Review of Yara Pilbara Nitrates Pty Ltd Commissioning Report (September 2017) for the Technical Ammonium Nitrate Plant in Relation to Human Health

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March 2018

Executive Summary

Results provided in the Yara Pilbara Nitrates Pty Ltd (YPN) Commissioning Report (29/09/2017) and Appendix 5 for the new ammonium nitrate plant show that a large number of emissions of the toxic gas, nitrogen dioxide, have occurred and threaten the health of people travelling to Hearson's Cove or Deep Gorge. The emissions have produced gas concentrations in the vicinity of the road to Hearson's Cove up to 23 times higher than stated in the Australian health standard guidelines. Evidence in the Report shows that most of the large releases of nitrogen dioxide occur outside daylight hours and have not been reported to government.

High nitrogen dioxide emissions appear to have continued when the plant was largely commissioned and operating normally. An independent review of the data in the Commissioning Report by the University of Adelaide Exposure Science and Health Centre concluded '*The pollutants would result in severe health outcomes for people exposed, particularly for people with asthmatic or other respiratory conditions. Due to the nature of these inorganic pollutants, the consequences of such high-level exposure are severe and should not be underestimated by industry or government*.'

The severe health hazards from operation of the YPN ammonium nitrate plant had previously been acknowledged by the former Premier of Western Australia, Colin Barnet, in a statement submitted to the Senate Inquiry into '*The protection of Aboriginal rock art of Burrup Peninsula'*.

The current WA Government has an obligation to ensure emissions from the ammonium nitrate plant are reduced to levels below those that endanger human health. The WA Government must insist that nitrogen dioxide emissions are continually monitored and controlled. All emissions exceeding 102.6 mg/m^3, the maximum allowable in the YPN ammonium nitrate plant Works Approval (W4701/2010/1), must be reported to Government and acted upon to ensure the safety of people in the vicinity of the plant.

Introduction

Yara Pilbara Nitrates Pty Ltd (YPN) was granted Works Approval W4701/2010/1 by the Department of Environment Regulation under Part V of the *Environmental Protection Act 1986* (EP Act) for the construction and commissioning of a Technical Ammonium Nitrate (TAN) Plant on Burrup Peninsula on 25 July 2013. YPN undertook a commissioning of the plant from April 2016 to 15 September 2017. A report on the commissioning phase of the plant (600-200-REP-YPN-0001) was completed on 29 September 2017 and provided to the Western Australian Government.

Following appropriate consultation with YPN, the Commissioning Report and Appendix 5 detailing emissions from the nitric acid stack was provided to one of the authors of this report (JLB) on 22 January 2018.

Appendix 5 of that report provides results for NO_x, ammonia and nitrous oxide emissions from the nitric acid plant every 15 minutes from 24 May 2016 to 15 September 2017. The results were provided as concentration in the air (mg/m^3) and emission rate (g/s). The more than 46,000 lines of data were transferred from the Appendix 5 pdf file to an Excel spreadsheet for analysis.

The results were analysed in relation to their likely effect on the health of humans in proximity to the plant. This analysis was supported by a photograph taken by a Karratha resident on 29 April 2017, showing a yellow cloud of nitrogen dioxide emitted from the plant and crossing the road to Hearson's Cove. NO_x emissions data from the nitric acid plant stack at the time of the photograph were used to identify the emission concentration and emission rate associated with the photographed nitrogen dioxide cloud. The results were used to determine the number of occasions and the time of release when emission from the stack exceeded that responsible for the photographed cloud of nitrogen dioxide.

Nitrogen dioxide is a health risk to humans and a major cause of respiratory illness in cities such as Delhi and Shanghai where it is emitted largely from vehicle exhausts. Nitrogen dioxide is heavier than air and concentrates near ground level where humans are exposed. Results from Appendix 5 were provided to Professor Dino Pisaniello from the Adelaide University Exposure Science and Health Centre for assessment of likely risks to human health.

Photographic evidence

The picture below (Figure 1) was taken at 4.06 pm on 29 April 2017 by a local Karratha resident while driving to Hearson's Cove on Burrup Peninsula. The yellow cloud is nitrogen dioxide emanating from the YPN ammonium nitrate plant seen to the far left of the road.

Figure 1: Yellow nitrogen dioxide cloud visible at centre of picture (from ABC North West, Appendix 1).

Nitrogen dioxide is a toxic gas with an Australian health guidance standard of 0.24 mg/m^3 for short term exposure and 0.06 mg/m^3 for long-term average annual exposure (Jalaludin and Cowie, 2012).

Nitrogen dioxide becomes visible as a yellow coloured gas cloud once the concentration reaches 0.47 ppm (0.99 mg/m^3) at a distance of one mile (Leighton, (1961) as cited in Maga (1965)). Thus, the nitrogen dioxide in the visible cloud photographed has a *minimum* concentration of 0.99 mg/m^3 and may be far greater. This minimum concentration for visualisation of nitrogen dioxide released by YPN is at least four-times greater than the Australian health standard guideline for safety.

The photographer reported that the yellow cloud drifted to Hearson's Cove, where YPN personnel told people on the beach to leave. This evidence is contrary to YPN being reported by the Karratha ABC as saying '*...no health risks were posed by the emissions*' (ABC North West, 2017. Appendix 1).

Nitric acid stack emissions associated with the photographed nitrogen dioxide cloud

A report of the photographed nitrogen dioxide release by YPN to the Western Australian Government shows the high nitrogen dioxide emissions took place from 15.58 to 16.07 hours on 29 April 2017, or approximately for 10 minutes. The YPN Commissioning Report states that emissions of NO_x (nitrogen dioxide) from the nitric acid plant stack at 16.00 hours on that day were 579.4437 mg/m^3 and 13.7948 g/s. These nitrogen dioxide emission levels observed at the time of the photographed cloud were used to determine the number of times similar exposure events, which are at least four-fold in excess of the Australian health standard guideline for safety, have occurred during the commissioning phase of the plant.

Photographed nitrogen dioxide cloud was not an isolated incident

Despite there being no incidents of large releases of nitrogen dioxide, other than the one on 29 April 2017, being reported to the Western Australian Government (QON C218, Appendix 2), a review of the emissions from the nitric acid stack provided in the YPN Commissioning Report shows that a concentration associated with the photographed cloud of 579 mg/m^3 was exceeded on 233 occasions (Figure 2) and a release greater than 13.79 g/s was exceeded on 73 occasions (Figure 3).

These high emissions are shown in Figures 2 and 3 in relation to time of day. Only one incident with nitrogen dioxide releases in the photographed visible range (13.79 g/s or more) occurred during full daylight hours (Figure 3) and that was the one photographed by a Karratha resident and YPN reported to the WA Government.

Many nitrogen dioxide releases were at rates above that of the photographed cloud

The concentrations and release rates of nitrogen dioxide occurring during commissioning of the plant were up to six-times greater than those associated with the nitrogen dioxide cloud photographed. Using the conversion that a stack nitrogen dioxide release of 579 mg/m^3 is, at least, equivalent to 0.99 mg/m^3 for people on the road to Hearson's Cove, the highest recorded release of 3275 mg/m^3 from the stack (21/02/2017 06:00:00) is associated with an equivalent concentration of 5.6 mg/m^3. This short-term exposure to nitrogen dioxide for

people accessing Hearson's Cove is 23 times greater than the Australian health standard guideline for safety.

Graphs of emissions provided in the YPN Commissioning Report indicate the plant was operating under normal conditions for most of the time from July 2017 to the end of commissioning. However, Figure 4 below shows that emissions exceeded 13.79 g/s on 33 occasions when the plant was operating 'normally' during August and September 2017. Nitrogen dioxide release at 18.15 hours for most days from 20 August 2017 to the end of the plant commissioning exceeded 20 g/s, well above the observable range.

This observation of large nitrogen dioxide releases during normal operating times suggests that the ammonium nitrate plant will be a continuous health hazard to people, whether employees, residents, tourists or visitors, within close proximity to the plant including those visiting Hearson's Cove or rock art sites at Deep Gorge.

Nitrogen dioxide emissions are a serious health hazard

Data contained in the YPN Appendix 5 Commissioning Report were provided to Professor Dino Pisaniello, Professor of Occupational and Environmental Hygiene, at the University of Adelaide Exposure Science and Health Centre for analysis in relation to danger to human health.

The resulting report contained the following conclusion: '*If of sufficient intensity, as suggested from the emissions data, the pollutants (from the nitric acid plant) would result in severe health outcomes for people exposed, particularly for people with asthmatic or other respiratory conditions. Due to the nature of these inorganic pollutants, the consequences of such high-level exposure are severe and should not be underestimated by industry or government*.'

The report indicated that the sever effects of the emission would be evident from short-term exposures of around 10 minutes as occurred on the day the nitrogen dioxide cloud was photographed. Results from the Commissioning Report show that levels of nitrogen dioxide emission concentration associated with the photographed cloud were maintained for more than one hour on 15 occasions.

Western Australian Government has known the Ammonium Nitrate plant will be a health hazard

Danger to public health from the ammonium nitrate plant has been acknowledged for some time by the WA Government. In a document submitted to the Senate Inquiry into '*The protection of Aboriginal rock art of Burrup Peninsula'*, the former Premier of Western Australia, Colin Barnett, wrote:

"*The rationale for wishing to see the MLKC (Murujuga Living Knowledge Centre) moved away from Hearson Cove is primarily one of public health and safety, rather than because of the visual effect of the Yarra Technical Ammonia Plant. …. Preliminary discussions with relevant State agencies have indicated that the development of the MLKC at Hearson Cove could present an unacceptable risk to public health and safety."*

Conclusion

Evidence produced from the YPN Commissioning Report for the ammonium nitrate plant shows that numerous short-term emissions of nitrogen dioxide from the nitric acid plant stack are a continuing serious hazard to the health of humans within proximity of the plant including those travelling to Hearson's Cove or Deep Gorge.

The current WA Government has an obligation to ensure emissions from the ammonium nitrate plant are reduced to levels below those that endanger human health. The WA Government must insist that nitrogen dioxide emissions are continually monitored and controlled. All emissions exceeding 102.6 mg/m^3, the maximum allowable in the YPN ammonium nitrate plant Works Approval (W4701/2010/1), must be reported to Government and acted upon to ensure the safety of people in the vicinity of the plant. Future breaches of this limit should result in closure of the plant.

References

Jalaludin, B. and Cowie, C. (2012) Health risk assessment – preliminary work to identify concentration-response functions for selected ambient air pollutants. Report prepared for EPA Victoria. Respiratory and Environmental Epidemiology, Woolcock Institute of Medical Research, Sydney.

Leighton, P.A. (1961) Photochemistry of air pollution. Academic Press, New York.

Maga, J.A. (1965) Considerations in Setting Standards for Oxides of Nitrogen. Journal of the Air Pollution Control Association, 15:12, 561-564, DOI:10.1080/00022470.1965.10468423.

Figure 2: Time of day when Nitric Acid stack emissions exceeded 579 mg/m^3, the concentration when the nitrogen dioxide cloud was visible (arrow).

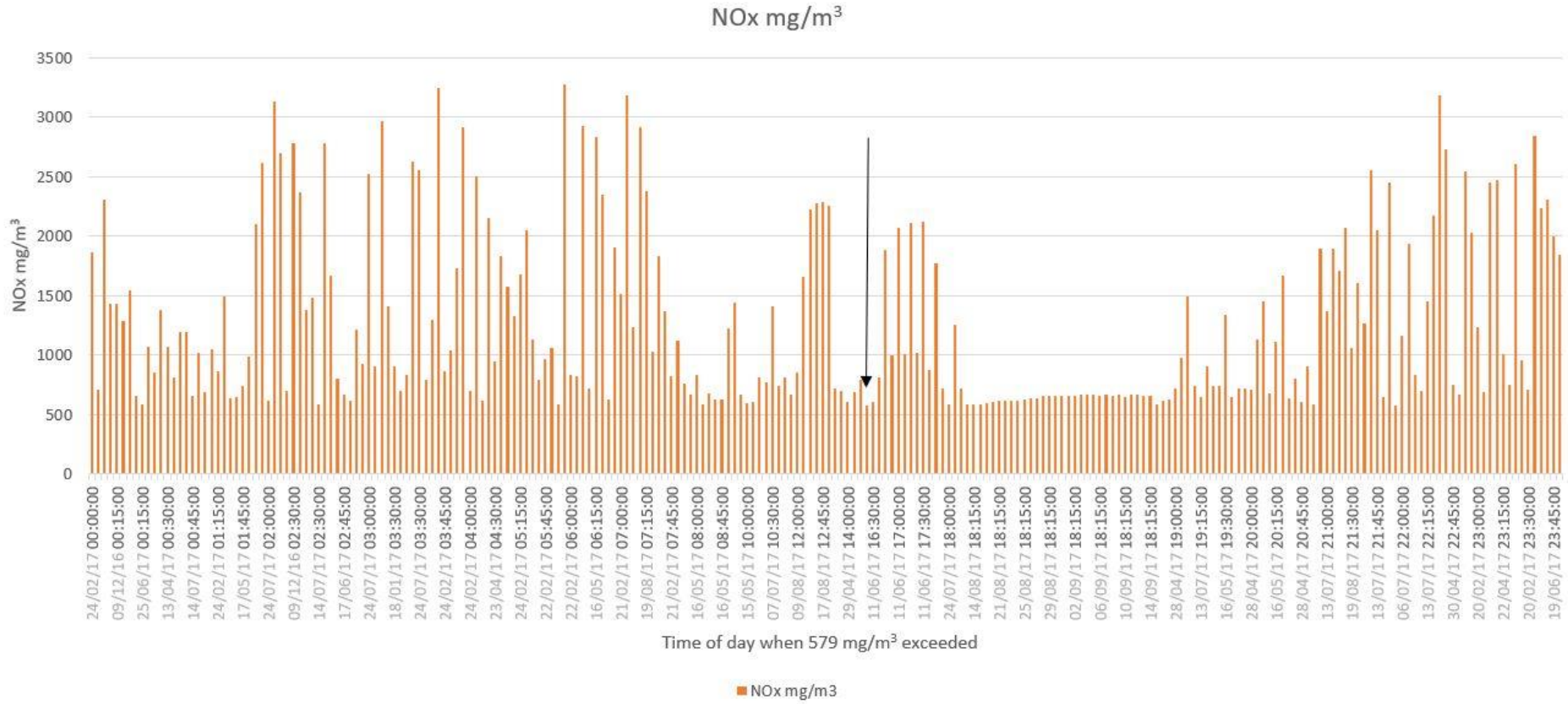


Figure 3: Time of day when Nitric Acid stack emissions exceeded 13.79 g/s, the concentration when the nitrogen dioxide cloud was visible. Only one emission occurred in full daylight between 06.00 and 18.15 and this was the one photographed (circled).

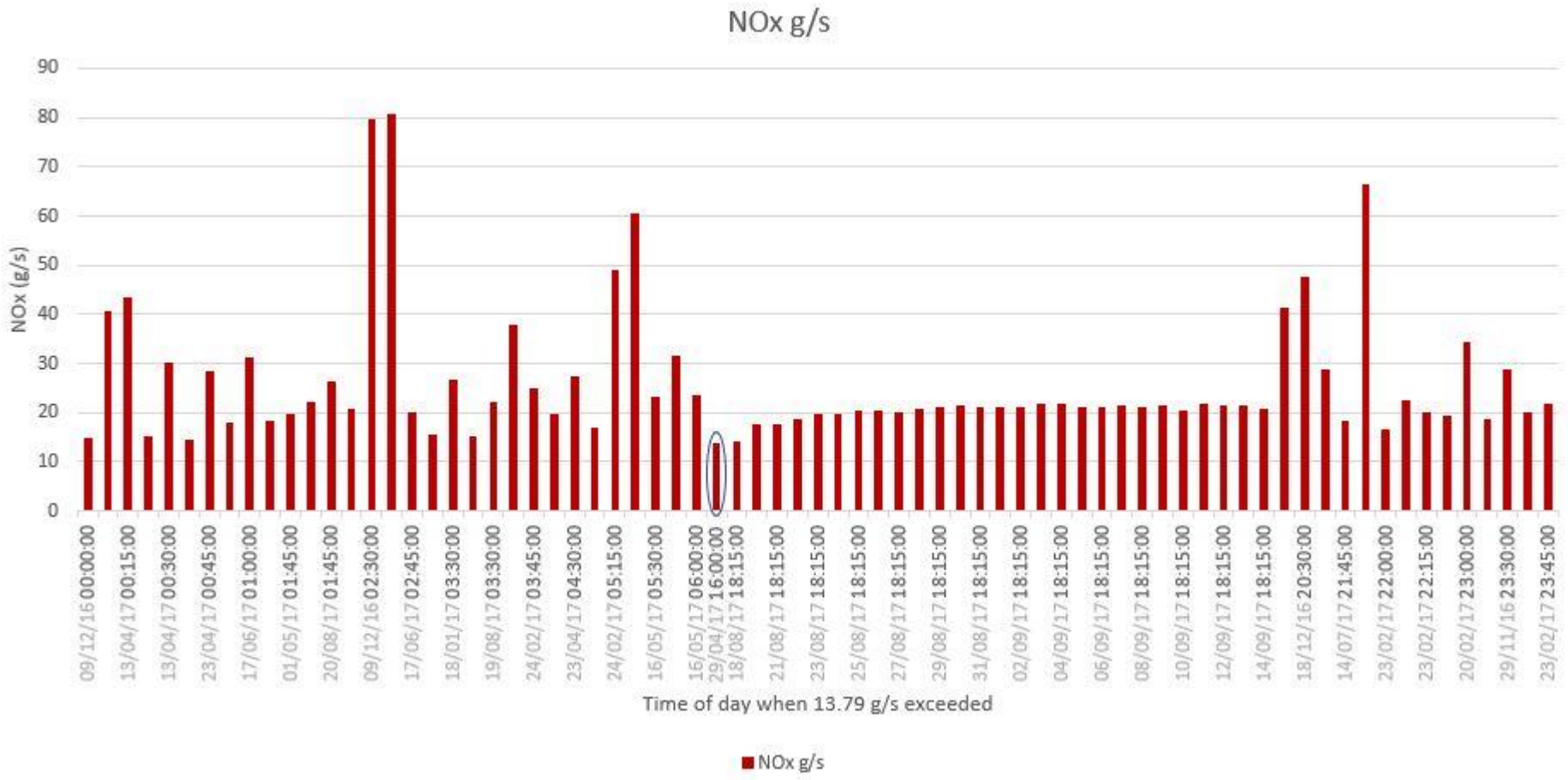
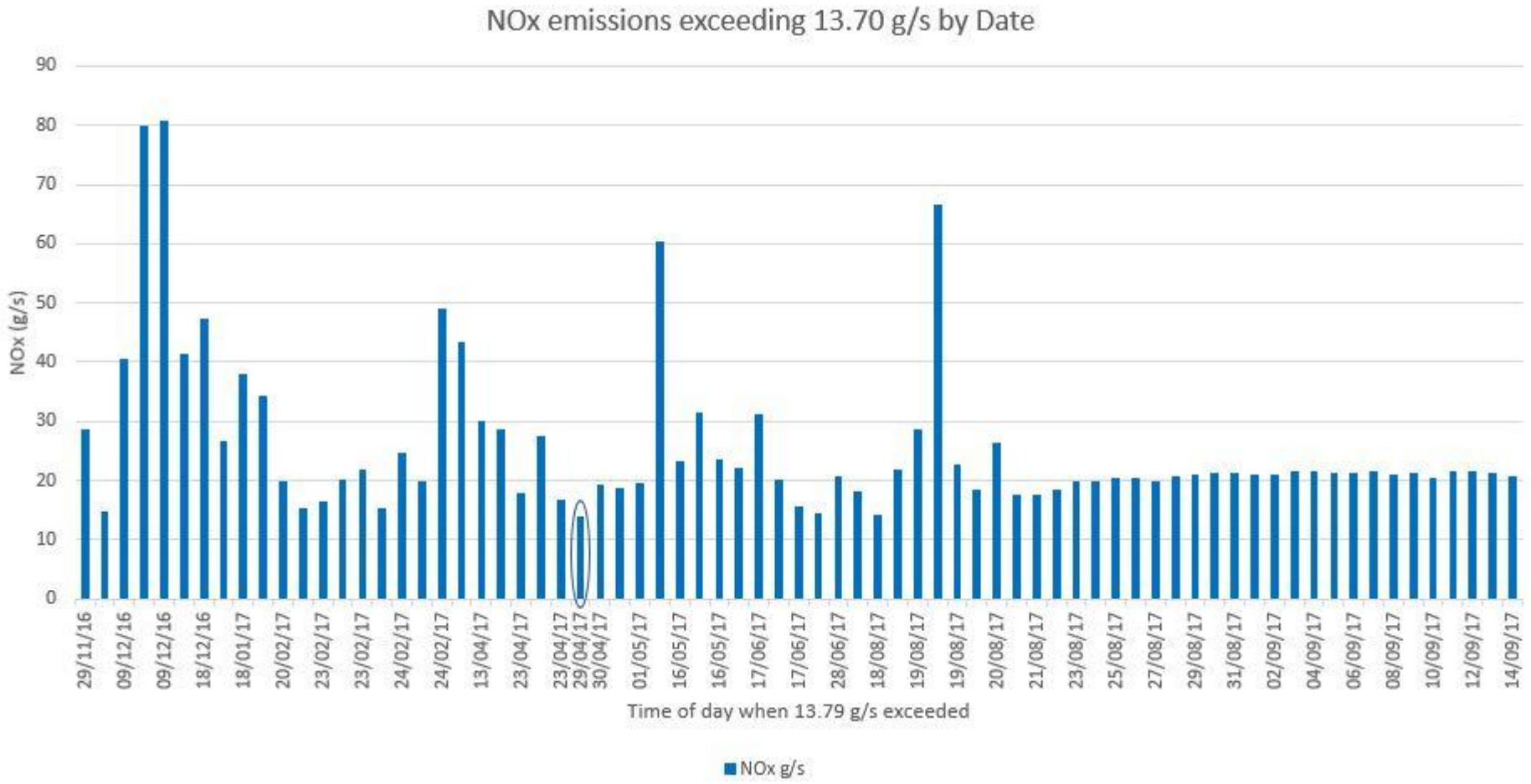


Figure 4: Date when Nitric Acid stack emissions exceeded 13.8 g/s, the concentration when the nitrogen dioxide cloud was visible. Numerous emissions occurred following the date of the photographed release (circled) and from July 2017 when the plant was operating near normal..



Appendix 1

ABC North West

Published by Kendall O'Connor [?] · 2 hrs ·

Yara Pilbara says yellow gas seen coming out of its Technical Ammonium Nitrate plant is part of the project's commissioning.

Photos of the Burrup Peninsula site have been circulating on social media.

In a statement, Yara Pilbara said as part of the commissioning process the TAN plant is shut down and started up several times, resulting in the release of nitrogen oxide.

Yara says no health risks were posed by the emissions.

Pic: Erin Kelly Hardy

Appendix 2

LEGISLATIVE COUNCIL

C218

QUESTION WITHOUT NOTICE
(Of which some notice has been given)

Wednesday, 14 June 2017

Hon Robin Chappie to the Minister for Environment:

I refer to the answer to my question yesterday regarding Yara Pilbara's Technical Ammonium Nitrate plant, and ask:

1. Were these 'start up' releases addressed in the EPA's original assessment of the TAN plant?
2. If yes to (1), is this a breach of Yara's operating conditions?
3. If no to (1), why not?
4. Has there been another release of this nature from the Yara TAN plant since April 29?
5. Given Yara Pilbara has stated there will be a release of this nature every time the plant is in 'start up' mode and the government's stated position that *'this is an abnormal event'*, what will be done to address these ongoing releases?

I thank the honourable member for some notice of this question. The following information has been provided to me by the Office of Environmental Protection Authority:

1. Yes
2. No
3. The company is required to adopt and implement best practice pollution control technology to minimise air emissions which are monitored under its approved Ambient Air Quality **M**onitoring Program. The conditions do not prohibit 'start up' events which large processing plants will always require as part of their operation.
4. There has not been another release of this nature from the TAN plant reported to the Department of Environment Regulation from the Yara TAN Plant since 29 April 2017.

5. Abnormal events can include plant start-up, shut-down, and upset conditions. During abnormal events, emissions can be higher than normal. The TAN plant is currently being commissioned, and therefore abnormal events may occur more frequently, however, these events are generally infrequent and for short durations. Once operational, it is expected that the TAN plant will shut-down or start-up four to five times per year. As a result of the 29 April event, Yara Pilbara has introduced additional controls to improve emissions during start-up.