Sunshine Coast COUNCIL

Attachment Folder

Under Separate Cover Attachments

Ordinary Meeting

Thursday, 21 April 2016

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Our ref: 150903 Air Quality Assessment 030216 pjs
Council Ref: MCU15/0203

3 February 2016

Sunshine Coast Regional Council
Locked Bag 72
SCMC QLD 4560

Attention: **Marc Cornell - Principal Development Planner**
Via Email: mail@sunshinecoast.qld.gov.au

Dear Marc,

Re: **Submission of Air Quality Impact Assessment**
Proposed Material Change of Use to Establish a Crematorium (Cremator)
139-159 Wises Road, Maroochydore
Lot 1 on SP197340
Council ref: MCU15/0203

I refer to our ongoing discussions in relation to the abovementioned development application and Council's correspondence dated 24 November 2015, requesting that we commission and provide an Air Quality Impact Assessment and Air Quality Management Plan to addresses the health concerns raised by a number public submissions received during the notification period. Specifically, Council have requested the following:

Air quality

1. *Provide an Air Quality Impact Assessment and Air Quality Management Plan which demonstrates that the location of the crematorium and associated exhaust stack is such that sensitive receivers will not be adversely impacted by air emissions. In this regard air emissions must meet the air quality objectives specified in schedule 1 the Environmental Protection (Air) Policy 2008 or where not specified criteria from other state, national or international standards are to be used. The air quality impact assessment must be carried out by a person suitably qualified in air quality impact assessment using recognised methodology for carrying out assessments.*

As requested, Abernethy Nominees Pty Ltd (the Applicant) commissioned MWA Environmental to undertake the requested Air Quality Assessment, with a copy of the completed assessment **enclosed**.

The attached assessment addresses the potential air quality impacts of the proposed cremator, has addressed the requirements of the *Sunshine Coast Planning Scheme 2014*, and provides an assessment of predicted air pollutant exposures at surrounding sensitive receptors against relevant air quality objectives. MWA Environmental's assessment has been based on site-specific meteorological and dispersion modelling of an extensive suite of air pollutant emissions from the proposed cremator, and subsequently demonstrates that all relevant air quality guidelines will be readily satisfied at all surrounding sensitive receptors. Predicted air pollutant concentrations and metal deposition rates also satisfy the relevant air quality objectives and consequently, MWA Environmental have concluded that *"…the proposed development can operate without causing adverse air quality impacts at surrounding sensitive land uses."*

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We trust that the attached assessment undertaken by MWA Environmental satisfies the concerns raised as part of the notification stage of the application and will enable Council to complete their assessment of the proposal. The information provided to Council in support of this development application demonstrates that the proposed cremator should be approved, subject to the imposition of reasonable and relevant conditions.

Should you have any questions in relation to this matter please do not hesitate to contact me direct.

Yours faithfully,
ADAMS + SPARKES
TOWN PLANNING + DEVELOPMENT

Pete Sparkes
DIRECTOR

Enc: Air Quality Assessment prepared by MWA Environmental

AIR QUALITY ASSESSMENT

PROPOSED CREMATOR

139 – 159 WISES ROAD

BUDERIM

Prepared for:

Abernethy Nominees Pty Ltd
C/-
Adams & Sparkes Town Planning & Development

Prepared by:

MWA Environmental

28 January 2016

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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

MWA Environmental has been engaged by Abernethy Nominees Pty Ltd to prepare an Air Quality Assessment for a proposed cremator at an approved Funeral Parlour at Buderim.

A Decision Notice was granted over the subject site for a Material Change of Use of Premises for a Funeral Parlour and Caretaker's Residence on 27 September 2013 (Council Ref: MCU13/0015). A subsequent Permissible Change to the approval was granted by Council on 2 April 2015 (Council Ref: MCU13/0015.02). The approved Funeral Parlour has been designed to integrate a cremator within it as depicted within the approved plans for MCU13/0015.

This assessment addresses the potential air quality impacts of the cremator as proposed in development application MCU15/0203.

The assessment has estimated air pollutant emissions released from the proposed cremator with reference to the following relevant documents:

- *National Pollutant Inventory Emission Estimation Technique Manual for Crematoria* (Environment Australia, March 2011)
- Lee, C. *Bay Area Air Quality Management District (BAAQMD) Permit Handbook Chapter 11.6 – Crematories* (2009)
- *Material Change of Use to Establish a Crematorium (Cremator) - 139-159 Wises Road, Maroochydore – Appendix II – Cremator Details* (Adams + Sparkes, September 15)

This report has addressed the requirements of the *Sunshine Coast Planning Scheme 2014*, and provides an assessment of predicted air pollutant exposures at surrounding sensitive receptors against relevant air quality objectives. Reference has also been made to air quality objectives published in:

- Queensland *Environmental Protection (Air) Policy 2008*
- *Brisbane City Council CityPlan 2014 Air Quality Planning Scheme Policy* and associated Codes.
- Texas Commission on Environmental Quality *Effects Screening Levels*
- Germany "Technical Instructions on Air Quality Control" (*Technische Anleitung zur Reinhaltung der Luft*) referred to as "*TA Luft*"

1.2 SITE DESCRIPTION

The subject site is located at 139 to 159 Wises Road, Maroochydore and has a Real Property Description of Lot 1 on SP197340.

The site location is shown on **Figure 1**.

Wises Road is located along the southern site boundary, with the Sunshine Motorway located to the north of the subject site.

The Maroochydore Rugby League Club is located to the east of the subject site.

Residential dwellings are located to the south and west of the subject site. The nearest residential land uses to the south are setback approximately 92 metres from the proposed cremator exhaust flue. 170 metres of dense vegetation on the subject site separates the proposed cremator exhaust flue from residential dwellings located to the west of the subject site.

1.3 PROPOSED DEVELOPMENT

It is proposed to install and operate a cremator at the approved Funeral Parlour.

The overall site development plan is shown on **Figure 2**.

The proposed development is limited to the installation of a Mathews Cremation "Ener-Tek – IV Plus" Cremator within the previously approved Building B at the site.

Architectural plans of the proposed cremator installation are included as **Attachment 1**.

The cremator will only operate between 6am and 10pm.

1.4 SURROUNDING LAND USES

Surrounding land uses include Low Density Residential development, a Sport and Recreation Zone, and Environmental Management and Conservation Zones.

Figure 3 identifies the location of the subject site and surrounding land uses as described under the Sunshine Coast Planning Scheme 2014.

The nearest surrounding residences are shown on the aerial photograph included as **Figure 4**. Representative residences are nominated on **Figure 4** as R1 to R12 for the purposes of this assessment.

2.0 AIR QUALITY ASSESSMENT

2.1 DESCRIPTION OF CREMATOR EMISSIONS

It is proposed to install and operate a Mathews Cremation "Ener-Tek – IV Plus" Cremator within Building B at the approved Funeral Parlour development. The cremator will be gas-fired and comprise primary and secondary combustion chambers. The "Ener-Tek – IV Plus" cremator to be installed at the site is a modern low-emission system incorporating best-practice emission control systems including:

- An Intuitive Logic Control (ILC) system with Automatic Timer Functions
- Secondary Chamber with Afterburner
- Opacity Monitor and Controller with Visual and Audible Alarms to minimise smoke and odour.
- Auxiliary Air Control System
- Microprocessor Temperature Control System
- Fail-safe shutdown system in the event of power loss to cease stack emissions

The secondary combustion chamber is designed to operate at between 760^{O}C and 982 ^{O}C with a residence time of more than 1 second to effectively control potential odour and smoke emissions. The secondary chamber control system will ensure that the operation of the cremator does not cause nuisance by way of visible smoke or odour.

Information regarding the Mathews Cremation "Ener-Tek – IV Plus" Cremator and representative emissions testing is provided in **Attachment 2**.

Air pollutant emissions from the cremator are generated from both fuel combustion and also from the combustion of biological remains. Emissions from the cremator will be released via a vertical discharge stack above cremator room roofline. The location and height of the cremator exhaust flue in relation to the adjacent Building B structure is shown on the drawings included as **Attachment 1**. The flue is proposed to be visually screened.

Based upon equipment specifications for the proposed cremator and emission testing supplied by the manufacturer[1] the following emission source parameters have been modelled:

Stack Internal Diameter:	510mm
Exhaust Velocity:	4.7 metres / second
Emission Temperature:	748^{O}C

[1] *Material Change of Use to Establish a Crematorium (Cremator) - 139-159 Wises Road, Maroochydore – Appendix II – Cremator Details* (Adams + Sparkes, September 15)

Emission rates from operation of the proposed cremator have been estimated based upon the Mathews Cremation "Ener-Tek – IV Plus" Cremator specifications and published emission factors from the following references:

- *National Pollutant Inventory Emission Estimation Technique Manual for Crematoria* (Environment Australia, March 2011).
- Lee, C. *Bay Area Air Quality Management District (BAAQMD) Permit Handbook Chapter 11.6 – Crematories* (2009)

The NPI was referenced for all pollutants aside from dioxins / furans for which no emission factor is specified. The BAAQMD[2] emission factor for dioxins / furans has been referenced for this pollutant.

The following comprehensive suite of air pollutants associated with the operation of the cremator have been assessed in the dispersion modelling:

- Acetaldehyde
- Aluminium
- Antimony
- Arsenic
- Barium
- Benzo(a)pyrene (as marker for PAH)
- Beryllium
- Cadmium
- Carbon monoxide
- Chlorine
- Chromium III
- Chromium VI
- Cobalt
- Copper dusts and mists
- Copper fumes
- Dioxins and furans (as TCDD TEF)
- Formaldehyde

[2] Lee, C. *Bay Area Air Quality Management District (BAAQMD) Permit Handbook Chapter 11.6 – Crematories* (2009)

- Hydrogen Bromide
- Hydrogen Chloride
- Hydrogen Fluoride
- Lead
- Manganese
- Mercury inorganic
- Molybdenum
- Nickel
- Nitrogen dioxide
- Total suspended particulates (TSP)
- Particulate Matter as PM_{10}
- Particulate Matter as $PM_{2.5}$
- Selenium
- Silver
- Sulfur dioxide
- Thallium
- Vanadium
- Zinc oxide

A summary of the emission estimation techniques, emission factors and emission rates modelled for the purpose of this assessment is provided in **Attachment 3**.

The manufacturer describes the "Ener-Tek – IV Plus" cremator as capable of completing a cremation every 75 minutes or less with up to 15 cremations performed in 18 hours.

For the purposes of emissions estimation and dispersion modelling it was conservatively assumed that one body is cremated every 60 minutes and that the cremator operates continuously between 6am and 10pm every day of the year. This is considered to be a highly conservative basis for the assessment of potential air quality impacts from the proposed cremator.

2.2 AMBIENT AIR QUALITY

The Queensland Department of Environment and Heritage Protection (EHP) operate a network of ambient air quality monitoring stations across the state. A summary of the relevant and available ambient air quality data for inclusion in the dispersion modelling predictions as ambient concentrations is presented in **Table 1**.

Table 1: **Ambient Air Pollutant Concentrations**

Air Pollutant	Concentration (µg/m³)	Reference
Nitrogen Dioxide (1 hour)	7.5	1-hour average 70th percentile for 2011 to 2014 at Mountain Creek
Nitrogen Dioxide (Annual)	5.6	50th percentile for 2011 to 2014 at Mountain Creek
Total Suspended Particulates	28.6	Assumption of double PM_{10} Annual Average for 2011 to 2014 at Mountain Creek
Particulate Matter PM_{10}	15.9	24-hour average 70th percentile for 2011 to 2014 at Mountain Creek
Particulate Matter $PM_{2.5}$ (24 hour)	5.3	24-hour average 70th percentile for 2011 to 2014 at Springwood
Particulate Matter $PM_{2.5}$ (Annual)	4.7	Annual average for 2011 to 2014 at Springwood
Sulphur Dioxide (1 hour)	5.2	1-hour average 90th [1] percentile for 2011 to 2014 at Springwood
Sulphur Dioxide (24 hour)	4.3	24-hour average 90th [1] percentile for 2011 to 2014 at Springwood
Sulphur Dioxide (Annual)	2.3	Annual average for 2011 to 2014 at Springwood
Carbon Monoxide	458	8-hour average 70th percentile for 2010 to 2014 at South Brisbane

Note 1: Conservatively increased to 90th percentile due to a high proportion of zero values

Ambient monitoring of other air pollutants likely to be discharged from the cremator is not routinely undertaken by EHP. Ambient concentrations of these pollutants is assumed to be negligible for the purposes of this assessment.

2.3 RELEVANT AIR QUALITY GUIDELINES

In the absence of specific air pollutant objectives described in the Sunshine Coast Council Planning Scheme 2014, for the purpose of this assessment, State, Brisbane City Council and international guidelines have been consulted in that order of precedence.

The extensive suite of air quality guidelines specified in the Brisbane City Council *CityPlan 2014 Air Quality Planning Scheme Policy* and associated codes have been referenced for this assessment. Reference has been made to the air quality objectives specified in the Queensland *Environmental Protection (Air) Policy 2008* and the criteria presented in the Texas Commission on Environmental Quality *Effects Screening Levels.*

Presented in **Table 2** is a summary of the air quality objectives and source adopted for this assessment.

In accordance with accepted practice, assessment of model predicted concentrations for objectives with averaging periods less than or equal to 1 hour are made against the 99.9th percentile concentrations. For air pollutant objectives with longer averaging times, assessment is based upon the maximum predicted concentrations.

Table 2: Air Quality Guidelines

Pollutant	Averaging time	Health outcome protected	Criteria including background (µg/m^3)	Source
Acetaldehyde	1 hour	Odour	42	BCC City Plan
Aluminium	1-hour	Health	50	TEXAS ESL
	Annual		5	TEXAS ESL
Antimony and compounds	1 hour	Health and wellbeing	9	BCC City Plan
Arsenic and compounds (as total metal content in PM_{10})	1 hour	IARC Group 1 carcinogen (known human carcinogen)	0.09	BCC City Plan
	Annual	Health and wellbeing	6ng/m^3	BCC City Plan
Barium, elemental as PM_{10}	Annual	Health	0.5	TEXAS ESL
	1 hour		5	TEXAS ESL
Benzo(a)pyrene (as marker for PAH)	Annual	Health and wellbeing	0.3ng/m^3	BCC City Plan
Beryllium and compounds	1 hour	IARC Group 1 carcinogen (known human carcinogen)	0.004	BCC City Plan
Cadmium and compounds (as total metal content in PM_{10})	Annual	Health and wellbeing	5ng/m^3	BCC City Plan
Carbon monoxide	8 hours	Health and wellbeing	11,000	BCC City Plan
Chlorine	1 hour	Health and wellbeing	50	BCC City Plan
Chromium III compounds	1 hour	Health and wellbeing	9	BCC City Plan
Chromium VI compounds	1 hour	IARC Group 1 carcinogen (known human carcinogen)	0.09	BCC City Plan
Cobalt	1-hour	Health	0.2	TEXAS ESL
	Annual		0.02	TEXAS ESL
Copper dusts and mists	1 hour	Health and wellbeing	18	BCC City Plan
Copper fumes	1 hour	Health and wellbeing	3.7	BCC City Plan

Pollutant	Averaging time	Health outcome protected	Criteria including background (µg/m^3)	Source
Dioxins and furans (as TCDD TEF)	1 hour	IARC Group 1 carcinogen (known human carcinogen)	0.000002	BCC City Plan
Formaldehyde	1 hour	Protecting aesthetic environment	96	BCC City Plan
	24 hours	Health and wellbeing	54	BCC City Plan
	30-min	Protecting aesthetic environment	110	EPP (Air)
Hydrogen Bromide	1-hour	Health	100	TEXAS ESL
	Annual		10	TEXAS ESL
Hydrogen chloride	1 hour	Health and wellbeing	140	BCC City Plan
Hydrogen Fluoride	24-hour	Health and Biodiversity of ecosystems (other than protected areas)	2.9	EPP (Air)
	30 day		0.84	EPP (Air)
	90 day		0.5	EPP (Air)
	90 day	Health and Biodiversity of ecosystems (For protected areas)	0.1	EPP (Air)
Lead and compounds (as total metal content in TSP)	Annual	Health and wellbeing	0.5	BCC City Plan
Manganese and compounds (as total metal content in PM_{10})	Annual	Health and wellbeing	0.16	BCC City Plan
Mercury inorganic	1 hour	Health and wellbeing	1.8	BCC City Plan
	Annual		1.1	BCC City Plan
Molybdenum	1-hour	Health	30	TEXAS ESL
	Annual		3	TEXAS ESL
Nickel and compounds (as total metal content in PM_{10})	Annual	Health and wellbeing	0.02	BCC City Plan
Nitrogen dioxide	1 hour	Health and wellbeing	250	BCC City Plan
	Annual		62	BCC City Plan
Total suspended particulates (TSP)	Annual	Health and wellbeing	90	BCC City Plan
PM_{10}	24 hours	Health and wellbeing	50	BCC City Plan

Pollutant	Averaging time	Health outcome protected	Criteria including background (µg/m^3)	Source
$PM_{2.5}$	24 hours	Health and wellbeing	25	BCC City Plan
	Annual		8	BCC City Plan
Selenium	1-hour	Health	2	TEXAS ESL
	Annual		0.2	TEXAS ESL
Silver	1-hour	Health	0.1	TEXAS ESL
	Annual		0.01	TEXAS ESL
Sulfur dioxide	1 hour	Health and wellbeing	570	BCC City Plan
	24 hours		230	BCC City Plan
	Annual		57	BCC City Plan
Thallium	1-hour	Health	1	TEXAS ESL
	Annual		0.1	TEXAS ESL
Vanadium and compounds (as total metal content in PM_{10})	24 hours	Health and wellbeing	1.1	BCC City Plan
Zinc oxide fumes	1 hour	Health and wellbeing	90	BCC City Plan

There are no relevant Australian policies / guidelines for the assessment of heavy metal deposition rates. As such, reference has been made to the 'trigger levels' proposed in the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety *TA Luft First Federal Administrative Regulation Pertaining to the Federal Immission Control Act (Technical Instructions on Air Quality Control - TA Luft).*

The TA Luft guidelines provide screening values for metals deposition rates which dictate whether a more detailed assessment health impact is warranted (i.e. if the trigger values are satisfied then a detailed health impact assessment is not warranted).

The relevant TA Luft trigger values for metal deposition are summarised in **Table 3** below.

Table 3: Summary of TA Luft Metal Annual Deposition Rate Trigger Values (µg/m²/day)

Metal	Receiving Environment			Units
	Human Health	Croplands	Grasslands	
Arsenic	4	1,170	60	(µg/m²/day)
Lead	100	185	1,900	(µg/m²/day)
Cadmium	2	2.5	32	(µg/m²/day)
Nickel	15	-	-	(µg/m²/day)
Mercury	1	30	3	(µg/m²/day)
Thallium	2	7	25	(µg/m²/day)

Additionally, the World Health Organisation[3] lead deposition guideline of 250 µg/m²/day has been considered in the analysis but is noted to be higher than the TA Luft trigger value.

[3] World Health Organisation (2000) *Air Quality Guidelines for Europe* 2nd Edition

The deposition modelling has considered particle size distribution in accordance with the USEPA AP-42[4] uncontrolled particle size distribution for medical waste incinerator particulate matter emissions.

Due to the nature of the mercury in dental amalgam and the cremation process, the vast majority of mercury emissions from cremators are in the gaseous (vapour) phase and are not expected to deposit in the local area. Particle phase mercury emissions from cremators are a relatively low proportion of total mercury emissions.

A report *UK Particulate and Heavy Metal Emissions from Industrial Processes*[5] produced for the UK Department for Environment, Food and Rural Affairs for the purpose of improving the estimation methods used in the National Atmospheric Emissions Inventory provides the following proposed species profile for mercury emissions from crematoria:

Hg^0 (vapour phase):	1%
Hg^{2+} (vapour phase):	95%
Hg(p) (particle phase):	4%

On this basis, the deposition modelling of mercury has considered particle phase emissions as 4% of the total mercury emission estimated in accordance with the *National Pollutant Inventory Emission Estimation Technique Manual for Crematoria*.

Emissions of other heavy metals have been assumed to be 100% in particle phase for the purpose of the deposition modelling based upon the expected nature of emissions.

[4] USEPA AP-42 (1993) *Solid Waste Disposal: Medical Waste Incineration*

[5] Passant, N. et al (2002) Report Number AEAT-6270 *UK Particulate and Heavy Metal Emissions from Industrial Processes, Issue 2,* DEFRA

2.4 SITE METEOROLOGY

To enable assessment of air pollutant concentrations and deposition rates at surrounding sensitive receptors, detailed dispersion modelling has been conducted using the TAPM / CALMET / CALPUFF modelling suite.

Following accepted methodology for detailed assessment, the TAPM software was utilised to develop a prognostic meteorological model which generated a year of representative hourly meteorological data for the region.

TAPM has been used to predict meteorological parameters specific to the region including temperature, wind speed, wind direction and stability classification. The model accesses databases of surface characteristics (terrain height, soil and vegetation) and synoptic weather analyses provided by CSIRO. TAPM is able to process the output data to produce input meteorological data files suitable for input to the CALMET / CALPUFF modelling system i.e. hourly predictions of meteorological parameters over a full year and generation of surface, upper air and geophysical data files.

Technical discussion of the model algorithms, inputs and model validation studies are provided in the *Part 1: Technical Paper* (Hurley, 2002) and *Part 2: Summary of Verification Studies* (Hurley *et al*, 2002)[6,7].

The centre coordinates for the model grid were Latitude -26°40' and Longitude 153°5'. The following nested model grids were applied to the TAPM modelling:

40 x 30 km grid (total area 1200 km x 1200 km)

40 x 10 km grid (total area 400 km x 400 km)

40 x 3 km grid (total area 120 km x 120 km)

40 x 1 km grid (total area 40 km x 40 km)

Twenty-five vertical grid levels were modelled.

The TAPM model was set up to generate a site-specific meteorological data file for the locality, based upon synoptic analysis data for the representative Year 2008, as provided by CSIRO.

Observed wind speeds and wind directions for the Bureau of Meteorology (BoM) stations at Sunshine Coast Airport and Nambour were incorporated into the TAPM model as assimilation data.

[6] Hurley, P.J. (2002) The Air Pollution Model (TAPM) Version 2: User Manual. Aspendale: CSIRO Atmospheric Research Internal Paper.

[7] Hurley, P.J. (2002) The Air Pollution Model (TAPM) Version 2: Part 1: Technical Description. Aspendale: CSIRO Atmospheric Research Technical Paper.

The TAPM output was processed using the CALTAPM software to produce a 3-dimensional data file suitable for input to the diagnostic CALMET model as an 'initial guess field'. The CALMET model further resolved the prognostic meteorology to a finer terrain, land use and soil type resolution of 100 metres over a 5 x 5 km area covering the subject site and surrounding region for the purpose of dispersion modelling.

Analysis of the CALMET derived meteorology for the site including a wind rose, wind frequency graph, monthly average temperatures graph and tabulated stability class analysis is contained in **Attachment 4**.

Meteorological data used in the dispersion model including TAPM and CALMET files can be supplied to Sunshine Coast Council in electronic form upon request.

2.5 MODELLING METHODOLOGY

The modelling intent is to determine whether the addition of the air pollutant emissions released from the cremator to the ambient concentrations measured by the EHP at nearby monitoring sites satisfies the relevant air quality objectives at surrounding sensitive land uses.

Detailed dispersion modelling has been conducted using the CALPUFF modelling system to assess the exposure of surrounding sensitive receptors to emissions from the proposed cremator.

A nested CALPUFF model was set up to assess dispersion within a 5km x 5km area covering the subject site and surrounding region. The topography of the subject site and surrounding area was sourced from NASA Shuttle Radar Topography Mission (SRTM3) digital elevation data at a resolution of 100 metres. A receptor grid of 10 metre spacing over the modelling domain was assessed in the CALPUFF model. The CALPUFF model has been configured at a suitable resolution to represent terrain features and the dispersion of air pollutants between the cremator flue and surrounding sensitive receptors.

Building wake effects have been considered on the dispersion of the cremator exhaust discharge. The building locations and elevations were input to the dispersion model using the BPIP utility for CALPUFF based upon the design drawings included as **Attachment 1**.

Concentrations and deposition rates have been predicted at surrounding sensitive receptors in addition to tabulating the maximum predicted ground level concentrations at any off-site location with the 5km x 5km modelling area.

The model-predicted air pollutant concentrations were added to the ambient air pollutant concentrations as presented in **Table 1**, to assess the cumulative air pollutant exposure at surrounding sensitive land uses.

2.6 RESULTS OF DISPERSION MODELLING

The results of the CALPUFF dispersion modelling with the inclusion of ambient concentrations at sensitive receptors are presented in the following tables **Table 4** to **Table 17**. The results presented also include a maximum predicted off-site concentration at ground level for any location within the model domain.

Presented in **Table 18** are the predicted deposition rates of various metals assessed against the TA Luft trigger levels.

In addition to the tabulated modelling results for surrounding sensitive receptors R1 to R12, MWA Environmental has prepared contour plots based upon gridded receptors at 10 metre horizontal spacing for a range of key pollutants (refer **Attachment 5**). The graphical outputs have only been provided for the following air pollutants with other air pollutant concentrations predicted to be a small percentage of the relevant air quality objectives;

- Dioxins and Furans as TCDD I-TEQs
- Hydrogen Fluoride
- Mercury
- Nitrogen Dioxide
- PAH (benzo(a)pyrene equivalents)
- PM_{10}
- $PM_{2.5}$

The results of the dispersion modelling demonstrate that emissions from the proposed cremator will comply with the relevant air quality objectives at all surrounding sensitive receptor locations.

Table 4: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Acetaldehyde	Aluminium	Aluminium	Antimony
Averaging Period	**1 hour**	**1-hour**	**Annual**	**1 hour**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	5.72E-03	3.46E-02	7.84E-04	1.33E-03
R2	3.07E-03	1.86E-02	6.66E-04	7.13E-04
R3	3.33E-03	2.01E-02	6.90E-04	7.72E-04
R4	2.02E-03	1.22E-02	4.22E-04	4.68E-04
R5	2.06E-03	1.25E-02	2.98E-04	4.78E-04
R6	1.81E-03	1.09E-02	2.63E-04	4.20E-04
R7	1.55E-03	9.36E-03	2.14E-04	3.59E-04
R8	1.53E-03	9.29E-03	2.00E-04	3.56E-04
R9	2.66E-03	1.61E-02	2.78E-04	6.18E-04
R10	2.22E-03	1.35E-02	3.24E-04	5.16E-04
R11	2.94E-03	1.78E-02	4.43E-04	6.82E-04
R12	2.88E-03	1.75E-02	5.62E-04	6.69E-04
Maximum Offsite Ground Level Concentration	9.87E-03	5.97E-02	2.50E-03	2.29E-03
Guideline	**42 µg/m³**	**50 µg/m³**	**5 µg/m³**	**9 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 5: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Arsenic	Arsenic	Barium	Barium
Averaging Period	**1 hour**	**Annual**	**1 hour**	**Annual**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	1.34E-03	3.04E-05	1.12E-02	2.53E-04
R2	7.20E-04	2.58E-05	6.01E-03	2.15E-04
R3	7.80E-04	2.67E-05	6.50E-03	2.23E-04
R4	4.73E-04	1.63E-05	3.94E-03	1.36E-04
R5	4.82E-04	1.15E-05	4.02E-03	9.61E-05
R6	4.24E-04	1.02E-05	3.53E-03	8.49E-05
R7	3.62E-04	8.28E-06	3.02E-03	6.91E-05
R8	3.60E-04	7.74E-06	3.00E-03	6.46E-05
R9	6.24E-04	1.08E-05	5.20E-03	8.98E-05
R10	5.21E-04	1.25E-05	4.34E-03	1.04E-04
R11	6.88E-04	1.72E-05	5.74E-03	1.43E-04
R12	6.76E-04	2.18E-05	5.64E-03	1.81E-04
Maximum Offsite Ground Level Concentration	2.31E-03	9.69E-05	1.93E-02	8.08E-04
Guideline	**0.09 µg/m³**	**0.006 µg/m³**	**5 µg/m³**	**0.5 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 6: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Benzo(a)pyrene (as marker for PAH)	Beryllium	Cadmium	Carbon monoxide
Averaging Period	**Annual**	**1 hour**	**Annual**	**8 hours**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	5.71E-05	6.15E-05	1.38E-05	924.3
R2	4.85E-05	3.31E-05	1.18E-05	923.7
R3	5.03E-05	3.58E-05	1.22E-05	924.1
R4	3.07E-05	2.17E-05	7.45E-06	922.6
R5	2.17E-05	2.21E-05	5.26E-06	920.7
R6	1.91E-05	1.95E-05	4.64E-06	920.6
R7	1.56E-05	1.66E-05	3.78E-06	920.2
R8	1.46E-05	1.65E-05	3.53E-06	920.0
R9	2.03E-05	2.86E-05	4.91E-06	921.7
R10	2.36E-05	2.39E-05	5.71E-06	921.6
R11	3.23E-05	3.16E-05	7.82E-06	922.5
R12	4.09E-05	3.10E-05	9.92E-06	921.7
Maximum Offsite Ground Level Concentration	1.82E-04	1.06E-04	4.42E-05	946.1
Guideline	**3.0E-04 µg/m³**	**0.004 µg/m³**	**0.005 µg/m³**	**11,000 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 7: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Chlorine	Chromium III	Chromium VI	Cobalt
Averaging Period	**1 hour**	**1 hour**	**1 hour**	**1-hour**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	3.46E-01	1.48E-03	5.93E-04	8.64E-05
R2	1.86E-01	7.93E-04	3.19E-04	4.64E-05
R3	2.01E-01	8.58E-04	3.45E-04	5.03E-05
R4	1.22E-01	5.21E-04	2.09E-04	3.05E-05
R5	1.25E-01	5.31E-04	2.13E-04	3.11E-05
R6	1.09E-01	4.67E-04	1.88E-04	2.73E-05
R7	9.36E-02	3.99E-04	1.60E-04	2.34E-05
R8	9.29E-02	3.96E-04	1.59E-04	2.32E-05
R9	1.61E-01	6.86E-04	2.76E-04	4.02E-05
R10	1.35E-01	5.74E-04	2.31E-04	3.36E-05
R11	1.78E-01	7.58E-04	3.05E-04	4.44E-05
R12	1.75E-01	7.44E-04	2.99E-04	4.36E-05
Maximum Offsite Ground Level Concentration	5.97E-01	2.55E-03	1.02E-03	1.49E-04
Guideline	**50 µg/m³**	**9 µg/m³**	**0.09 µg/m³**	**0.2 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Cobalt	Copper dusts and mists	Copper fumes	Dioxins and furans (as TCDD TEF)
Averaging Period	**Annual**	**1 hour**	**1 hour**	**1 hour**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	1.96E-06	1.30E-03	1.30E-03	4.75E-07
R2	1.66E-06	6.97E-04	6.97E-04	2.55E-07
R3	1.72E-06	7.55E-04	7.55E-04	2.76E-07
R4	1.05E-06	4.58E-04	4.58E-04	1.68E-07
R5	7.43E-07	4.67E-04	4.67E-04	1.71E-07
R6	6.56E-07	4.10E-04	4.10E-04	1.50E-07
R7	5.34E-07	3.51E-04	3.51E-04	1.28E-07
R8	4.99E-07	3.48E-04	3.48E-04	1.27E-07
R9	6.94E-07	6.03E-04	6.03E-04	2.21E-07
R10	8.08E-07	5.04E-04	5.04E-04	1.85E-07
R11	1.11E-06	6.66E-04	6.66E-04	2.44E-07
R12	1.40E-06	6.54E-04	6.54E-04	2.39E-07
Maximum Offsite Ground Level Concentration	6.24E-06	2.24E-03	2.24E-03	8.20E-07
Guideline	**0.02 µg/m³**	**18 µg/m³**	**3.7 µg/m³**	**0.000002 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 9: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Formaldehyde	Formaldehyde	Formaldehyde	Hydrogen Bromide
Averaging Period	**30-min**	**1 hour**	**24 hours**	**1-hour**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	1.15E-02	9.93E-03	1.58E-03	1.43E-01
R2	6.17E-03	5.34E-03	1.46E-03	7.67E-02
R3	6.68E-03	5.78E-03	1.74E-03	8.30E-02
R4	4.05E-03	3.50E-03	1.32E-03	5.04E-02
R5	4.13E-03	3.57E-03	1.04E-03	5.14E-02
R6	3.63E-03	3.14E-03	9.17E-04	4.51E-02
R7	3.11E-03	2.68E-03	7.29E-04	3.86E-02
R8	3.08E-03	2.67E-03	5.99E-04	3.83E-02
R9	5.34E-03	4.62E-03	1.00E-03	6.64E-02
R10	4.47E-03	3.86E-03	8.56E-04	5.55E-02
R11	5.90E-03	5.10E-03	1.10E-03	7.33E-02
R12	5.79E-03	5.01E-03	1.07E-03	7.20E-02
Maximum Offsite Ground Level Concentration	1.98E-02	1.71E-02	6.53E-03	2.46E-01
Guideline	**110 µg/m³**	**96 µg/m³**	**54 µg/m³**	**100 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 10: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Hydrogen Bromide	Hydrogen chloride	Hydrogen Fluoride	Hydrogen Fluoride
Averaging Period	**Annual**	**1 hour**	**24-hour**	**30 day**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	3.23E-03	3.17E+00	2.24E-02	7.40E-03
R2	2.75E-03	1.70E+00	2.09E-02	5.86E-03
R3	2.85E-03	1.84E+00	2.48E-02	3.97E-03
R4	1.74E-03	1.12E+00	1.89E-02	3.06E-03
R5	1.23E-03	1.14E+00	1.49E-02	2.79E-03
R6	1.08E-03	1.00E+00	1.31E-02	2.28E-03
R7	8.82E-04	8.57E-01	1.04E-02	2.19E-03
R8	8.25E-04	8.50E-01	8.54E-03	3.10E-03
R9	1.15E-03	1.47E+00	1.43E-02	2.45E-03
R10	1.33E-03	1.23E+00	1.22E-02	3.93E-03
R11	1.83E-03	1.63E+00	1.57E-02	5.92E-03
R12	2.32E-03	1.60E+00	1.52E-02	9.30E-03
Maximum Offsite Ground Level Concentration	1.03E-02	5.47E+00	9.30E-02	2.62E-02
Guideline	**10 µg/m³**	**140 µg/m³**	**2.9 µg/m³**	**0.84 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 11: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Hydrogen Fluoride	Lead	Manganese
Averaging Period	**90 day**	**Annual**	**Annual**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**
R1	5.50E-03	6.71E-05	4.33E-05
R2	5.50E-03	5.70E-05	3.68E-05
R3	2.85E-03	5.91E-05	3.81E-05
R4	1.98E-03	3.61E-05	2.33E-05
R5	1.75E-03	2.55E-05	1.64E-05
R6	1.42E-03	2.25E-05	1.45E-05
R7	1.32E-03	1.83E-05	1.18E-05
R8	1.60E-03	1.71E-05	1.10E-05
R9	2.12E-03	2.38E-05	1.54E-05
R10	3.10E-03	2.77E-05	1.79E-05
R11	4.11E-03	3.79E-05	2.45E-05
R12	6.55E-03	4.81E-05	3.10E-05
Maximum Offsite Ground Level Concentration	1.79E-02	2.14E-04	1.38E-04
Guideline	**0.1 µg/m³** (For protected areas) **0.5 µg/m³** (For other than protected areas)	**0.5 µg/m³**	**0.16 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**

Table 12: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Mercury inorganic	Mercury inorganic	Molybdenum	Molybdenum
Averaging Period	**1 hour**	**Annual**	**1-hour**	**Annual**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	1.50E-01	3.40E-03	1.24E-04	2.80E-06
R2	8.07E-02	2.89E-03	6.65E-05	2.38E-06
R3	8.74E-02	3.00E-03	7.20E-05	2.47E-06
R4	5.30E-02	1.83E-03	4.37E-05	1.51E-06
R5	5.41E-02	1.29E-03	4.45E-05	1.06E-06
R6	4.75E-02	1.14E-03	3.91E-05	9.40E-07
R7	4.06E-02	9.28E-04	3.35E-05	7.65E-07
R8	4.03E-02	8.68E-04	3.32E-05	7.15E-07
R9	6.99E-02	1.21E-03	5.76E-05	9.95E-07
R10	5.84E-02	1.40E-03	4.81E-05	1.16E-06
R11	7.71E-02	1.92E-03	6.36E-05	1.58E-06
R12	7.58E-02	2.44E-03	6.24E-05	2.01E-06
Maximum Offsite Ground Level Concentration	2.59E-01	1.09E-02	2.14E-04	8.94E-06
Guideline	**1.8 µg/m³**	**1.1 µg/m³**	**30 µg/m³**	**3 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 13: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Nickel	Nitrogen dioxide	Nitrogen dioxide	TSP
Averaging Period	**Annual**	**1 hour**	**Annual**	**Annual**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	4.33E-05	69.3	7.0	28.60
R2	3.68E-05	40.7	6.8	28.60
R3	3.82E-05	43.5	6.8	28.60
R4	2.33E-05	29.3	6.4	28.60
R5	1.64E-05	29.8	6.1	28.60
R6	1.45E-05	27.1	6.1	28.60
R7	1.18E-05	24.2	6.0	28.60
R8	1.11E-05	24.1	6.0	28.60
R9	1.54E-05	36.3	6.1	28.60
R10	1.79E-05	31.5	6.2	28.60
R11	2.45E-05	39.3	6.4	28.60
R12	3.11E-05	38.7	6.6	28.60
Maximum Offsite Ground Level Concentration	1.38E-04	114.2	10.1	28.60
Guideline	**0.02 µg/m³**	**250 µg/m³**	**62 µg/m³**	**90 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 14: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	Selenium
Averaging Period	**24 hours**	**24 hours**	**Annual**	**1-hour**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	16.6	5.8	4.8	1.92E-03
R2	16.6	5.8	4.8	1.03E-03
R3	16.7	5.9	4.8	1.12E-03
R4	16.5	5.7	4.7	6.78E-04
R5	16.4	5.7	4.7	6.92E-04
R6	16.3	5.6	4.7	6.08E-04
R7	16.2	5.5	4.7	5.19E-04
R8	16.2	5.5	4.7	5.16E-04
R9	16.4	5.6	4.7	8.94E-04
R10	16.3	5.6	4.7	7.47E-04
R11	16.4	5.7	4.7	9.87E-04
R12	16.4	5.7	4.8	9.69E-04
Maximum Offsite Ground Level Concentration	18.9	7.5	4.9	3.32E-03
Guideline	**50 µg/m³**	**25 µg/m³**	**8 µg/m³**	**2 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 15: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Selenium	Silver	Silver	Sulfur dioxide
Averaging Period	Annual	1-hour	Annual	1 hour
Sensitive Receptor	µg/m^3	µg/m^3	µg/m^3	µg/m^3
R1	4.35E-05	7.45E-04	1.69E-05	12.4
R2	3.70E-05	4.00E-04	1.43E-05	9.1
R3	3.83E-05	4.33E-04	1.49E-05	9.4
R4	2.34E-05	2.63E-04	9.08E-06	7.8
R5	1.65E-05	2.68E-04	6.41E-06	7.8
R6	1.46E-05	2.36E-04	5.66E-06	7.5
R7	1.19E-05	2.01E-04	4.60E-06	7.2
R8	1.11E-05	2.00E-04	4.30E-06	7.1
R9	1.54E-05	3.47E-04	5.99E-06	8.6
R10	1.80E-05	2.90E-04	6.96E-06	8.0
R11	2.46E-05	3.83E-04	9.54E-06	8.9
R12	3.12E-05	3.76E-04	1.21E-05	8.8
Maximum Offsite Ground Level Concentration	1.39E-04	1.29E-03	5.38E-05	17.7
Guideline	**0.2 µg/m^3**	**0.1 µg/m^3**	**0.01 µg/m^3**	**570 µg/m^3**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 16: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Sulfur dioxide	Sulfur dioxide	Thallium	Thallium
Averaging Period	**24 hours**	**Annual**	**1-hour**	**Annual**
Sensitive Receptor	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
R1	5.4	2.5	3.63E-03	8.22E-05
R2	5.4	2.4	1.95E-03	6.98E-05
R3	5.6	2.4	2.11E-03	7.23E-05
R4	5.3	2.4	1.28E-03	4.42E-05
R5	5.1	2.4	1.31E-03	3.12E-05
R6	5.0	2.4	1.15E-03	2.76E-05
R7	4.8	2.3	9.80E-04	2.24E-05
R8	4.7	2.3	9.73E-04	2.10E-05
R9	5.0	2.4	1.69E-03	2.91E-05
R10	4.9	2.4	1.41E-03	3.39E-05
R11	5.1	2.4	1.86E-03	4.64E-05
R12	5.1	2.4	1.83E-03	5.89E-05
Maximum Offsite Ground Level Concentration	9.1	2.8	6.26E-03	2.62E-04
Guideline	**230 µg/m³**	**57 µg/m³**	**1 µg/m³**	**0.1 µg/m³**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**

Table 17: Summary of Modelling Results at Surrounding Sensitive Receptors

Pollutant	Vanadium	Zinc oxide
Averaging Period	**24 hours**	**1 hour**
Sensitive Receptor	**µg/m^3**	**µg/m^3**
R1	4.11E-05	1.88E-02
R2	3.81E-05	1.01E-02
R3	4.53E-05	1.09E-02
R4	3.45E-05	6.62E-03
R5	2.72E-05	6.76E-03
R6	2.39E-05	5.93E-03
R7	1.90E-05	5.07E-03
R8	1.56E-05	5.04E-03
R9	2.62E-05	8.73E-03
R10	2.23E-05	7.30E-03
R11	2.87E-05	9.64E-03
R12	2.79E-05	9.46E-03
Maximum Offsite Ground Level Concentration	1.70E-04	3.24E-02
Guideline	**1.1 µg/m^3**	**90 µg/m^3**
Complies?	**Yes**	**Yes**

Table 18: Summary of Deposition of Metals assessed against TA Luft Human Health Objectives at Surrounding Sensitive Receptors

Pollutant	Arsenic	Lead	Cadmium	Nickel	Mercury	Thallium
Averaging Period	Annual	Annual	Annual	Annual	Annual	Annual
Sensitive Receptor	µg/m²/day	µg/m²/day	µg/m²/day	µg/m²/day	µg/m²/day	µg/m²/day
R1	0.06	0.13	0.03	0.08	0.26	0.16
R2	0.05	0.12	0.02	0.08	0.24	0.14
R3	0.05	0.12	0.02	0.08	0.24	0.14
R4	0.04	0.09	0.02	0.06	0.18	0.11
R5	0.03	0.07	0.02	0.05	0.15	0.09
R6	0.03	0.07	0.01	0.04	0.13	0.08
R7	0.03	0.06	0.01	0.04	0.12	0.07
R8	0.02	0.05	0.01	0.03	0.11	0.06
R9	0.02	0.05	0.01	0.03	0.10	0.06
R10	0.02	0.05	0.01	0.03	0.10	0.06
R11	0.03	0.06	0.01	0.04	0.12	0.07
R12	0.03	0.07	0.01	0.05	0.14	0.09
Maximum Offsite Ground Level Concentration	0.14	0.31	0.06	0.20	0.64	0.38
Guideline	**4 µg/m²/day**	**100 µg/m²/day**	**2 µg/m²/day**	**15 µg/m²/day**	**1 µg/m²/day**	**2 µg/m²/day**
Complies?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

The results of the dispersion modelling demonstrate that the maximum predicted air pollutant concentrations and metal deposition rates satisfy the relevant air quality objectives at all surrounding sensitive receptors.

Predicted air pollutant concentrations and metal deposition rates also satisfy the relevant air quality objectives at ground level receptors for all off-site locations within the model domain, including the sporting fields to the east.

It is also noted that the assessment is highly conservative based upon representation of continuous operation of the cremator between 6am and 10pm every day of the year. As a result of this conservative representation, the maximum predicted concentrations in the surrounding receiving environment are likely to be overstated.

As such, the assessment undertaken demonstrates that the proposed development can operate without causing adverse air quality impacts at surrounding sensitive receptors.

2.7 MANAGEMENT OF EMISSIONS

The management of visible smoke from operation of the cremator during routine, upset and non-routine operations is a potential community concern.

As described in **Section 2.1**, the Mathews Cremation "Ener-Tek – IV Plus" cremator to be installed at the site is a modern low-emission system incorporating best-practice emission control systems including:

- An Intuitive Logic Control (ILC) system with Automatic Timer Functions
- Secondary Chamber with Afterburner
- Opacity Monitor and Controller with Visual and Audible Alarms to minimise smoke and odour.
- Auxiliary Air Control System
- Microprocessor Temperature Control System
- Fail-safe shutdown system in the event of power loss to cease stack emissions

Given the modern control systems integrated into the proposed cremator, management of visible emissions from operation of the cremator to mitigate community concerns may be addressed through an appropriate development approval condition such as the following:

> *"The activity shall not result on the discharge of visible emissions from the cremator exhaust with an opacity in excess of 20 percent for an aggregate of more than 5 minutes in any 1 hour period or more than 20 minutes in any 24 hour period"*

3.0 CONCLUSION

MWA Environmental has been engaged by Abernethy Nominees Pty Ltd to prepare an Air Quality Assessment for a proposed cremator at an approved Funeral Parlour at Buderim.

The approved Funeral Parlour has been designed to integrate a cremator within it as depicted within the approved plans for MCU13/0015. This assessment addresses the potential air quality impacts of the cremator as proposed in development application MCU15/0203.

This report has addressed the requirements of the *Sunshine Coast Planning Scheme 2014*, and provides an assessment of predicted air pollutant exposures at surrounding sensitive receptors against relevant air quality objectives. Reference has also been made to air quality objectives published in:

- Queensland *Environmental Protection (Air) Policy 2008*
- *Brisbane City Council CityPlan 2014 Air Quality Planning Scheme Policy* and associated Codes.
- Texas Commission on Environmental Quality *Effects Screening Levels*
- Germany "Technical Instructions on Air Quality Control" (*Technische Anleitung zur Reinhaltung der Luft*) (referred to as "*TA Luft")*

A detailed air quality assessment based upon site-specific meteorological and dispersion modelling of an extensive suite of air pollutant emissions from the cremator has demonstrated that the relevant air quality guidelines will be readily satisfied at all surrounding sensitive receptors even based upon the conservative assumption of continuous operation of the cremator between 6am and 10pm every day of the year.

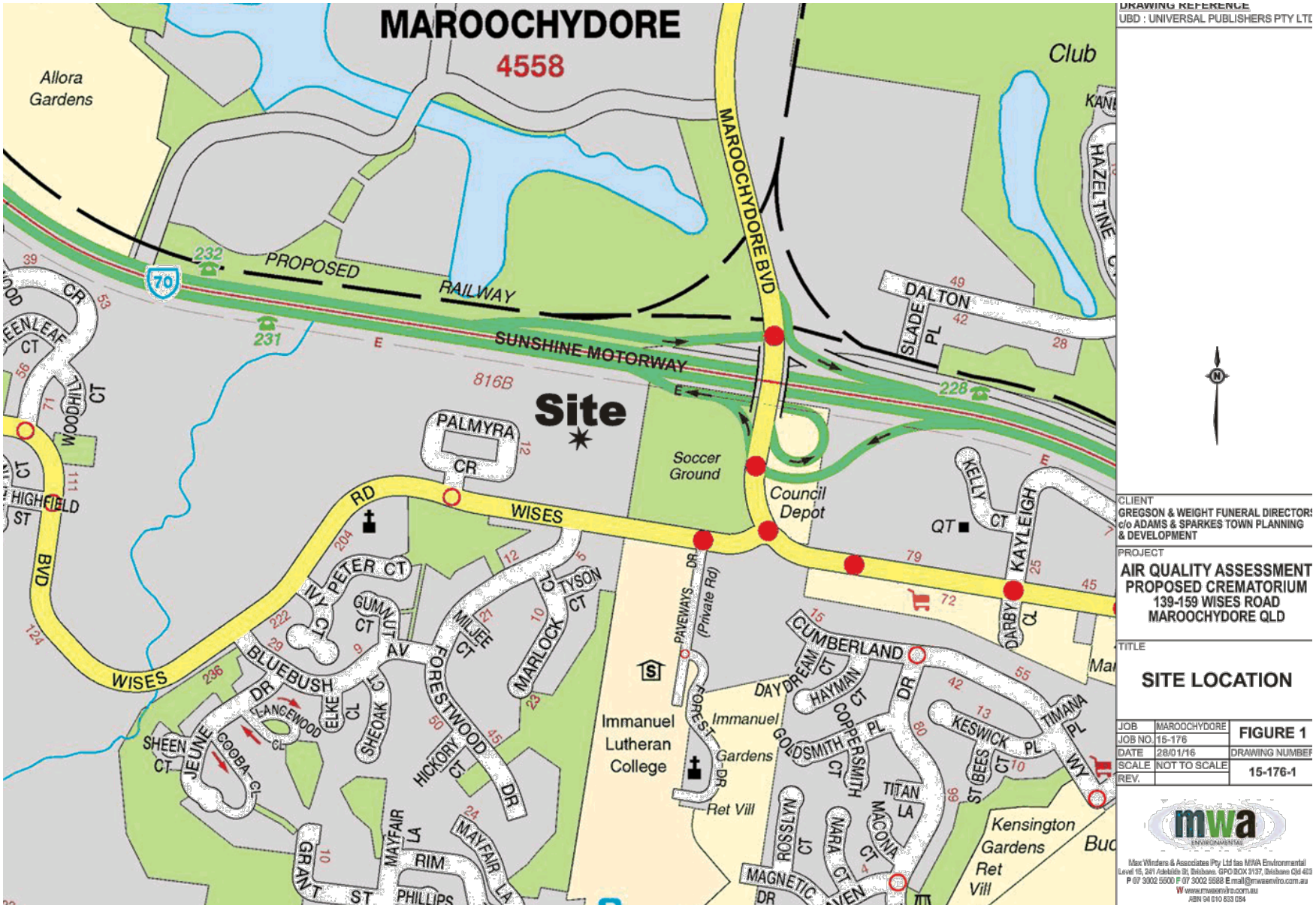
Predicted air pollutant concentrations and metal deposition rates also satisfy the relevant air quality objectives at ground level receptors for all off-site locations within the model domain, including the sporting fields to the east.

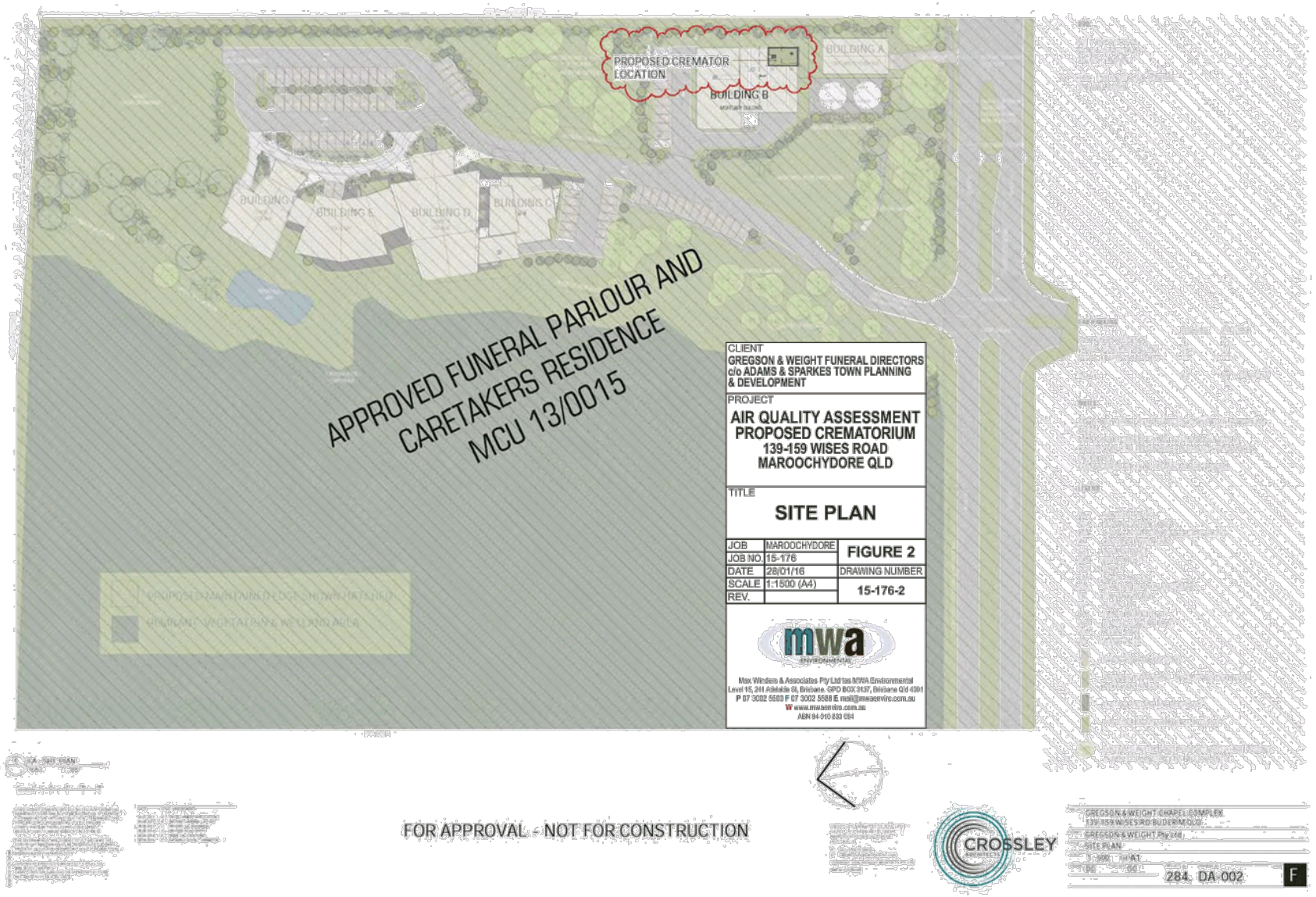
Thus, the assessment undertaken demonstrates that the proposed development can operate without causing adverse air quality impacts at surrounding sensitive land uses.

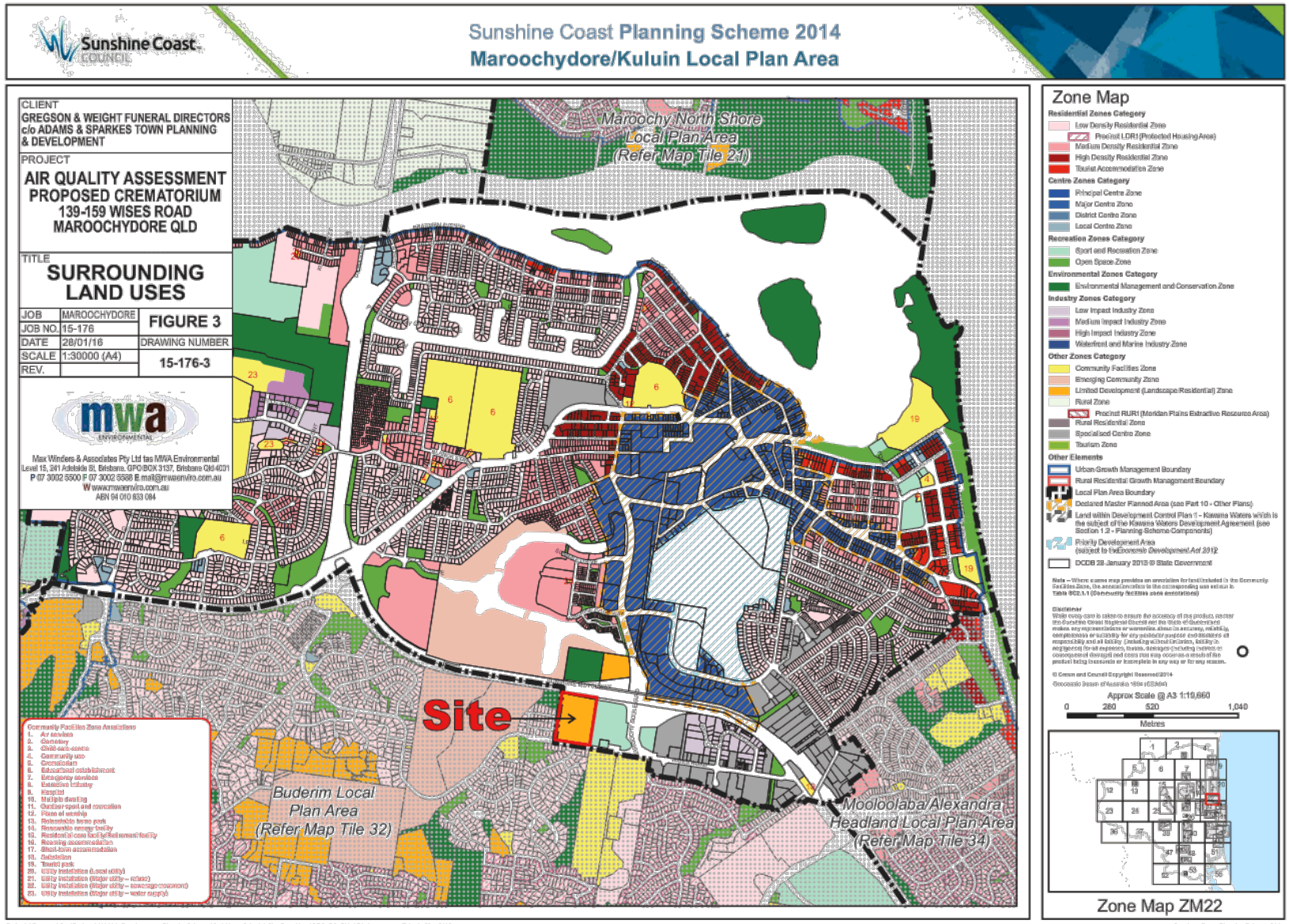
It is recommended the cremator be approved with relevant and reasonable conditions.

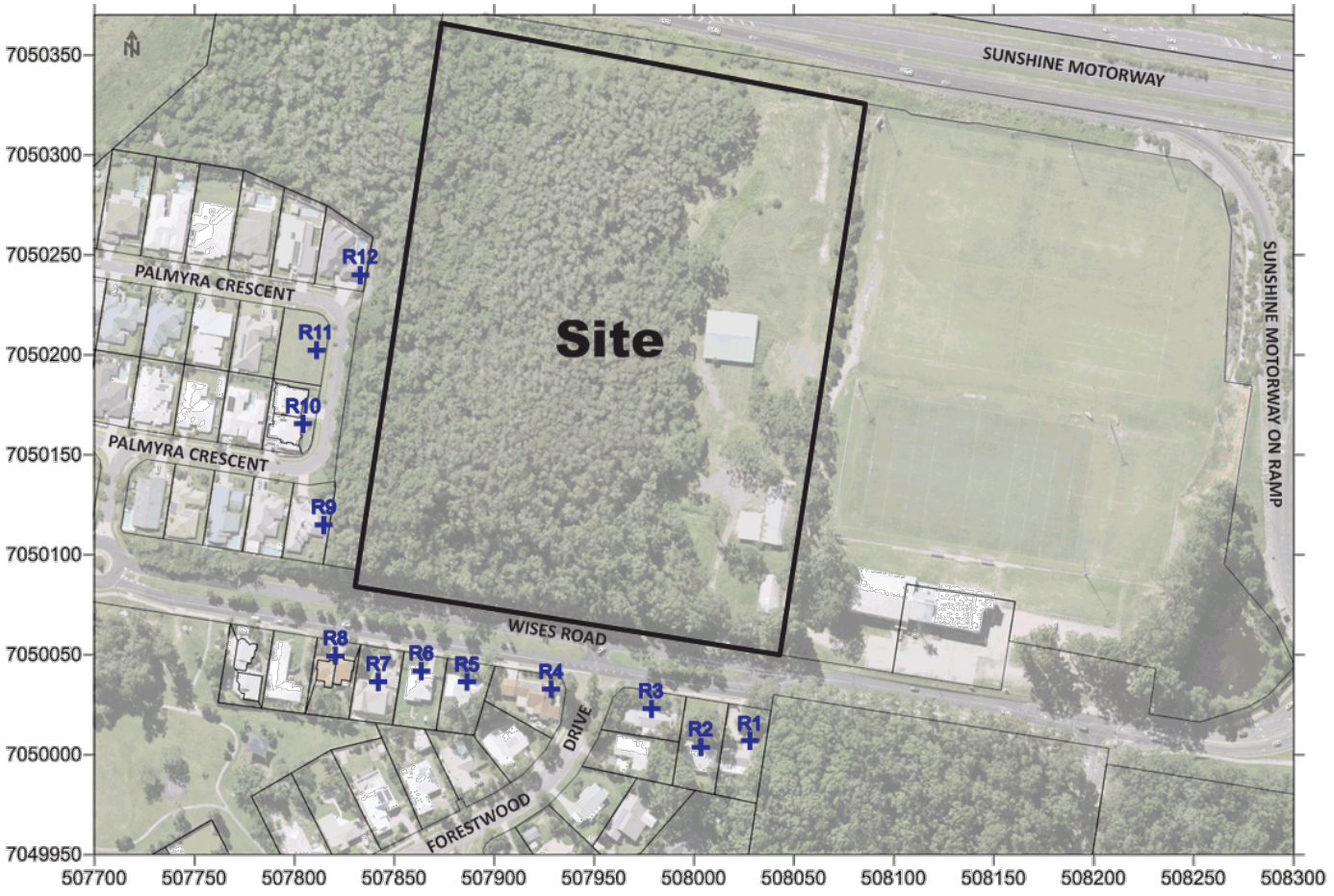
MWA Environmental
28 January 2016

FIGURES


MAROOCHYDORE
4558
Allora Gardens
Club
PROPOSED RAILWAY
SUNSHINE MOTORWAY
MAROOCHYDORE BVD
816B
Site
PALMYRA CR
Soccer Ground
Council Depot
WISES RD
HIGHFIELD ST
BVD
DALTON
SLADE PL
HAZELTINE
KELLY CT
KAYLEIGH
DARBY CL
PETER CT
IVY CT
GUMNUT AV
MILJEE CT
MARLOCK CT
TYSON CT
BLUEBUSH DR
FLANGEWOOD CL
ELKE CL
SHEOAK CL
FORESTWOOD DR
HICKORY CT
SHEEN CT
JEUNE
GOOBA CL
GRANT ST
MAYFAIR LA
RIM
PHILLIPS
PAVEWAYS DR (Private Rd)
Immanuel Lutheran College
Immanuel Gardens
FOREST DR
Ret Vill
CUMBERLAND
DAYDREAM CT
HAYMAN CT
COPPERSMITH PL
GOLDSMITH CT
KESWICK PL
TIMANA PL
ST BEES CT
TITAN LA
MACONA CT
NARA CT
ROSSLYN CT
MAGNETIC DR
Kensington Gardens Ret Vill
DRAWING REFERENCE
UBD : UNIVERSAL PUBLISHERS PTY LTD
CLIENT
GREGSON & WEIGHT FUNERAL DIRECTORS
c/o ADAMS & SPARKES TOWN PLANNING & DEVELOPMENT
PROJECT
AIR QUALITY ASSESSMENT
PROPOSED CREMATORIUM
139-159 WISES ROAD
MAROOCHYDORE QLD
TITLE
SITE LOCATION
JOB MAROOCHYDORE
JOB NO. 15-176
DATE 28/01/16
SCALE NOT TO SCALE
REV.
FIGURE 1
DRAWING NUMBER
15-176-1
mwa ENVIRONMENTAL
Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 Adelaide St, Brisbane. GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5600 F 07 3002 5688 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 094


PROPOSED CREMATOR LOCATION
BUILDING B
BUILDING A
BUILDING C
BUILDING D
APPROVED FUNERAL PARLOUR AND CARETAKERS RESIDENCE MCU 13/0015
CLIENT
GREGSON & WEIGHT FUNERAL DIRECTORS c/o ADAMS & SPARKES TOWN PLANNING & DEVELOPMENT
PROJECT
AIR QUALITY ASSESSMENT PROPOSED CREMATORIUM 139-159 WISES ROAD MAROOCHYDORE QLD
TITLE
SITE PLAN
JOB MAROOCHYDORE
JOB NO. 15-176
DATE 28/01/16
SCALE 1:1500 (A4)
REV.
FIGURE 2
DRAWING NUMBER
15-176-2
mwa
Max Winders & Associates Pty Ltd t/as MWA Environmental
Level 16, 241 Adelaide St, Brisbane. GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenvire.com.au
W www.mwaenvire.com.au
ABN 84 010 833 664
FOR APPROVAL - NOT FOR CONSTRUCTION
CROSSLEY
284. DA-002
F


Sunshine Coast Planning Scheme 2014
Maroochydore/Kuluin Local Plan Area
CLIENT
GREGSON & WEIGHT FUNERAL DIRECTORS
c/o ADAMS & SPARKES TOWN PLANNING & DEVELOPMENT
PROJECT
AIR QUALITY ASSESSMENT
PROPOSED CREMATORIUM
139-159 WISES ROAD
MAROOCHYDORE QLD
TITLE
SURROUNDING LAND USES
JOB MAROOCHYDORE
JOB NO. 15-176
DATE 28/01/16
SCALE 1:30000 (A4)
REV.
FIGURE 3
DRAWING NUMBER
15-176-3
Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 Adelaide St, Brisbane, QPO BOX 3137, Brisbane Qld 4001
P 07 3002 5600 F 07 3002 5688 E mail@mwaenvhq.com.au
W www.mwaenvhq.com.au
ABN 94 010 833 084
Maroochy North Shore Local Plan Area (Refer Map Tile 21)
Site
Buderim Local Plan Area (Refer Map Tile 32)
Mooloolaba/Alexandra Headland Local Plan Area (Refer Map Tile 34)
Zone Map
Residential Zones Category
Low Density Residential Zone
Precinct LDR1 (Protected Housing Area)
Medium Density Residential Zone
High Density Residential Zone
Tourist Accommodation Zone
Centre Zones Category
Principal Centre Zone
Major Centre Zone
District Centre Zone
Local Centre Zone
Recreation Zones Category
Sport and Recreation Zone
Open Space Zone
Environmental Zones Category
Environmental Management and Conservation Zone
Industry Zones Category
Low Impact Industry Zone
Medium Impact Industry Zone
High Impact Industry Zone
Waterfront and Marine Industry Zone
Other Zones Category
Community Facilities Zone
Emerging Community Zone
Limited Development (Landscape/Residential) Zone
Rural Zone
Precinct RUR1 (Meridan Plains Extractive Resource Area)
Rural Residential Zone
Specialised Centre Zone
Tourism Zone
Other Elements
Urban Growth Management Boundary
Rural Residential Growth Management Boundary
Local Plan Area Boundary
Declared Master Planned Area (see Part 10 - Other Plans)
Land within Development Control Plan 1 - Kawana Waters which is the subject of the Kawana Waters Development Agreement (see Section 1.2 - Planning Scheme Components)
Priority Development Area (subject to the Economic Development Act 2012)
DCDB 28 January 2015 © State Government
Approx Scale @ A3 1:19,660
0 260 520 1,040
Metres
Zone Map ZM22



LEGEND

SITE BOUNDARY

R12 SENSITIVE RECEPTORS (12)

DRAWING REFERENCES

- © THE STATE OF QUEENSLAND 2015 QLDGLOBE
- GOOGLE EARTH PRO 18/09/13.

0 25 50 75 100m

CLIENT
GREGSON & WEIGHT FUNERAL DIRECTORS
c/o ADAMS & SPARKES TOWN PLANNING & DEVELOPMENT

PROJECT
AIR QUALITY ASSESSMENT
PROPOSED CREMATORIUM
139-159 WISES ROAD
MAROOCHYDORE QLD

TITLE
SENSITIVE RECEPTORS

JOB	MAROOCHYDORE	FIGURE 4
JOB NO.	15-176	
DATE	26/01/16	DRAWING NUMBER
SCALE	1:3000 (A4)	15-176-4
REV.		

Max Winders & Associates Pty Ltd tas MWA Environmental
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W www.mwaenviro.com.au
ABN 94 010 833 084

ATTACHMENT 1

Architectural Drawings

1 CA - SITE PLAN
SCALE 1 : 500

FOR APPROVAL - NOT FOR CONSTRUCTION

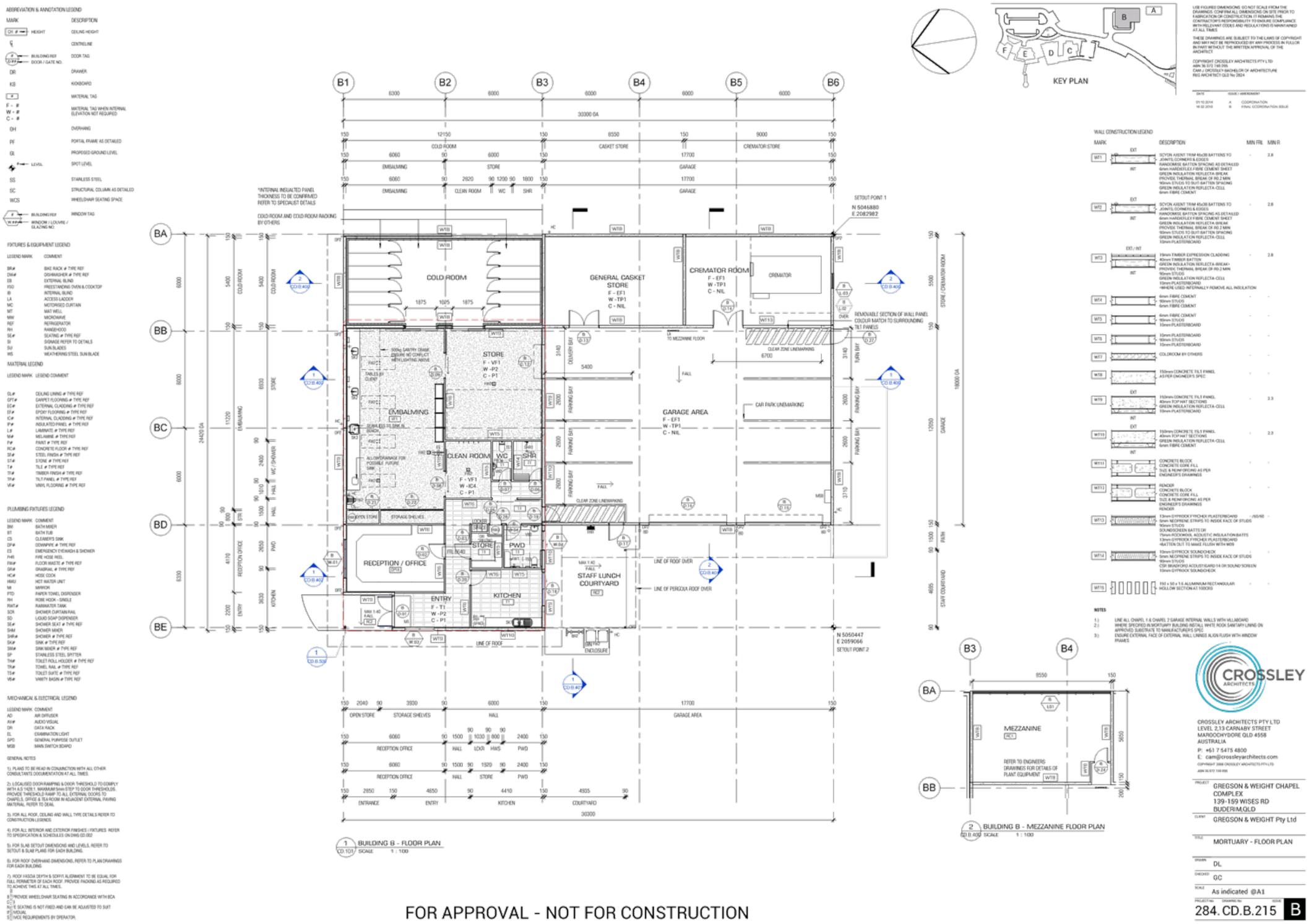
CROSSLEY ARCHITECTS

GREGSON & WEIGHT CHAPEL COMPLEX
139-159 WISES RD BUDERIM QLD
GREGSON & WEIGHT Pty Ltd
SITE PLAN
1 : 500 @A1
DC GC
284 DA-002 F

FOR APPROVAL - NOT FOR CONSTRUCTION

CROSSLEY ARCHITECTS

GREGSON & WEIGHT CHAPEL COMPLEX
139- 159 WISES RD BUDERIM QLD
GREGSON & WEIGHT Pty Ltd
FLOOR PLANS
1 : 200 @A1
DC GC
284_DA- 201



CROSSLEY ARCHITECTS

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AUSTRALIA
P: +61 7 5475 4800
E: cam@crossleyarchitects.com

PROJECT: GREGSON & WEIGHT CHAPEL COMPLEX
139-159 WISES RD
BUDERIM QLD

CLIENT: GREGSON & WEIGHT Pty Ltd

TITLE: MORTUARY - FLOOR PLAN

DRAWN: DL
CHECKED: GC
SCALE: As indicated @A1

PROJECT No. 284. DRAWING No. CD.B.215 ISSUE B

ABBREVIATION & ANNOTATION LEGEND

MARK	DESCRIPTION
CH #	CEILING HEIGHT
℄	CENTRELINE
BUILDING REF / DOOR / GATE NO.	DOOR TAG
DR	DRAWER
KB	KICKBOARD
#	MATERIAL TAG
F - # / W - # / C - #	MATERIAL TAG WHEN INTERNAL ELEVATION NOT REQUIRED
OH	OVERHANG
PF	PORTAL FRAME AS DETAILED
GL	PROPOSED GROUND LEVEL
LEVEL	SPOT LEVEL
SS	STAINLESS STEEL
SC	STRUCTURAL COLUMN AS DETAILED
WHC	WHEELCHAIR SEATING SPACE

MATERIAL LEGEND

LEGEND MARK	LEGEND COMMENT
BUILDING REF	WINDOW TAG
W.PP#	WINDOW / LOUVRE / CURTAINING # TYPE REF
CP.#	CARPET FLOORING # TYPE REF
CP1.#	CARPET FLOORING # TYPE REF
EC#	EXTERNAL CLADDING # TYPE REF
EF#	EPOXY FLOORING # TYPE REF
IC#	INTERNAL CLADDING # TYPE REF
IP#	INSULATED PANEL # TYPE REF
LA#	LAMINATE # TYPE REF
M#	MELAMINE # TYPE REF
P#	PAINT # TYPE REF
RC#	CONCRETE FLOOR # TYPE REF
SF#	STEEL FINISH # TYPE REF
ST#	STONE # TYPE REF
T#	TILE # TYPE REF
TF#	TIMBER FINISH # TYPE REF
TP#	TILT PANEL # TYPE REF
VF#	VINYL FLOORING # TYPE REF

MECHANICAL & ELECTRICAL LEGEND

LEGEND MARK	COMMENT
AD	AIR DIFFUSER
AV#	AUDIO VISUAL
DR	DATA RACK
EL	EXAMINATION LIGHT
GPO	GENERAL PURPOSE OUTLET
MSB	MAIN SWITCH BOARD

PLUMBING FIXTURES LEGEND

LEGEND MARK	COMMENT
BM	BATH MIXER
BT	BATH TUB
CS	CLEANER'S SINK
DP#	DOWNPIPE # TYPE REF
ES	EMERGENCY EYEWASH & SHOWER
FHR	FIRE HOSE REEL
FW#	FLOOR WASTE # TYPE REF
GR#	GRABRAIL # TYPE REF
HC#	HOSE COCK
HWU	HOT WATER UNIT
MI	MIRROR
PTD	PAPER TOWEL DISPENSER
RH	ROBE HOOK - SINGLE
RWT #	RAINWATER TANK
SCR	SHOWER CURTAIN RAIL
SD	LIQUID SOAP DISPENSER
SE#	SHOWER SEAT # TYPE REF
SHM	SHOWER MIXER
SHH#	SHOWER # TYPE REF
SK#	SINK # TYPE REF
SMM#	SINK MIXER # TYPE REF
SP	STAINLESS STEEL SPITTER
TH#	TOILET ROLL HOLDER # TYPE REF
TR#	TOWEL RAIL # TYPE REF
TS#	TOILET SUITE # TYPE REF
VB#	VANITY BASIN # TYPE REF

ROOF LEGEND

LEGEND MARK	COMMENT
BG	BOX GUTTER
EG#	EAVES GUTTER # TYPE REF
RF	ROOF FLASHING
RH	RAINWATER HEAD
RV	ROOF VENTILATOR
SL#	SKYLIGHT / SOLARTUBE # TYPE REF

GENERAL NOTES

1). PLANS TO BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DOCUMENTATION AT ALL TIMES.

2). LOCALISED DOOR RAMPING & DOOR THRESHOLD TO COMPLY WITH AS 1428.1. MAXIMUM 5mm STEP TO DOOR THRESHOLDS. PROVIDE THRESHOLD RAMP TO ALL EXTERNAL DOORS TO CHAPELS, OFFICE & TEA ROOM IN ADJACENT EXTERNAL PAVING MATERIAL. REFER TO DEAL

3). FOR ALL ROOF, CEILING AND WALL TYPE DETAILS REFER TO CONSTRUCTION LEGENDS

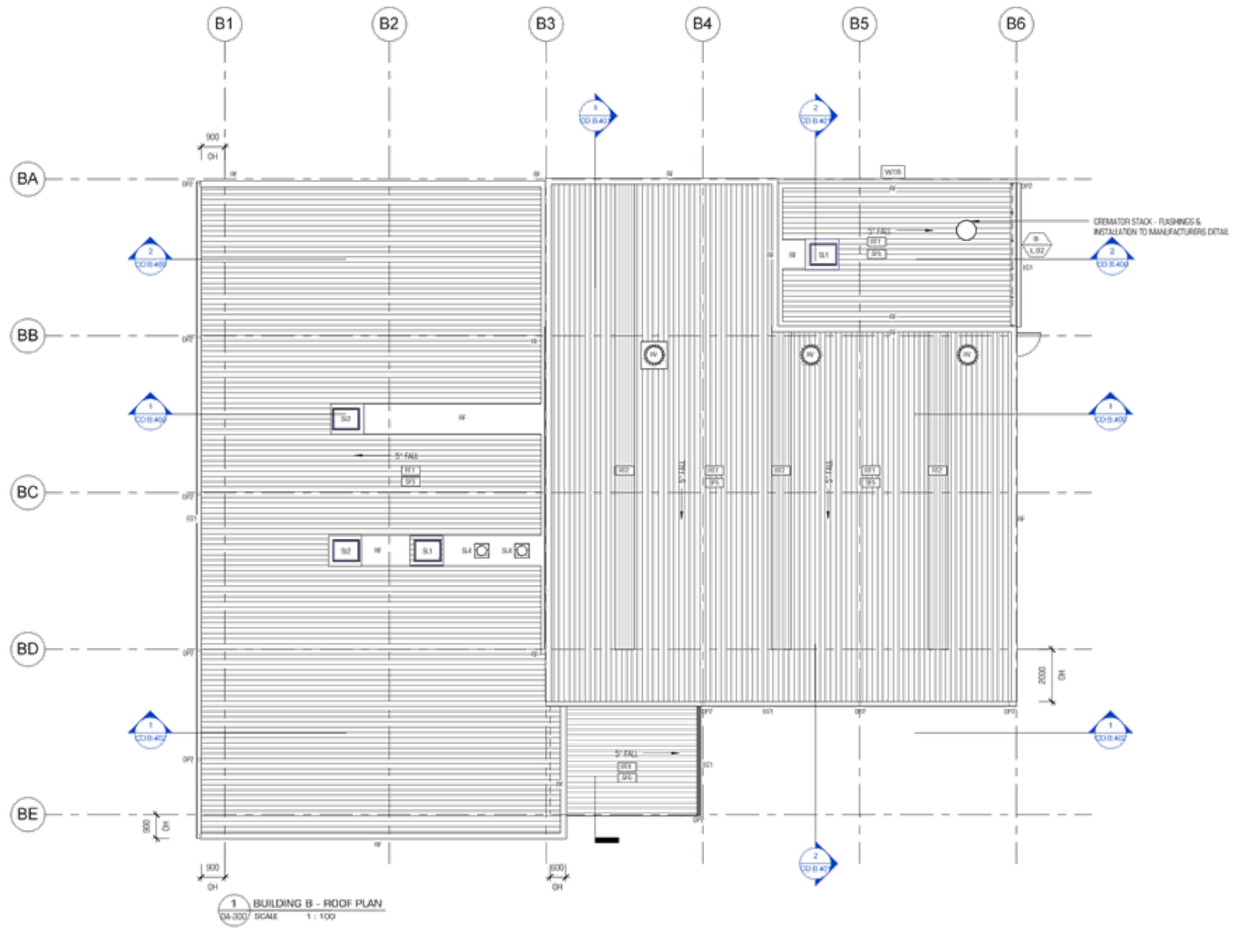
4). FOR ALL INTERIOR AND EXTERIOR FINISHES / FIXTURES. REFER TO SPECIFICATION & SCHEDULES ON DWG CD.002

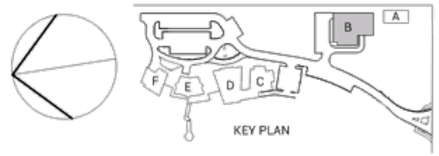
5). FOR SLAB SETOUT DIMENSIONS AND LEVELS, REFER TO SETOUT & SLAB PLANS FOR EACH BUILDING.

6). FOR ROOF OVERHANG DIMENSIONS, REFER TO PLAN DRAWINGS FOR EACH BUILDING

7). ROOF FASCIA DEPTH & SOFFIT ALIGNMENT TO BE EQUAL FOR FULL PERIMETER OF EACH ROOF. PROVIDE PACKING AS REQUIRED TO ACHIEVE THIS AT ALL TIMES.

8). PROVIDE WHEELCHAIR SEATING IN ACCORDANCE WITH BCA D3.9
NOTE SEATING IS NOT FIXED AND CAN BE ADJUSTED TO SUIT INDIVIDUAL
SERVICE REQUIREMENTS BY OPERATOR.





USE FIGURED DIMENSIONS. DO NOT SCALE FROM THE DRAWINGS. CONFIRM ALL DIMENSIONS ON SITE PRIOR TO FABRICATION OR CONSTRUCTION. IT REMAINS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE COMPLIANCE WITH RELEVANT CODES AND REGULATIONS IS MAINTAINED AT ALL TIMES.

DATE	ISSUE / AMENDMENT	
01.10.2014	A	COORDINATION
16.02.2016	B	FINAL COORDINATION ISSUE

ROOF & CEILING CONSTRUCTION LEGEND

MARK	DESCRIPTION	MIN R
RT1 / CT1	STRAMIT LONGSPAN ROOF SHEETING CONTINUOUS CSR BRADFORD ANTICON 50 2mm SAFETY MESH PURLINS AS PER ENGINEER'S DRAWINGS / 40mm TOP HAT SECTIONS AT MAX 450 CRS FURRING CHANNEL WALL TRACK 140 CSR BRADFORD ACOUSTIGARD 14 FLUSH SET 10mm SOUNDCHEK RONDO PS1 SHADOWLINE CORNICE	3.2
RT1 / CT2	STRAMIT LONGSPAN ROOF SHEETING CONTINUOUS CSR BRADFORD ANTICON 50 2mm SAFETY MESH PURLINS AS PER ENGINEER'S DRAWINGS / CONCEALED SUSPENDED CEILING SYSTEM CSR BRADFORD ACOUSTIGARD 14 FLUSH SET 10mm PLASTERBOARD RONDO PS1 SHADOWLINE CORNICE	3.7
RT1 / CT3	STRAMIT LONGSPAN ROOF SHEETING CONTINUOUS CSR BRADFORD ANTICON 50 2mm SAFETY MESH PURLINS AS PER ENGINEER'S DRAWINGS / CONCEALED SUSPENDED CEILING SYSTEM CSR BRADFORD ACOUSTIGARD 14 12mm PLYWOOD	3.7
RT1 / CT4	STRAMIT LONGSPAN ROOF SHEETING CONTINUOUS CSR BRADFORD ANTICON 50 2mm SAFETY MESH PURLINS AS PER ENGINEER'S DRAWINGS / 40mm TOP HAT SECTIONS AT 450 CRS FLUSH SET 6mm VILLABOARD SOFFIT	NA
RT1 / CT5	STRAMIT LONGSPAN ROOF SHEETING CONTINUOUS CSR BRADFORD ANTICON 50 2mm SAFETY MESH PURLINS AS PER ENGINEER'S DRAWINGS / PROVIDE SUPPORT FRAME AND TO INCLUDE MAINTENANCE ACCESS WALKWAY TO M&E AREAS CSR BRADFORD ACOUSTIGARD 14 FLUSH SET 10mm SOUNDCHEK RONDO PS1 SHADOWLINE CORNICE	3.7
RT2	AMPELITE COOL-LITE LONGSPAN TRANSLUCENT ROOF SHEETING PURLINS AS PER ENGINEER'S DRAWINGS	-
RT3	COLDROOM BY OTHERS	-
RT4	SOLARSPAN INSULATED ROOF PLAIN CEILING UNDERSIDE OR APPROVED SIMILAR REFER SPEC	-

* MECHANICALLY FIX ALTRO P250 TWIN WALL TONGUE & GROOVED CEILING SYSTEM TO CT2 IN EMBALMING ROOM

CROSSLEY ARCHITECTS PTY LTD
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AUSTRALIA
P: +61 7 5475 4800
E: cam@crossleyarchitects.com

PROJECT	GREGSON & WEIGHT CHAPEL COMPLEX 139-159 WISES RD BUDERIM,QLD
CLIENT	GREGSON & WEIGHT Pty Ltd
TITLE	MORTUARY - ROOF PLAN
DRAWN	DL
CHECKED	GC
SCALE	As indicated @A1
PROJECT No. / DRAWING No. / ISSUE	284. CD.B.216 B

FOR APPROVAL - NOT FOR CONSTRUCTION

ABBREVIATION & ANNOTATION LEGEND

MARK	DESCRIPTION
OH # — HEIGHT	CEILING HEIGHT
℄	CENTRELINE
# — BUILDING REF; D ## — DOOR / GATE NO.	DOOR TAG
DR	DRAWER
KB	KICKBOARD
#	MATERIAL TAG
F - # W - # C - #	MATERIAL TAG WHEN INTERNAL ELEVATION NOT REQUIRED
OH	OVERHANG
PF	PORTAL FRAME AS DETAILED
GL	PROPOSED GROUND LEVEL
RL — LEVEL	SPOT LEVEL
SS	STAINLESS STEEL
SC	STRUCTURAL COLUMN AS DETAILED
WCS	WHEELCHAIR SEATING SPACE
# — BUILDING REF; W ### — WINDOW / LOUVRE / GLAZING NO.	WINDOW TAG

MATERIAL LEGEND

LEGEND MARK	LEGEND COMMENT
CL#	CEILING LINING # TYPE REF
CPT-#	CARPET FLOORING # TYPE REF
EC#	EXTERNAL CLADDING # TYPE REF
EF#	EPOXY FLOORING # TYPE REF
IC#	INTERNAL CLADDING # TYPE REF
IP#	INSULATED PANEL # TYPE REF
L#	LAMINATE # TYPE REF
M#	MELAMINE # TYPE REF
P#	PAINT # TYPE REF
RC#	CONCRETE FLOOR # TYPE REF
SF#	STEEL FINISH # TYPE REF
ST#	STONE # TYPE REF
T#	TILE # TYPE REF
TF#	TIMBER FINISH # TYPE REF
TP#	TILT PANEL # TYPE REF
VF#	VINYL FLOORING # TYPE REF

ROOF LEGEND

LEGEND MARK	COMMENT
BG	BOX GUTTER
EG#	EAVES GUTTER # TYPE REF
RF	ROOF FLASHING
RH	RAINWATER HEAD
RV	ROOF VENTILATOR
SL#	SKYLIGHT / SOLARTUBE # TYPE REF

GENERAL NOTES

1). PLANS TO BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DOCUMENTATION AT ALL TIMES.

2). LOCALISED DOOR RAMPING & DOOR THRESHOLD TO COMPLY WITH A.S 1428.1- MAXIMUM 5mm STEP TO DOOR THRESHOLDS. PROVIDE THRESHOLD RAMP TO ALL EXTERNAL DOORS TO CHAPELS, OFFICE & TEA ROOM IN ADJACENT EXTERNAL PAVING MATERIAL. REFER TO DEAIL

3). FOR ALL ROOF, CEILING AND WALL TYPE DETAILS REFER TO CONSTRUCTION LOGENDS

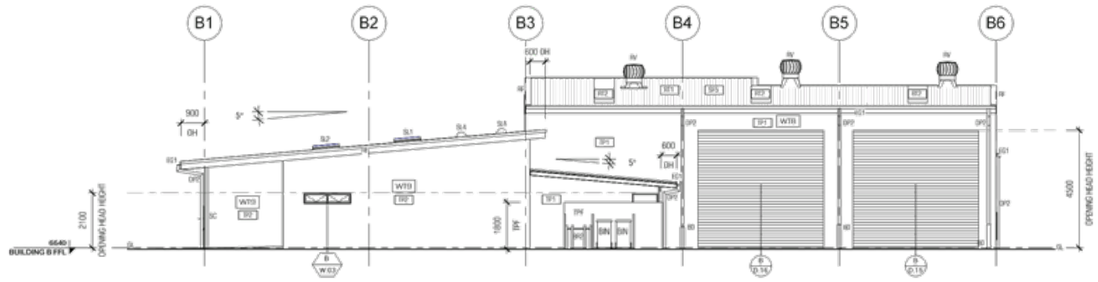
4). FOR ALL INTERIOR AND EXTERIOR FINISHES / FIXTURES REFER TO SPECIFICATION & SCHEDULES ON DWG CD.002

5). FOR SLAB SETOUT DIMENSIONS AND LEVELS, REFER TO SETOUT & SLAB PLANS FOR EACH BUILDING.

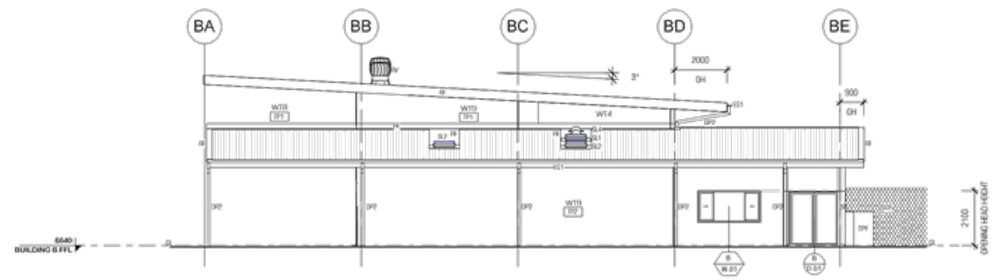
6). FOR ROOF OVERHANG DIMENSIONS, REFER TO PLAN DRAWINGS FOR EACH BUILDING

7). ROOF FASCIA DEPTH & SOFFIT ALIGNMENT TO BE EQUAL FOR FULL PERIMETER OF EACH ROOF. PROVIDE PACKING AS REQUIRED TO ACHIEVE THIS AT ALL TIMES.

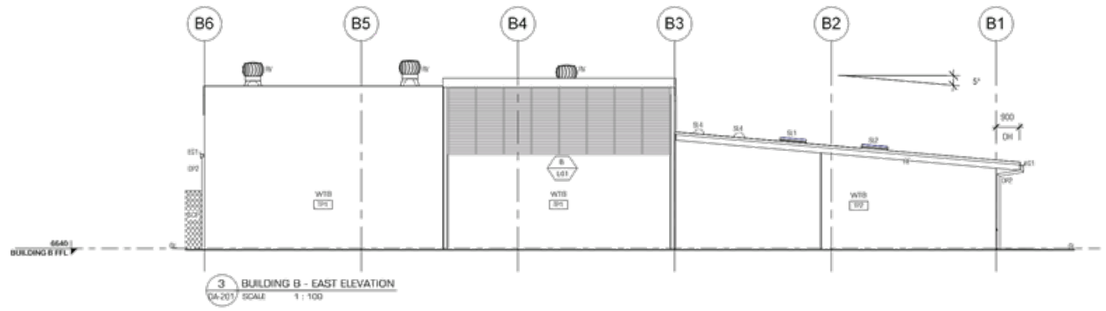
8). PROVIDE WHEELCHAIR SEATING IN ACCORDANCE WITH BCA D3.9
NOTE SEATING IS NOT FIXED AND CAN BE ADJUSTED TO SUIT INDIVIDUAL SERVICE REQUIREMENTS BY OPERATOR.



1 BUILDING B - WEST ELEVATION
DA-201 SCALE 1 : 100



2 BUILDING B - NORTH ELEVATION
DA-201 SCALE 1 : 100



3 BUILDING B - EAST ELEVATION
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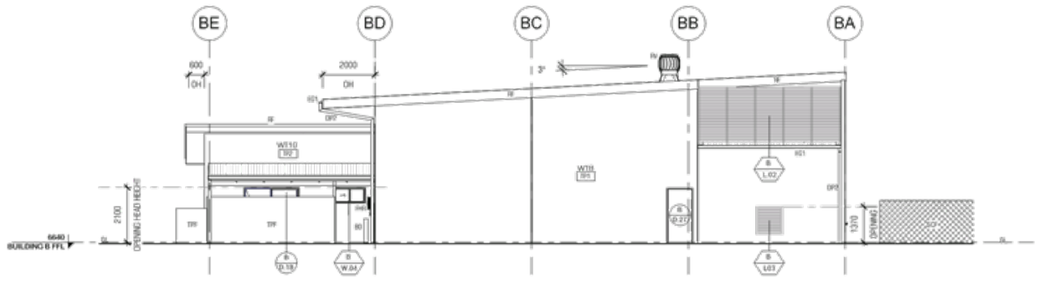

4 BUILDING B - SOUTH ELEVATION
DA-201 SCALE 1 : 100

FOR APPROVAL - NOT FOR CONSTRUCTION

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DATE	ISSUE / AMENDMENT	
01.10.2014	A	COORDINATION
16.02.2016	B	FINAL COORDINATION ISSUE

CROSSLEY ARCHITECTS

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E: cami@crossleyarchitects.com

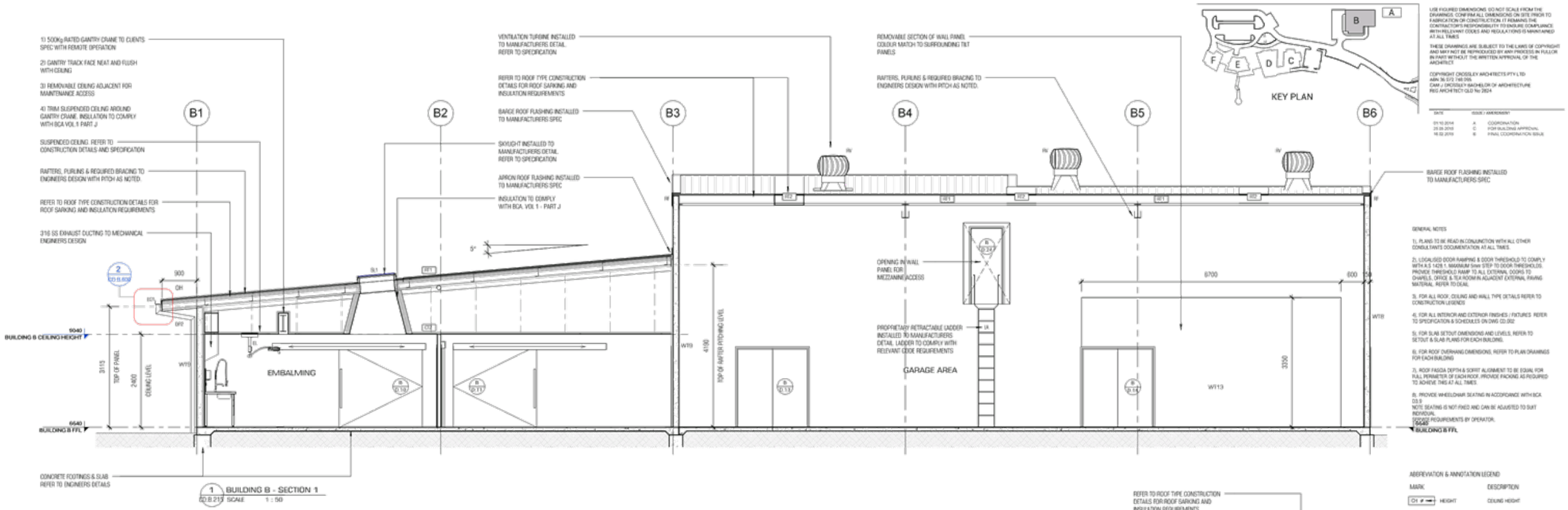
PROJECT: GREGSON & WEIGHT CHAPEL COMPLEX
139-159 WISES RD
BUDERIM,QLD

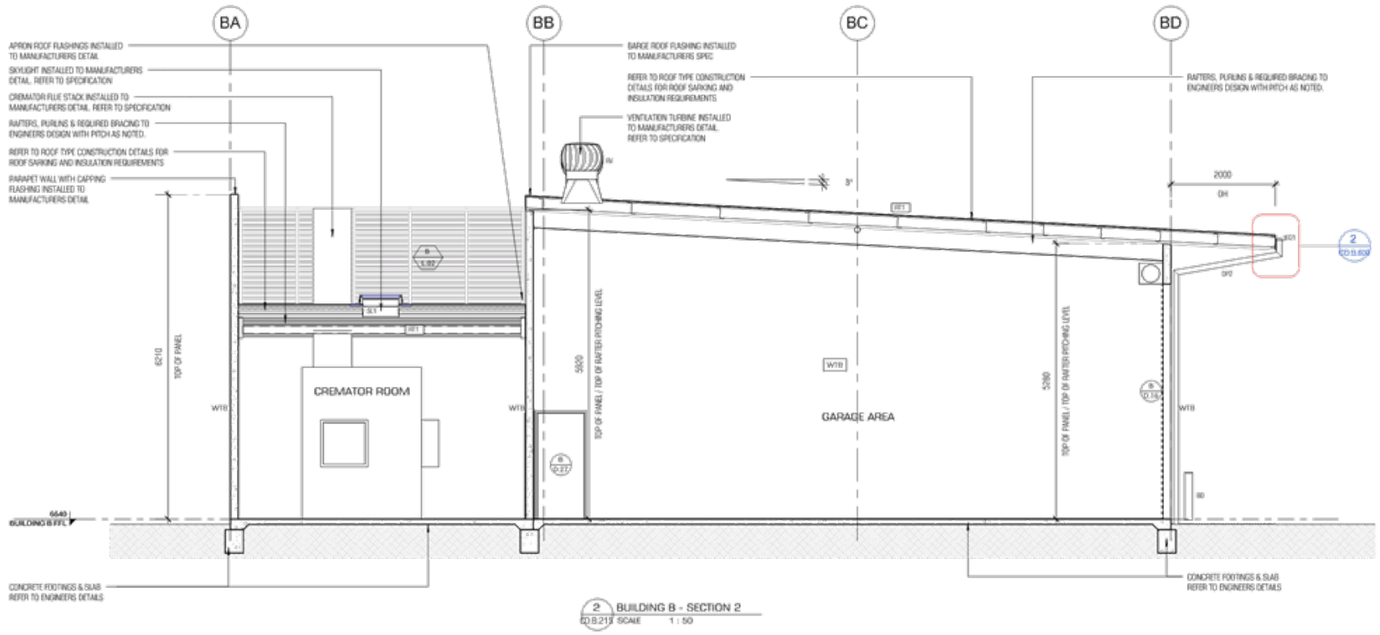
CLIENT: GREGSON & WEIGHT Pty Ltd

TITLE: MORTUARY - ELEVATIONS

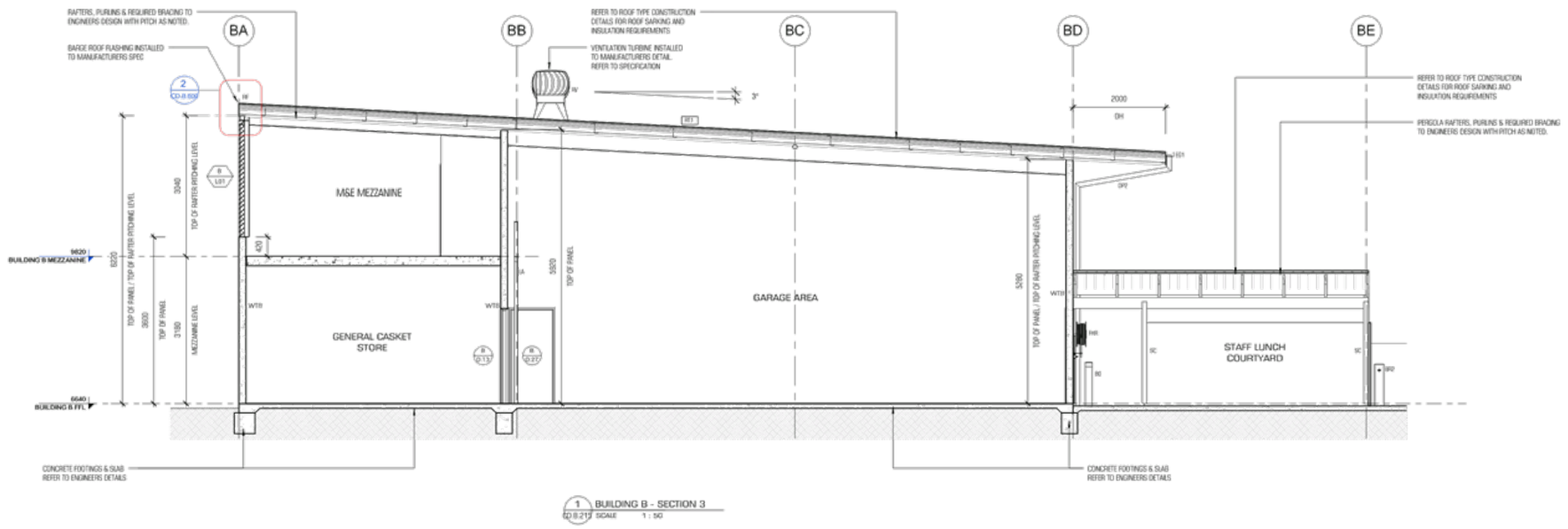
DRAWN: M.D
CHECKED: GC
SCALE: As indicated @A1

PROJECT No: 284. DRAWING No: CD.B.300 ISSUE: B


1) 500Kg RATED GANTRY CRANE TO CLIENTS SPEC WITH REMOTE OPERATION
2) GANTRY TRACK FACE NEAT AND FLUSH WITH CEILING
3) REMOVABLE CEILING ADJACENT FOR MAINTENANCE ACCESS
4) TRIM SUSPENDED CEILING AROUND GANTRY CRANE. INSULATION TO COMPLY WITH BCA VOL 1 PART J
SUSPENDED CEILING. REFER TO CONSTRUCTION DETAILS AND SPECIFICATION
RAFTERS, PURLINS & REQUIRED BRACING TO ENGINEERS DESIGN WITH PITCH AS NOTED.
REFER TO ROOF TYPE CONSTRUCTION DETAILS FOR ROOF SARKING AND INSULATION REQUIREMENTS
316 SS EXHAUST DUCTING TO MECHANICAL ENGINEERS DESIGN
VENTILATION TURBINE INSTALLED TO MANUFACTURERS DETAIL REFER TO SPECIFICATION
REFER TO ROOF TYPE CONSTRUCTION DETAILS FOR ROOF SARKING AND INSULATION REQUIREMENTS
BARGE ROOF FLASHING INSTALLED TO MANUFACTURERS SPEC
SKYLIGHT INSTALLED TO MANUFACTURERS DETAIL REFER TO SPECIFICATION
APRON ROOF FLASHING INSTALLED TO MANUFACTURERS SPEC
INSULATION TO COMPLY WITH BCA. VOL 1 - PART J
REMOVABLE SECTION OF WALL PANEL COLOUR MATCH TO SURROUNDING TILT PANELS
RAFTERS, PURLINS & REQUIRED BRACING TO ENGINEERS DESIGN WITH PITCH AS NOTED.
OPENING IN WALL PANEL FOR MEZZANINE ACCESS
PROPRIETARY RETRACTABLE LADDER INSTALLED TO MANUFACTURERS DETAIL. LADDER TO COMPLY WITH RELEVANT CODE REQUIREMENTS
BARGE ROOF FLASHING INSTALLED TO MANUFACTURERS SPEC
B1
B2
B3
B4
B5
B6
EMBALMING
GARAGE AREA
9040 BUILDING B CEILING HEIGHT
6640 BUILDING B FFL
TOP OF PANEL
CEILING LEVEL
TOP OF RAFTER PITCHING LEVEL
CONCRETE FOOTINGS & SLAB REFER TO ENGINEERS DETAILS
1 BUILDING B - SECTION 1
02.B.213 SCALE 1 : 50
KEY PLAN
GENERAL NOTES
ABBREVIATION & ANNOTATION LEGEND
COLDROOM FLOOR, WALL & CEILING PANELS DESIGNED & CONSTRUCTED BY OTHERS
RAFTERS, PURLINS, BATTENS & REQUIRED BRACING TO ENGINEERS DESIGN WITH PITCH AS NOTED.
REFER TO ROOF TYPE CONSTRUCTION DETAILS FOR ROOF SARKING AND INSULATION REQUIREMENTS
BARGE ROOF FLASHING INSTALLED TO MANUFACTURERS SPEC
APRON ROOF FLASHING INSTALLED TO MANUFACTURERS SPEC
CREMATOR FLUE STACK INSTALLED TO MANUFACTURERS DETAIL. REFER TO SPECIFICATION
PARAPET WALL WITH CAPPING FLASHING INSTALLED TO MANUFACTURERS DETAIL
MEZZANINE
9920 BUILDING B MEZZANINE
COLD ROOM
GENERAL CASKET STORE
CREMATOR ROOM
CONCRETE FOOTINGS & SLAB REFER TO ENGINEERS DETAILS
COLDROOM BY OTHERS
CONCRETE SLAB REFER TO ENGINEERS DETAILS
REFER TO ENGINEERS DRAWINGS FOR DETAILS OF PLANT EQUIPMENT ON MEZZANINE
2 BUILDING B - SECTION 5
02.B.213 SCALE 1 : 50
CROSSLEY ARCHITECTS PTY LTD
LEVEL 2,13 CARNABY STREET
MAROOCHYDORE QLD 4558
AUSTRALIA
P: +61 7 5475 4800
E: cam@crossleyarchitects.com
PROJECT GREGSON & WEIGHT CHAPEL COMPLEX 139-159 WISES RD BUDERIM,QLD
CLIENT GREGSON & WEIGHT Pty Ltd
TITLE MORTUARY - SECTIONS 1
DRAWN MD
CHECKED GC
SCALE As indicated @A1
284. CD.B.400 C
FOR APPROVAL - NOT FOR CONSTRUCTION



BUILDING B - SECTION 2
SCALE 1 : 50



BUILDING B - SECTION 3
SCALE 1 : 50

FOR APPROVAL - NOT FOR CONSTRUCTION

USE FIGURED DIMENSIONS. DO NOT SCALE FROM THE DRAWINGS. CONFIRM ALL DIMENSIONS ON SITE PRIOR TO FABRICATION OR CONSTRUCTION. IT REMAINS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE COMPLIANCE WITH RELEVANT CODES AND REGULATIONS IS MAINTAINED AT ALL TIMES.

DATE	ISSUE / AMENDMENT
25.05.2015	B FOR BUILDING APPROVAL
18.02.2016	A FINAL ECOORDINATION ISSUE

ABBREVIATION & ANNOTATION LEGEND

MARK	DESCRIPTION
DH #	CEILING HEIGHT
℄	CENTRELINE
BUILDING REF / DOOR / GATE NO.	DOOR TAG
DR	DRAWER
KB	KICKBOARD
MATERIAL TAG	MATERIAL TAG
F - # / W - # / C - #	MATERIAL TAG WHEN INTERNAL ELEVATION NOT REQUIRED
OH	OVERHANG
PF	PORTAL FRAME AS DETAILED
GL	PROPOSED GROUND LEVEL
LEVEL	SPOT LEVEL
SS	STAINLESS STEEL
SC	STRUCTURAL COLUMN AS DETAILED
WCS	WHEELCHAIR SEATING SPACE
BUILDING REF / WINDOW / LOUVRE / GLAZING NO.	WINDOW TAG

GENERAL NOTES

1). PLANS TO BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DOCUMENTATION AT ALL TIMES.

2). LOCALISED DOOR RAMPING & DOOR THRESHOLD TO COMPLY WITH A.S.1428.1. MAXIMUM 5mm STEP TO DOOR THRESHOLDS. PROVIDE THRESHOLD RAMP TO ALL EXTERNAL DOORS TO CHAPELS, OFFICE & TEA ROOM IN ADJACENT EXTERNAL PAVING MATERIAL. REFER TO DETAIL

3). FOR ALL ROOF, CEILING AND WALL TYPE DETAILS REFER TO CONSTRUCTION LEGENDS

4). FOR ALL INTERIOR AND EXTERIOR FINISHES / FIXTURES REFER TO SPECIFICATION & SCHEDULES ON DWG ID.000

5). FOR SLAB SETOUT DIMENSIONS AND LEVELS, REFER TO SETOUT & SLAB PLANS FOR EACH BUILDING.

6). FOR ROOF OVERHANG DIMENSIONS, REFER TO PLAN DRAWINGS FOR EACH BUILDING

7). ROOF FASCIA DEPTH & SOFFIT ALIGNMENT TO BE EQUAL FOR FULL PERIMETER OF EACH ROOF. PROVIDE PACKING AS REQUIRED TO ACHIEVE THIS AT ALL TIMES.

8). PROVIDE WHEELCHAIR SEATING IN ACCORDANCE WITH BCA D3.9
NOTE SEATING IS NOT FIXED AND CAN BE ADJUSTED TO SUIT INDIVIDUAL SERVICE REQUIREMENTS BY OPERATOR.

CROSSLEY ARCHITECTS

CROSSLEY ARCHITECTS PTY LTD
LEVEL 2,13 CARNABY STREET
MAROOCHYDORE QLD 4558
AUSTRALIA
P: +61 7 5475 4800
E: cam@crossleyarchitects.com

PROJECT: GREGSON & WEIGHT CHAPEL COMPLEX
139-159 WISES RD
BUDERIM,QLD

CLIENT: GREGSON & WEIGHT Pty Ltd

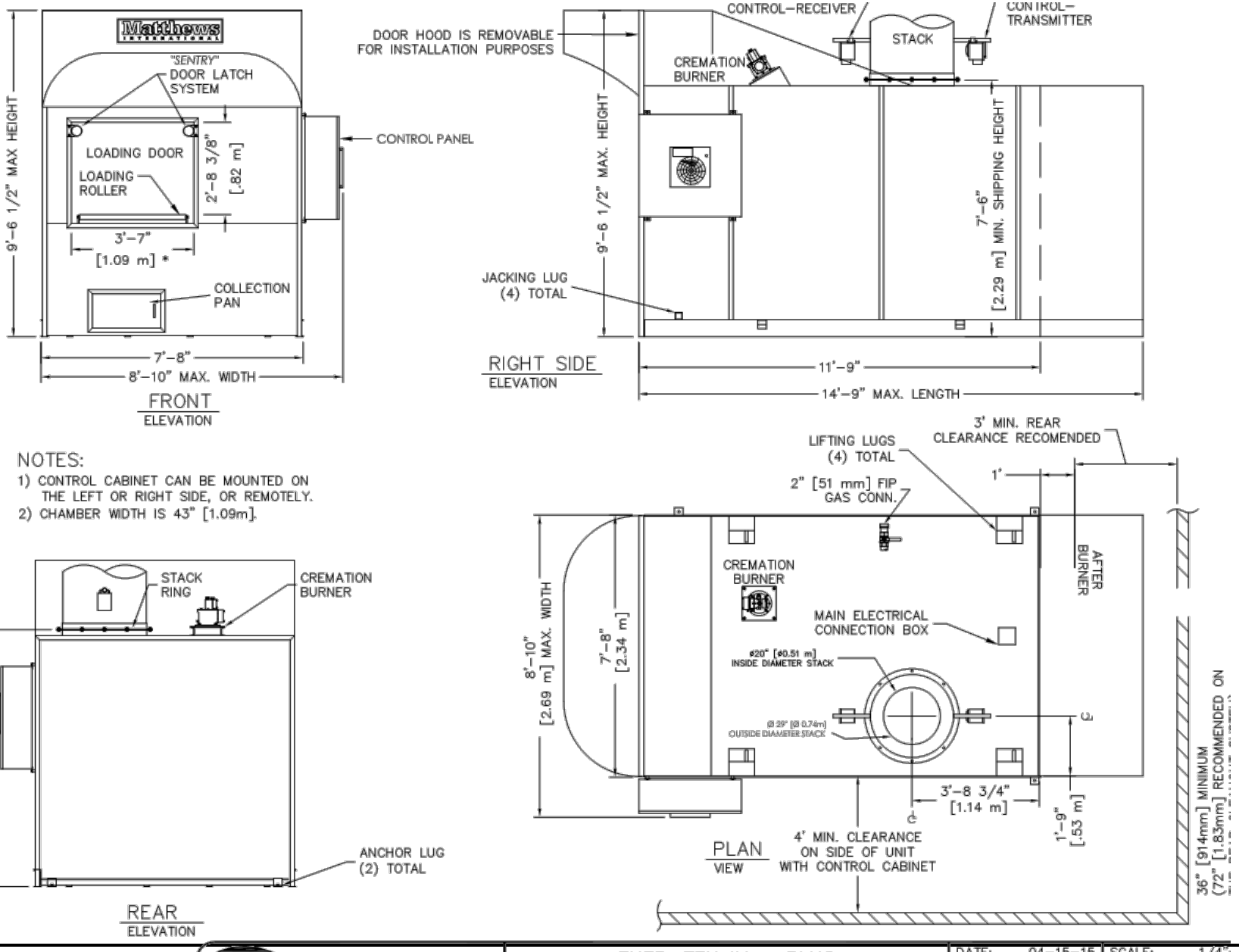
TITLE: MORTUARY - SECTIONS 2

DRAWN: M.D
CHECKED: GC
SCALE: As indicated @A1

PROJECT No. 284. DRAWING No. CD.B.401 ISSUE B

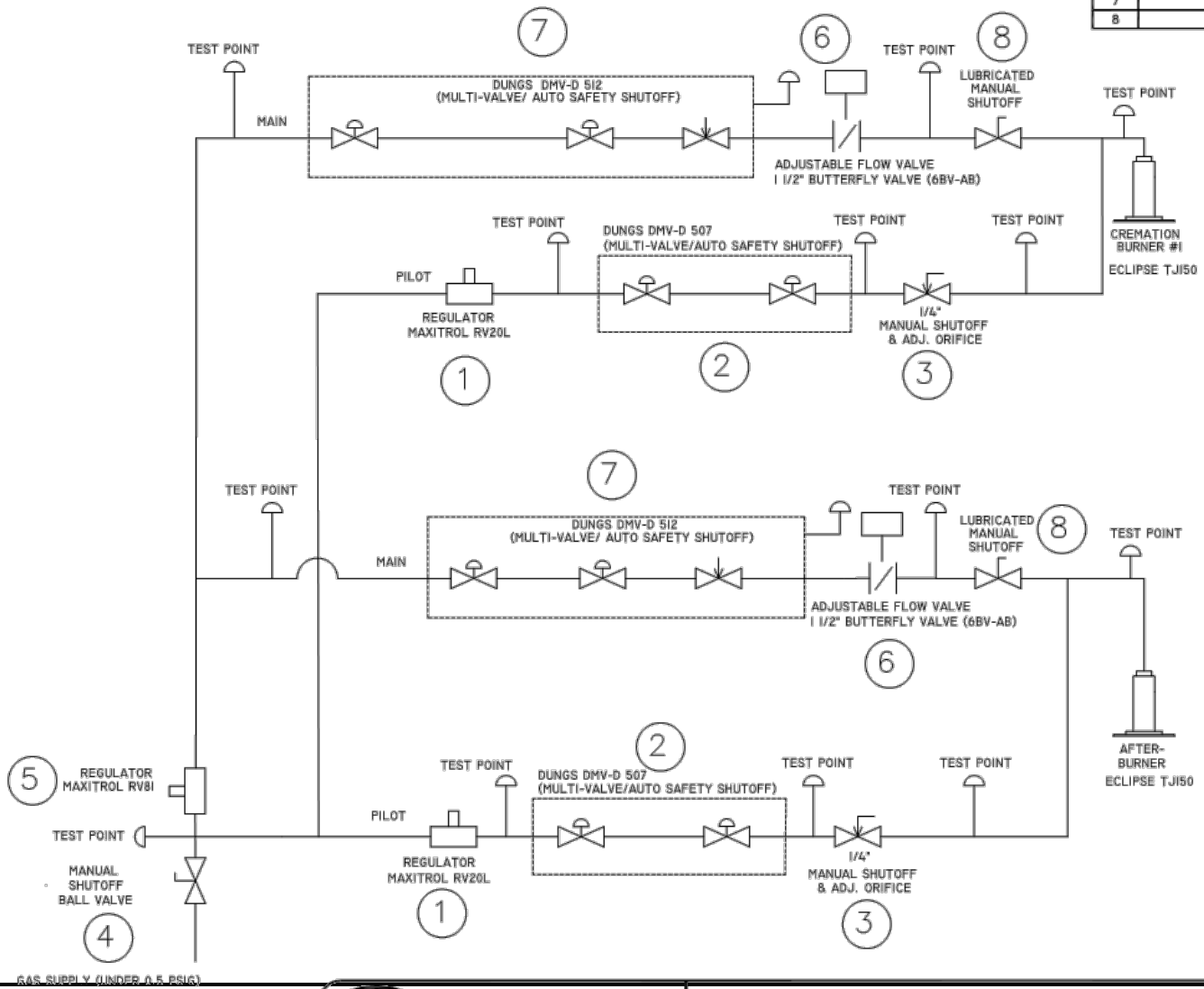
ATTACHMENT 2

Relevant Cremator Specifications



Matthews CREMATION DIVISION 2045 Sprint Boulevard Apopka, Florida 32703 USA	ENER-TEK IV – PLUS	DATE: 04-15-15	SCALE: 1/4"
	PLAN & ELEVATIONS INCL: CLEARANCES, REQUIREMENTS, & RECOMMENDATIONS	APRVD:	SHEET: 1 OF:
		DWG FILE: ET-PlusMarketingPlanElevS1	

ITEM	MCD PART #	DESCRIPTION
1		3/8" MAXITROL REGULATOR (RV20L)
2		BLOCK VALVE DUNGS DMV-D 507
3		1/4" ORIFICE / MAN SHUTOFF
4		2" STAUFF BALL VALVE
5		1 1/2" REGULATOR VALVE (RV81)
6		1 1/2" BUTTERFLY VALVE (6BV-AB)
7		1 1/2" BLOCK VALVE (DMV-D 512)
8		1 1/2" STAUFF BALL VALVE

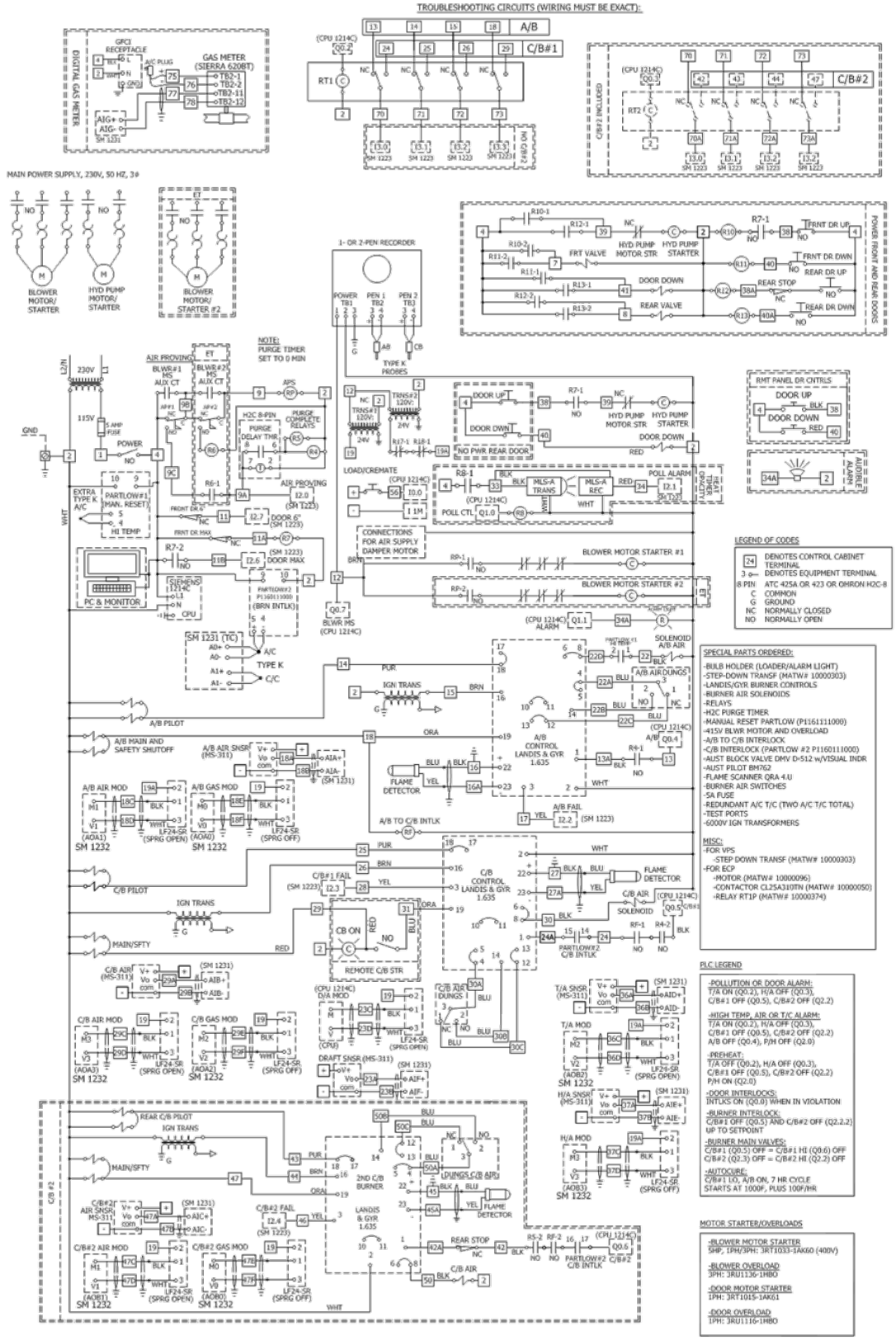


Matthews CREMATION DIVISION
2045 Sprint Boulevard
Apopka, Florida 32703
USA

Gas Train Schematic

ET Plus

DATE: 7/2/15	SCALE:
APRVD:	SHEET: 1 OF:
DWG FILE:	ETPlusGasSc


TROUBLESHOOTING CIRCUITS (WIRING MUST BE EXACT):
MAIN POWER SUPPLY, 230V, 50 HZ, 3Φ
LEGEND OF CODES
SPECIAL PARTS ORDERED:
PLC LEGEND
MOTOR STARTER/OVERLOADS
Matthews
CREMATION DIVISION
2045 Sprint Boulevard
Apopka, Florida 32703
MPYRE 2.0
AUSTRALIA
DATE: 3/25/15
SCALE: N.T.
DRAWN: MS/MT
PLOT SCALE: N.T.
APRVD:
SHEET: 1 OF: 2
DWG FILE:

Jan 22, 2015 1

SPECIFICATIONS - Ener-Tek - Plus

1.	Equipment Type	IE43-ET-Plus
	A. Underwriters Laboratories Listing No	MH14647
2.	Dimensions	
	A. Footprint	12' – 4" x 7' – 8" (3.76m x 2.34m)
	B. Maximum Length	14' – 6 ¼ " (4.43 m)
	C. Maximum Width	8' -10" (2.69 m)
	D. Maximum Height	9' - 6¾" (2.91 m)
	E. Chamber Loading Opening	33" (84cm)H x 43" (109 cm)W (into chamber)
3.	Weight	36,000 lbs. (16,330 kg)
4.	Utility/Air Requirements	
	A. Gross Gas Input, Natural or LP Gas	2.7 million BTU/hr. maximum (733kW)
	Running Gas Pressure, Natural Gas	11 inches w.c. or greater (2.74kPa)
	Running Gas Pressure, LP Gas	11 inches w.c. or greater (2.74kPa)
	B. Electrical Supply	230 volt, 3Ø or 1Ø, 60 hz (other available)
	C. Air Supply	3,000 cfm (85 m^3/min)
5.	Incineration Capacity	250 lbs./hr. (113 kg/hr.)
6.	Typical Loading Capacity of Waste Types	
	A. Type 4 Material	750 lbs. (340 kg)
7.	Construction and Safety Standards	Incineration Institute of America, Underwriters Laboratories, Canadian Standards Association
8.	Steel Structure Construction	
	A. Frame	2" (50mm) square tubing
	B. Front/Rear Plates	3/8" (10mm) plate
	C. Floor Plates	3/16" (5mm) plate
	D. Outer Side Casing	12 gauge plate
	E. Inner Side Casing	12 gauge plate
9.	Stack Construction (3 wall)	
	A. Inner Wall	12 gauge type 304 s.s., welded seams
	B. Middle Wall	2" (50mm) insulating block
	C. Outer Wall	22 gauge galvanized steel, screwed seams
10.	Draft Nozzle Construction	Schedule 40 type 316 s.s., welded connections
11.	Main Chamber Door Construction	
	A. Steel Shell	3/16" (5mm) steel, welded with reinforcement
	B. Outer Refractory	1" (25mm) insulating block
	C. Inner Refractory	4½" (114mm) insulating firebrick

SPECIFICATIONS - Ener-Tek - Plus

12.	Primary Chamber Wall Construction	12 gauge plate
	A. Outer Casing Wall	2" (50mm) air compartment
	B. Inner Frame/Air Compartment	12 gauge plate
	C. Inner Casing Wall	5" (127mm) insulating block (minimum)
	D. Outer Refractory Wall	4½" (114mm) firebrick
	E. Inner Refractory Wall	
13.	Secondary Chamber Wall Construction	
	A. Outer Casing Wall	12 gauge plate
	B. Inner Frame/Air Compartment	2" (51mm) air compartment
	C. Inner Casing Wall	12 gauge plate
	D. Outer Refractory Wall	6" (152mm) insulating block
	E. Inner Refractory Wall	4½" (114mm) firebrick
14.	Refractory Temperature Ratings	
	A. Standard Firebrick	3,100° F. (1,704° C)
	B. Insulating Firebrick	2,600° F. (1,426° C)
	C. Castable Refractory (Hearth)	2,550° F. (1,400° C)
	D. Castable Refractory	2,550° F. (1,400° C)
	E. Insulating Block	1,900° F. (1,037° C)
	F. Bonding Mortar	3,200° F. (1,760° C)
15.	Chamber Volumes (not including external flues, stacks or chimneys)	
	A. Primary Chamber	82 cubic feet (2.32 m^3)
	B. Secondary Chamber	125 cubic feet (3.54 m^3)
16.	Emission Control Features	
	A. Secondary Chamber with Afterburner	Included
	B. Opacity Monitor and Controller with Visual and Audible Alarms	Included
	C. Auxiliary Air Control System	Included
	D. Microprocessor Temperature Control System	Included
17.	Operating Temperatures	
	A. Primary Chamber	32° F. – 2.000° F. (0° C – 1,093° C)
	B. Secondary Chamber	1,400° F. - 1,800° F. (760°C - 982°C) (as required)
18.	Secondary Chamber Retention Time	
	A. Type 4 Material	250 lbs./hr. (113 kg/hr.)
	Retention Time	> 1 second
19.	Ash Removal	Door functions as a heat shield. Sweep out beneath rear door into hopper which fills collection pan.

SPECIFICATIONS - Ener-Tek - Plus

20.	Safety Interlocks	Optional
	A. High Gas Pressure	Optional
	B. Low Gas Pressure	Included
	C. Blower Air Pressure	Included
	D. Door Position	Included
	E. Opacity	Included
	F. Motor Starter Function	Included
	G. Chamber Temperature	Included
	H. Motor Overload	Included
	I. Flame Quality	Included
	J. Burner Safe Start	
22.	Burner Description	The nozzle mix burners used on this cremation equipment are industrial quality and designed for incinerator use.
23.	Ultraviolet Flame Detection	Ultraviolet flame detection has proven to be the most reliable means of flame safety. The system is completely sealed in a quartz capsule to eliminate problems, caused by moisture and dust created in the cremation process, which effect flame rod detectors.
24.	Operating Panel Indicating Lights	
	A. Safe Run	Included
	B. Door Closed	Included
	C. Pollution Alarm	Included
	D. Afterburner On (Secondary Burner)	Included
	E. Cremation Burner On (2)	Included
	F. Temperature Control	Included
	G. Afterburner (Secondary Burner) Reset	Included
	H. Cremation Burners Reset (2)	Included
	I. Hearth Air	Included
	J. Throat Air	Included
25.	Automatic Timer Functions	
	A. Master Cycle	Included
	B. Afterburner (Secondary Burner)	Included
	C. Cremation Burner (2)	Included
	D. Hearth Air	Included
	E. Throat Air	Included
	F. Pollution Monitoring	Included
	G. Afterburner (Secondary Burner) Prepurge	Included
	H. Cremation Burner Prepurge (2)	Included
	I. Cool Down	Included

SPECIFICATIONS - Ener-Tek - Plus

26.	Exterior Finish	2 coats rust inhibiting
	A. Primer	2 coats textured finish
	B. Finish	
27.	Start-Up and Training	Startup of cremation equipment and training of operators to properly operate and maintain the equipment is performed on-site under actual operating conditions. Included is a comprehensive owner's manual, with details on the equipment, its components and proper operation.
28.	Environmental Submittals	Complete technical portion of state environmental permits. Engineering calculations, technical data, existing stack test results and equipment blueprints provided.

SECTION 1.0
INTRODUCTION

Environmental Laboratories Inc. (ELI), under a contract to Galli Engineering PC, provided technical and sampling support for a Particulate Matter (PM) emission compliance evaluation of the human remains cremation incinerator at the Long Island Cremation Co., Inc. located in W. Babylon, NY.

This report specifies the objectives, approach evaluation and results required by the NYSDEC Air Facility Registration Permit. The emissions testing was performed in triplicate at the maximum charging rate.

This document contains the report information required by NYSDEC. The following sections present the results of the test program and a detailed description of the program objectives, plant description, sampling and analytical approaches and a discussion of the QA/QC program applicable to the test methodologies.

1.1 Program Objective

The objective was to perform Compliance Emission testing for PM and to establish the empirical data for PM emission rates.

The testing of the source was used to determine PM emissions compliance with the emission allowable limit of 0.08 grains per dry standard cubic foot (corrected to 7% O_2) while maintaining the following operating requirements:

- Human remains/waste charging rate maximum of 750 lb;
- Secondary chamber temperature ≥1,800 °F; and,
- Facility visible emissions monitor not to exceed 10 percent opacity.

The following presents a summary of the October 24, 2013 test results:

Parameter	Test Result Avg. (1)
Charging Rate (Total Load, lb)	121
Secondary Chamber Exhaust Temp (°F)	1,822
PM emission Rate:	
gr/dscf @ 7% O_2	0.015
lb/hr	0.060
lb/MMBtu	0.027

(1) Average of triplicate test run

SECTION 2.0
TECHNICAL APPROACH

2.1 Test Program Overview

The test program at the Long Island Cremation Co., Inc. facility was designed to meet the following objective:

1) Determine PM emission compliance status.

The objective was met by performing EPA Reference Method testing for O_2, CO_2, volumetric flow rate and PM emissions. Emissions testing consisted of a total for three (3) 60-minute test runs performed during maximum achievable load operation. The testing matrix for all these parameters is presented in Table 2-1.

TABLE 2-1

LONG ISLAND CREMATION CO., INC.

COMPLIANCE TEST REPORT
SAMPLING AND ANALYTICAL APPROACH

OCTOBER 2013

Source/Operating Conditions	Test Location	No. of Total Runs	Parameter(s) Measured	Sample Time per Run (minutes)	Test Method (1)
1. Cremation Unit Natural Gas-Fired Max. Load	Exhaust Stack	3	PM O_2/CO_2 Volumetric Flow Rate Moisture	60 60 60 60	EPA 5 EPA 3 EPA 1 & 2 EPA 4
2. Plant Process Data Emission Source	Plant Control Equipment	All Runs	-Primary & Secondary Chamber Temp.; -Plant Visual Emission Recording; and, -Waste remains charging rate (lbs per charge and time logging)		Process Equipment

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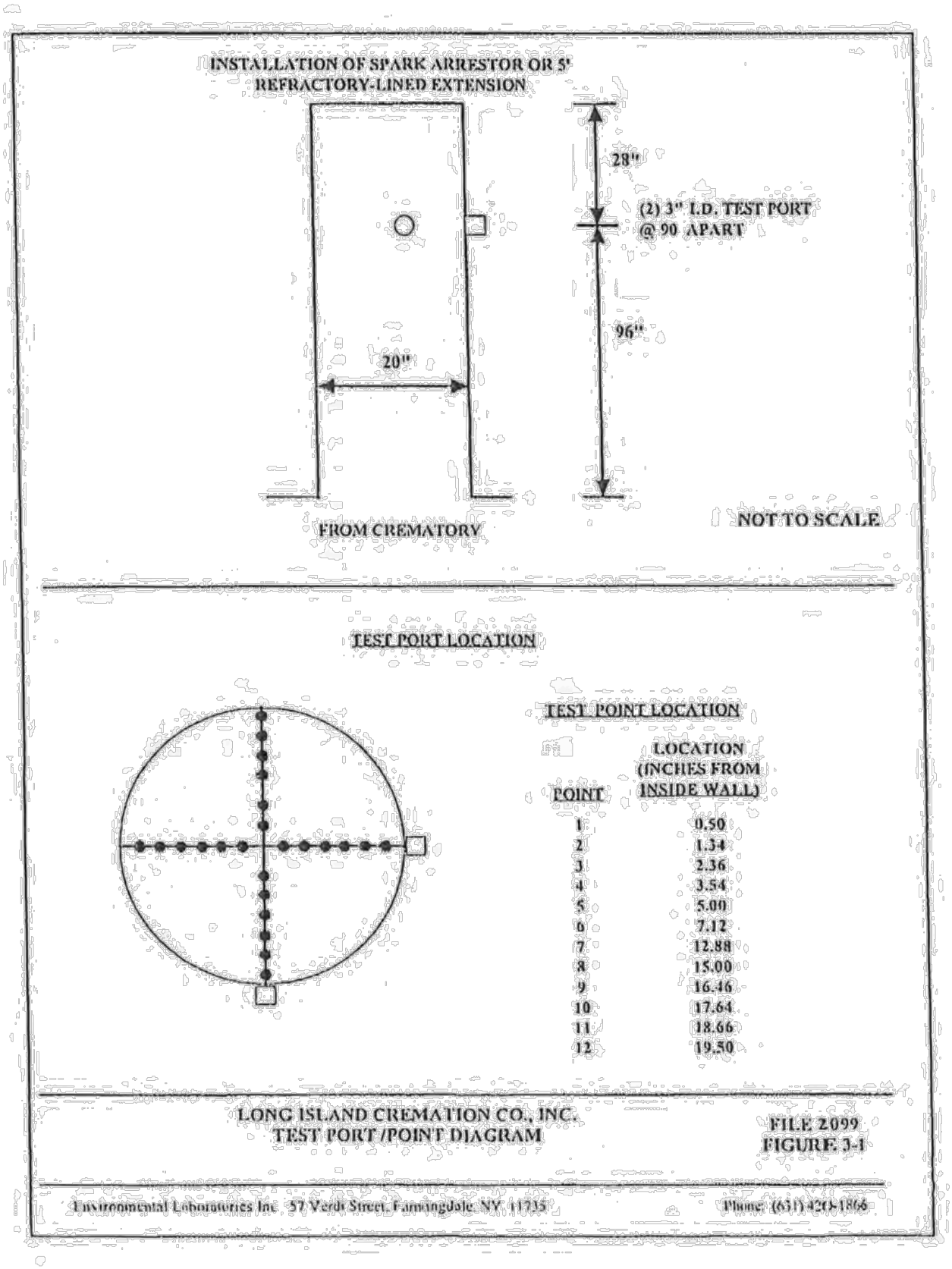
SECTION 3.0
PLANT DESCRIPTION

The crematory consists of one (1) dual chamber human remains cremation retort. The retort consists of a primary and secondary chamber with natural gas-fired burners rated at a total heat input rate of 2.7 MMBtu/hr.

The unit is rated at a maximum loading capacity of 750 pounds of human remains. The unit was manufactured by Matthews Cremation Division of Apopka, Florida. The unit is Model Number ENER-TEK IE43-ET.

Test port location within the exhaust stack is presented in Figure 3-1.


INSTALLATION OF SPARK ARRESTOR OR 5' REFRACTORY-LINED EXTENSION
28"
(2) 3" I.D. TEST PORT @ 90 APART
96"
20"
FROM CREMATORY
NOT TO SCALE
TEST PORT LOCATION
TEST POINT LOCATION
POINT
LOCATION (INCHES FROM INSIDE WALL)
1 0.50
2 1.34
3 2.36
4 3.54
5 5.00
6 7.12
7 12.88
8 15.00
9 16.46
10 17.64
11 18.66
12 19.50
LONG ISLAND CREMATION CO., INC.
TEST PORT /POINT DIAGRAM
FILE 2099
FIGURE 3-1
Environmental Laboratories Inc. 57 Verdi Street, Farmingdale, NY 11735 Phone: (631) 420-1868

SECTION 4.0
TEST METHODOLOGIES

This section describes the sampling and analytical methods that were used for this test program. These reference methods and analytical techniques have been chosen due to their proven success on previous compliance programs where they have generated consistent, reliable data for electric utilities, boiler plants independent power producers, waste-to-energy facilities and medical waste incinerators.

4.1 Sample Locations

Sampling for PM emission were performed in the exhaust stack. Figure 3-1 presents the test port/point locations for the source. These test locations were used for PM emissions and flue gas velocity profile testing.

4.2 Sample Trains

One (1) sample train was used to conduct the gaseous exhaust stream sampling portion of the test program. Table 4-1 lists the sample train and sampling methods. The following section summarizes the test methodology in more detail and discusses any deviations from the reference methodology. Appendix A contains further details on the standard methods.

4.2.1 Particulate Matter

Total suspended Particulate Matter (PM) emissions sampling were performed in accordance with a modified version of EPA Method 5. Front-half catch were utilized. This is a standard EPA Method 5 test train which consisted of a quart glass buttonhook nozzle, a quartz glass probe, a heated filter, and unheated interconnect line, a series of impingers, a dry gas meter and a high vacuum pump. The temperature of the filter holder was maintained at 248°F ± 25°F during the tests. The filter was followed by four (4) Greenburg/Smith impingers in the following configuration:

- Impinger 1: 100 mls of DDI H_2O;
- Impinger 2: 100 mls of DDI H_2O;
- Impinger 3: Empty for moisture knockout; and,

TABLE 4-1

LONG ISLAND CREMATION CO., INC.

SAMPLE TRAINS USED FOR EXHAUST GAS SAMPLING

Train	Sampling Method	Species to be Measured	No. of Replicates	Sample Duration	No. of Sample Points
Particulate Matter	EPA 1-5	Total Front ½ PM	3	60 min.	24 points
Exhaust Gas Flow Rate	EPA 1, 2 & 4	Exhaust Gas Velocity & Moisture Content	3	60 min.	24 points

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- Impinger 4: 200-300 gms of silica gel.

Sample train recovery consisted of the following:

Container	Sample Train Components	Description
C1	Filter	Placed in petri dish and labeled
C2	Nozzle, probe and connecting glassware to and including front-half of filter holder	Rinse with acetone, placed in glass jar, level marked and labeled.

The filter catch, and acetone probe rinses were gravimetrically determined and combined to calculate total PM emission rates. The analysis of the PM sample fractions was performed in accordance with EPA Method 5 procedures. Sample analytical QA included a field and trip blank preparation and analytical determinations.

4.2.2 Flue Gas Flow Rate

EPA RM 1 & 2 were utilized to establish the exhaust gas velocity profile. The velocity measurements were performed in accordance with EPA Methods 1 & 2. An "S" type Pitot tube were used for the exhaust gas velocity and volumetric flow rate determination. Exhaust gas moisture content was determined by EPA Method 4. Impinger condensation and final silica gel collection comprised the collection media.

4.3 Quality Assurance

Stringent QA procedures were followed throughout the testing program. A summary of ELI's quality assurance program is presented in Appendix B. Close attention to details and proper handling procedures assures the quality of the samples, analysis and results. Appendix C presents typical data sheets utilized during execution of the field test portion of the program.

SECTION 5.0

SUMMARY TEST RESULTS

Testing was conducted on October 24, 2013. The crematory was charged with a single body as required by law, per each test run. The average particulate emissions were 0.015 grains/dscf corrected to 7% O_2, well within the permit allowable 0.08 grains/dscf@7% O_2. Summary test results are presented in Table 5-1 and additional results and calculations can be found in Appendix C.

Table 5-1
2099 - Long Island Cremations Inc.
Particulate Matter Emissions Summary Table
Dual Chamber Crematory

Date / Test I.D.		10/24/2013 Run 1	10/24/2013 Run 2	10/24/2013 Run 3	Average	Permit Limit
Operating Data:						
Charging Rate (lbs)		137.00	124.00	103.00	121.33	
Fuel Flow/min (scfm)		23.70	22.95	22.39	23.01	
Heat Input, MMBtu/hr		1.45	1.40	1.37	1.41	
Stack Conditions:						
Temp., F		1389.2	1395.9	1353.3	1379.5	
Vol. Flow Rate:						
wacfm		2,059.8	2,051.3	1,985.6	2,032.2	
dscfm		515.8	509.4	504.3	509.8	
O_2, % vol. dry		7.8	7.8	7.8	7.8	
CO_2, % vol. dry		8.0	8.0	8.0	8.0	
H2O, %		12.25	12.65	12.72	12.5	
Sample Train Data:						
Sample Time, min.		60.0	60.0	60.0	60.0	
Sample Volume, dscf		46.23	45.12	43.59	45.0	
Total Particulate Catch, PM mg		0.0	0.0	0.0	40.1	
Particulate Emissions (PM):						
lb/hr		0.063	0.066	0.051	0.060	------
gr/dscf		0.0144	0.0150	0.0118	0.0137	------
lb/MMBtu	(1)	0.0285	0.0299	0.0234	0.0273	------
mg/m³ @ 15% O2		0.0119	0.0124	0.0097	0.0113	------
gr/dscf @ 7% O2	(2)	0.0152	0.0160	0.0125	0.0146	0.08

Standard Conditions: 68 F., 29.92 in Hg. and Dry
Standard Cubic Feet: Cubic Feet at Standard Conditions
Stack Conditions: At Actual Stack Temperature, Pressure, Moisture and Volume
PM via EPA RM 5 from half catch
(1) Based on 1,020 Btu/Sscf
(2) Based on EPA Fuel 'F' Factor of 8,710; 8,710; 8,710; respectively per run.

Environmental Laboratories Inc., 53 Veith Street, Farmingdale, NY 11735 631.420.1366

ATTACHMENT 3

Summary of the emission estimation techniques, emission factors and emission rates

Pollutant	GAS COMBUSTION EMISSIONS				CREMATION EMISSIONS				Total (g/s)
	Emission Factor	Units	Source	Gas combustion Emissions (g/s)	Emission Factor	Units	Source	Cremation Emissions (g/s)	
Acetaldehyde	-	-	-	-	5.90E-05	kg/cremation	NPI	1.64E-05	1.6E-05
Aluminium	-	-	-	-	1.05E-02	lb/ton	AP-42 Ch 2.3	9.92E-05	9.9E-05
Antimony	-	-	-	-	1.37E-05	kg/cremation	NPI	3.81E-06	3.8E-06
Arsenic	3.20E-09	kg/m³ of gas	AP-42 Ch 1.4	6.45E-08	1.36E-05	kg/cremation	NPI	3.78E-06	3.8E-06
Barium	7.05E-08	kg/m³ of gas	AP-42 Ch 1.4	1.42E-06	3.24E-03	lb/ton	AP-42 Ch 2.3	3.06E-05	3.2E-05
Beryllium	1.92E-10	kg/m³ of gas	AP-42 Ch 1.4	3.87E-09	6.21E-07	kg/cremation	NPI	1.73E-07	1.8E-07
Cadmium	1.76E-08	kg/m³ of gas	AP-42 Ch 1.4	3.55E-07	5.03E-06	kg/cremation	NPI	1.40E-06	1.8E-06
Carbon Monoxide	0.001345574	kg/m³ of gas	BAAQMD Permit Handbook	2.71E-02	1.00E-01	kg/cremation	NPI	2.78E-02	5.5E-02
Chlorine	-	-	-	-	1.05E-01	lb/ton	AP-42 Ch 2.3	9.92E-04	9.9E-04
Chromium	2.24E-08	kg/m³ of gas	AP-42 Ch 1.4	4.52E-07	1.36E-05	kg/cremation	NPI	3.78E-06	4.2E-06
Chromium, hx	-	-	-	-	6.12E-06	kg/cremation	NPI	1.70E-06	1.7E-06
Cobalt	1.35E-09	kg/m³ of gas	AP-42 Ch 1.4	2.71E-08	7.94E-07	kg/cremation	NPI	2.21E-07	2.5E-07
Copper	1.36E-08	kg/m³ of gas	AP-42 Ch 1.4	2.74E-07	1.24E-05	kg/cremation	NPI	3.44E-06	3.7E-06
Dioxins and Furans as TCDD I-TEQs	-	-	-	-	1.40E-09	lb/body	BAAQMD Permit Handbook	1.76E-10	1.8E-10
Formaldehyde	1.20E-06	kg/m³ of gas	AP-42 Ch 1.4	2.42E-05	1.54E-05	kg/cremation	NPI	4.28E-06	2.8E-05
HBr	-	-	-	-	4.33E-02	lb/ton	AP-42 Ch 2.3	4.09E-04	4.1E-04
Hydrogen chloride	-	-	-	-	3.27E-02	kg/cremation	NPI	9.08E-03	9.1E-03
Hydrogen Fluoride	-	-	-	-	1.46E-03	kg/cremation	NPI	4.06E-04	4.1E-04
Iron	-	-	-	-	1.44E-02	lb/ton	AP-42 Ch 2.3	1.36E-04	1.4E-04
Lead	8.01E-09	kg/m³ of gas	AP-42 Ch 1.4	1.61E-07	3.00E-05	kg/cremation	NPI	8.33E-06	8.5E-06
Manganese	6.09E-09	kg/m³ of gas	AP-42 Ch 1.4	1.23E-07	5.67E-04	lb/ton	AP-42 Ch 2.3	5.36E-06	5.5E-06
Mercury	4.16E-09	kg/m³ of gas	AP-42 Ch 1.4	8.39E-08	1.55E-03	kg/cremation	NPI	4.31E-04	4.3E-04
Molybdenum	1.76E-08	kg/m³ of gas	AP-42 Ch 1.4	3.55E-07	-	-	-	-	3.5E-07
Nickel	3.36E-08	kg/m³ of gas	AP-42 Ch 1.4	6.77E-07	1.73E-05	kg/cremation	NPI	4.81E-06	5.5E-06
Nitrogen Dioxide	0.001601873	kg/m³ of gas	BAAQMD Permit Handbook	3.23E-02	3.56E+00	lb/ton	NPI	1.45E-01	1.8E-01
PAH (benzo(a)pyrene equivalents)	-	-	-	-	2.60E-05	kg/cremation	NPI	7.22E-06	7.2E-06
Particulate Matter (PM-10)	0.000121742	kg/m³ of gas	BAAQMD Permit Handbook	2.45E-03	3.86E-02	kg/cremation	NPI	1.07E-02	1.3E-02
PM2.5	-	-	-	-	3.47E-02	kg/cremation	NPI	9.64E-03	9.6E-03
Polychlorinated dioxins and furans (PCDFs)	-	-	-	-	4.90E-09	kg/cremation	NPI	1.36E-09	1.4E-09
Selenium	3.84E-10	kg/m³ of gas	AP-42 Ch 1.4	7.74E-09	1.98E-05	kg/cremation	NPI	5.50E-06	5.5E-06
Silver	-	-	-	-	2.26E-04	lb/ton	AP-42 Ch 2.3	2.14E-06	2.1E-06
Sulfur Dioxide	9.61124E-06	kg/m³ of gas	BAAQMD Permit Handbook	1.94E-04	7.39E-02	kg/cremation	NPI	2.05E-02	2.1E-02
Thallium	-	-	-	-	1.10E-03	lb/ton	AP-42 Ch 2.3	1.04E-05	1.0E-05
TOC	1.76E-04	kg/m³ of gas	AP-42 Ch 1.4	3.55E-03	2.99E-01	lb/ton	AP-42 Ch 2.3	2.83E-03	6.4E-03
Total PCBs	-	-	-	-	4.65E-05	lb/ton	AP-42 Ch 2.3	4.39E-07	4.4E-07
Total PM	-	-	-	-	4.67E+00	lb/ton	AP-42 Ch 2.3	4.41E-02	4.4E-02
Vanadium	3.68E-08	kg/m³ of gas	AP-42 Ch 1.4	7.42E-07	-	-	-	-	7.4E-07
VOCs	8.81E-05	kg/m³ of gas	AP-42 Ch 1.4	1.77E-03	1.02E-01	kg/cremation	NPI	2.83E-02	3.0E-02
Zinc Oxide	4.65E-07	kg/m³ of gas	AP-42 Ch 1.4	9.35E-06	1.60E-04	kg/cremation	NPI	4.44E-05	5.4E-05

ATTACHMENT 4

Analysis of TAPM-Generated Meteorological Data

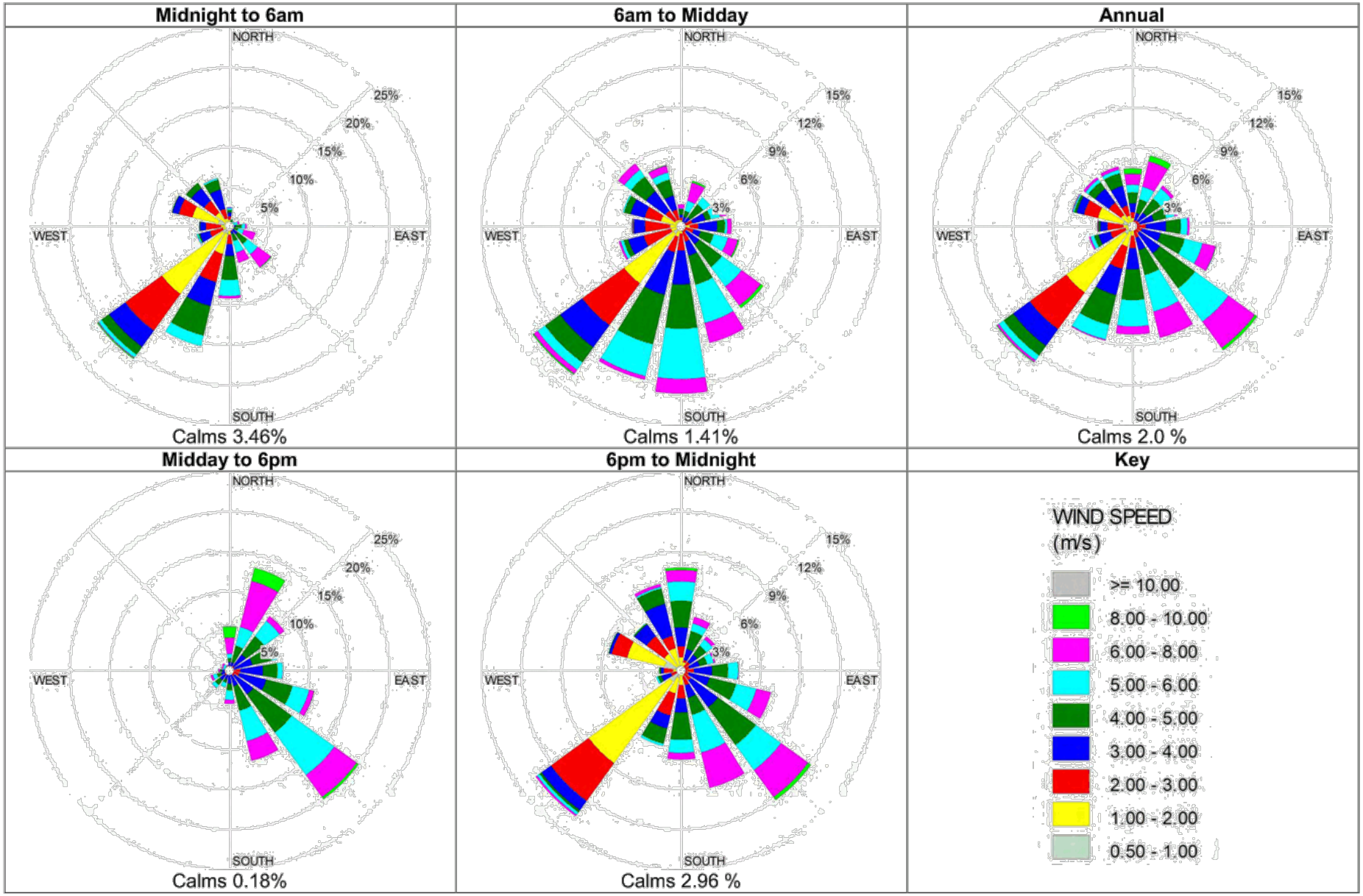

Figure A4.1 Diurnal wind roses for the Site as generated by CALMET

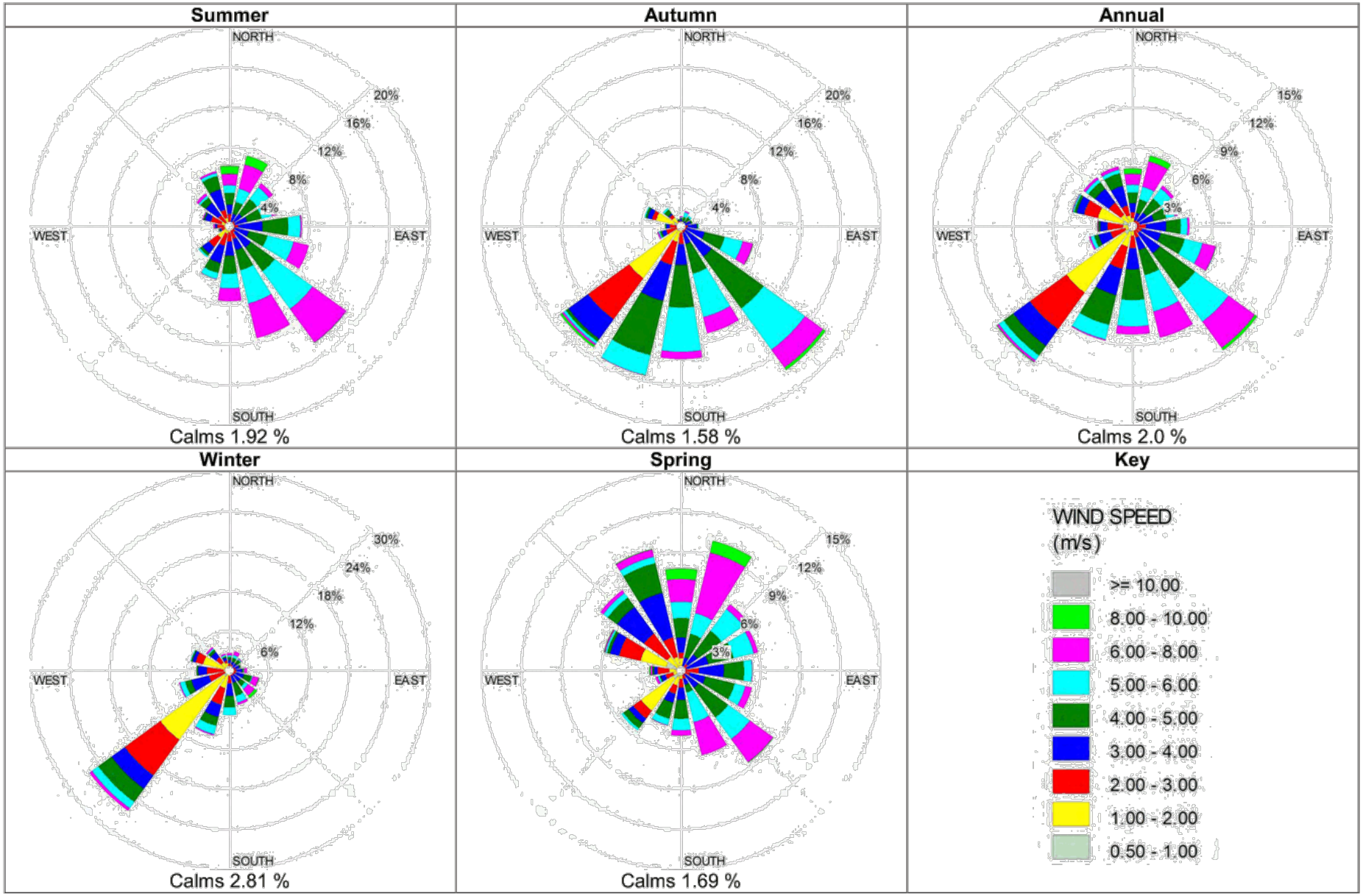

Figure A4.2 Seasonal wind roses for the Site as generated by CALMET

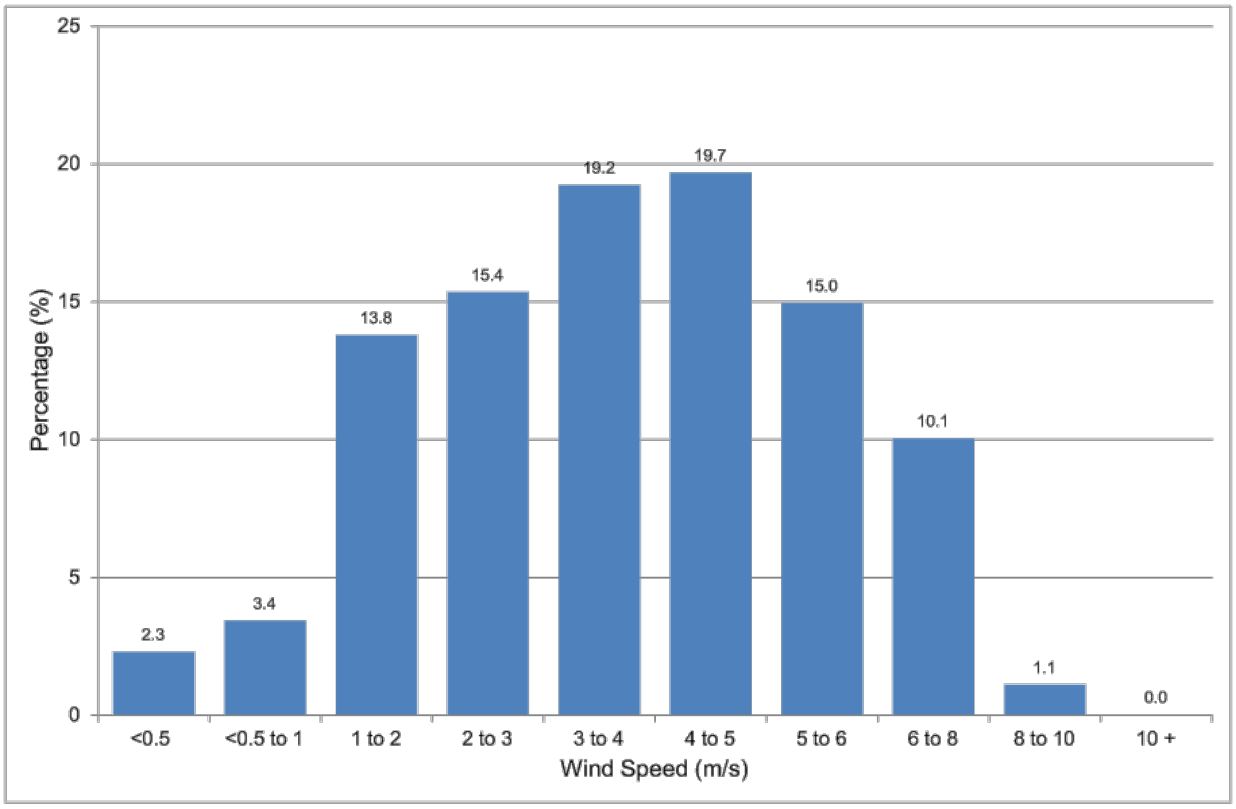

Figure A4.3 Wind frequency graph for the Site as generated by CALMET

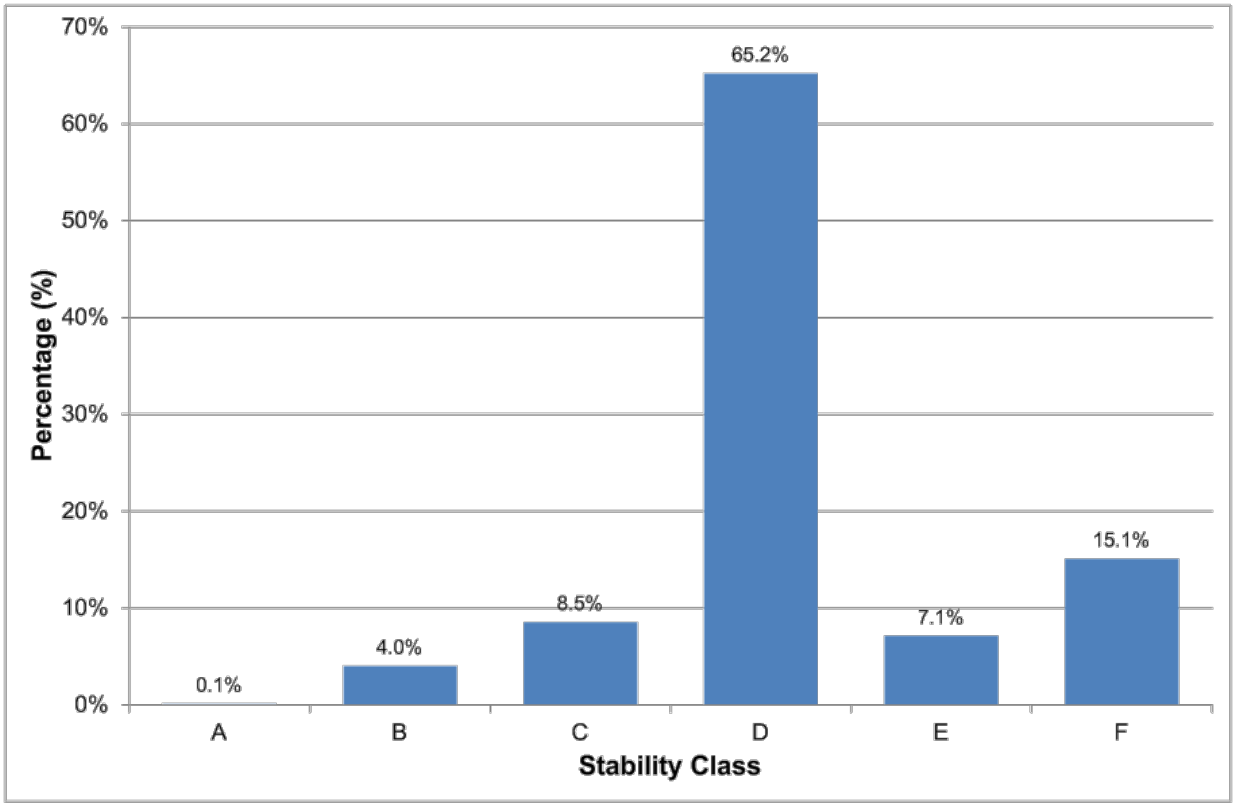

Figure A4.4 Stability Class Histograms for the Site as generated by CALMET

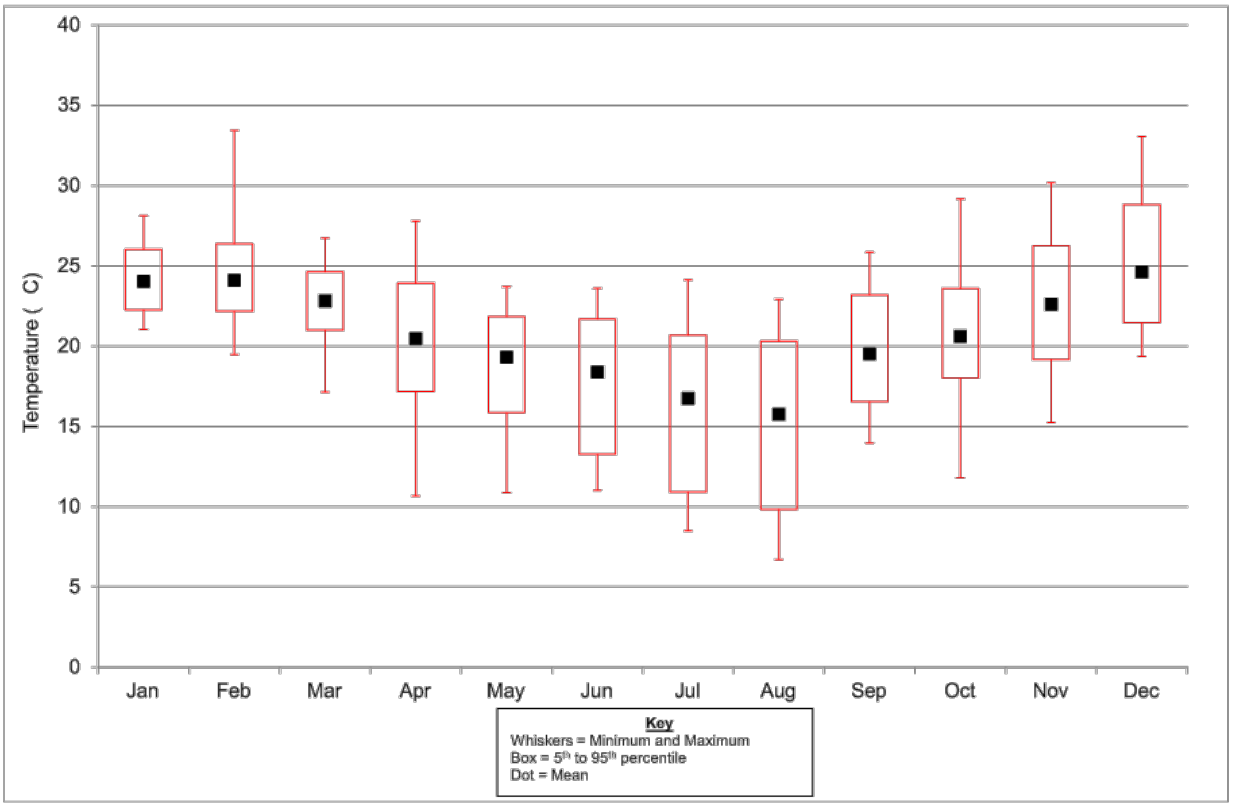

Figure A4.5 Box and Whisker plot of monthly temperature for the Site as generated by CALMET

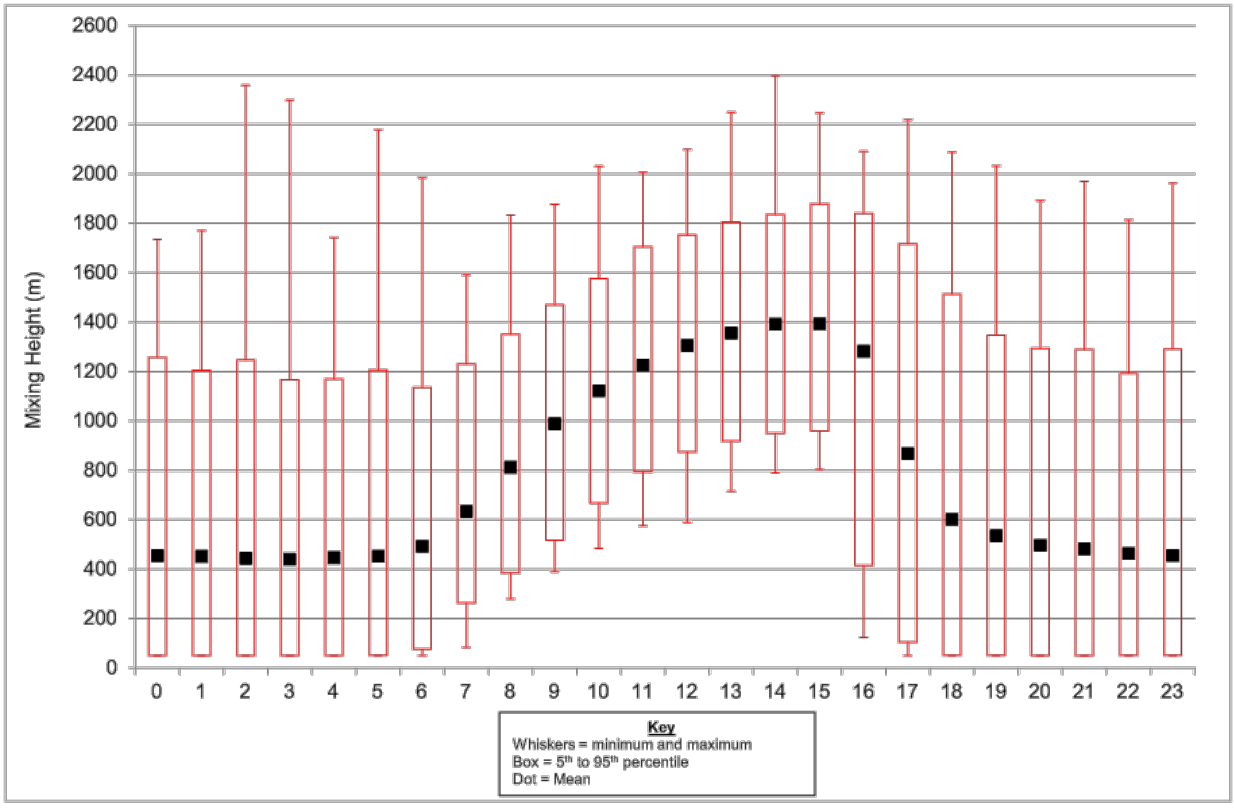

Figure A4.6 Box and Whisker plot of diurnal mixing height for the Site as generated by CALMET

ATTACHMENT 5

CALPUFF Contour Plots

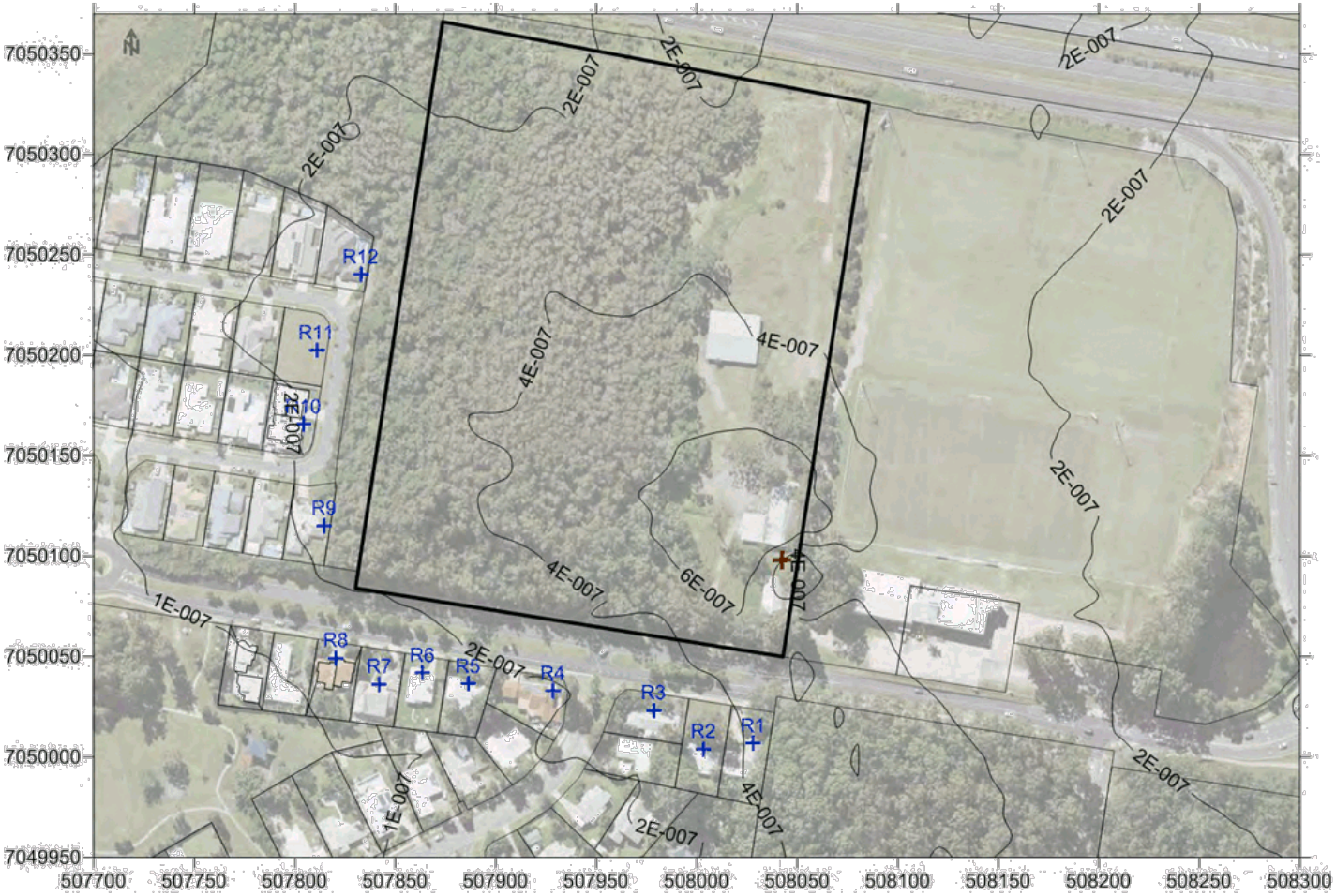

Figure A5.1	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	Dioxins and Furans as TCDD I-TEQs	1-hour 99.9th	0.000002	BCC City Plan 2014	µg/m³	2016-01-28

Figure A5.2	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	Hydrogen Fluoride	90-day	0.1 (For protected areas) 0.5 (For other than protected areas)	BCC City Plan 2014	µg/m³	2016-01-28

Figure A5.3	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	Mercury	1-hour 99.9th	1.8	BCC City Plan 2014	µg/m³	2016-01-28

Figure A5.4	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	Mercury	Annual	1.1	BCC City Plan 2014	µg/m³	2016-01-28

Figure A5.5	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	Mercury	Annual	1	TA Luft Trigger Levels	µg/m²/day	2016-01-28

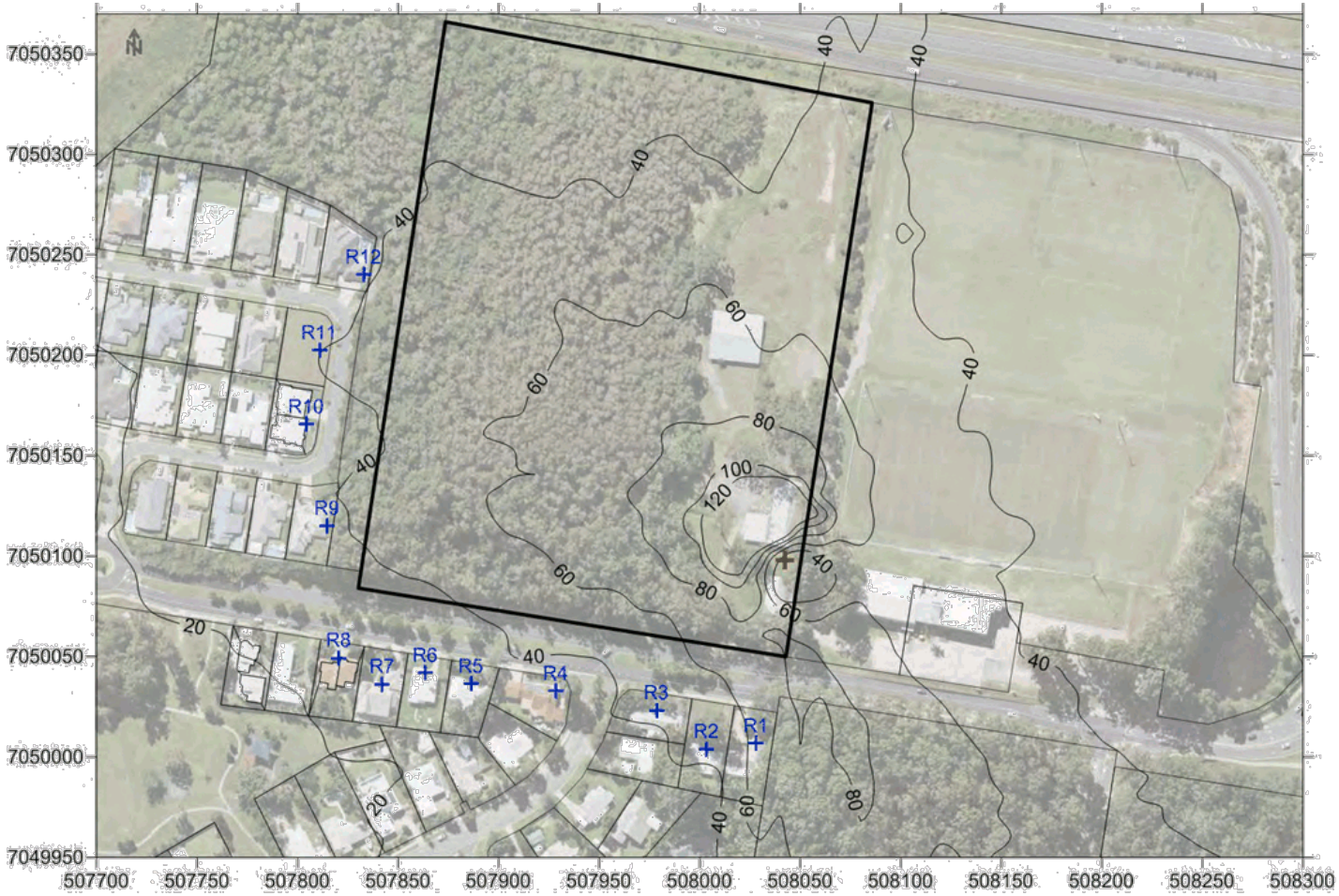

Figure A5.6	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	Nitrogen Dioxide	1-hour 99.9th	250	BCC City Plan 2014	µg/m³	2016-01-28

Figure A5.7	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	Nitrogen Dioxide	Annual	62	BCC City Plan 2014	µg/m³	2016-01-28

Figure A5.8	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	PAH (benzo(a)pyrene equivalents)	Annual	0.0003	BCC City Plan 2014	µg/m³	2016-01-28

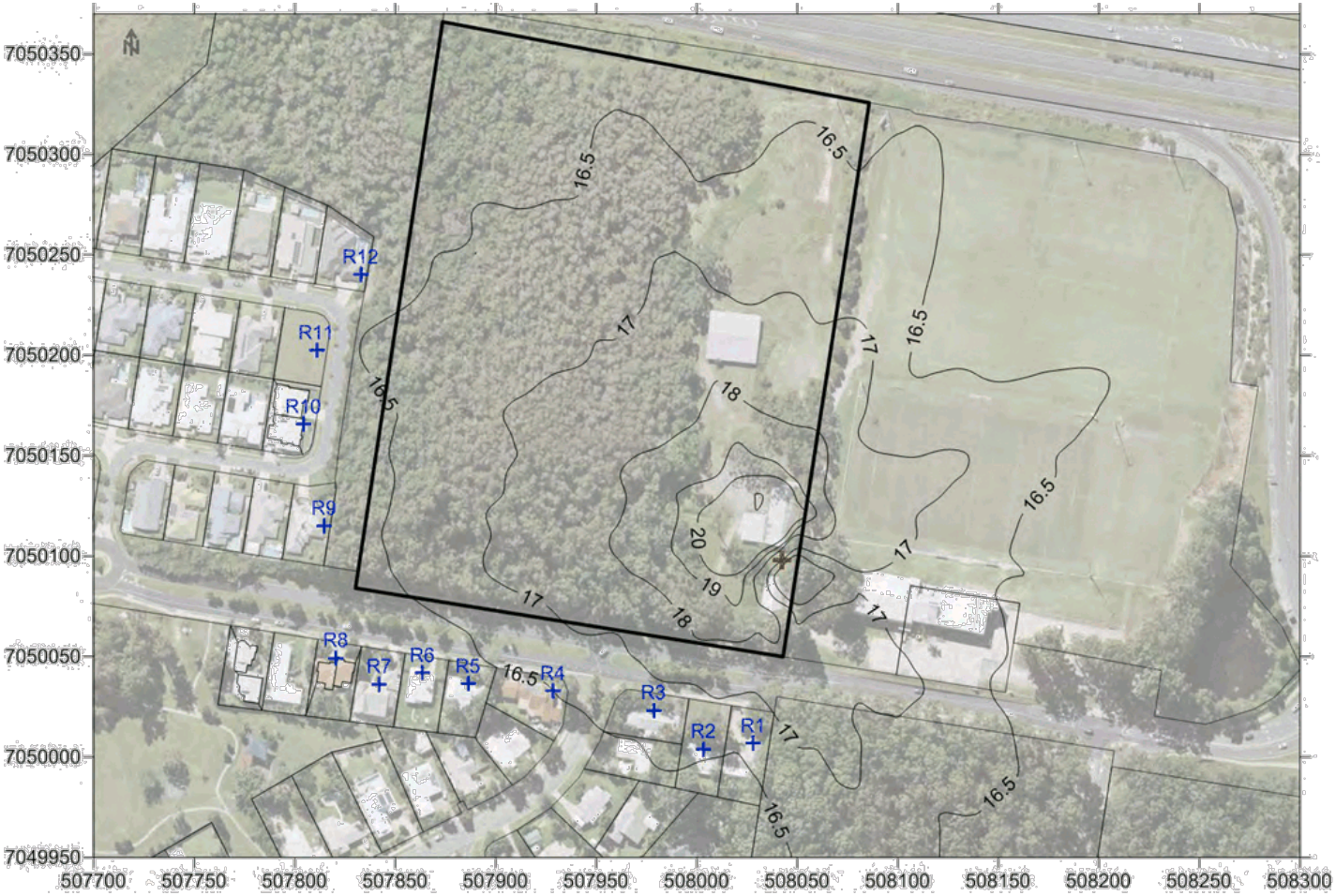

Figure A5.9	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	PM_{10}	24-hour	50	BCC City Plan 2014	µg/m³	2016-01-28

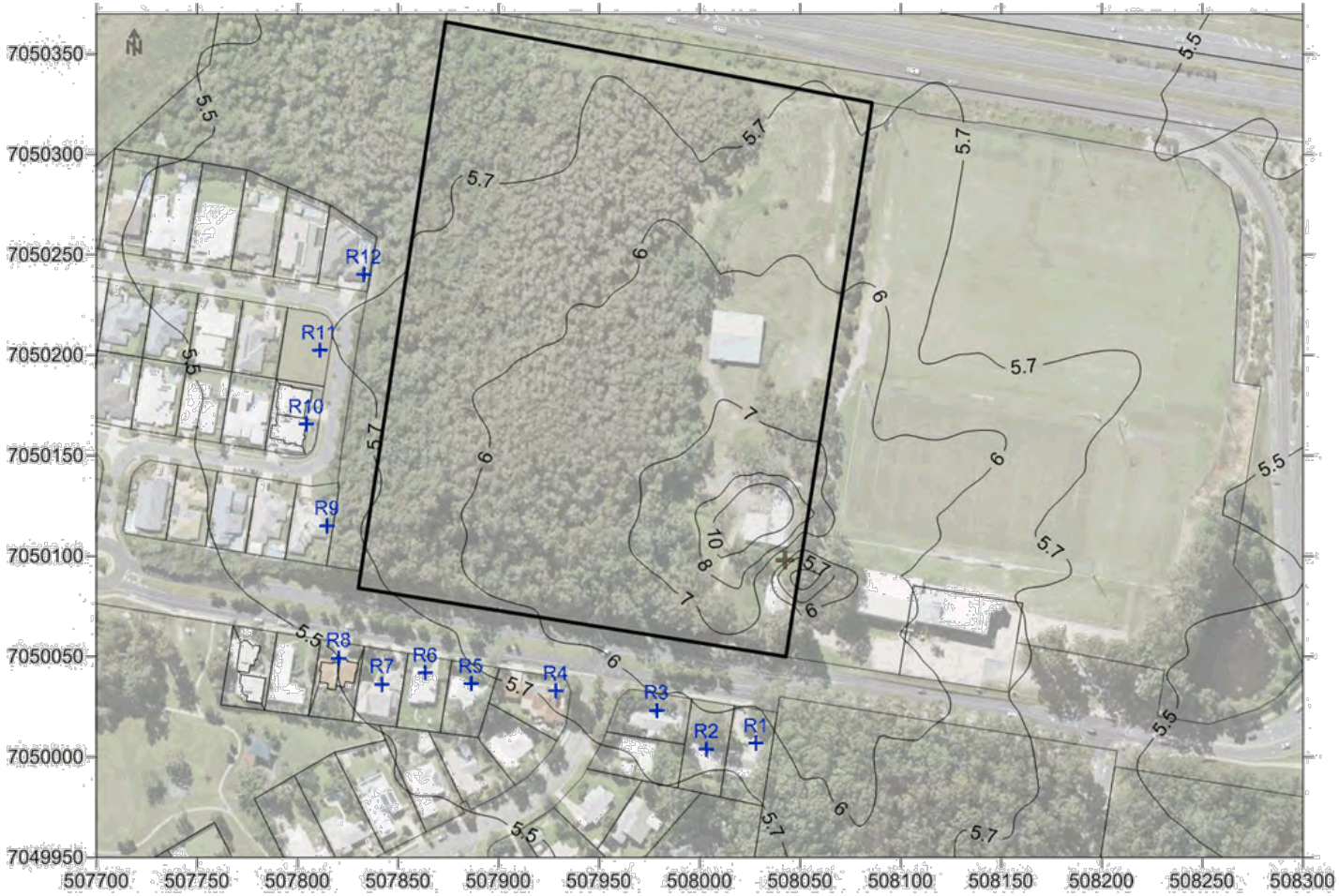

Figure A5.10	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	$PM_{2.5}$	24-hour	25	BCC City Plan 2014	µg/m³	2016-01-28

Figure A5.11	Pollutant	Averaging Period	Objective	Source	Units	Date
mwa ENVIRONMENTAL	$PM_{2.5}$	Annual	8	BCC City Plan 2014	µg/m³	2016-01-28