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Tony MacKenzie | Project Manager, Grocon
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Via email: tonymackenzie@grocon.com.au

25 March 2019

Reference: 0468089

Dear Tony,

Subject: Grocon Group Ribbon Development Response

ERM has been engaged by Grocon to provide a brief letter detailing a review of the proposed monitoring system and a response to the Road and Maritime Services (RMS) information request (dated 13 March 2019 - document reference SYD15/01513/13) and the Department of Planning & Environment (DPE) information request (Dated 15 March 2019 – document reference SSD 7388 MOD 7).

1. BACKGROUND

ERM (formerly Pacific Environment; PE) has previously assessed potential air quality impacts of the Cross City Tunnel Vent (CCTV) emissions on the proposed Ribbon Sydney development (the Development), (PE, 2013, 2015, 2016a, 2016b, 2016c, ERM, 2018), due to commence operations in late 2019 – early 2020.

These studies involved the assessment of potential nitrogen dioxide (NO_2) impacts using conventional regulatory environmental atmospheric dispersion models (PE, 2013, 2015), with subsequent refinement using Computational Fluid Dynamic (CFD) modelling (PE, 2016a).

More recently, Grocon has sought to understand the nature of potential air quality impacts for an open roof design. This design would feature an open-top deck and pool area within Level 29 and Level 30 of the development (the Level 29 pool area).

Accordingly, ERM was then commissioned to undertake a review of previous dispersion modelling and CFD analyses to understand potential air quality impacts in the vicinity of the Level 29 pool area (PE, 2016b), with subsequent refined assessment (2016c).

Additional analysis to consider the real-world operational data from the CCTV was also completed by ERM (2018).

1.1 Scope of Work

ERM was engaged by Grocon to conduct the following scope of works:

- Review current Grocon documentation to provide suggested changes to NO_2 alert criteria.

- Review proposed Lear Siegler monitoring equipment design.
- Review of monitoring system to include commentary on the sample inlet locations.
- Discuss monitoring design with Lear Siegler to confirm practicability of system set up.
- Provide brief response to Department of Environment & Planning / RMS submissions.

Corresponding discussion is provided in the following sections.

2. SUGGESTED CHANGES TO NO_2 ALERT CRITERIA

The *Updated Plan of Management* previously submitted by Grocon noted alert / alarm criteria based on NO_x concentrations. We acknowledge that this criteria should be applied for NO_2 concentrations.

To understand the existing ambient air quality conditions, the daily 1 hour maximum NO_2 concentrations at the Rozelle air quality monitoring station were analysed (OEH, 2019). Data from 2016 to 2019 (to date) were reviewed and the statistics are presented in **Figure 2.1**.

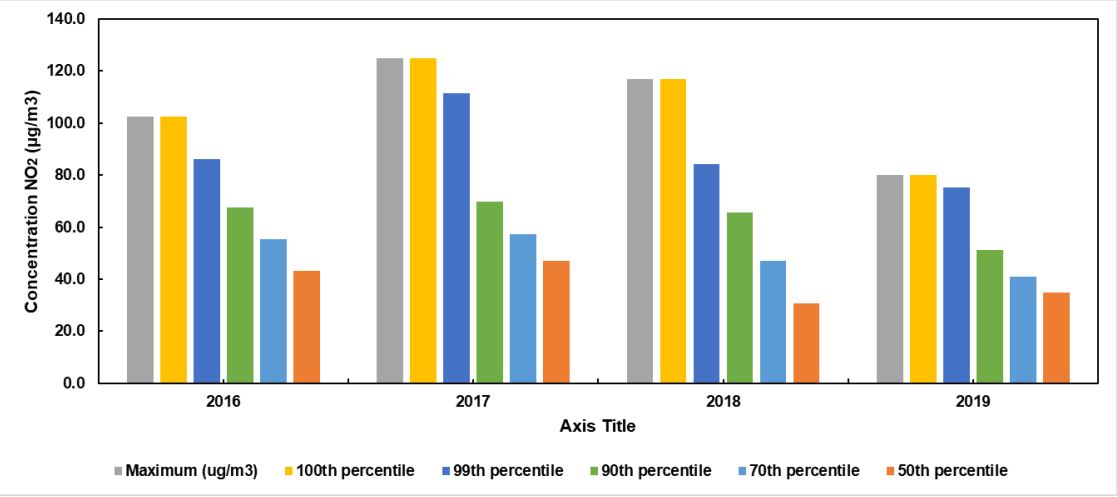

Figure 2.1: Rozelle 1-hour NO_2 Concentration Trend Analysis, 2016-2019

Similarly, a review of maximum 1-hour average NO_2 concentrations across multiple ambient air quality monitoring stations across Sydney is presented in **Figure 2.2**.

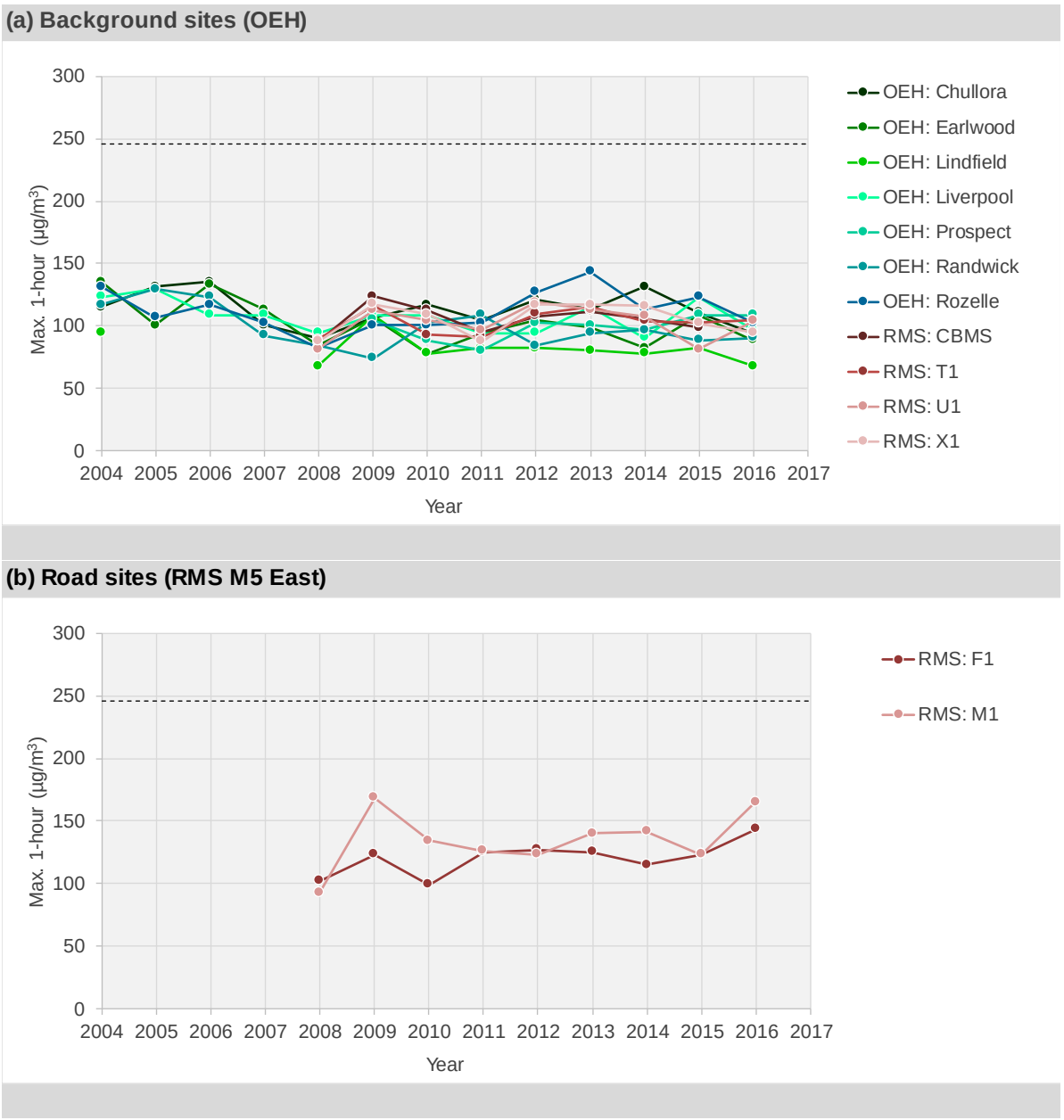

Figure 2.2: Maximum 1-hour NO_2 Concentration Trend Analysis at Sydney Ambient Air Quality Monitoring Sites, 2014-2017

Based on the review of the above ambient air quality monitoring data, revised NO_2 alert/alarm concentrations and proposed actions are presented in **Table 2.1**.

These alert/alarm concentrations are nominated to balance the competing drivers of being adequately protective of health while not triggering alerts as a result of expected ambient air quality concentrations within an urban environment.

Table 2.1: Suggested NO_2 Alert Criteria

Alert/Alarm Level	NO_2 Concentration ($\mu g/m^3$)	Rolling Averaging Period	Action Taken
Alert level 1	246	15-minute	Raise a warning text/email to pool area supervisory management. Check for local sources of NO_2 (such as outdoor gas heating) that may trigger this, and shut down as practicable.
Alert level 2	246	30-minute	Raise a warning alarm (strobe) and text/email to pool area supervisory management to advise patrons to be ready to vacate
Alarm level	246	1-hour	Raise a warning alarm (strobe + audible) advising patrons to evacuate the pool wet deck immediately.
Reoccupation level	<200	1-hour	Patrons are refused access, the pool access locked and the pool area is fully vacated of any occupants until such time as concentrations below this level are achieved.

3. REVIEW OF MONITORING EQUIPMENT DESIGN

The proposed location of the NO_2 analyser equipment on Level 23 and the NO2 sensor tube locations on Level 22 are presented in **Figure 3.1** and **Figure 3.2**.

Please note that these figures should read nitrogen dioxide analyser and nitrogen dioxide sample inlets as opposed to ‘sensor tubes’.

The proposed monitoring equipment is the 2B Technologies Model 405 nm $NO_2/NO/NO_x$ Monitor. This monitor is an US EPA Federal Equivalent Method for NO_2 monitoring.

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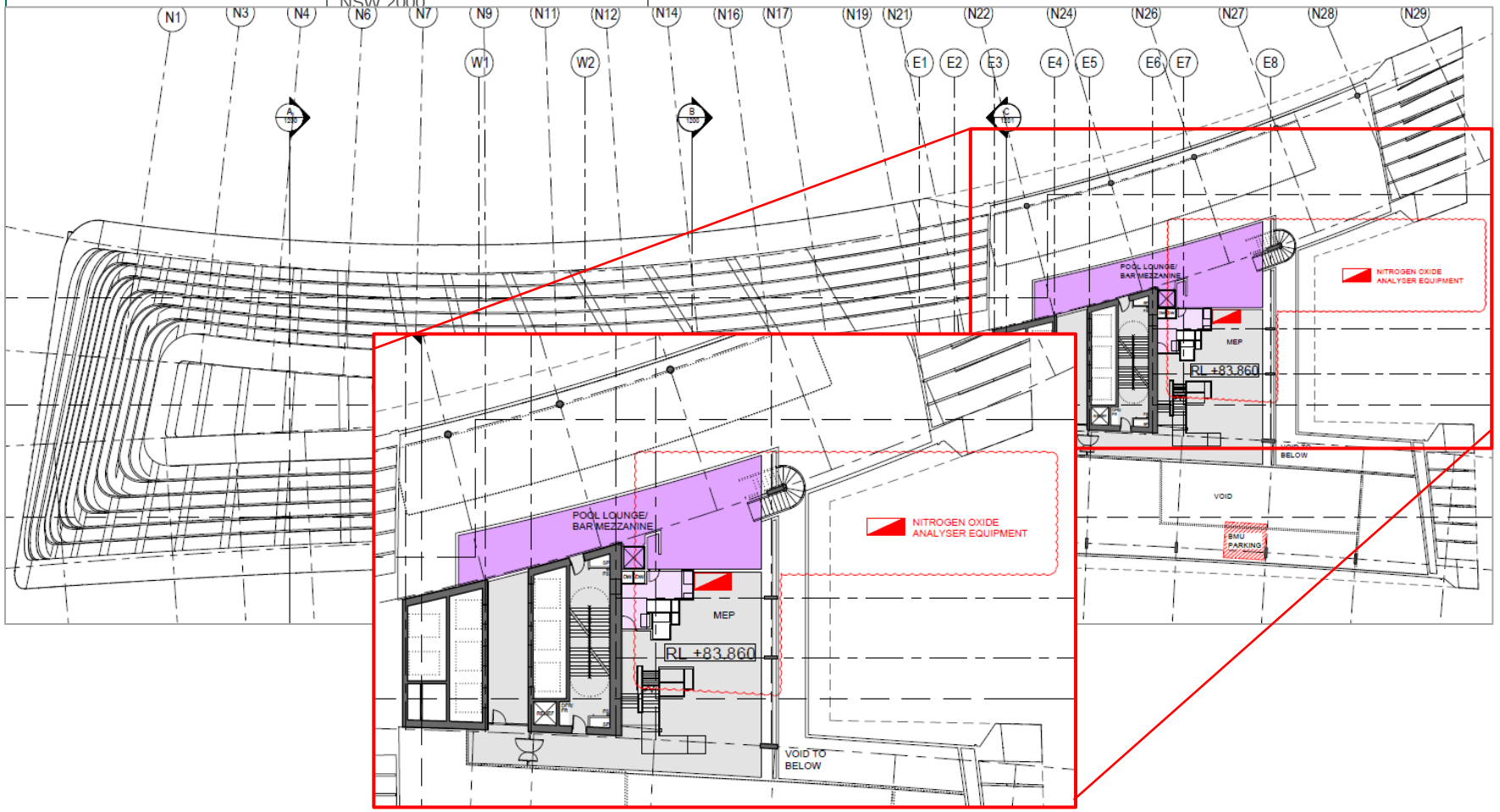

Figure 3.1: NO_2 Analyser Equipment Location on Level 23

Figure 3.2: NO_2 Sensor Locations on Level 22

4. REVIEW OF SAMPLE INLET LOCATIONS

Figure 3.2 shows four sample inlets spaced around the pool deck area. Following discussions with the equipment provider, Lear Siegler, it is anticipated that all sample inlets will draw air to a central sampling manifold within the plant room (refer **Figure 3.1**).

A composite sample of the pool area air will then be sampled by the analyser located within the plant room, with outputs handled by a data logger and modem configuration to enable alerts/alarms to be triggered.

It is considered that drawing air from these sample inlet locations will result in a composite air sample that is representative of the potential exposure to nitrogen dioxide experienced by occupants of the pool deck area.

Air sampling has been taken from the locations where people may be exposed (i.e. the pool deck area). It is not considered appropriate / meaningful to sample air from the building façade or roof, as these locations are not representative of areas where exposure of staff / patrons may typically occur.

5. SYSTEM SET UP AND CALIBRATIONS

Discussions with the equipment provider indicate that the proposed equipment and sampling configuration is fit for purpose.

It is anticipated that the nitrogen dioxide analyser will be set up for nightly Span and Zero checks, with monthly / quarterly / six monthly and annual maintenance visits from a technician.

It is noted that the equipment provider anticipates being able to issue reports to the requirements of the National Association of Testing Authorities (NATA) for this method.

6. RESPONSE TO RMS SUBMISSION

ERM's responses to the air quality related matters in the information request from RMS dated 13 March 2019 (document reference SYD15/01513/13) are provided below.

RMS Item 2: *The pollutant of concern is NO_2, not NO_x as there is no health based criteria for NO_x.*

As such, the action levels in the proposed plan of management should be revised. Roads and Maritime require the report to be based on total ambient concentrations NO_2 and reviewed by an independent air quality consultant.

ERM's Response: Please refer to Section 2 of this document that updates the proposed NO_2 alert/alarm levels.

RMS Item 3 a): *The site proposes installing four nitrogen oxide sensor tubes and analysers, which may not prevent comprised air quality and may only trigger after air quality has been compromised, additional details of regarding the rationale behind the proposed number of sensors, and whether pool supervisory management will receive the text/email notifications (as documented in the Plan of Management)*.

ERM's Response: Please refer to Section 2 to Section 4 of this document. This provides rationale behind the proposed number of sample inlets (NB: these are not sensors per se) and alert system.

Providing an alert based on a rolling 15-minute averaging period is considered suitably pre-emptive and protective of health given that health criteria are based on the same concentration value, however over a one-hour period.

7. RESPONSE TO DEPARTMENT OF PLANNING & ENVIRONMENT COMMENTS

ERM's responses to the air quality related matters in the information request from DPE dated 15 March 2019 (document reference SSD 7388 MOD 7) are presented below.

DPE Item: *Plans - Clarify the rationale for the proposed number and location of NO_2 sensors. If the sensors are to be located externally, provide appropriately scaled drawings (including elevations) clearly illustrating the proposed sensors, mounting brackets and any weatherproofing or other housing proposed. Consideration should be given to minimising the impact to the external appearance of the building.*

ERM's Response:

Please see Section 3 of this document for the proposed locations of the NO_2 sample inlets (NB: not sensors). The sample inlets will be located on the underside of the open roofing on Level 23.

8. CLOSURE

We trust that the above addresses the issues identified. Should you have any questions, please do not hesitate to contact the undersigned.

Yours sincerely,

Damon Roddis
Partner – Air Quality and Greenhouse

REFERENCES

OEH (2019) Search for air quality data, NSW Government – Office of Environment & Heritage retrieved from: https://www.environment.nsw.gov.au/AQMS/search.htm

PE (2013) Air Quality Impacts for Redevelopment of 31 Wheat Rd Revised Design, Pacific Environment, August 2013.

PE (2015) The Ribbon Air Quality Assessment 2015 Revised Design, Pacific Environment, November 2015.

PE (2016a) The Ribbon – Air Quality Assessment, Final Report, Pacific Environment, 11 October 2016.

PE (2016b) The Ribbon – Level 29 Pool Area Assessment, Pacific Environment, 23 December 2016.

PE (2017) The Ribbon – Refined Assessment of Level 29 Pool Area, Pacific Environment, 12 August 2017.

ERM (2018) Assessment of Level 29 Pool Area with Operational CCTV Data, ERM , 3 March 2018.