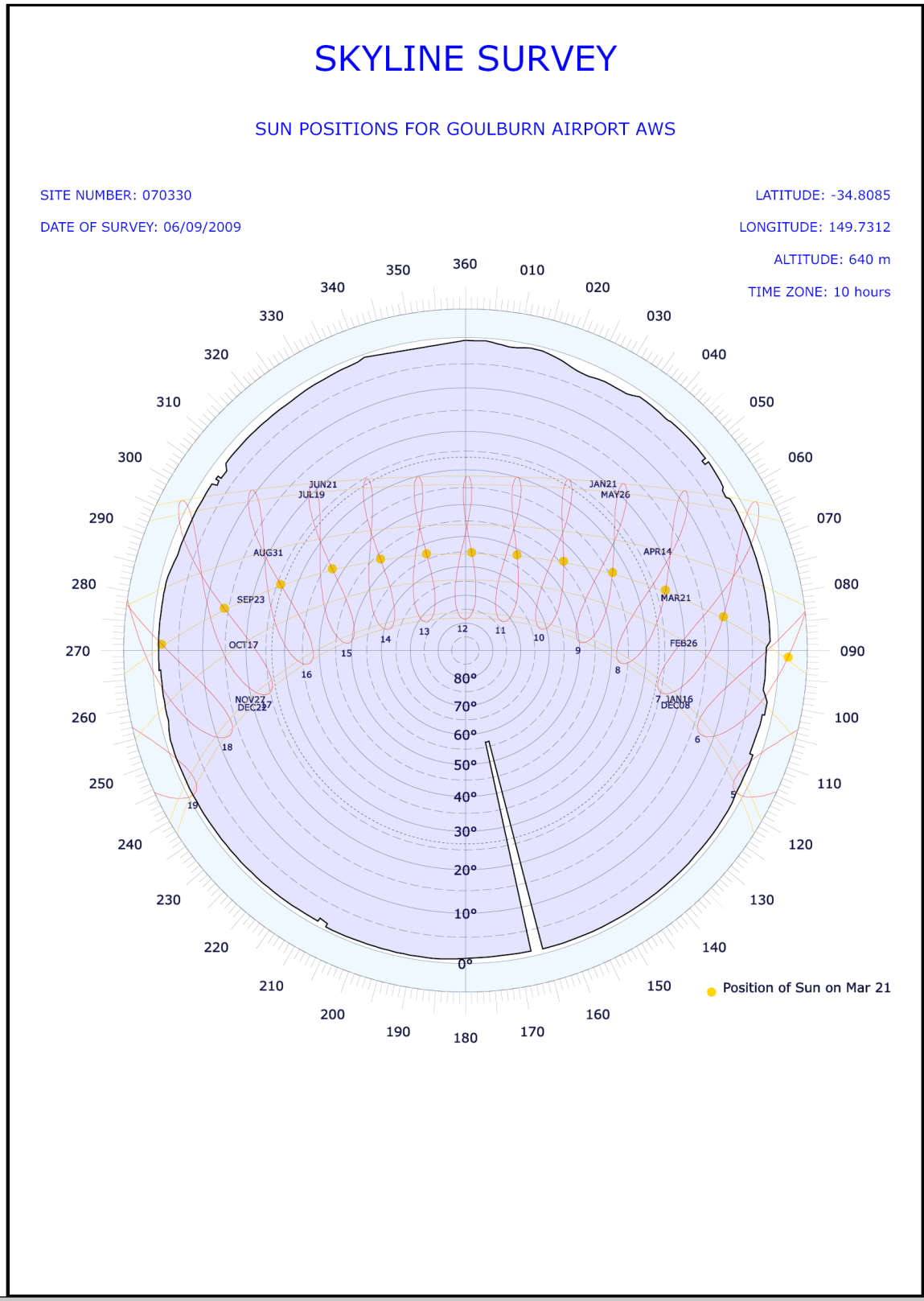


Historical metadata for this site has not been quality controlled for accuracy and completeness. Data other than current station information, particularly earlier than 1998, should be considered accordingly. Information may not be complete, as backfilling of historical data is incomplete.

Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Skyline Diagram
06/09/2009

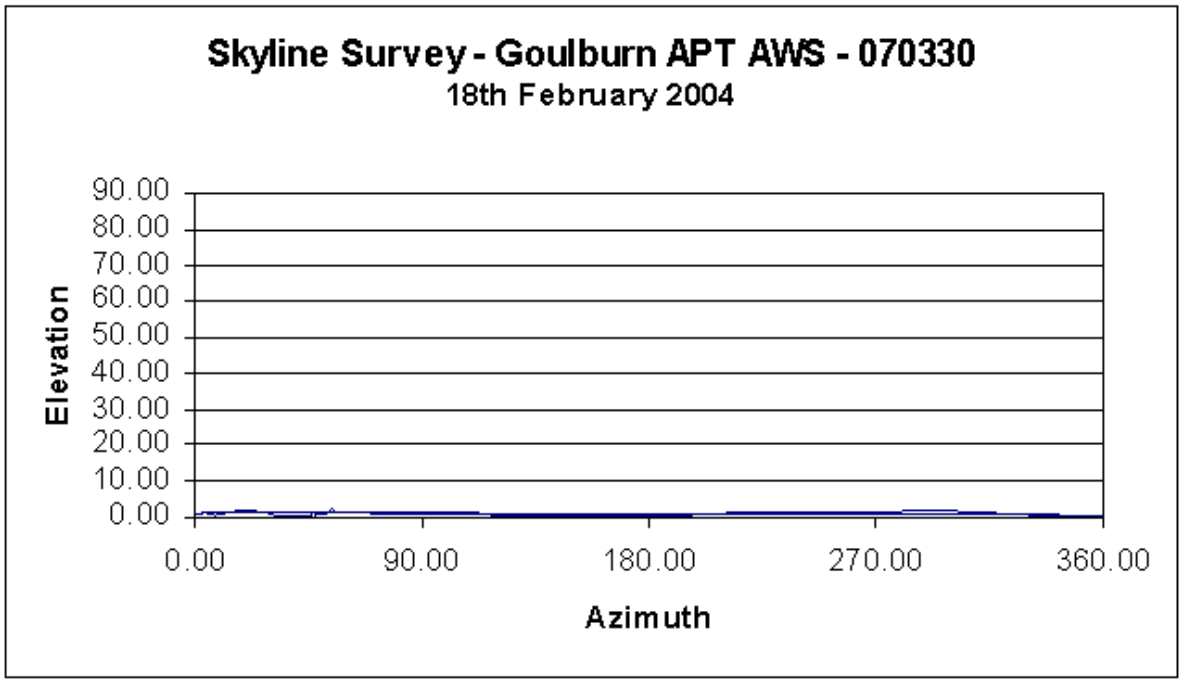


Historical metadata for this site has not been quality controlled for accuracy and completeness. Data other than current station information, particularly earlier than 1998, should be considered accordingly. Information may not be complete, as backfilling of historical data is incomplete.

Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Skyline Diagram
24/02/2004



Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Station Observation Program Summary (Surface Observations) from 01/11/1988 to 13/09/2010

Current Observation	Continuous	Half Hourly	Hourly
Surface Observations	-	Y	Y

Current Observation	Program Type	12 AM	3 AM	6 AM	9 AM	12 PM	3 PM	6 AM	9 AM
Surface Observation	PERFORMED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	REPORTED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	SEASONAL	-	-	-	-	-	-	-	-

Station Observation Program Summary (Surface Observations) 26 NOV 2015 (most recent)

Current Observation	Continuous	Half Hourly	Hourly
Surface Observations	Y	Y	Y

Current Observation	Program Type	12 AM	3 AM	6 AM	9 AM	12 PM	3 PM	6 AM	9 AM
Surface Observation	PERFORMED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	REPORTED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	SEASONAL	-	-	-	-	-	-	-	-

Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Station Equipment History

Equipment Install/Remove

Cloud Height

31/OCT/2013 INSTALL Ceilometer (Type Vaisala CL31 S/N - J3510003) Surface Observations

River Height (No Electronic History)

Wind Run (No Electronic History)

Spectral Radiation (No Electronic History)

Sea Surface Temperature (No Electronic History)

Sea Water Temperature (No Electronic History)

Evaporation (No Electronic History)

Minimum Temperature (No Electronic History)

Soil Temperature 50cm (No Electronic History)

Sub Surface Temperature (No Electronic History)

Electrical Conductivity (No Electronic History)

Maximum Temperature (No Electronic History)

Soil Temperature 20cm (No Electronic History)

Solar Radiation (No Electronic History)

Soil Temperature 5cm (No Electronic History)

Oxygen Content (No Electronic History)

Sea Water Level (No Electronic History)

Surface Inclination (No Electronic History)

Terrestial Minimum Temperature (No Electronic History)

Visibility (No Electronic History)

Solar Radiation (Direct) (No Electronic History)

Magnetic Bearing (No Electronic History)

Wind Direction

10/SEP/2004 INSTALL Anemometer (Type Synchrotac Cups - Type 732 S/N - 80261) Surface Observations

01/NOV/1988 INSTALL Anemometer (Type Synchrotac Vane - Type 706 S/N - WS - 74105 WD - 74066) Surface Observations

01/NOV/1988 INSTALL Mast Anemometer (Type Pivot, Standard 8m S/N - NONE) Infrastructure

15/FEB/2005 REPLACE Anemometer (Now Synchrotac Cups - Type 732 S/N - D100) Surface Observations

10/SEP/2004 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - 80309) Surface Observations

15/FEB/2005 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - D100) Surface Observations

Air Temperature

01/NOV/1988 INSTALL Humidity Probe (Type Rotronics S/N - 713201/9) Surface Observations

23/FEB/2012 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 11666-005) Surface Observations

19/FEB/2010 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 39220-007) Surface Observations

03/APR/2012 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 49513-003) Surface Observations

25/NOV/2002 REPLACE Humidity Probe (Now Vaisala HMP45D S/N - X4150011) Surface Observations

01/NOV/1988 INSTALL Temperature Probe - Dry Bulb (Type Rosemount S/N - NONE) Surface Observations

23/FEB/2012 REPLACE Temperature Probe - Dry Bulb (Now WIKA TR40 S/N - 107822-1) Surface Observations

01/NOV/1988 INSTALL Thermometer, Mercury, Dry Bulb (Type Dobbie S/N - M1803) Surface Observations

Wet Bulb Temperature (No Electronic History)

Lightning (No Electronic History)

Turbidity (No Electronic History)

Total Column Ozone Amount (No Electronic History)

Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Station Equipment History (continued)

Equipment Install/Remove(Continued)

Pressure

01/MAY/1995 INSTALL Barometer (Type Vaisala PA11A S/N - 601091) Surface Observations
23/SEP/2002 REPLACE Barometer (Now Vaisala PA11A S/N - 458199) Surface Observations
31/MAR/2011 REPLACE Barometer (Now Vaisala PTB220B S/N - D3540108) Surface Observations

Humidity

01/NOV/1988 INSTALL Humidity Probe (Type Rotronics S/N - 713201/9) Surface Observations
23/FEB/2012 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 11666-005) Surface Observations
19/FEB/2010 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 39220-007) Surface Observations
03/APR/2012 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 49513-003) Surface Observations
25/NOV/2002 REPLACE Humidity Probe (Now Vaisala HMP45D S/N - X4150011) Surface Observations

Sunshine Hours (No Electronic History)

Pressure Trend (No Electronic History)

Snow Height (No Electronic History)

Wind Speed

10/SEP/2004 INSTALL Anemometer (Type Synchrotac Cups - Type 732 S/N - 80261) Surface Observations
01/NOV/1988 INSTALL Anemometer (Type Synchrotac Vane - Type 706 S/N - WS - 74105 WD - 74066) Surface Observations
01/NOV/1988 INSTALL Mast Anemometer (Type Pivot, Standard 8m S/N - NONE) Infrastructure
15/FEB/2005 REPLACE Anemometer (Now Synchrotac Cups - Type 732 S/N - D100) Surface Observations
10/SEP/2004 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - 80309) Surface Observations
15/FEB/2005 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - D100) Surface Observations

Rainfall

01/NOV/1988 INSTALL Raingauge (Type Rimco 7499 TBRG S/N - 66837) Surface Observations
31/JUL/2006 REPLACE Raingauge (Now Rimco 7499 TBRG S/N - 84619) Surface Observations
01/AUG/2006 REPLACE Raingauge (Now Rimco 7499 TBRG S/N - 84625) Surface Observations

Soil Temperature 100cm (No Electronic History)

Soil Temperature 10cm (No Electronic History)

Solar Radiation (Long Wave) (No Electronic History)

RF Reflectivity (No Electronic History)

The following table summarises information on field performance checks available electronically over the period indicated. The number of instances an instrument was found to fail field performance checks should only be used as a guide. A system of data quality flags is implemented by the Bureau of Meteorology to indicate the data quality of an observation as determined by a mutli-stage quality control process.

Available Date Range	Element	Fail Field Performance Check
14/NOV/2013 - 10/MAR/2015	Cloud Height	0
09/MAR/1998 - 18/NOV/2015	Wind Direction	6
09/MAR/1998 - 18/NOV/2015	Air Temperature	3
09/MAR/1998 - 10/MAR/2015	Pressure	0
09/MAR/1998 - 18/NOV/2015	Humidity	2
09/MAR/1998 - 18/NOV/2015	Wind Speed	6
09/MAR/1998 - 18/NOV/2015	Rainfall	4

Station Detail Changes

09/MAY/2006 CLASSIFICATION Category D (TAF D)

Historical metadata for this site has not been quality controlled for accuracy and completeness. Data other than current station information, particularly earlier than 1998, should be considered accordingly. Information may not be complete, as backfilling of historical data is incomplete.

Extended Climatological Station Metadata
All History

Station:	GOULBURN AIRPORT AWS			**Location:**	GOULBURN AIRPORT AWS			**State:**	NSW
Bureau No.:	070330	**WMO No.:**	95716	**Aviation ID:**	YGLB	**Opened:**	07 Nov 1988	**Current Status:**	Still open
Latitude:	-34.8085	**Longitude:**	149.7312	**Elevation:**	640 m	**Barometer Elev:**	640.8 m	**Metadata compiled:**	26 NOV 2015

Station Equipment History (continued)

Station Detail Changes(Continued)

01/NOV/1988 CLASSIFICATION Mesonet (FME)
05/OCT/2001 CLASSIFICATION National Benchmark Network for Agrometeorology (NBNA)
10/JAN/2011 CLASSIFICATION Standard (ASOSSTD)
10/JUN/2014 CLASSIFICATION Standard Aviation or Defence (AVSTD)
28/JUN/2011 OBJECT Document/AWS SITE AUDIT
14/NOV/2013 OBJECT Document/CEILOMETER STATUS
24/FEB/2004 OBJECT Document/Goulburn APT AWS Skyline points
06/SEP/2009 OBJECT Document/SKYLINE DATA
11/FEB/2014 OBJECT Document/SKYLINE DATA
07/NOV/1988 STATION - (nondb seeding) Opened
07/NOV/1988 STATION - (nondb seeding) aero_ht Changed to 652.6
07/NOV/1988 STATION - (nondb seeding) bar_ht Changed to 640.8
07/NOV/1988 STATION - (nondb seeding) bar_ht_deriv Changed to MAP 1:25 000
07/NOV/1988 STATION - (nondb seeding) stn_ht Changed to 640
07/NOV/1988 STATION - (nondb seeding) stn_ht_deriv Changed to MAP 1:25 000
07/NOV/1988 STATION - (nondb seeding) wmo_num Changed to 95716
07/NOV/1988 STATION aviation_id Changed to YGLB
07/NOV/1988 STATION latitude Changed to -34.80854
07/NOV/1988 STATION latlon_deriv Changed to GPS
07/NOV/1988 STATION latlon_error Changed to 4
07/NOV/1988 STATION longitude Changed to 149.73118
09/MAR/1998 STATION lu_0_100m Changed to Airport
09/MAR/1998 STATION lu_100m_1km Changed to Airport
09/MAR/1998 STATION lu_1km_10km Changed to Open farmland, grassland or tundra
07/NOV/1988 STATION name Changed to GOULBURN AIRPORT AWS
09/MAR/1998 STATION soil_type Changed to red soil
09/MAR/1998 STATION surface_type Changed to fully covered by grass

System Changes

01/NOV/1988 SYSTEM Infrastructure Commenced
01/NOV/1988 SYSTEM Surface Observations Commenced

Notes on these metadata

The following notes have been compiled to assist with interpreting the metadata provided in this document. These notes are subject to change as the network evolves. Changes in station-specific metadata occur more frequently, both as recent changes are recorded and historical information is transferred from paper file to electronic database.

Reliability of the metadata

The Commonwealth Bureau of Meteorology maintains information on more than 20,000 stations which have operated since observations began in the mid 1800s. The amount of information available for each of these sites and its associated uncertainty are influenced by a number of factors including the type and purpose of the station and the time over which it operated.

Early information about stations was held only on paper file. In 1998 a corporate electronic database was established to help maintain information about the network and its components. The number of parameters recorded about a station is now much greater than before this database was established. The national database has also helped improve consistency in the metadata through the implementation of predefined fields. As a result, and through the refinement of operating procedures, station metadata recorded since 1998 are of a higher overall standard than previously, although occasional omissions and errors are still possible.

The Bureau is part way through a task of entering historical information held on paper file into the corporate database. **Until this process is completed there will remain large gaps in the information contained in these metadata documents and considerable caution should be used when deriving conclusions from the metadata.** As an example, two consecutive entries about a rain gauge dated 50 years apart may appear in the equipment metadata. This may either mean that nothing happened to that instrument over the 50 years, or that information for the intervening period has yet to be entered into the database. Similarly, if no information was available about instruments at a site when it was first established, fields which were required to have a value present may have used the earliest information available as a best-guess estimate. Sometimes this was the metadata current when the database was established in 1998. In some instances there may be gaps in metadata relevant to the post 1998 period.

For the above reasons it is recommended that all metadata prior to 1998 be considered as indicative only, and used with caution, unless it has been quality controlled. The Bureau of Meteorology should be contacted if further information or confirmation of the data is required. Depending on the nature of the inquiry there may be a fee associated with this request. Contact details are provided in the telephone book for each capital city or the Bureau's web site at:
http://www.bom.gov.au

The following pages contain explanatory notes for selected terms found in this document.

Station Number

The Bureau of Meteorology station number uniquely specifies a station and is not intended to change over time time, although on very rare occasions a station number may change or be deleted from the record (usually to correct an error). Generally a new station number is established if an existing station changes in a way that would affect the climate data record for that site (measured in terms of air temperature and precipitation). Significant station moves are an example of this.

Some stations also possess a World Meteorological Organization (WMO) station number. The WMO number is different to the Bureau of Meteorology number. It also uniquely specifies a station at any given time but can be reassigned to another station if the new station takes priority in the global reporting network. Only selected stations will have a WMO number. Significant stations may maintain their WMO number for many decades.

Notes on these metadata

Network Classification

SUPPORTING the BASIC CLIMATE SERVICE
Global Climate Observing System (GCOS)
GCOS Upper Air Network (GUAN)
GCOS Surface Network (GSN)
National Climate Network {not yet assigned}
Reference Climate Stations (RCS)
Regional Basic Climatological Network (RBCN)
CLIMAT Stations (CLC)
CLIMAT TEMP Stations (CLT)
SUPPORTING the NATIONAL WEATHER WATCH SYSTEM
WMO Global Observing System (GOS)
GOS Upper Air Network
GOS Satellite Network
Global Atmospheric Watch
Background Atmospheric Pollution Monitoring Network (BAPMON)
Basic Ozone Network
Basic Solar and Terrestrial Radiation Network
Regional Basic Synoptic Network (RBSN)
WMO Global Oceanic Observing System (GOOS)
SUPPORTING the BASIC WEATHER SERVICE (BWS)
BWS Land Network
Significant Land Locations
Capital City Mesonets
National Benchmark Network for Agrometeorology (NBNA)
BWS Marine Network
Significant Coastal Loactions
Open Ocean Network
BWS Upper Air Network
Major Significant Locations
BWS Remote Sensing Network
Weather Watch Radar Network
Fire Weather Wind Mesonets
High Resolution Satellite
SUPPORTING the BASIC HYDROLOGICAL SERVICE
Regional Flood Warning Network
Water Resources Assessment Network
Global Hydrological Network
Global Terrestrial Observing System (GTOS)
World Hydrological Cycle Observing System (WHYCOS)
National Hydrological Network

Networks of stations are defined for a variety of purposes (as defined in above table).

Notes on these metadata

Network Classification Continued....

Stations may be included in several different networks, which may change over time. The table on the previous page lists current network classifications related to the scientific purpose of the network. Some of these networks - the GCOS network for instance - are components of a global network. Entries in the database for some networks may not be complete, thus not properly representing the status of the network. The composition of the network will usually change over time. While several of the networks have international significance, other network classifications have been developed to aid operational management.

Station Purpose

The station purpose can be classified according to the observation program listed below. Parameters in brackets list some of the various different configurations which occur.

- Synoptic [Seasonal, River Height, Climatological, Telegraphic Rain, Aeronautical, Upper Air]
- Climatological [Seasonal, Telegraphic Rain]
- Aeronautical
- Rainfall [River Height]
- River Height
- Telegraphic Rain [Non-Telegraphic River Height, Telegraphic River Height]
- Non-Telegraphic Rain [Telegraphic River Height]
- Evaporation [Rainfall, River Height, Telegraphic River Height, Non-Telegraphic River Height, Telegraphic Rain, Non-Telegraphic Rain]
- Pluviograph [Rainfall, Telegraphic Rain, Non-Telegraphic Rain, River Height, Telegraphic River Height, Non-Telegraphic River Height]
- Radiation
- Lightning Flash Counter
- Public Information
- Local Conditions
- Radar Site
- Unclassified
- No Routine Observations

Note: Telegraphic observations are those which are sent by some electronic means be it a phone or telegram to the responsible Bureau office. It is a term which is historically linked to analogue non automatic data transmission.

Station Observation Program Summary

Surface Observations

The following terms are used to describe the frequency of surface observations at a site. Historical observation programs will typically be missing for many sites until the database is backfilled with information.

Set a)

- Continuous Program
  - More than half hourly observations sent (eg an automatic weather station {AWS} which continuously transmits 10 minute observations). This will automatically include half hourly and hourly observations programs.
- Half hourly observations
  - Half hourly observations sent. This will automatically include hourly observations.
- Hourly observations
  - Hourly observations sent only. Stations report on non-synoptic hours (ie. 0100, 0200, 0400, 0500, etc)

Notes on these metadata

Surface observations continued....

Set b)

- Performed
  - Observations performed, instruments read and observations recorded
- Reported
  - Observations performed, instruments read and reported real time
- Seasonal
  - The program may only be performed during a defined season (such as Fire Weather observations) or the routine program may increase in reporting frequency and/or parameters. The program dates are currently modified at the start and end of each season for stations performing seasonal observations. Historically this was not always the case.

Current Station Equipment Summary

Equipment listed in this metadata product is catalogued under one of systems listed below, appropriate to its application. The "Infrastructure" category has been included since it contains information about the mast height of an anemometer (if present).

- Flood Warning
- Infrastructure
- Radiation
- Rainfall Intensity
- Surface Observations
- Upper Air
- Weather Watch {RADAR}

Station Equipment History

Equipment Install/Remove

One of four types of actions can be performed on an instrument in this listing:

Install - A new instrument is installed at the site. This can be either a completely new addition (eg the first barometer at the site), or the replacement of an existing instrument with a different type (eg replacing mercury barometer with electronic barometer)

Remove - An instrument can be removed either when it is no longer necessary to measure a particular element, or when the element is to be measured by an instrument of a different type (see under "Install" above)

Replace - This occurs when one instrument is replaced with another of the same type (eg Kew pattern mercury barometer replacing another Kew pattern mercury barometer)

Share - The same instrument is used for observations under two (or more) systems (eg a rain gauge may be used within both Surface Observations and Rainfall Intensity systems)

Unshare - The instrument is no longer shared between systems

Notes on these metadata

Calibration

During a site inspection an instrument will be calibrated as either being within or not within the specified tolerance in accuracy.

Where a quantative calibration result can be achieved by comparison to a transfer standard (eg barometer comparisons and tipping bucket rain gauge calibrations), the instrument will be recorded as being within or outside the required tolerance. Instruments (such as 203mm rain gauges, screens and evaporation pans) where quantitative calibrations cannot be derived should be regarded as meeting specifications when the instrument is in 'good working order'.

This product provides a summary table of the number of times an instrument was found to be out of calibration

Station Detail Changes

This set of metadata indicates when some aspect of the general information about a station has changed.

- STATION

Metadata which are categorised as pertaining to STATION are items of (textual) information describing a specific attribute of the station. A reference to (nondB seeding) indicates initial information of this field has been sourced from a previous database.

Station position

- Latitude and longitude

Derivation of station latitude and longitude, defined by the location of the rain gauge when it is present, has changed over time. Current practice is to locate or verify open and operational station latitude and longitude based on Global Positioning System equipment. Methods used to locate a station as described in this product (latlon_deriv) are as follows: GPS, MAP 1:10000, MAP 1:12500, MAP 1:25000, MAP 1:50000, MAP 1:100000, MAP 1:250000, SURVEY, and Unknown (which is more commonly represented by a null value). The field latlon_error should be used with caution as the method of determining this value has been interpreted in different ways over time.

- Height

Determination of heights for observing sites is by survey where possible. Otherwise height may be determined using a Digital Aneroid Barometer and a known surveyed point, or derived from map contours. The source of height is provided in the corresponding parameter with a suffix of "_deriv".

Heights which may appear in these metadata are:

- aero_ht
  - The official elevation of the aerodrome which normally corresponds to the altitude of the highest threshold of the runways at that airport;
- bar_ht
  - this represents the height of the mercury barometer cistern or the digital aneroid barometer above mean sea level (MSL);
- stn_ht
  - this normally represents the height of the rain gauge above MSL

Notes on these metadata

- Land Use

To assist the long term understanding of climate change it is important to be able to determine the differences over time which are attributed to variations in the climate. Since land use has an effect on the micro climate around the site, and changes in land use will therefore affect the climate record, it is important that the characteristics of the site are monitored. Soil types are recorded as they affect the land use and also add to the knowledge of the site details.

Defined Land use Types.

- Non-vegetated (barren, desert)
- Coastal or Island
- Forest
- Open farmland, grassland or tundra
- Small town, less than 1000 population
- Town 1000 to 10,000 population
- City area with buildings less than 10 metres (3 stories)
- City area with buildings greater than 10 metres (3 stories)
- Airport

The land use code is entered on the station inspection form in the ranges 0 to 100 m, 100 to 1 km and 1km to 10 km; ie:

- lu_0_100m: Land Use 0 to 100 metres from the enclosure
- lu_100m_1km: Land Use 100 metres to 1 kilometre
- lu_1km_10km: Land Use 1 kilometre to 10 kilometres

Defined Soil Type (At Enclosure).

- unable to determine
- sand
- black soil
- clay
- rock
- red soil
- other

Surface Type (At Enclosure).

- unable to determine
- fully covered by grass
- mostly covered by grass
- partly covered by grass
- bare ground
- sand
- concrete
- asphalt
- rock
- other

Veolia Australia & New Zealand

Appendix C:

CALPUFF Source and Emission Modelling Configurations

Appendix C - CALPUFF Source and Emission Modelling Configurations

THE ODOUR UNIT

AREA SOURCE

Source Name	Lower Left X Coord.	Lower Left Y Coord.	Upper Left X Coord.	Upper Left Y Coord.	Upper Right X Coord.	Upper Right Y Coord.	Lower Right X Coord.	Lower Right Y Coord.	Effect. Height	Base Elev.	Init. Sigma Z	ODOUR
(12 chars.)	(km)	(km)	(km)	(km)	(km)	(km)	(km)	(km)	(m)	(m)	(m)	(g/m**2/s)
LDAM	734.1	6117.183	734.166	6117.287	734.184	6117.268	734.129	6117.163	0	797.19	0.1	3.6
GW	733.455	6117.624	733.399	6117.421	733.552	6117.39	733.652	6117.541	0	791.39	0.1	0.3
TL1	733.559	6117.387	733.658	6117.54	733.707	6117.508	733.725	6117.46	0	791.56	0.1	3.6
UTL	733.661	6117.366	733.788	6117.346	733.73	6117.455	733.662	6117.37	0	791.55	0.1	5
COVW	734.128	6116.962	734.37	6117.189	734.463	6117.157	734.735	6117.023	0	731.67	0.1	0.3
AGEDW	734.156	6116.944	734.649	6116.721	734.498	6116.646	734.099	6116.859	0	687.56	0.1	3.6
FW	734.099	6116.858	734.098	6116.793	734.359	6116.638	734.493	6116.644	0	753.02	0.1	0.7
WR3	733.132	6117.509	733.185	6117.628	732.905	6117.753	732.852	6117.634	0	793.74	2	0.253
WR2	733.163	6117.495	733.216	6117.614	733.185	6117.628	733.132	6117.509	0	792.15	2	13
WR4	733.193	6117.482	733.246	6117.6	733.216	6117.614	733.163	6117.495	0	791.81	2	11.3
WR4_2	732.816	6117.65	732.869	6117.769	732.857	6117.775	732.803	6117.656	0	796.36	2	11.3
WR5	732.803	6117.656	732.857	6117.775	732.843	6117.781	732.79	6117.662	0	796.38	2	5.45
WR5_2	732.79	6117.662	732.843	6117.781	732.778	6117.81	732.725	6117.691	0	796.74	2	0.253
ED3S-S	733.529	6116.967	733.523	6117.122	733.739	6117.044	733.641	6116.904	0	794	0.1	0.159
ED3S1	733.449	6117.187	733.394	6117.285	733.579	6117.344	733.533	6117.15	0	793	0.1	0.159
ED3S2	733.533	6117.15	733.579	6117.344	733.805	6117.32	733.746	6117.093	0	793	0.1	0.159

VOLUME SOURCE

Source Name	X Coord.	Y Coord.	Effect. Height	Base Elev.	Init. Sigma Y	Init. Sigma Z	ODOUR
(12 chars.)	(km)	(km)	(m)	(m)	(m)	(m)	(g/s)
SRC_1	732.95	6117.695	0	0	20	2	5.65
SRC_2	733.066	6117.623	0	0	10	2	2.37