



2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT

**ORICA KOORAGANG ISLAND
SSD 08_0129**

DECEMBER 2021



Revision	Date	Description	Author	Approver
2	17/12/2021	2021 Annual Environmental Report	N Robinson	P Cunsolo
1	18/12/2020	2020 Annual Environmental Report	D Williams	N Robinson
0	20/12/2019	2019 Annual Environmental Report	N Robinson	A Taylor

CONTENTS

1	INTRODUCTION	1
2	ANNUAL ENVIRONMENTAL MANAGEMENT REPORT REQUIREMENTS	3
3	PROJECT APPROVALS	4
4	ACTIONS IDENTIFIED FROM PREVIOUS ANNUAL ENVIRONMENTAL MANAGEMENT REPORT	4
5	PROJECT STANDARDS AND PERFORMANCE MEASURES	4
6	PROJECT STATUS	7
6.1	Project Progress Review	7
6.2	Planned Project Progress during 2020/2021	12
7	ENVIRONMENTAL MONITORING AND COMPLAINTS SUMMARY	13
7.1	Environmental Monitoring	13
8	COMMUNITY	17
8.1	Community Engagement Activities	17
8.2	Community Investment	18
8.3	Community Complaints	18
9	AN1 PRILL TOWER EMISSION REDUCTION INVESTIGATIONS	20
9.1	Particulate Minimisation Program	20
10	RECLAIMED WATER PROJECT	23
11	PROJECT APPROVAL COMPLIANCE	24
11.1	Condition Compliance	24
11.2	Summary of Submitted Reports	35
11.3	Independent hazard audit action plan	39
11.4	Independent environmental audit	47
	APPENDIX A – 2021 NOISE AUDIT REPORT	50

ABBREVIATIONS

AN3	No. 3 Ammonium Nitrate Plant
CEMP	Construction Environmental Management Plan
DECCW	Department of Environment, Climate Change and Water (superseded by DPIE)
DPIE	Department of Planning, Industry and Environment (formerly Department of Planning and Environment)
EPA	Environment Protection Authority
EPL	Environment Protection Licence
HAZOP	Hazard and Operability Study
ktpa	kilo tonnes per annum
NAP4	No. 4 Nitric Acid Plant
SH&E	Safety, Health and Environment

1 INTRODUCTION

Orica Australia Pty Ltd (Orica) operates an ammonium nitrate manufacturing facility on Kooragang Island, NSW (**Figure 1**). The facility commenced operations in 1969 and has undergone several projects aimed at increasing the ammonium nitrate production capability of the site since. The current site operations consist of an Ammonia Plant, three Nitric Acid Plants, two Ammonium Nitrate Plants and associated despatch and support infrastructure (Existing Operations).

An approval for the expansion of the Kooragang Island site (the expansion Project) was granted by the Department of Planning, Industry and Environment (DPIE) on 1 December 2009 allowing ammonium nitrate production to increase from 500 kilo tonnes per annum (ktpa) to 750ktpa. The expansion project broadly involved the uprate of the existing ammonia plant, construction of an additional Nitric Acid (NAP4) and Ammonium Nitrate Plants (AN3) and the upgrade and expansion of the site's ammonium nitrate storage and ancillary infrastructure.

Since the approval was granted in 2009, Orica has applied to DPIE to modify the approval on five occasions. Modifications to the 2009 approval included:

Project Modification 1 (approved 11 July 2012)

- The relocation of plant and equipment further away from the closest residential properties located in Stockton;
- Relocation of AN3 to NAP4 to reduce the pipeline distance in which ammonia is required to be transported;

Project Modification 2 (approved 17 December 2014)

- Rationalisation and upgrade of ammonia storage and distribution infrastructure including a reduction in ammonia inventories stored in plant ammonia storage tanks;
- The construction and operation of three ammonia flares; Instrumentation and integrity improvements to ammonia handling and storage systems; and
- The relocation and increase in storage quantity of a previously approved nitric acid tank.

Project Modification 3 (approved 17 December 2015)

- Increase the allowable annual production limit relating to the manufacture of ammonia at the site from 360,000t to 385,000t.

Project Modification 4 (approved 13 May 2021)

- Construction of a nitrates effluent tank to replace the existing nitrates effluent pond

Project Modification 5 (approved 29 October 2021)

- Construction of a prill tower scrubber to remove particulate associated with the existing ANP1 Prill tower

This report has been prepared in accordance with Condition 50 of the expansion project's Development Consent (08-0129) which requires an Annual Environmental Management Report (AEMR) to be submitted to the DPIE.



Figure 1: Site Location

2 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT REQUIREMENTS

Condition 50 of Project Development Consent (08-0129) requires that Orica submit an AEMR within the first 12 months of commencing the project and annually thereafter. This report details environmental compliance of the Project between the 1 December 2020 and 30 November 2021 and:

- a) Identifies the standards and performance measures for the project;
- b) Describes the works carried out in the past 12 months and the works to be carried out in the next 12 months;
- c) Includes a summary of complaints received in the past year and provide a comparison with previous years;
- d) Reports results of all monitoring required by this approval and the EPL for the Project
- e) Provides analysis of monitoring results in the context of the relevant criteria and limits, previous monitoring results and predictions made in the EA.
- f) Identifies any trends in monitoring results over the life of the Project; and
- g) Reports on compliance with the project approval, summarises non-compliances in the previous 12 months and reports on actions taken to rectify non-conformances.

3 PROJECT APPROVALS

The following licences and permits are held by the site relating to the Project.

Requirement	Issuing Authority	Licence Identifier	Licence Activities	Changes made during 2021 AEMR reporting period
Licences				
Environmental Licence	NSW EPA	No. 828	Details the environmental performance standards, monitoring and reporting requirements for manufacturing activities at the Kooragang Island site.	Variations approved in conjunction with EPA
Major Hazard Facility	Safework NSW	20-17-75	Manufacture and storage of NSW WHS Regulation Schedule 15 chemicals.	MHF Licence granted 11/11/21 MHF Licence expires 11/11/26
Licence to Manufacture Explosives and Security Sensitive Dangerous Goods	SafeWork NSW	XMNF100001	Authority to manufacture and store security sensitive dangerous goods (ammonium nitrate).	Update to licence holder
Notification of Dangerous Goods	SafeWork NSW	Acknowledgement No. NDG015329	Notifies SafeWork NSW of the storage of hazardous chemicals	Nil
Anhydrous Ammonia Pipeline Licence Agreement	Port of Newcastle	44400033	Licence for the operation of the anhydrous ammonia import and export pipeline between the site and the K2 berth.	Nil
Sewerage systems <ul style="list-style-type: none"> Collection tanks 	NSW EPA	No. 828	Operation of a site-based sewerage system	

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Requirement	Issuing Authority	Licence Identifier	Licence Activities	Changes made during 2021 AEMR reporting period
<ul style="list-style-type: none"> Transpiration system 				
Ammonia Plant Main Cooling tower	Newcastle City Council	NCC-0077-01	Certificate of completion for independent audits	Submitted
Ammonia Storage Cooling tower	Newcastle City Council	NCC-0078-01	Certificate of completion for independent audits	Submitted
Nitric Acid Plant 1 Cooling System	Newcastle City Council	NCC-0079-01	Certificate of completion for independent audits	Submitted
Nitric Acid Plant 2 Cooling System	Newcastle City Council	NCC-0080-01	Certificate of completion for independent audits	Submitted
Nitric Acid Plant 3 Cooling System	Newcastle City Council	NCC-0081-01	Certificate of completion for independent audits	Submitted
Permit to Import Prohibited Chemicals - MDEA Import	Australian Government	2021/45	Permit to import MDEA for use in the ammonia plant.	Renewed
Consents				
Project Approval – Ammonium Nitrate Expansion Project	Minister for Planning and Infrastructure	08_0129		MOD4 approved 13 May 21 MOD5 approved 29 October 2021
Easements				

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Requirement	Issuing Authority	Licence Identifier	Licence Activities	Changes made during 2021 AEMR reporting period
Effluent Pipeline	Roads and Maritime		Agreement with RMS for the effluent pipeline in the North Arm of the Hunter River.	Nil
Effluent Pipeline Easement	Port of Newcastle	N/A	Agreement with Port of Newcastle for the effluent pipeline between the site and the Hunter River	Term extended
Lease Agreement				
Lot 9 Lease agreement	Port of Newcastle	44400157	Licence to enable access to land adjacent to the site effluent pipeline.	Nil

4 ACTIONS IDENTIFIED FROM PREVIOUS ANNUAL ENVIRONMENTAL MANAGEMENT REPORT

Feedback regarding Orica's 2020 AEMR was provided by DPIE on 22 January 2021 as follows. Key design criteria detailed in these documents are in Table 1.

Table 1 – DPIE feedback resolution

Date	Request	Relevant Section
2020 AEMR feedback (22 January 2021)	Make a copy of the AEMR available on the project website, preferably by 5 February 2021.	The 2020 AEMR was published 22 January 2021 on Orica KI Public Website
2019 AEMR feedback (10 Feb 2020)	2019 AEMR to be on Orica Kooragang Island public website preferably by 11 March 2020	Published on Orica KI Public Website
2019 AEMR feedback (10 Feb 2020)	Make the 2016 hazard audit report available on the project website by 11 March 2020.	Published on Orica KI Public Website
2019 AEMR feedback (10 Feb 2020)	Submit the OEMP to the Department by 30 June 2020	Submitted to DPIE on 5 June 2020 and published on Orica KI Public Website
2018 AEMR feedback (19 Feb 2019)	Include a comparison of monitoring results to the predictions made in the Environmental Assessment(s) for air quality, noise and water; and	Air – 7.1.1 Noise – 7.1.2 Water – 7.1.3 and 10
2018 AEMR feedback (19 Feb 2019)	Identify any trends in monitoring results over the life of the Project for air quality, noise and water.	Air – 7.1.1 Noise – 7.1.2 Water - 7.1.3 and 10
2018 AEMR feedback (19 Feb 2019)	The above requests should be tabulated within the next AEMR, with specific references as to where each point has been addressed within the document."	Table in Section 4 (this table)

5 PROJECT STANDARDS AND PERFORMANCE MEASURES

The Project is required to meet the standards and conditions detailed in the following documents:

- Project Approval 08-0129 dated 1 December 2009 as subsequently modified (currently to MOD5)
- Project Environmental Assessment dated June 2009

- Statement of Commitments dated August 2009
- Modification Application 08-0129 MOD 1 and supporting documentation titled Kooragang Island Facility Modification Request dated 20 April 2011;
- Modification Application 08_0129 MOD 2 Environmental Assessment titled Kooragang Island Modification Request dated 13 November 2013;
- Response to MOD 2 submissions dated 10 February 2014;
- Orica Mining Services Report for Kooragang Island Uprate PHA MOD1 Report dated March 2012
- Orica Mining Services Kooragang Island Uprate PHA MOD2 rev 1 dated May 2014 including Appendix VIII" nitric Acid Tank PHA, Rev C dated May 2014.
- Submissions Report dated 13 October 2014
- Orica Kooragang Island Ammonia Annual Quantity Increase Environment Assessment dated 28 April 2015.

Key design criteria detailed in these documents are detailed in Table 2.

Table 2 - Standards and performance implemented in plant design and construction

Criteria	Standard	Performance Measure	Comment
Noise Management	No increase in community noise levels as a result of implementing the Project.	Operating Project to be at least 10dB (A) less than the existing plant noise levels.	<p>To enable the site to demonstrate compliance with the noise conditions detailed in the Development Consent, background noise testing at the community interface was performed prior to the Ammonia Plant uprate in 2011 in compliance with requirements detailed in Condition 31.</p> <p>Quarterly noise testing was subsequently performed during the 2013 AEMR period and annually thereafter in accordance with the DPE approved noise management plan.</p> <p>Noise testing was undertaken during May/June 2021 and confirmed that noise contributions from the Project satisfied the project noise criteria. A full copy of the Annual Noise Audit is provided as Appendix A.</p>
Air Quality	Minimisation of particulate emissions associated with the Project.	AN3 stack emissions to be $\leq 20\text{mg/Nm}^3$	<p>Ammonium Nitrate Plant 3 has yet to be constructed; however, the requirement has been incorporated into the plant design.</p> <p>Particulate emission performance of AN3 will be confirmed during plant commissioning activities.</p>

Criteria	Standard	Performance Measure		Comment
	Minimisation of NOx emissions associated with the project.	Existing Reformer Stack NOx emission $\leq 350 \text{ mg/Nm}^3$ (as NO ₂ equivalent)		A purge gas scrubber was installed in 2011 during the Ammonia Plant uprate aimed at reducing NOx emissions from the Ammonia Plant Reformer Stack. One stack test was completed and analysed during the 2021 AEMR reporting period and complied with the site's EPL NOx concentration limit.
		Pre-Reformer Furnace Stack NOx emission $\leq 350 \text{ mg/Nm}^3$ (as NO ₂ equivalent)		Annual stack emission testing has been performed following the commencement of operations on the 29 February 2012. One stack test was completed and analysed during the 2021 AEMR reporting period and complied with the site's EPL NOx concentration limit.
		Expansion Boiler Stack NOx emission $\leq 350 \text{ mg/Nm}^3$ (as NO ₂ equivalent)		Requirement has been incorporated into the Expansion Boiler design. One stack test was completed and analysed during the 2021 AEMR reporting period and complied with the site's EPL NOx concentration limit.
		NAP4 Stack NOx $\leq 150 \text{ ppm}$ (99%tile)		NAP 4 has yet to be constructed; however, the requirement has been incorporated into the plant design.
		Scrubbing of ammonia emissions under normal plant operations to be installed for NAP4 and AN3.		Requirement has been incorporated into design. The site has completed a project relating to the management of ammonia emissions generated from existing operating plants including the construction of three ammonia flares.
Greenhouse Gas Emissions	Installation of abatement technology on Nitric Acid Plants	Site N ₂ O emissions to be reduced by $\leq 65\%$ compared to a "do nothing" approach. Abatement projects to be completed within 6 months of commissioning of NAP4.		Not triggered as NAP 4 has not been constructed. However, an N ₂ O emissions reduction strategy for the site has been implemented, with N ₂ O abatement technology installed in NAP2 from July 2013. N ₂ O emissions are continually monitored in all existing nitric acid plants.
Water Emissions	New Plant and Equipment to comply with existing EPL conditions for effluent		mg/L	Effluent discharged from the site is continually monitored and reported in the site's EPA Annual Return.
			90% limit	
			100% limit	
		Ammonia		N/A
		As		0.05

Criteria	Standard	Performance Measure			Comment
	discharge parameters.	Oil and Grease		10	The nitrogen mass discharge limit has been reduced to 170tpa during the 2021 AEMR period
		Nitrogen	1500	2000	
		Cr (6+)	0.05	0.2	
		TSS		50	
		pH		6.2 – 9.5	
		Temperature		43°C	
		Volume		4500kL/day	
		Nitrogen Mass Discharge		170tpa	
Production Limits	Production not to exceed prescribed levels.	Ammonia – 385ktpa Nitric Acid – 605ktpa Ammonium Nitrate – 750ktpa			Requirement incorporated into design. Production during the 2021 AEMR reporting period was as follows: Ammonia – 345 ktpa Nitric Acid – 311ktpa Ammonium Nitrate – 391ktpa

To ensure that environmental performance standards are appropriately integrated into the new plant design and associated construction activities, a Construction Environmental Management Plan (CEMP) was developed and approved for use by DPIE in 2011. The site CEMP has been updated to reflect the additional requirements outlined in Condition 49A of the development consent. Environmental control measures addressed in the CEMP relate to air quality, water quality, contaminated soil and acid sulphate soil, waste management, traffic, heritage and erosion and sediment control.

6 PROJECT STATUS

6.1 PROJECT PROGRESS REVIEW

Orica is undertaking the expansion of the site in a number of construction phases. This approach has been adopted to ensure that construction works associated with the upgrade have minimal impact on the site's existing operations, that upgraded ammonium nitrate product storage and loadout facilities are completed prior to the construction of the new nitric acid and ammonium nitrate plants and that market demand is accommodated in the construction timing. Project construction phases are as follows:

- *Phase 1: Ammonia Plant Upstate:* including improvement works designed to increase production capacity of the existing ammonia plant from 295ktpa to 385ktpa. This phase has been completed, with the uprated Ammonia Plant commencing operation on the 28 February 2012.

- *Phase 2:* Upgrade and improvement works to the site's supporting infrastructure: including the construction and upgrade of the site's ammonium nitrate storage facilities and product load out infrastructure. Construction works associated with this phase have been designed to reduce the site's risk profile associated with the storage of ammonium nitrate and the transportation and use of ammonia onsite.
- *Phase 3:* Ammonium nitrate expansion: construction works designed to increase ammonium nitrate production capability of the site from 505ktpa to 750ktpa through the construction of a new nitric acid and ammonium nitrate plant.
- *Phase 4:* The construction and operation of three ammonia flares (MOD 2). The flares are only one component of a broader program currently being implemented at the site, designed to reduce the risk associated with handling ammonia.
- *Phase 5:* The construction of a Nitric Acid tank. Orica has approval to change the proposed location and increase the storage capacity of a previously approved nitric acid tank (MOD 2).
- *Phase 6:* Construction and Operation of the Projects Boiler. Orica completed a consistency review to support a change to the expansion project boiler site location in 2018/2019. The Projects Boiler was completed in 2019 and commissioned on 12 December 2019.
- *Phase 7:* Construction and Operation of the Nitrates Effluent Tank. Currently underway, with a scheduled completion date of late CY2022
- *Phase 8:* Construction and Operation of the Prill Tower scrubber. Currently underway, with a scheduled completion date of late CY2023.
- Orica's DPIE approved project Staging Plan is detailed in Table 3:

Table 3 – Project Staging Plan (December 2021)

Phase Stage		Description of Work	Sub-Stage	Approval Status	Estimated Construction Timing
Ammonia Plant Uprate					
1	1a	Ammonia Plant Expansion – Plant Air Compressor Building Construction of Plant Air Compressor building shell (compressor installed in Stage 1(b)).	Completed	Construction Complete and Operational	Completed
	1b	Ammonia Plant Expansion - Installation/Modification of Plant Installation of new equipment including new compressor, process vessels pipework and instruments in the Ammonia Plant.	Completed		
Proposed Trident Nitrates Expansion Project Construction Scheduling					
2	2a	OBL 1(a) – Nitrates Infrastructure & ANS Loadout Installation of new site infrastructure including the new site entrances, internal access roads, security and weighbridge facilities, ANS product storage and despatch facilities.	<div>1. Internal access roads and minor civil works.</div> <div>2. Site entrances, security offices and weighbridges.</div> <div>3. Major civil works including piling and foundations.</div> <div>4. New ANS storage vessel loading equipment</div>	Approval for Construction granted / construction yet to commence.	Yet to be determined
	2b	OBL 1(b) – Nitrates Despatch & Support Infrastructure Construction of new AN Bag store, AN Despatch facilities and amenities, demolition of existing AN Bag store and despatch, construction of new AN Bulk Store, modification to existing AN bulk store, construction of WANS, construction of new control room and electrical infrastructure.		Approval to commence construction not yet granted by DoPI.	Yet to be determined

Phase Stage		Description of Work	Sub-Stage	Approval Status	Estimated Construction Timing
3	3a	NAP4 – Nitric Acid & AN Solution plants and Support Infrastructure Construction of the NAP4/ ANS Plant and tie-ins Construction of Nitrates support infrastructure including new Nitric Acid Storage, Ammonia Storage, Boiler, Cooling Tower, Demin Plant expansion Instrument Air upgrades, new Ammonia pumps, pipebridges & transfer lines.		Approval to commence construction not yet granted by DoPI.	Yet to be determined
	3b	AN3 – AN Prill Plant Construction of ANP3 Dry Section plant and tie-ins		Approval to commence construction not yet granted by DoPI.	Yet to be determined
Ammonia Management Improvement Program					
4	4	Ammonia Flares Construction and operation of three ammonia flares.	1. Nitrates Plant Flare 2. Ammonia Storage Flare 3. Ammonia Plant Flare	Approval to commence construction of the flares was granted on 23 June 2015. Ammonia Flares The nitrates flare became operational during February 2016 The ammonia storage flare became operational during April 2016. The ammonia plant flare was commissioned during April 2017.	Completed

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Phase Stage		Description of Work	Sub-Stage	Approval Status	Estimated Construction Timing
Nitric Acid Tank					
5	5	Nitric Acid Tank Construction and Operation of a nitric acid tank and associated scrubber, capable of exporting and importing nitric acid via the site's nitric acid wharf pipeline.		Approval to commence construction not yet granted by DoPI.	Yet to be determined
Boiler					
6	6	Construction and operation of new Site Boiler Construction and Operation of a new site boiler (to replace the decommissioned original site boiler)		Approval to commence construction granted on 27 July 2015	Construction completed 12 December 2019
Nitrates Effluent Tank					
7	7	Construction and operation of new Nitrates Effluent Tank (MOD4) Construction and Operation of a new Nitrate Effluent Tank (to replace the Nitrates Effluent Pond)		Approval to commence construction granted on 13 May 2021	Estimated to commence early CY 2022
Prill Tower Scrubber					
8	8	Construction and operation of new Prill Tower Scrubber (MOD5) Construction and Operation of a prill tower scrubber to remove particulate associated with the existing ANP1 Prill Tower		Approval to commence construction granted on 29 Oct 2021	Estimated to commence late CY 2022

A summary of the Project works completed between 1 December 2020 and 30 November 2021 is detailed below.

6.1.1 PHASE 1: AMMONIA PLANT EXPANSION

Works that have been performed in the last 12 months associated with the uprate of the Ammonia Plant include:

- Stack emission testing of Reformer and Pre-Reformer monitoring points in accordance with the site's EPL.
- Annual compliance noise monitoring in compliance with the revised noise management plan.
- Regulatory reporting in accordance with the approvals Condition of Consent.

6.1.2 PHASE 2: OUTSIDE BOUNDARY LIMITS

No construction activities commenced in the previous 12 months associated with Phase 2 construction activities.

6.1.3 PHASE 3: NITRATE EXPANSION

No construction activities commenced in the previous 12 months associated with Phase 3 construction activities.

6.1.4 PHASE 4: AMMONIA MANAGEMENT IMPROVEMENT PROGRAM

The original liquid ammonia export pumps and associated piping at the 12,000-tonne ammonia storage tank were replaced in February 2020. This project was the final phase of the Ammonia Management Improvement (AMI) Program, which has been implemented in stages over the last seven years.

Detailed procedures, risk assessments and hazard studies were developed and reviewed by independent experts in preparation for the pump replacement. The relevant government agencies were briefed on the project in October 2019. The AMI project is now complete.

6.1.5 PHASE 5: NITRIC ACID TANK

No construction activities commenced in the previous 12 months associated with Phase 5 construction activities.

6.1.6 PHASE 6: EXPANSION PROJECT BOILER

Construction of the new Boiler was completed and commissioned on 12 December 2019. Orica completed stack emission testing to confirm environmental performance of the boiler combustion system (NO_x concentration) compared to that predicted in the project EA documentation upon commissioning of the expansion project boiler. This data was submitted to DPIE in the Project Stage Air Quality Verification Study (Condition 23).

6.1.7 PHASE 7: NITRATES EFFLUENT TANK

Project planning has commenced with commencement of construction scheduled for early CY 2022.

6.1.8 PHASE 8: PRILL TOWER SCRUBBER

Project planning has commenced with commencement of construction scheduled for late CY 2022.

6.2 PLANNED PROJECT PROGRESS DURING 2020/2021

Current market conditions have meant that Stages 2, 3 and 5 remain on hold. The timing associated with the implementation of these stages will be reviewed when market conditions are more favourable.

Orica is still progressing with reporting requirements associated with Phase 1 as detailed in the project approval Condition of Consent.

Project works anticipated to be completed in the following twelve months include:

6.2.1 PHASE 1 AMMONIA PLANT UPRATE

- Environmental monitoring as outlined in the site's EPL.
- Annual noise monitoring in compliance with the updated project noise monitoring plan.
- Reporting requirements as detailed in the project's Development Consent

6.2.2 PHASE 2 - OUTSIDE BOUNDARY LIMITS (OBL)

No construction works associated this phase are expected in the next 12 months.

6.2.3 PHASE 3 – NITRATES EXPANSION

No construction works associated this phase are expected in the next 12 months.

6.2.4 PHASE 4 - AMMONIA MANAGEMENT IMPROVEMENT PROGRAM

This project's final phase of the Ammonia Management Improvement (AMI) Program was completed in the 2020 AEMR reporting period, which has been implemented in stages over the last seven years. No further works associated this phase are expected.

6.2.5 PHASE 5 - NITRIC ACID TANK

No construction works associated this phase are expected in the next 12 months.

6.2.6 PHASE 6 - EXPANSION PROJECT BOILER

No further works associated this phase are expected.

6.2.7 PHASE 7 - NITRATES EFFLUENT TANK

Construction is anticipated to be completed in the next 12 months.

6.2.8 PHASE 8 - PRILL TOWER SCRUBBER

Preliminary works are anticipated to commence in the next 12 months.

7 ENVIRONMENTAL MONITORING AND COMPLAINTS SUMMARY

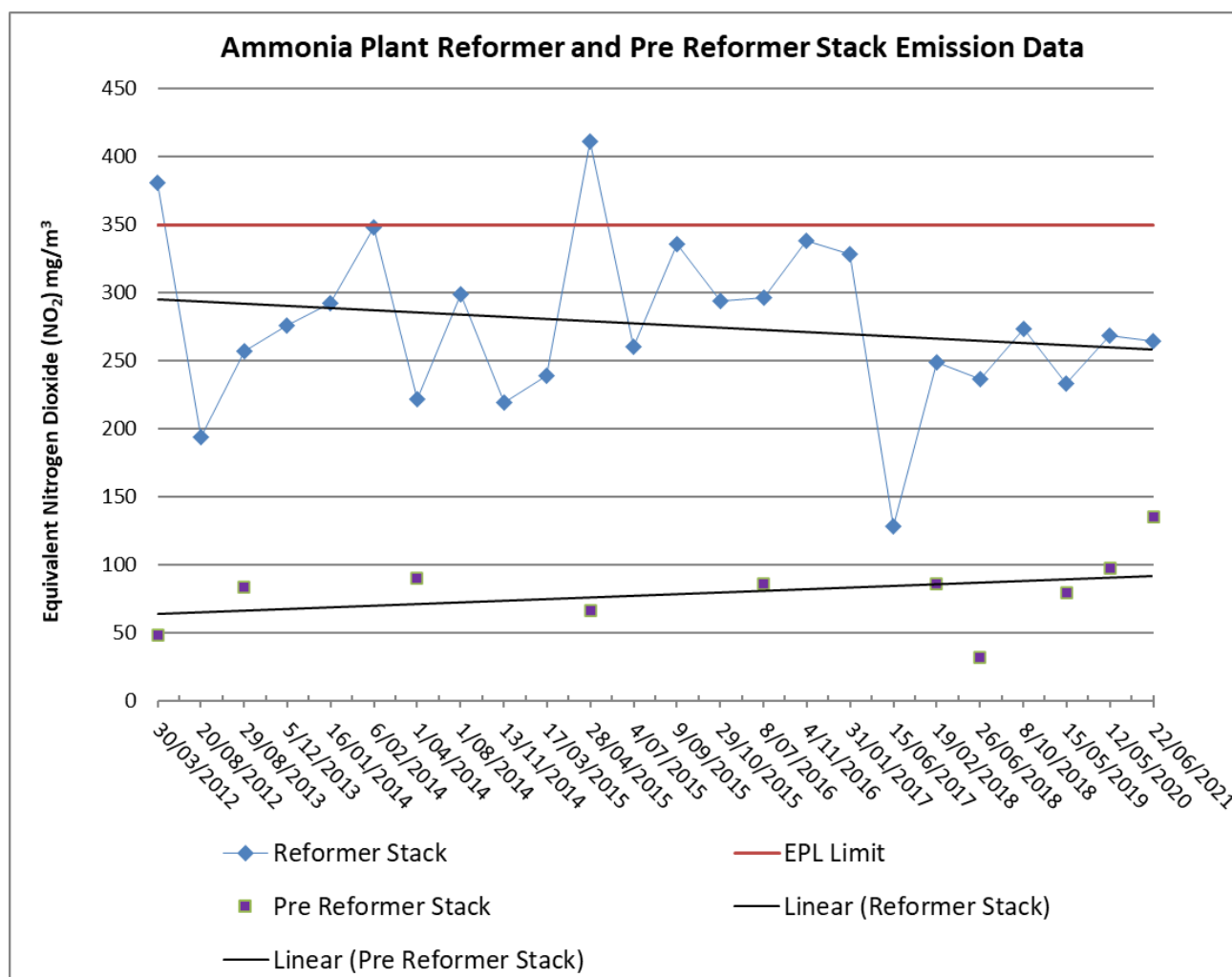
7.1 ENVIRONMENTAL MONITORING

The Project Approval and EPL do not require environmental monitoring to be undertaken during the construction phase of the Project, however control measures specified in the project's CEMP have been implemented. The uprated Ammonia Plant has completed all required environmental monitoring in accordance with the site Environment Protection Licence (EPL 828).

7.1.1 AIR QUALITY

Orica is required to perform stack emission testing for both the Pre-Reformer and Reformer Stacks annually in accordance with the site's EPL anniversary date, 1 April each year. One stack test was performed at the Reformer and Pre-Reformer during the 2021 AEMR reporting period. The results complied with the NO_x concentration limit of 350mg/m³. Emissions were consistent with the long-term average for both stacks. The long term NO_x emissions trends is stable to reducing for the Reformer, and stable for the Pre Reformer.

Figure 2 – Stack emission testing for uprated ammonia plant



Stack emission data collected during the 2021 AEMR reporting period complied with the site's Environment Protection Licence.

7.1.2 NOISE

In order to demonstrate compliance to noise criteria for new plant and equipment associated with the ammonia plant uprate, the following procedure was developed by Orica and detailed in the Project's Noise Management Plan (NMP). This plan was approved by DPE in July 2011, with compliance to the project's noise criteria to be demonstrated through the:

- Update of the site's noise model (Table 4) following the commencement of operation of the Project to predict the noise contribution for expansion project new plant and equipment in relation to identified reference monitoring locations. This process assisted identification of noise reduction opportunities.
- Undertake attended and unattended noise monitoring to evaluate changes in noise levels and identify trends in ambient noise levels.

Noise modelling detailed in the 2009 environmental assessment predicted that the noise contribution associated with the site expansion would satisfy the 10dB below pre-expansion predicted levels consent requirement. As the expansion project is being implemented in three phases, the noise model will be updated following the commencement of operations for each project phase.

Table 4 – Noise compliance modelling results detailed in 2011 mod 1 report

Assessment Location	Predicted Sound Pressure Levels LAeq, 15min	
	Existing Plant	Uprated Plant
Assessment Location R1	50	37
Assessment Location R2	53	41
Assessment Location R3	51	39

The site's noise model was updated following the commencement of operations of the uprated ammonia plant representing the completion of Phase 1 construction activities. This model was updated using noise data collected from near field noise monitoring. Site noise modelling results confirmed that that noise level contribution associated with the uprated ammonia plant were less than 10dB below the predicted noise levels for the reference locations in Stockton and therefore did not increase existing noise levels (Table 5).

Table 5 – Revised compliance modelling results (quarter 1 testing)

Assessment Location	Predicted Sound Pressure Levels LAeq,15min (dBA)		
	Existing Plant	Post Ammonia Plant Uprate	Ammonia Plant contribution
Assessment Location R1	50	50	20
Assessment Location R2	53	52	22

Assessment Location R3	51	50	21
------------------------	----	----	----

Attended and unattended noise monitoring was also undertaken at six reference locations to establish noise trends for the entire site, consistent with the process previously undertaken in 2011. Noise monitoring reference points R4, R5 and R6 have predominately been utilised to establish Orica's contribution to surrounding noise levels. Monitoring Location R6 was relocated in 2014 due to access to the location being restricted by new tenancy. The location of each noise monitoring point is detailed in **Figure 3**.

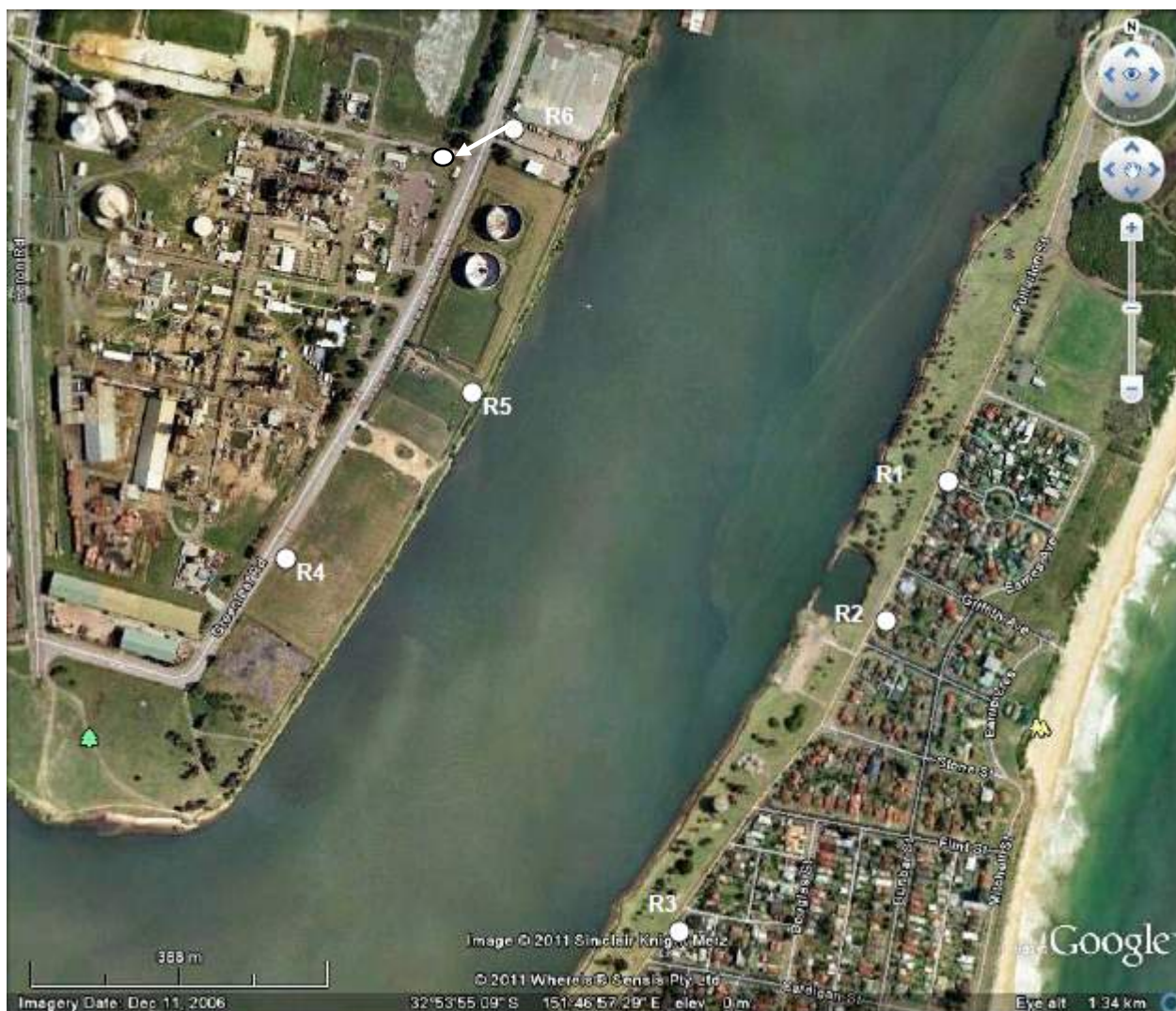


Figure 3 – Noise Monitoring Locations

Whilst it is difficult to directly compare current noise data against historical trends due to variability in the meteorological conditions under which the data was collected, attended and unattended monitoring can be useful in gaining an increased understanding of the individual noise sources that contribute to the overall noise profile of the site. Noise monitoring was undertaken on a quarterly basis during the first 12 months of the ammonia plant being upgraded (2013) and annually thereafter.

Unattended and attended measurements were conducted during June 2021 to assess noise from the Orica site and ambient noise trends. Unattended noise monitoring results are detailed in Figure 4.

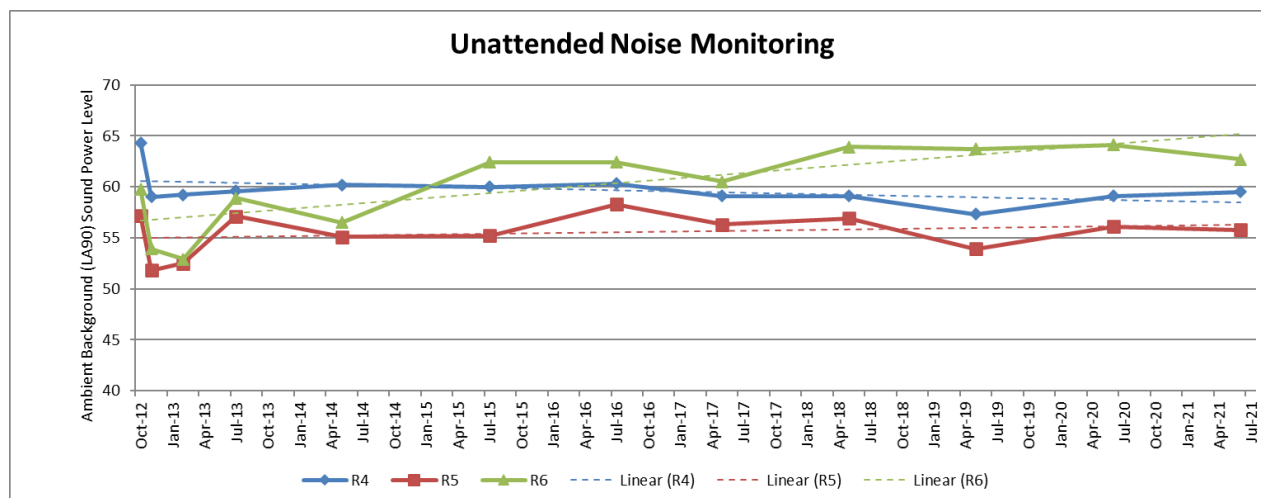


Figure 4 – Unattended noise results for Kooragang Island

Following the completion of both attended and unattended monitoring, the data was evaluated against the baseline 2012 data, with median noise levels found to be consistent with the 2012 median range as detailed in Table 6.

Table 6: Comparison of baseline and attended and unattended monitoring results

Reference Measurement Location	Ambient Background RBL's dBA										
	Baseline Levels (2012)		Measured Levels 2012/2013	Measured Levels 2013/2014	Measured Levels 2014/2015	Measured Levels 2015/2016	Measured Levels 2016/2017	Measured Levels 2017/2018	Measured Levels 2018/2019	Measured Levels 2019/2020	Measured Levels 2020/2021
	Median Range	Median	Median	Median	Median	Median	Median	Median	Median	Median	Median
R4 - Roadside (South)	61.2 - 62.9	62	59.6	61.5	59.7	60.2	60.1	59.6	59.4	59.2	59.4
R5 - Riverside (Central)	55.8 - 58.2	57	55.4	55.0	54.9	55.5	55.9	55.6	55.9	56.0	55.8
R6 - Riverside (North)	58.2 - 60.6	59.8	57.7	60.0	62.8	62.5	62.2	62.5	62.6	62.9	62.7

Observations noted during attended measurement identified noise from the Ammonia Plant CO2 vent, quench valves and 183L Generator, the Ammonia Nitrate Plant 1 CDC Fan and steam, Nitric Acid Plant 1 low frequency fan/compressor and steam pipe noise and occasional steam pipe hammer.

Modelling undertaken utilising the unattended noise monitoring data demonstrated that noise contributions from the site satisfied the project noise criteria established in 2012. Attended night audits confirmed that Orica related maximum (L_{Amax}) noise levels were not observed to cause exceedances greater than 5dBA above the measured L_{Aeq} levels at any of the reference monitoring locations.

A copy of the 2021 Annual Noise Audit report is appended to the AEMR as Attachment A and is also available on the [Orica KI website](#).

7.1.3 WATER MANAGEMENT

Process effluent generated from the site's ammonia plant, three nitric acid plants and two ammonium nitrate plants is discharged to the north arm of the hunter river via and effluent pipeline. An effluent monitoring station, located on the western bank of the north arm of the Hunter River, continually monitors effluent water quality in compliance with the requirements detailed in the site's Environment Protection Licence No. 828. Although the ammonia plant is one of several effluent sources generating from operating plants onsite, with no additional effluent sources generated by the uprate of the ammonia plant, a summary of effluent monitoring results is detailed in Table 7 for completeness.

Table 7 – Effluent Monitoring Results 2021 AEMR reporting period

Pollutant	Units of Measure	Monitoring Frequency Required by Licence	Min. Value	Max. Value	90 percentile Licence Limit	100 percentile Licence Limit	Exceedence? (Yes/No)
Ammonia	mg/L	Daily	12	281	-	N/A	No
Arsenic	mg/L	Daily	0.001	0.018	-	0.05	No
Chromium (hexavalent)	mg/L	Daily	0	0.039	0.05	0.2	No
Nitrogen (Total)	mg/L	Daily	41	474	1500	2000	No
Oil and Grease	mg/L	Twice per Week	0	1.5	-	10	No
pH	pH	Continuous	6.52	9.22	-	6.2-9.5	No
Temperature	Degrees Celsius	Continuous	10.7	41.0	-	43	No
TSS	mg/L	Daily	2	35	-	50	No
Zinc	mg/L	Daily	0.00	0.65	-	5	No
Flow	kL/day	Daily	1542	3874	-	4500	No

Effluent quality and volumes have been generally consistent with previous years.

8 COMMUNITY

8.1 COMMUNITY ENGAGEMENT ACTIVITIES

Orica Kooragang Island is committed to effective and targeted stakeholder engagement by ensuring that the community is informed during each stage of the Project. To do so, the site undertakes the following activities.

- The production and distribution of four community newsletters per year, which are delivered to residents in our neighboring suburbs of Stockton, Carrington, Tighes Hill, Mayfield East, Fern Bay and Maryville;
- Regular (3 monthly) Community Reference Group (CRG) meetings, a number of which feature independent guest speakers to talk about specific matters;
- Regular site tours for the general community and special interest groups;
- Annual emergency response briefings with industrial neighbors; and
- Regular briefings with EPA and SafeWork.

In addition, an Orica employee has been an industry representative on the EPA's Newcastle Community Consultative Committee for the Environment (NCCCE).

8.2 COMMUNITY INVESTMENT

Orica Kooragang Island aims to have a positive contribution to the community by supporting local initiatives and events. Through the Orica Kooragang Island Community Investment Program we support a range of projects that promote education and lifelong learning, improve and protect the environment, and build strong communities. In the 2021 reporting period, Orica Kooragang Island provided approximately \$280,000 in community grants to support a range of local events, activities and organisations including:

- Mentor Support Network
- Jenny's Place
- Variety the Children's Charity
- John Hunter Children's Hospital
- Curious Legends Theatre Company
- Worimi community
- Awabakal
- Chuck Duck Breakfast Club
- Hunter District Cycling Club
- Supertee
- Soul Cafe
- Hunter Wetlands Centre
- Newcastle Art Society
- Newcastle Rowing Club
- Local Sporting Clubs
- Local schools

8.3 COMMUNITY COMPLAINTS

Information on how the community can contact Orica to discuss the Project or make a complaint in relation to site activities is provided in community newsletters, which are distributed to adjacent suburbs including Stockton, Fern Bay, Carrington, and areas of Mayfield, Maryville and Tighes Hill, via the Orica Kooragang Island website (www.orica.com/kooragang), the White pages, a community calendar which is distributed to Stockton and Fern Bay and in periodic advertorials run in the local print media.

All complaints received by Orica are documented in the site's incident reporting system (Enablon). All complaints are investigated to establish the root cause of the concern and determine whether the complaint is justified.

During the 2021 AEMR reporting period 6 complaints were received relating to the Project. Details of the complaints can be found in the following table (Table 8).

Table 8 – Community complaints (note that justified and unjustified complaints are included)

Year	Total	Concern raised in complaint/notification
2021	6	<ul style="list-style-type: none"> 3 complaints relating to a fire on 102E vessel in the ammonia plant 1 complaint raised in relation to noise from Ammonia plant trip 1 complaint related to odour 1 complaint related to offsite staining of concrete
2020	5	<ul style="list-style-type: none"> 1 complaint relating to ignition of vent stack in Ammonia Plant during plant start up 2 complaints related to odour received by an industrial neighbour and by a community member at Nobby's Break wall on separate occasions 1 complaint related to noise received from a resident of Stockton 1 complaint in relation to visible steam from cooling towers and site boiler
2019	1	<ul style="list-style-type: none"> 1 complaint relating to noise received from nearby residents.
2018	3	<ul style="list-style-type: none"> 3 complaints related to odour received from residents of Stockton.
2017	5	<ul style="list-style-type: none"> 3 complaints related to odour received from residents and industrial neighbours 2 complaints related to noise from Stockton residents
2016	14	<ul style="list-style-type: none"> 10 complaints related to odour received from residents and industrial neighbours 3 complaints were received regarding noise 1 complaint regarding ignition of ammonia plant vent
2015	8	<ul style="list-style-type: none"> 6 complaints related to odour received from residents and industrial neighbours 2 complaints related to noise generated from steam venting
2014	10	<ul style="list-style-type: none"> 7 complaints were received relating to ammonia odour 1 complaint received regarding noise from the Ammonia Plant 2 complaints relating to ignition of vent stack in Ammonia Plant during plant startup.
2013	7	<ul style="list-style-type: none"> 6 complaints relating to noise 1 complaint relating to ammonia odour as a result of an incident in the Ammonia Plant
2012	27	<ul style="list-style-type: none"> 18 related to ignition of vent stacks during Ammonia Plant restart 9 complaints relating to noise

9 AN1 PRILL TOWER EMISSION REDUCTION INVESTIGATIONS

9.1 PARTICULATE MINIMISATION PROGRAM

Condition 27 of the Project Approval requires:

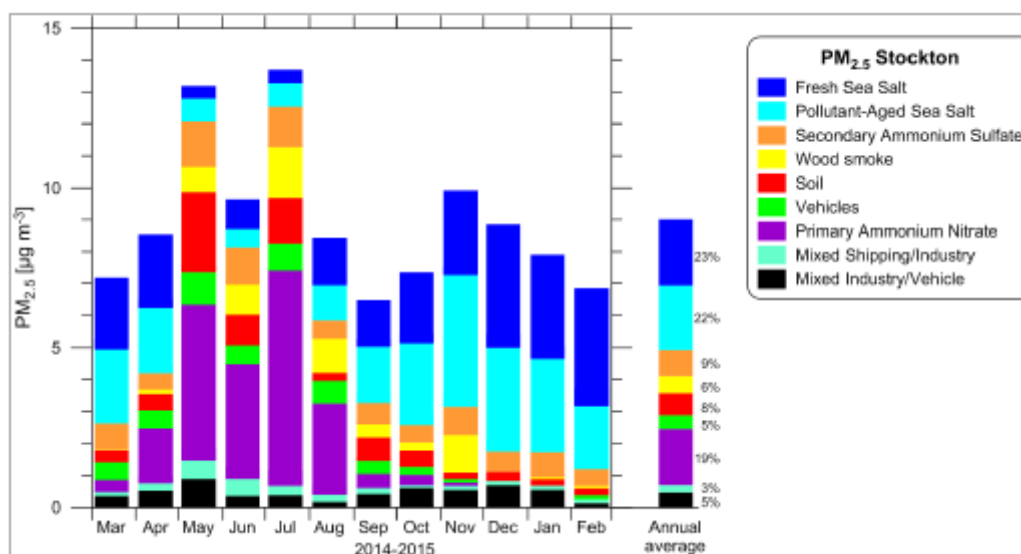
The Proponent shall investigate and report on the progress to reduce PM10 emissions from the existing Prill Tower on the Ammonium Nitrate Plant No. 1. The report shall:

- (a) *be provided annually, and can be reported through the Annual Environmental Management Report required by condition 50; and*
- (b) *Provide an update on the timeframe for the implementation of emission controls.*

9.1.1 EPA PARTICLE CHARACTERISATION STUDY

The Lower Hunter Particle Characterisation Study (LHPCS) was initiated in 2013 by the NSW EPA in response to community concerns regarding the health effects of particle pollution in the community. The project focused on the composition and likely sources of airborne PM 2.5 particles.

The study utilised monitoring data from existing monitoring stations, with the closest station to Orica's Kooragang Island facility located 700m to the south-east of the site. Composition analysis performed on PM2.5 samples collected from the Stockton monitoring station identified that ammonium nitrate contributed to 19% of the annual average and up to 40% of the mass during May to July, corresponding to predominately north-westerly winds. Orica's Kooragang Island Ammonium Nitrate Prill Tower was cited in the report as being a likely source of the elevated ammonium nitrate concentrations monitored at the Stockton monitoring station.



9.1.2 PM2.5 PARTICLE CHARACTERISATION STUDY

In response to the findings of the Lower Hunter Particle Characterisation Study Orica entered into a Pollution Reduction Program (PRP46) with the following requirements:

U3.1 – The licensee must fund the analysis of the ammonium and nitrate component of samples collected at the Stockton Air Quality Monitoring Station as part of the ANSTO Aerosol Sampling Program (ASP) PM2.5 during the period April to September 2015 and April to September 2016.

Within one month of receiving the results the licensee must submit them to the EPA's Regional Manager - Hunter at PO Box 488G, Newcastle NSW 2300, or by email to hunter.region@epa.nsw.gov.au.

U3.2 – The licensee will undertake an investigation to determine the contribution of ammonium nitrate particles with a diameter of 2.5µm or less (PM2.5) discharged from sources located at the site to total PM2.5 concentrations at the Stockton Air Quality Monitoring Station.

A report detailing this investigation and its findings must be submitted to the EPA's Regional Manager - Hunter at PO Box 488G, Newcastle NSW 2300, or by email to hunter.region@epa.nsw.gov.au.

Date for completion: 28 February 2018

U3.3 - The licensee must undertake a review that identifies feasible options to reduce PM2.5 ammonium nitrate particle emissions from sources identified as being significant as a result of the investigation completed in U3.2.

A report detailing the outcomes of the review must be submitted to the EPA's Regional Manager – Hunter at PO Box 488G, Newcastle NSW 2300, or by email to hunter.region@epa.nsw.gov.au.

Date for completion: 28 February 2018

A review of feasible technologies for reducing PM2.5 emissions from the site's Prill Tower was completed and a report submitted to the EPA. These technologies varied from simple dry filtration units, to more complex wet scrubbing systems and less conventional technologies such as electrostatic precipitation. The review concluded that irrigated fibre-bed scrubbing technology was the most suitable technology to reduce Prill Tower Emissions.

Following the completion of PRP 46, Orica committed to evaluating the feasibility of installing irrigated fibre-bed scrubbing technology into the existing Prill Tower, through the completion of a further pollution reduction program *PRP 47 - Feasibility Assessment of Irrigated Fibre-Bed Scrubbing Technology to Reduce PM2.5 Emissions from the Prill Tower* (EPL 828 August 2020 variation) which was completed and submitted in December 2019.

As part of the EPL 828 variation dated August 2020, a further pollution reduction program; *PRP 50 - Installation of new Pollution Controls* was added to the license. Details of PRP 50 are as follows (directly from EPL 828);

U3.1 Background

The Lower Hunter Particle Characterisation Study (2015) found that a portion of the PM2.5 detected at the Stockton ambient air quality monitoring station was composed of primary ammonium nitrate. Primary ammonium nitrate was subsequently found to make up about 40 % of the PM2.5 detected at the Stockton ambient air monitoring station in winter; a time when the monitor is often downwind of the Prill Tower. The licensee has completed Pollution Reduction Program (PRP) 46 and PRP 47, which were investigations into feasible options to reduce PM2.5 emissions from the Prill Tower. The licensee has identified that irrigated fibrebed scrubber technology is an appropriate pollution control for the Prill Tower air emissions. This PRP is the next step, being formalisation of the installation of new pollution controls to address PM2.5 emissions from the Prill Tower.

U3.2 Deliverables

The licensee must install an irrigated fibrebed scrubber at the Prill Tower (Point 16) to minimise PM2.5 ammonium nitrate emissions from the premises. The licensee must carry out the project as follows:

- a) By 1 February 2021, the licensee must complete all geotechnical and structural engineering investigations associated with the current Prill Tower (including but not limited to intrusive structural investigations of the Prill Tower foundations) and prepare a stakeholder engagement and a regulatory approvals plan for the project;*
- b) By 1 October 2021, the licensee must complete all necessary final engineering designs for the project to allow for the procurement tendering process to commence for long lead time items;*
- c) By 1 April 2022, the licensee must finalise orders for all long lead-time items for the project;*
- d) By 1 April 2023, the licensee must complete all necessary pre-works for the project (including earthworks, civil, electrical, structural and mechanical works) and receive the scrubber at the premises;*
- e) By 1 November 2023, the licensee must achieve practical completion of the project;*
- f) By 31 January 2024, the licensee must achieve final completion of the project.*

Note: This PRP has been added to the licence during the COVID-19 pandemic in mid-2020. COVID has resulted in delays, particularly for items that need to be imported from abroad. The EPA recognises that there might need to be some refinement to the above dates depending upon how the COVID pandemic plays out.

U3.3 The licensee must submit to the EPA's Director Metro North a progress report within sixty days of each of the dates given in the condition above. Each progress report must include, but need not be limited to:

- a) an overview of the project;*
- b) a description of the project activities and works completed during the period;*
- c) a description of the project activities and works proposed for the next period;*
- d) a summary of any significant deviation(s) from the engineering design or the milestones given in the condition above, along with their cause.*

U3.4 The licensee must notify the EPA's Director Metro North within thirty days of becoming aware of any significant deviation from the engineering design or the milestones and their cause.

Progress reports for milestones 1 (U3.2a) and 2 (U3.2b) have been submitted to NSW EPA in accordance with EPL requirement.

10 RECLAIMED WATER PROJECT

As detailed in Condition 37 of the Project Approval, Orica was required to investigate the feasibility of receiving recycled water from Hunter Water Corporation's recycled water scheme. The site commenced receiving recycled water on the 28 November 2014. The water is used in the Ammonia Plant Cooling Tower, Demineralised Water Treatment Plant and No. 1, 2 and 3 Nitric Acid Plant Cooling Towers. A breakdown of potable water usage compared with recycled water usage is detailed in Figure 5.

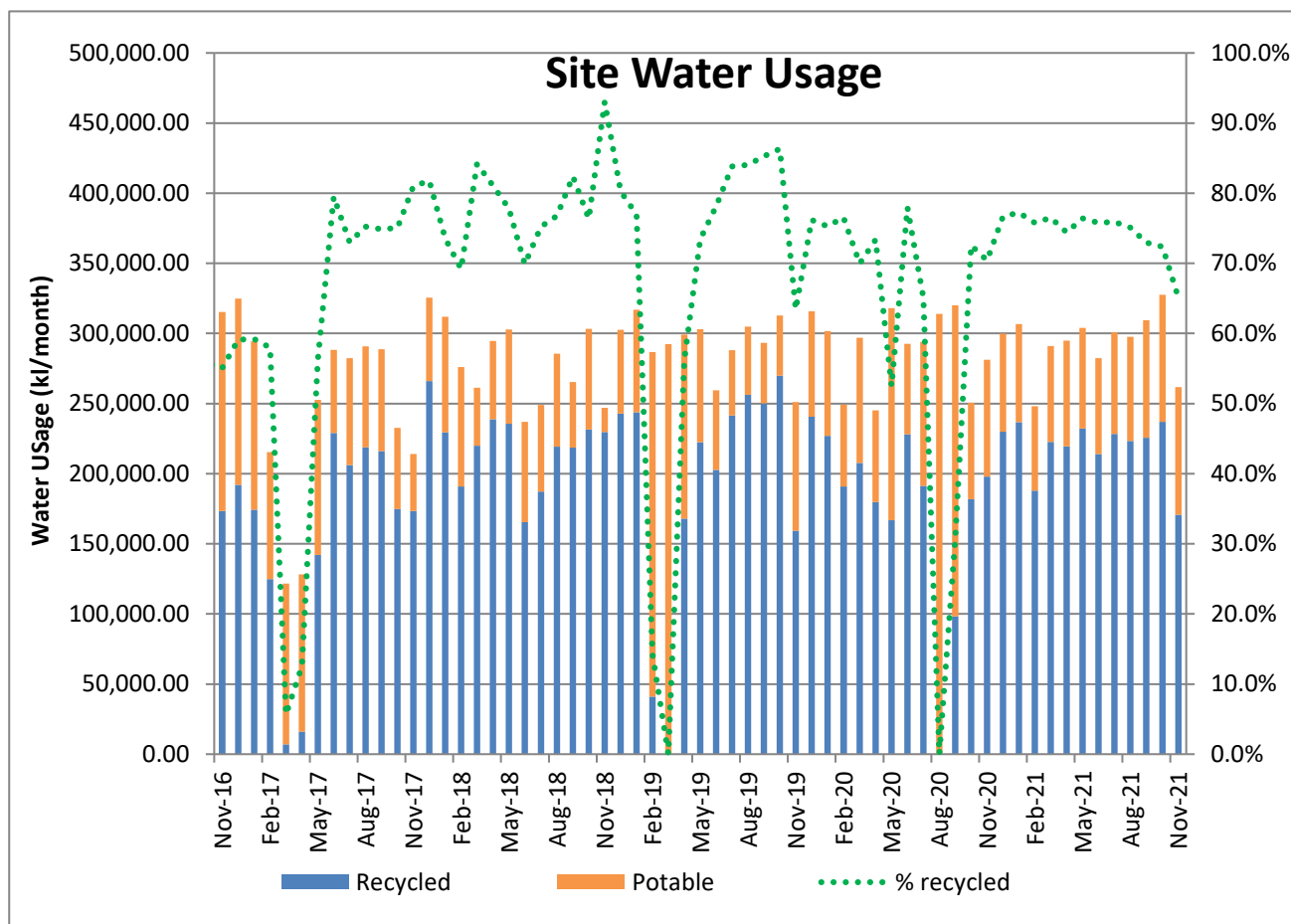


Figure 5 Potable water and recycled water usage comparison

Recycled water continued during the 2021 AEMR period, with recycled water contributing approximately 75% of water consumed at the site when supply was available.

11 PROJECT APPROVAL COMPLIANCE

11.1 CONDITION COMPLIANCE

A review of the status of compliance with the Project Approval 08-0129 is detailed in the table below. Where there was not complete compliance with the condition, actions to address the issues are detailed. Any noncompliance identified in Table 10, have been identified in accordance with the following risk level detailed in below.

Table 2 – Noncompliance risk level ranking

Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

Table 10 Summary of Compliance with Project Approvals during 2021 AEMR Reporting Period

Issue	Condition	Requirement	Compliance Status	Comment
General Responsibilities	1	Implement all reasonable and feasible measures to prevent pollution and minimise harm to the environment.	Compliant	Management plans and project management activities are in place to ensure that environmental harm during construction and operational activities is minimised.
	2	Project to be carried out in accordance with the EA, Statement of Commitments, Project Approval and Submission Approval, Modification report and PHA.	Compliant	Project documentation has been updated to reflect development consent MOD1, MOD2 and MOD3, MOD4 and MOD5 documentation.
	3	Management of inconsistencies between the various Project Approval documents.	Compliant	No issues were identified during the period.
	4	Comply with the requirements of the Secretary	Compliant	No issues were identified during the period.
	5	Production capacity limits for ammonia, nitric acid and ammonium nitrate.	Compliant	Ammonia – 345ktpa (385ktpa) Nitric Acid – 311ktpa (605ktpa) Ammonium Nitrate – 391ktpa (750ktpa)
	6	Management of Project Approval conditions in the event that there are delays to the stages of the project.	Compliant	No construction works were undertaken in relation to Phase 2, 3 and 5 of the expansion construction program. Regulatory reporting associated with the uprated ammonia plant (Phase 1) has continued in accordance with the conditions of the project approval.
	7(a) 7(b)	The project shall be carried out generally in accordance with the approved Staging Plan	Compliant	A revised Staging Plan was submitted to DPIE in the 2021 AEMR reporting period incorporating MOD4 and MOD5. Updated staging plan (December 2021) included in this AEMR.

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Issue	Condition	Requirement	Compliance Status	Comment
	7 (e)	Submission of plans on a progressive basis.	Compliant	Orica has submitted plans on a progressive basis following discussions with the DPIE. A revised Staging Plan outlining the progressive submission of plans is submitted annually to DPIE in the AEMR and as required under the consent.
	7(f)	Minor design Variations	Compliant	No minor design variations were sought during the 2021 AEMR period. DPIE confirmed the upgrade of the existing NOx abatement systems on the NAPs could proceed without planning approval or post approval documentation on 29 October 2021.
	8	Buildings and structures to be constructed in accordance with the requirements of the Building Code of Australia.	Compliant	Construction of the NAP1 Stack Replacement (as a minor design variation under Condition 7F) commenced during the 2021 AEMR reporting period and has been constructed in accordance with the relevant Codes and Standards.
	9	The Proponent is required to repair any public infrastructure damaged as a result of the Project.	Compliant	No construction works requiring the use of public roads were undertaken during the 2021 AEMR reporting period.
	10	Undertaking of a dilapidation report prior to the commencement of construction. The report is to be undertaken in consultation with NPC and submitted to the Department of Planning.	Compliant	No updates to the dilapidation report were required during the 2021 AEMR reporting period.
	11	Obtain approval from service providers prior to commencement of utility construction activities	Compliant	Recycled water was connected to the site in cooperation with Hunter Water Corporation in 2014. No additional utilities were connected to the site during the 2021 AEMR reporting period.
	12	Ensure all equipment is maintained and operated in a proper and efficient manner.	Compliant	Phase 1 - ongoing. Maintenance and training activities associated with Phase 1 have been incorporated into routine plant activities.
	13	Section 94 contribution to NCC.	Compliant.	Section 94 contribution was submitted to NCC in September 2010. No further contributions were determined to be required for MOD4 and MOD5 given their nature.

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Issue	Condition	Requirement	Compliance Status	Comment
Hazard Management	14	Undertake the following studies and submit to DPE Secretary for approval:		
	a)	<ul style="list-style-type: none"> Fire Safety Study 	Compliant	Orica elected to update the FSS in June 2019 and submitted to DPIE as part of Phase 6 Pre-Start Up Compliance Report under condition 16. There were no changes to the FSS during 2021 AEMR reporting period.
	b)	<ul style="list-style-type: none"> HAZOP 	Compliant	No HAZOP reports were submitted to DPIE during the 2021 AEMR reporting period.
	c)	<ul style="list-style-type: none"> Final Hazard Analysis 	Compliant	No FHA's were submitted during the 2021 AEMR period.
	d)	<ul style="list-style-type: none"> Construction Safety Study 	Compliant	No CSS's were submitted to DPE during the 2021 AEMR reporting period.
	15	Undertake the following studies and submit to DPE Secretary for approval:	Compliant	The transport of hazardous materials study was updated during the 2021 reporting period.
		<ul style="list-style-type: none"> Transport of Hazardous Materials Study 		
		<ul style="list-style-type: none"> Emergency Plan 	Compliant	General updates were made to the site's Emergency Plan and a copy supplied to DPIE on 2 August 2019.
		<ul style="list-style-type: none"> Safety Management System 	Compliant	No changes to the site safety management system were made during the 2021 AEMR reporting period.
	16	Submission of Pre-Startup Compliance Report	Compliant	No Pre-Startup Compliance Reports were required to be submitted during the 2021 AEMR reporting period
	17	Submission of Post-Startup Compliance Report	Compliant	No Post-Startup Compliance Reports were required to be submitted during the 2021 AEMR reporting period
	18	Submission of Risk Reduction Program to reduce risk to neighbouring land	Compliant	This Condition is deemed satisfied through the risk reduction measures detailed in the MOD1, MOD 2 and MOD3 PHA's.

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Issue	Condition	Requirement	Compliance Status	Comment
	19	Undertake a Hazard Analysis of the site operations	Compliant	This report was not required to be submitted during the 2021 AEMR reporting period.
	20	Undertake a comprehensive Hazard Audit of the Project and submit a report to the DPE Secretary	Compliant	A Hazard Audit report was submitted to DPIE on 14 November 2016. An action plan to address recommendations was also submitted on 14 December 2016. An update regarding the status of actions included in the plan is detailed in Section 12.1 The 3 yearly Hazard Audit was last completed in November 2019.
Air Quality	21	Emission controls detailed in Section 7.8.1 of the Environmental Assessment are to be incorporated into the design.	Compliant	The Refrigeration Purge Gas Scrubber was commissioned in 2012 and is operating in accordance with the environmental assessment.
	21 (a)	The site will operate the flares in a proper and efficient manner	Compliant	The ammonia plant, ammonia storage and nitrates flares were operational during the 2021 AEMR reporting period.
	22	Air emission monitoring required by the EPL is to be undertaken for the Project.	Compliant	Orica has undertaken stack testing during the 2021 AEMR reporting period. All tests complied with the site's EPL requirements.
	23	Undertake an Air Quality Verification Study	Compliant	Orica sought clarification from DPIE regarding the requirement for an Air Quality Verification Study to be completed relating to the site's three ammonia flares on 29 March 2018 which was viewed as not practical from a technical perspective. Orica did not receive a response, and is operating under the assumption this conclusion is acceptable to DPIE. AQVS for Phase 6 – Boiler was submitted in May 2021.
	24	Implement reasonable and feasible actions to address exceedances identified in the Air Quality Verification Study or routine monitoring.	Compliant	No exceedances were identified in the Air Quality Verification Study.

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Issue	Condition	Requirement	Compliance Status	Comment
	25	Minimisation of dust generation from Project using reasonable and feasible means.	Compliant	Measures for the control of dust were included in the Construction Environmental Management Plan which was approved by DPIE in February 2010. The CEMP was updated during the 2021 AEMR period.
	26	Trucks entering or leaving the Project site must have their loads covered and must not track dirt onto public roads	Compliant	Measures for the control of dust were included in the Construction Environmental Management Plan which was approved by DPIE in February 2010.
	27	An annual report must be prepared detailing the progress of the project to reduce PM10 emission from the existing Prill Tower	Compliant.	A summary of the progress is detailed in this Annual Environmental Management Report. The Prill Tower Scrubber project (MOD5) addresses this issue.
	27 (a)	Air Quality Management Plan	N/A	An operational AQMP has been drafted and submitted to DPIE that will outline the operational and maintenance procedures used by Orica to ensure air emissions are managed in a proper and efficient manner. Refer to air related emissions monitoring requirements and limits in the site EPL.
	27 (b)	Consult with IPL in regard to the Air Quality Risk Management Strategy	N/A	IPL expansion project has lapsed
	27 (c)	Consult with IPL in regard to the Air Quality Risk Management Strategy	N/A	IPL expansion project has lapsed
Greenhouse Gas Emissions	28	Emission reduction technologies to be implemented in accordance with EA commitment	Compliant	The following emission reduction technologies were included in the Ammonia Plant; a Pre-Reformer, a new compressor powered by a steam turbine and a larger motor generator (Item 28b) has been installed in the plant.
	29	Implementation of N ₂ O abatement technology on NAP1, NAP2 and NAP3.	n/a during the period.	N ₂ O abatement technology was installed in the No. 2 and No 3 Nitric Acid Plants.

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Issue	Condition	Requirement	Compliance Status	Comment
				Funding has been approved to upgrade existing NOx and N ₂ O abatement systems with tertiary N ₂ O abatement technology on the 3 Nitric Acid Plants, with construction expected to be completed by end CY2022.
Water Management	37	Water management Plan, including reporting on progress of investigations to receive recycled water from Hunter Water Corporations recycled water scheme.	Compliant	A Water Management Plan for Phase 1 was completed. Infrastructure associated with receiving recycled water has been installed and commissioned, with recycled water received at site from 28 November 2014. Recycled water continues to be used to the extent possible. Phase 7 and 8 of the Project do not impact site water use.
	40	The Project is to meet the requirements of the EPL in relation to stormwater and effluent discharge	Compliant	The site's effluent and stormwater were monitored in accordance with the requirements of the EPL. No non-compliances were recorded during the 2021 AEMR reporting period relating to the expansion consent.
	37	A Water Efficiency Plan is to be prepared and implemented to the satisfaction of the DPE Secretary	Compliant	No amendments to the Project's water efficiency plans were completed in the 2021 AEMR reporting period. Phase 7 and 8 of the Project do not impact site water use.
	41	Compliance with s120 of POEO	Compliant	There were no water pollution related incidents directly attributed to construction activities associated with the Project recorded during the 2021 AEMR reporting period.
	42	A Stormwater Management Plan is to be prepared and implemented	Compliant	No changes to the Project's approved stormwater monitoring plan were required during the 2021 AEMR reporting period. Phase 7 and 8 of the Project will utilise existing stormwater arrangements.
	43	Bunding design to meet Australian and DECCW requirements	Compliant	A bunding specification in accordance with the Australian standard has been implemented into the design of the plants. Orica continues to upgrade existing bunds in accordance with Special Condition detailed in the EPL.

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Issue	Condition	Requirement	Compliance Status	Comment
Noise Management	30	Noise emissions from Project to be 10dB(A) below that of the existing operations.	Compliant	Annual noise monitoring was completed during the 2021 AEMR reporting period and was compliant. A copy of the full 2021 noise audit report is provided in Appendix A.
	31	Existing Operations Noise Verification Program to be developed and implemented to the satisfaction of the DPE Secretary	Compliant	An updated noise management plan, including details of the Project's noise verification program, was submitted and approved by the DPIE in November 2021.
	32	A Noise Management Plan is to be developed and implemented. The plan is to be updated annually.	Compliant	An updated noise management plan, including details of the Project's noise verification program was submitted and approved by the DPIE in November 2021.. The noise management plan was reviewed and updated during the 2021 AEMR reporting period.
	32 (a)	Ports Precinct Noise Management	n/a	Study yet to commence.
	33	Construction hours for the Project are:	Compliant	No project related construction activities occurred during the 2021 AEMR period.
		Monday – Friday		
		Saturday		
		Sunday and Public Holidays		
Land Management	38	Construction outside of these hours is permitted if inaudible at the nearest residences.	Compliant	Phase 1 - Complete. Phase 2, 3 and 5 – no construction activities have commenced at this time. However, the revised CEMP for Phase 2 and 3, which includes measures for the management and identification of contamination, was submitted to DPE on 05/11/2011. Phase 6 – N/A
		Operational hours for the Project are:		
		All days		
		24 hours		

Issue	Condition	Requirement	Compliance Status	Comment
				Phase 7 and 8 – No significant contamination in project area
	39	Prepare an Acid Sulphate Soil Management Plan	Compliant	Phase 1 - Complete. Phase 2, 3 and 5 – no construction activities have commenced at this time. However, the revised CEMP for Phase 2 and 3, which has measures for the management and identification of ASS, was submitted to DPE on 05/11/2011. Phase 6 – N/A Phase 7 – Considered as part of project CEMP
	44	Prepare an Erosion and Sediment Control Plan	Compliant	Phase 1 - Complete. Phase 2, 3 and 5 – no construction activities have commenced at this time. However, the revised CEMP for Phase 2 and 3, which has measures for erosion and sediment control, was submitted to DPE on 05/11/2011. Phase 6 – N/A Phase 7 and 8– Considered as part of project CEMP
Traffic Management	34	All roads, access points and parking to comply with the nominated Australian Standards	n/a during the period.	N/A
	35	Traffic associated with the Project must not impede traffic on Greenleaf Road and Heron Road	Compliant	Phase 1 - Complete. Phase 2, 3 and 5 – no construction activities have commenced at this time. However a revised Construction Traffic Management Plan for Phase 2 and 3, which includes measures for the management of traffic during construction, was submitted to DPE on 05/11/2011. Phase 6 – N/A Phase 7 and 8 – Considered as part of project CEMP
	36	A Construction Traffic Management Plan (CTMP) is to be submitted to the DPE Secretary	Complaint	A CTMP for Phase 2 and 3, including measures for the management of traffic during construction has been submitted to DPE (05/11/2011). No amendments were made to the plan during the 2021 AEMR reporting period.

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Issue	Condition	Requirement	Compliance Status	Comment
				Phase 7 and 8 – Considered as part of project CEMP
Visual	45	Prepare a Landscape Plan for the Project and submit to the DPE Secretary	Compliant	A landscape plan has been submitted for the project.
	46	Lighting to comply with Australian Standards and avoid nuisance to surrounding landusers and roadways.	n/a during the period.	Phase 1 – There was no additional external lighting installed by the project during the 2019 AEMR reporting period. Phase 6 – The project has completed an assessment and the lighting is compliant with this requirement.
Waste Management	37	Water management Plan, including reporting on progress of investigations to receive recycled water from Hunter Water Corporation's recycled water scheme.	Compliant	A Water Management Plan for Phase 1 has been completed. Infrastructure associated with receiving recycled water has been installed and commissioned with recycled water received at site on the 28 November 2014. The Reclaimed Water Management Plan has been reviewed and updated during the 2021 AEMR reporting period.
	47	Waste to be classified in accordance with DECCW guidelines and disposed to approved premises	Compliant	All wastes disposed of from site are classified in accordance with the relevant EPA guidelines and disposed of via licensed waste facilities where relevant.
	48	Prepare and implement a Waste Management Plan which has been submitted to the DPE Secretary	Compliant	A waste management plan for the uprated Ammonia Plant was submitted to the DPIE on 28 March 2013.
Environmental Reporting and Auditing	49(a)	Construction Environmental Management Plan	Compliant	CEMP was reviewed and updated during 2021 AEMR reporting period.
	49(b)	Operational Environmental Management Plan	Compliant	Orica submitted an OEMP for the Project to DPIE for approval by 30 June 2020. Comments were received in August 2021 and are currently being assessed.
	50	Prepare an Annual Environmental Management Report and submit to the DPE Secretary	Compliant	Submission of this report occurs annually

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Issue	Condition	Requirement	Compliance Status	Comment
	51(a) and b)	The DPIE Secretary is to be notified of any incident associated with the Project that results in actual or potential for offsite harm to people or the environment	Compliant	One incident occurred during the reporting period relating to a fire on the cladding of the 102E vessel (Carbon dioxide removal vessel) in the ammonia plant. The incident occurred on 13 November 2021 and was notified to DPIE 14 November 2021. A formal incident report was submitted to DPIE on 19 November. No harm occurred to the environment or people as a consequence of the incident.
	51(c)	Flare activation reporting	Compliant	An annual flare activation report was submitted to DPIE during the 2021 AEMR period.
	52	An Independent Environmental Audit by a team of experts is to be undertaken in relation to the Project	Compliant	The independent environmental audit report was submitted to DPIE on 31 August 2020. The next independent audit is scheduled for June 2023.
	53	<p>The following information regarding the Project is to be included on the website:</p> <ul style="list-style-type: none"> • Copy of all current statutory approvals • Copy of the current EMS and associated plans and programs • Copy of the last 5 years of Annual Reports • Copy of Independent Environmental Audit reports and responses to recommendations 	Compliant	Copies of relevant information relating to the project continue to be included on the Kooragang Island website (www.orica.com/kooragang).

11.2 SUMMARY OF SUBMITTED REPORTS

Details on the reports submitted in compliance with the Project Approval are detailed in the table below.

Table 2: Reporting Requirements and Status (November 2021)

✓ = Submitted to DPIE and Approved ✓ = Submitted to DPIE awaiting approval from DPIE or Other ✓ = Yet to be submitted to DPIE x = not submitted to DPIE NR = Update not required/triggered following review

Condition	Condition Requirement	Project Phase										Reports submitted to DPIE to date	
		Phase 1	Phase 2		Phase 3		Phase 4	Phase 5	Phase 6	Phase 7	Phase 8		TBD
		Ammonia Plant Uprate	OBL 1(a)	OBL 1(b)	NAP4 & ANS	ANP	AMI	Nitric Acid Tank	Boiler	Nitrates Effluent Tank	Prill Tower Scrubber		Ammonia Tank
Reporting Requirements for Commencing Construction													
14 (a)	A Fire Safety Study	✓	✓	✓	✓		NR*	NR	✓^	NR	NR	✓	1. FSS Kooragang Island Site (21 June 2011) 2. FSS Ammonia Uprate project (17 April 2010) 3. FSS Phase 2 OBL 1(a) (17 February 2012) 4. FSS Phase 2 OBL 1(b) (23 October 2012) 5. FSS Phase 3 Nitric Acid and Ammonium Nitrate plants (7 January 2013) * No formal requirement for FSS associated with Phase, however reduction in ammonia inventories to be updated to site FSS in next FSS revision ^ Boiler detailed in Site FSS. New location updated in Site FSS
14 (b)	A Hazard and Operability Study	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	1. Ammonia Plant Uprate (22 March 2010) 2. Phase 2 OBL 1(a) (27 March 2012) 3. Phase 2 OBL 1(b) (30 October 2012) 4. Ammonium Nitrate Prill Plant (15 Nov 2012) 5. Nitric Acid 4 and Ammonium Nitrate Solution 3 (28 Oct 2012) 6. AMI HAZOP Report (dated 12 January 2015) 7. KI Steam HAZOP Report (dated 22 June 2015) 8. Nitrates Effluent Tank HAZOP (to be submitted) 9. Prill Tower Scrubber HAZOP (to be submitted)
14 (c)	A Final Hazard Analysis	✓	✓	x		✓		x	NR	NR	NR	✓	1. N/A
14 (d)	A Construction Safety Study	✓	✓	✓	✓*		✓		x	✓	✓	✓	1. CSS for air compressor building (5 December 2009) 2. CSS for ammonia plant uprate (29 March 2010) 3. CSS OBL 1 (a) (3 December 2011) 4. CSS OBL 1(b) (1 August 2012) 5. CSS AMI Rev C (dated 2 April 2015) 6. CSS Boiler Rev B (dated 15 June 2015) 7. CSS Nitrates Effluent Tank (to be submitted) 8. CSS Prill Tower Scrubber (to be submitted) * Civil construction activities associated with phase 3 considered in OBL 1(b) CSS only

Condition	Condition Requirement	Project Phase											Reports submitted to DPIE to date
		Phase 1	Phase 2		Phase 3		Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	TBD	
		Ammonia Plant Update	OBL 1(a)	OBL 1(b)	NAP4 & ANS	ANP	AMI	Nitric Acid Tank	Boiler	Nitrates Effluent Tank	Prill Tower Scrubber	Ammonia Tank	
36	Construction Traffic Management Plan	✓	✓				NR	NR	NR	NR^	NR^	NR^	1. Ammonium Nitrate Facility Upgrade CTMP (March 2010) 2. Ammonium Nitrate Facility Upgrade CTMP (September 2011) ^ Incorporated in Project CEMP
37	Water Efficiency Plan	✓	NR	NR	✓		NR	NR	NR	NR	NR	NR	1. Water efficiency Plan Phase 1: Ammonia Plant Upgrade (April 2011) 2. Water efficiency Plan Phase 3: NAP4 and AN3 (May 2013)
38	Soil and Groundwater Contamination investigation	✓									NR	NR	1. Soil Management Plan (December 2009) 2. Targeted soil and groundwater quality assessment (13 April 2012)
42	Stormwater Management Plan	✓									NR	NR	1. Stormwater Nitrate Facility Upgrade Stormwater Management Plan Phase 1 (March 2010) 2. Stormwater Nitrate Facility Upgrade Stormwater Management Plan (November 2011)
45	Landscape plan	✓									NR	✓	1. Landscape Plan (3 June 2011)
49A	Construction Environment Management Plan	✓									✓^	✓	1. Construction Environment Management Plan rev 2 dated September 2011 and updated periodically ^ Project specific CEMP prepared
Reporting Requirements for Commencing Commissioning													
15 (a)	Transport of Hazardous Materials Study	NR	NR	NR	NR	✓	NR	NR	NR	NR	NR	✓	1. Transport and hazardous materials study (22 April 2013) 2. Transport and hazardous materials study (March 2021) – updated in response to IEA recommendation, not a project phase
15 (b)	Emergency Plan	✓					✓*	X*	X*	NR	NR	✓	1. KI emergency response plan (11 April 2011) *Update to approved ERP required for Phase
15 (c)	Safety Management System	✓					✓*	X*	X*	NR	NR	✓	1. Safety management system (December 2010) *Update to approved SMS required for Phase
16	Pre-Startup Compliance Report	✓	x	x	x	x	✓	x	✓	✓	✓	✓	1. Pre-Start up Compliance report Phase 1 Ammonia plant uprate (June 2011) 2. Pre-Start up Compliance report Phase 4 AMI (dated August 2015) 3. Pre-Start up Compliance report Phase 6 Boiler (dated August 2019) 4. Pre-Start up Compliance report Phase 7 Nitrates Effluent Tank (to be submitted) 5. Pre-Start up Compliance report Phase 8 Prill Tower Scrubber (to be submitted)

Condition	Condition Requirement	Project Phase											Reports submitted to DPIE to date
		Phase 1	Phase 2		Phase 3		Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	TBD	
		Ammonia Plant Uprate	OBL 1(a)	OBL 1(b)	NAP4 & ANS	ANP	AMI	Nitric Acid Tank	Boiler	Nitrates Effluent Tank	Prill Tower Scrubber	Ammonia Tank	
49B	Operational Environmental Management Plan	✓^									✓	✓	1. Environmental Management Strategy (December 2009) ^ update to approved EMS completed to meet additional requirements incorporated into Development Consent following the completion of modification approval processes.
Reporting Requirements for Commencing Operation													
17	Post-Startup Compliance Report	✓	x	x	x	x	x	x	✓	✓	✓	✓	1. Post-Startup Compliance report Phase 1 Ammonia plant uprate (May 2012) 2. Post-Startup Compliance report Phase 6 Boiler (Dec 2019) 3. Post-Start up Compliance report Phase 7 Nitrates Effluent Tank (to be submitted) 4. Post-Start up Compliance report Phase 8 Prill Tower Scrubber (to be submitted)
18	Further risk reduction program	NR									NR	NR	Not required due to updated PHA is now compliant
19	Hazard Analysis Update	x									NR	NR	3 years after the completion of the Project
20	Hazard Audit of the Project	✓									✓	✓	1. Hazard Audit (2013) 2. Hazard Audit (2016) 3. Hazard Audit (2019) * Three yearly schedule
23	Air quality verification study	✓	NR	NR	x	x	x	x	✓	NR	✓	NR	1. Ammonia Plant uprate air verification study (27 February 2014) 2. Boiler Air Quality Verification study (May 2021) 3. Phase 8 Air Quality Verification study (to be submitted)
27A	Air Quality Management Plan	✓	x	x	x	x	x	x	x	NR	✓	NR	1. Construction Air Quality Management Plan dated 15 January 2010 2. Operational Air Quality Management Plan (submitted to DPIE for review December 2021)
30	Noise Verification Program	✓									✓	✓	Refer to Condition 32
32	Noise Management Plan	✓									✓	✓	1. Noise Management Plan (August 2011 and updated 2021) 2. Annual Noise Audit (2010-current) * Initial quarterly noise testing compliance completed (2012-2013) * Noise management plan reviewed in 2021 * Annual noise audit report prepared and submitted in Appendix A
45	Landscape plan	✓									✓	✓	1. Landscape plan (3 June 2011)
48	Waste Management Plan	✓	✓			✓	NR	NR	NR^	NR^	NR^	NR^	1. Ammonia Plant waste management plan (February 2013) ^Part of project CEMP
50	Annual Environmental Management Report	✓									✓	✓	1. Annual Environmental Management Report (2010-current)
52	Independent Environmental Audit	✓									✓	✓	1. Independent Environmental audit dated (2014) 2. Independent Environmental audit dated (2017)

Condition	Condition Requirement	Project Phase										Reports submitted to DPIE to date	
		Phase 1	Phase 2		Phase 3		Phase 4	Phase 5	Phase 6	Phase 7	Phase 8		TBD
		Ammonia Plant Uprate	OBL 1(a)	OBL 1(b)	NAP4 & ANS	ANP	AMI	Nitric Acid Tank	Boiler	Nitrates Effluent Tank	Prill Tower Scrubber		Ammonia Tank
												3. Independent Environmental audit dated (2020) * 3 yearly audit schedule.	

Staging Plan Review triggers

The Staging Plan shall be reviewed and if necessary updated:

- a) In accordance with requirements of Condition 7C
- b) As part of submission of the AEMR

11.3 INDEPENDENT HAZARD AUDIT ACTION PLAN

Recommendations	Proposed Action	Area Owner	Proposed completion date
1 Observation: the available Safety policy at the time of the audit (Sept 2016) was signed in July 2013 by previous CEO (this is a corporate issue and can't be addressed at the KI site level). Noted that at the time of the audit there was a review of the SHECMS being undertaken at corporate level so the policy would most likely be updated as part of this). Check at next Hazard Audit (2019).	Orica will ensure that this recommendation is included in the 2019 Hazard Audit Scope. Action Taken: Included in the scope of the 2019 hazard audit	Sherree Woodroffe	30/6/2019 Complete
2 Confirm lightning protection is adequate for AN bulk store and AN bag store	Orica has completed an audit of lightning protection in both the bag and bulk storage areas.	Paul Hastie	15/12/2017 Completed
3 Observation: The QRA (in FHA) appears to use the total inventory of the Bag Store (Table AV-5) in the consequence assessment. Given the storage configuration with 8m between stacks there may be scope to reduce this to a single stack basis in future revision of the QRA. Orica to review QRA AN bag store basis when QRA update is next required	Orica will ensure that this observation is considered when updating the site's QRA	Sherree Woodroffe	N/A
4 Observation: The wooden walkways between the disused building adjacent to the AN bulk store are the only identified combustible building materials in the vicinity of the Bulk Store. Whilst ignition and escalation are unlikely, removal is suggested which would eliminate all combustibles in the vicinity of the Bulk Store.	The wooden walkway has been removed.	Paul Hastie	30/6/2017 Complete
5 Confirm the design fire / suppression basis for the fire protection systems in the AN Bulk and Bag Stores to ensure they are "adequate", eg meet relevant codes or control measure adequacy tests adopted in MHF risk assessments.	Orica has completed a verification process to confirm that fire suppression systems in the bulk and bag store are adequate.	Yasmine Vosper	15/12/2017 Complete

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Recommendations	Proposed Action	Area Owner	Proposed completion date
6 Observation: It is not clear what "adequate" ventilation is for the AN storage buildings. It is suggested that this be clarified ie is it to meet relevant codes or control measure adequacy tests adopted in MHF risk assessments and whether provided systems achieve this	Orica has completed a ventilation assessment for both the bulk and bag stores.	Yasmine Vosper	15/12/2017 Complete
7 Develop implementation plan for improving HA compliance with gaps identified in HA inspection activities (which were completed Dec 2015) and verify progress in next Hazard Audit (2019)	Orica will ensure that this recommendation is included in the 2019 Hazard Audit Scope. Action Taken: Included in the scope of the 2019 hazard audit	Sherree Woodroffe	30/6/2019 Complete
8 Observation: (2013 Hazard Audit Rec 4) Fire pump test log results are available in electronic form but not in pump house. If hard copy local records are not preferred by Orica, it is suggested that information be provided in the Pump house as to where to find the records.	Fire pump test log now maintained at pumphouse.	Bruce Volkiene	30/6/2017 Complete
9 (2013 Hazard Audit Rec 7) Clarify the process for providing feedback on completion of a job completed under a WO, ie if there is an issue with completion of work confirm how is this captured and how any patterns are identified over time.	Orica has completed a review of the WO closeout procedure including an audit of WO's to ensure that they are completed appropriately.	Bruce Volkiene	15/12/2017 Complete
10. (2013 Hazard Audit Rec 14) The installed pressure / flow capability of the modified fire water system at the AN Bag store needs to be confirmed to ensure that it meets the required design basis. Confirmation the velocities in firewater piping do not exceed AS requirements is also required	Orica has completed a verification process to demonstrate that the AN Bag Store fire system upgrades have achieved the site's performance objective.	Paul Hastie	15/12/2017 Completed
11. Confirm that the separation distance between the H2 cylinders and the adjacent oxidising gas cylinders is adequate, for example meets requirements in AS 4332 <i>The storage and handling of gases in cylinders</i>	Orica will undertake an audit to confirm that the H ₂ cylinders located in plant areas are appropriately located and stored.	Steve Hessel	30/9/2017 Completed

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Recommendations	Proposed Action	Area Owner	Proposed completion date
12. Observation: Overall reduction in combustibles in vicinity of AN can only be achieved by removal of wooden pallets and potentially change in AN bag material. It is suggested that Orica ensure that the current project investigating use of non-combustible pallets / bags include a formal SFARP demonstration that supports the project decision (as required under MHF regulations) and also that project outcomes be checked in next Hazard Audit (2019)	Orica has completed building modifications to enable the use of pallets in the bag store to cease.	Paul Hastie	15/12/2017 Completed
13. Observation: Orica has previously had in place Technical Panels to provide advice to the sites on best practices for the various technologies (AN, ammonia). These are referred to in the SHEC MS and the BoS. If this structure is changed, KI will need to update process for seeking technical advice in various systems, for example Modifications. Check in next Hazard Audit (2019)	Orica will ensure that this recommendation is included in the 2019 Hazard Audit Scope. Action Taken: Included in the scope of the 2019 hazard audit	Mick Gill	30/6/2019 Complete
14. Observation: The TWC system appears to be being phased out. It was unclear at time of the audit if all compliance information had been migrated to Enablon. Check in next Hazard Audit (2019).	Orica will ensure that this recommendation is included in the 2019 Hazard Audit Scope. Action Taken: Included in the scope of the 2019 hazard audit	Sherree Woodroffe	30/6/2019 Complete
15. An overall risk profile for the KI site should be developed to allow identification of the highest site risks, and also used to show risk reduction over time or effect of removal of safeguards. From a hazard perspective this should cover risk with a safety consequence. (However it is noted that SHECMS requires that each site maintain a record of their current hazards in a Major Hazard Register, with Major Hazards definition covering Safety as well as Health, Environment, Community, Business)	Orica will consolidate the site's risk assessment processes to allow for the prioritisation of the site's risks to be developed. Action Taken: Orica is currently in the process of updating the site's major hazard HIRACs and consolidating risk assessments that will enable the site to compare the risk contribution associated with each risk scenario.	Belinda Moss	29/07/2022

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Recommendations	Proposed Action	Area Owner	Proposed completion date
<p>16. Develop a system for managing actions arising from hazard studies and risk assessments that allows demonstration of progress to be shown. This should include:</p> <ul style="list-style-type: none"> - prioritisation of the actions in a timely manner as they arise out of studies such as periodic hazard study 2 and 3. (Priority could be based on addressing non-compliance with regulations, magnitude of potential risk reduction / effectiveness, ease of installation, cost etc similar to the SFARP process for MHF) - implementation schedule and associated resources that suit allocated priority. <p>A KPI could also be developed around completion rate or overdue high priority actions.</p>	<p>Orica has developed a procedure to prioritise actions in HAZOPS and risk assessment processes to ensure that resources are effectively deployed to the highest priorities.</p>	<p>Yasmine Vosper</p>	<p>30/9/2017 Complete</p>
<p>17. Observation: The Nitrates area operating procedures include specific guidance and instructions for responding to abnormal process situations, the NH3 plant doesn't although there is some coverage in scenario based training. Orica to review whether the NH3 plant should adopt a similar approach to developing procedures for response to abnormal situations as has been done in the Nitrates areas. Check in next Hazard Audit (2019)</p>	<p>Orica will develop a procedure to include specific guidance and instructions for responding to abnormal process situations in the Ammonia Plant, consistent with the approach adopted by nitrates.</p>	<p>Paul Hastie</p>	<p>15/12/2017 Complete</p>
<p>18. Observation: The FSS has been updated (Feb 16) and provides a clear summary of firewater demands however does not refer to the basis for these (for example an AS or NFPA, process dilution rate or something else). The protection basis should be identified and included in the next FSS revision</p>	<p>The basis of fire water demand will be included in the next update of the site FSS.</p> <p>Action Taken:</p> <p>The FSS has been updated to include the basis of the fire water demand for the bag store.</p>	<p>Sherree Woodroffe</p>	<p>28/2/2019 Complete</p>

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Recommendations	Proposed Action	Area Owner	Proposed completion date
19. Observation: Labelling standard in new equipment was good. Some areas of older plant also good. Check progress of equipment labelling project in next audit (2019)	Orica will ensure that this recommendation is included in the 2019 Hazard Audit Scope. Action Taken: Included in the scope of the 2019 hazard audit	Sherree Woodroffe	30/6/2019 Complete
20. Develop a formal process covering required response to Capstone pressure vessel failure criticality ratings, and required documentation and authorization / acceptance process for any deferrals of inspection or maintenance.	Orica has developed a formal process covering required response to Capstone pressure vessel failure criticality ratings, and required documentation and authorization / acceptance process for any deferrals of inspection or maintenance.	Bruce Volkiene	30/6/2017 Complete
21. Observation: Lockout isolation sheets appear to be developed as a list of valves / isolation points on isolation sheet on a case by case basis. A potential improvement would be to have predefined isolation plans for common isolations and also to attach the marked up PIDs to the isolation sheet for all process isolations.	Orica will develop and trial the effectiveness of standard isolation sheets for routine isolations.	Paul Hastie	15/12/2017 Complete
22. Observation: A potential improvement would be to add the Modification number to the WO information in SAP so it also appears with the PTW and it is immediately clear the proposed work is part of a modification.	Orica will evaluate the feasibility of including the modification number to the PTW documentations.	Bruce Volkiene	15/12/2017 Date extended to 30/4/2018 Complete
23. Observation: The MHF Process HIRACs have identified some procedures as critical controls. It is suggested that Orica determine a process for differentiating these from other procedures, eg "critical" tag on document, different review frequency, specific observations, auditing or training requirements. Check in next Hazard Audit (2019)	Orica will develop a procedure to ensure that procedures associated with HIRAC's are easily recognizable.	Steve Hessel	15/12/2017 Complete

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Recommendations	Proposed Action	Area Owner	Proposed completion date
24. Observation: Organizational change assessment was not reviewed in 2016 audit. Ensure this is covered in 2019 Hazard Audit	Orica will ensure that this recommendation is included in the 2019 Hazard Audit Scope. Action Taken: Included in the scope of the 2019 hazard audit	Sherree Woodroffe	30/6/2019 Complete
25. Observation: the quality of closeout of some hazard study actions associated with Mods was variable. To monitor this it is suggested that some sample mods be selected periodically and a detailed check of closeout action quality be carried out to identify any patterns and determine if there the need for any actions such as refresher training.	Orica has developed and implement an auditing schedule of closed out mods to ensure that close out actions quality is maintained at a high standard.	Mick Gill	30/9/2017 Complete
26. Observation: It would be useful for KPI tracking for MHF purposes to include a Process Safety Event (PSE) flag in Enablon. It is recognised that this would need to be done at a corporate level . Check progress of PSE tracking at next Hazard Audit (2019)	Orica will ensure that this recommendation is included in the 2019 Hazard Audit Scope. Action Taken: Included in the scope of the 2019 hazard audit	Sherree Woodroffe	30/6/2019 Complete
27. Observation: Notes from emergency response exercise debriefs are available. However it is suggested that any actions are formally prioritised and completion tracked (eg using Enablon)	Orica has updated the emergency response procedure to include the requirement to upload actions resulting from emergency exercises into Enablon.	Steve Hessel	30/9/2017 Complete
28. Check progress on compliance with site firewater booster arrangements against AS2419 in next Hazard Audit (2019)	Orica will continue to investigate the feasibility of upgrading the site's fire water booster arrangement in compliance with AS2419. Action Taken: See below.	Sheree Woodroffe	15/12/2019 Complete

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Recommendations	Proposed Action	Area Owner	Proposed completion date
	<p>To ensure that the risks are appropriately managed, Orica will undertake a risk assessment to identify whether additional controls are required in the interim to manage this risk until the system is upgraded to meet Australian Standard requirement.</p> <p>Action Taken:</p> <p>A SFAIRP analysis has been undertaken to determine whether modification of the fire water booster connections is justified. The analysis concluded that modifications to the connections could not be justified as that the current design is SFAIRP.</p>	Paul Hastie	Complete
Additional Recommendations associated with Department of Planning Feedback			
Please clarify why, taking into account that contaminated TGAN may occur in site as Orica, which manufacture and store significant quantities of AN.	Orica has undertaken a review of the procedure including ensuring additional control measures are implemented to ensure compliance with the maximum permissible quantity allowed to be stored onsite with consideration to SAFEX requirements.	Paul Hastie	31/7/2017 Complete
Orica to provide 6 monthly updates regarding the progress made in address recommendations detailed in the 2016 Hazard Audit	Orica will recommence provision of six monthly hazard audit updates to DPE from 30 June 2017 and will continue until all actions detailed in the 2016 Hazard Audit are completed.	Antony Taylor	Complete

ORICA 2021 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT – DECEMBER 2021

Recommendations	Proposed Action	Area Owner	Proposed completion date
Orica has been implementing a program to progressively upgrade labelling of pipes and valves within the site's existing plants. Several of these areas were inspected during the audit. On page 17 of the 2016 Hazard audit report a recommendation was made to inspect progress made in implementing this program in 2019. This requirement will be transferred to the hazard audit action plan to ensure it is addressed during the next audit.	<p>30. Orica to provide 6 monthly updates regarding the progress made in addressing recommendations detailed in the 2016 Hazard Audit.</p> <p>Action Taken:</p> <p>Included in the scope of the 2019 hazard audit</p>	Antony Taylor	30 June 2019 Complete

11.4 INDEPENDENT ENVIRONMENTAL AUDIT

Orica KI engaged Ramboll Australia Ltd (Ramboll) to conduct an independent environmental audit (IEA) in accordance with condition 52 of SSD 08_0128 (combined report with separate audit of with SSD 7831), with the final report dated 31 August 2020. The report was submitted to DPIE on 2 September 2020 and can be found on the [Orica KI Public Website](#).

Submission correspondence and RAR actions responses are included in **Appendix A** and **Appendix B**

The audit identified 73 conditions where KI was compliant and aspects of 2 conditions that were deemed non-compliance in the final audit report. Of the 2 non-compliances, one was overturned by the Department due to the phase of the expansion project having not commenced yet and there for not triggered (Table 4).

Table 3: 2017 IEA Auditor Actions / Recommendations

Previous Audit Actions/Recommendations (2017 IEA)			
Condition	Auditors recommendation	Orica response	Date of Action
7C, 17	Ensure the submission requirements relating to new stages in the Project are fully complied with	Orica has updated the Projects staging plan to ensure that Project milestone reports are submitted in accordance with the relevant timeframes.	Complete
45	Prepare and submit to the Secretary an updated landscape plan and gain approval for a staged implementation of landscaping required under the approval, potentially tied to the broader staging plan submitted annually.	A landscape plan has been developed for the project submitted to DPE or implemented. Orica has sought clarification from DPE regarding the timing of the landscaping requirements as landscaping is linked to stage 2 of the project which is yet to commence.	Complete
48	Commence implementation of a weekly environmental inspections program when undertaking construction activities associated with the project.	This requirement has been detailed in the Projects Construction Environment Management Plan (CEMP)	Complete
49B/C	Prepare and implement an Operational Environmental Management Plan for the flares.	Orica submitted an OEMP for the Project to DPIE in June 2020.	Complete
53	Ensure all relevant post approval and audit documents are available on the website	Orica has clarification regarding what reports are required to be published on the website as project documentation can contain sensitive design and risk management data.	Complete

	Opportunities for Improvement		
	Noting the infrequent use of the flares (one reported activation between April and June 2017) it is recommended that Secretary confirmation be sought that an update to the Air Quality Management Plan is not required and that volumetric flow determination remains a suitable method for describing the emissions at points 24-36.	Orica sought clarification from DPIE regarding the requirement for an Air Quality Verification Study to be completed relating to the site's three ammonia flares on 29 March 2018 which was viewed as not practical from a technical perspective. Orica did not receive a response, and is operating under the assumption this conclusion is acceptable to DPIE.	Complete
	The Noise and Vibration Management Plan should include LAeq and LAmx noise management for the site following the addition of the boiler.	Annual Noise Report incorporates this requirement.	Complete.
	Once the boiler is constructed and operational, conduct noise verification assessment to ensure noise levels from operation are below 10db. Low frequency components of boilers may require special attention.	Annual noise Report incorporates this requirement.	Complete.
	Whilst there have been no complaints regarding traffic management, it is recommended that weekly inspections are undertaken during construction and recorded and that occasional review of this requirement is included.	Requirement included in Project CEMP	Complete.
	The Water Efficiency Plan should be updated after the boiler is operational.	Conditions 37 a), b) and c) have been completed. Recycled water has been implemented, which was the main component of the Water Efficiency Plan. Reclaimed Water Management Plan was updated during 2021 AEMR period. Further review of water efficiency may occur if the Kooragang Island Water Scheme operator makes additional reclaimed water available.	Complete

Table 4: 2020 IEA Auditor Actions / Recommendations

Most Recent Audit Actions/Recommendations (2020 IEA)			
Condition	Auditors recommendation	Orica response	Date of Action
23	That formal acceptance be sought from the Department that an Air Quality Verification Study of the flares is not required.	Orica sought clarification from the Department and was deemed compliant with Schedule 2, Condition 23 as the relevant phase (5) has not yet commenced.	Complete
40	As the non-compliances with EPL conditions have been reported to the EPA and are subject to improvement programs under the EPL and/or discussions between the EPA and Orica, the Auditors make no further recommendation.	Orica sought clarification from the Department and the non-compliance was upheld.	Complete
Opportunities for Improvement			
15 (a)	That the Transport of Hazardous Materials Plan be reviewed for any changes that may be required as a result of changes in the road network since 2013.	Review in progress	Complete
19	That Orica seek clarification from the Department of the intended application of this condition as it appears likely that it is relevant to Phase 3 (expansion of nitric acid and ammonium nitrate capacity), which has not commenced.	Position noted in correspondence submitted to DPIE in relation to the IEA on 2 September 2020	Complete
32	That the Noise Management Plan be updated when the new boiler is fully operational.	Annual noise report incorporates this requirement.	Complete

APPENDIX A – 2021 NOISE AUDIT REPORT



Postal Address
P.O. Box 432
Gladesville
N.S.W. 1675
AUSTRALIA
A.C.N. 068 727 195
A.B.N. 19 068 727 195
Telephone: 02 9879 4544
Fax: 02 9879 4810
Email: AtkinsAcoustics@bigpond.com.au

Atkins Acoustics and Associates Pty Ltd.

Consulting Acoustical & Vibration Engineers

**ORICA AUSTRALIA PTY LTD.
KOORAGANG ISLAND
ENVIRONMENTAL NOISE AUDIT
JUNE 2021**

51.6719.R11:GA/DT/2021

Rev 01

Prepared for: Orica Australia Pty Ltd
15 Greenleaf Road
KOORAGANG ISLAND NSW 2304

Prepared by: Atkins Acoustics and Associates
P.O. Box 432
GLADESVILLE NSW 2111

June 2021

CONTENTS

	Page No
1.0 INTRODUCTION.....	1
2.0 OVERVIEW	1
2.1 Compliance Noise Monitoring	1
3.0 STATUTORY REQUIREMENTS	2
4.0 PROJECT SPECIFIC NOISE CRITERIA.....	3
4.1 Stockton Noise Criteria	4
5.0 RESULTS AND ASSESSMENT	4
5.1 Noise Model Updating	4
5.2 Site Attended Noise Measurement Results (May/June 2021).....	5
5.2.1 Measurement Instrumentation	5
5.2.2 Meteorological Conditions	5
5.2.3 Site Operating Conditions	5
5.2.4 Review of Incident Reports	5
5.2.5 Site Attended Noise Measurement Results.....	6
5.2.6 Unattended Noise Measurement Results.....	7
5.2.7 Assessment of Noise Trends	7
6.0 SUMMARY	8

TABLES

Table 1: Project Noise Criteria	3
Table 2: Predicted Pre Uprate and Project Noise Contributions	4
Table 3: Predicted Baseline and Project Noise Contributions.....	5
Table 4: Attended Noise Measurement Results/Observations	6
Table 5: Summary of Rating Background (RBL) and Ambient Levels	7
Table 6: Baseline RBL Noise Trends	8

FIGURES

Figure 1. Compliance Noise Monitoring Locations.....	2
--	---

ATTACHMENTS

ATTACHMENT 1: AMBIENT SOUND PRESSURE LEVEL MEASUREMENT RESULTS	
ATTACHMENT 2: SUMMARY of REPORTED NOISE INCIDENTS	

1.0 INTRODUCTION

Atkins Acoustics was retained by Orica Australia Pty Ltd (*Orica*) to conduct an environmental noise audit for their Kooragang Island plant. The report presents results and findings of the audit, an assessment of operational noise from the site including plant associated with the expansion of the ammonium nitrate plant (*the Project*) and the implementation of noise mitigation to existing plant. Works undertaken as part of the first phase of the *Orica* expansion are described in Environmental Noise Audit Report dated November 2012, include;

- a new Ammonia Plant Process air compressor;
- cooling tower cells and pumps to service the Ammonia Plant;
- steam power generator 183L; and
- de-commissioning two (2) process air compressors (102J and 122J);

In addition to the above uprate works, *Orica* implemented a site noise reduction program (*SNRP*). Details of those works are summarised in the *Atkins Acoustics* Environmental Noise Audit report dated March 2013. Site improvement works implemented during 2020 included the decommissioning of the off-site boiler, commissioning of a new site boiler and relocation of the CO₂ vent with an inline discharge attenuator.

2.0 OVERVIEW

To control industrial noise exposure for the Stockton residential area, the NSW Department of Planning (*Department*) concluded that any additional noise emitted from *the Project* must achieve a noise contribution at least 10dBA below the agreed existing levels determined prior to the proposed uprate works.

Initially noise audit monitoring locations were selected to provide for reliable site access to install instrumentation and security. The locations identified as R4 and R6 due to access arrangements and instrumentation security were relocated from the riverside to roadside positions. Similarly, due to access restrictions monitoring location R1 (294 Fullerton Street) was changed to 284 Fullerton Street and R3 186 (Fullerton Road) was changed to 184 Fullerton Road.

2.1 Compliance Noise Monitoring

For the assessment of noise emitted from *Orica*, six (6) reference assessment locations (*Figure 1*) were selected. The locations are referenced in the *Orica* Noise Management Plan (*NMP*), three (3) located at Stockton and three (3) on Kooragang Island.

- R1 - 284 Fullerton Street, Stockton.
- R2 - 218 Fullerton Street, Stockton.
- R3 - 184 Fullerton Street, Stockton.
- R4 - Roadside (south) opposite Ammonium Nitrate Area
- R5 - Riverside (central) opposite Administration Building.
- R6 - Roadside (north) north of Ammonia Plant.

Figure 1. Compliance Noise Monitoring Locations



3.0 STATUTORY REQUIREMENTS

The following *Project* noise assessment requirements are referenced in Schedule 3 'Specific Environmental Conditions' of the *Department* Project Approval (08_0129) dated 1 December 2009.

Noise Limits

30. The Proponent shall ensure that noise levels from the operation of the Project are at least 10dB(A) below noise levels from Orica's Existing Operations as specified by conditions 31 & 32 below.

Existing Operations - Noise Verification Program

31. Prior to the commencement of construction the Proponent shall prepare and implement an Existing Operations Noise Verification Program to the satisfaction of the Director-General. The Program shall:
- (a) be undertaken by a suitably qualified and experienced person;
 - (b) identify future reference points that will be used to demonstrate compliance;
 - (c) collect new or review existing data, and report on the seasonal background levels for the noise catchment; and
 - (d) confirm the noise levels from Orica's Existing Operations.

Note: Some construction activities may occur under the Project Approval provided that such activity are not undertaken during the monitoring period or that Orica can demonstrate that the activity would not contribute to the background noise level, to the satisfaction of the Director-General.

Noise Management Plan

32. Prior to the commencement of operations of the Project, the Proponent shall prepare and implement a Noise Management Plan in consultation with DECCW and to the satisfaction of the Director-General. The Plan shall:
- (a) be undertaken by a suitability qualified and experienced expert;
 - (b) demonstrate how noise levels from the Project would be managed to ensure noise levels would be 10dB(A) below noise levels from Orica's Existing Operations (see conditions 30 & 31);
 - (c) include a detailed monitoring program for reporting on ongoing compliance. The monitoring program shall:
 - outline the proposed receiver sites at Stockton and sites on Kooragang Island that would be monitored;
 - include both attended and unattended noise monitoring;
 - verify that actual noise levels from the Project are consistent with the predictions made in the EA; and
 - verify that noise levels from the Project are 10dB(A) below the noise levels identified in condition 31 for Orica's Existing Operations;
 - (d) provide details of any complaints received in the preceding year relating to noise generated by the Project, and action taken to respond to those complaints;
 - (e) detail procedures for implementing additional reasonable and feasible noise mitigation measures for the Project in response to exceedance of limits and/or noise complaints; and
 - (f) be updated annually, unless otherwise agreed to by the Director-General.

4.0 PROJECT SPECIFIC NOISE CRITERIA

Night-time attended audits reported for the monitoring locations on Kooragang Island (2011) confirmed that noise from *Orica* was steady state with minimal influence from other industrial sources. At the reference monitoring locations it was reported there was minimal variation between the measured L_{A90} and L_{Aeq} levels.

Referring to the *Departments* Conditions for assessing noise trends and compliance status, operational noise resulting from *the Project* should be at least 10dBA below levels from *Orica's* existing plant. *Table 1* presents a summary of the baseline background levels and the *Project* noise criteria.

Table 1: Project Noise Criteria

dBA re: 20×10^{-6} Pa

Reference Assessment Location	Baseline Background Sound Pressure Levels	Project Noise Criteria dBA
R4	62	52
R5	57	47
R6	56	46

4.1 Stockton Noise Criteria

Modelling reported for *the Project* (Atkins Acoustics Feb '09) predicted noise levels would satisfy *the Project* criteria. Table 2 presents a summary of noise levels predicted for the Stockton reference residential assessment locations from the existing plant and *the Project* for calm weather conditions.

Table 2. Predicted Pre Uprate and Project Noise Contributions

dBA re: 20 x 10⁻⁶ Pa

Reference Assessment Location	Predicted Sound Pressure Levels dBA	
	Pre-Uprate Noise Levels	Uprated Plant Contributions
Assessment Location R1	50	37
Assessment Location R2	53	41
Assessment Location R3	51	39

5.0 RESULTS AND ASSESSMENT

For the assessment of noise from *the Project* and compliance status, it was recognised that demonstration of compliance would be difficult to confirm by direct measurement alone due to the variability of ambient background levels and contributions being greater than 10dB below the pre-uprate level. Therefore, to assess compliance with *the Project* noise criteria in accordance with the *NMP*, it was proposed to:

- Update the site noise model following the commencement of operation of *the Project* to determine contributions from *the Project*; and
- undertake attended and unattended monitoring at the reference locations to assess changes in ambient background levels and noise trends.

5.1 Noise Model Updating

Modelling reported in the *Kooragang Island Noise Assessment (Report Number 39.6357.R1:GACD03 Rev 3, Atkins Acoustics, 2009)* was updated to determine predicted noise contributions from *the Project*.

Table 3 presents a summary of the predicted pre-uprate noise contributions and levels from *the Project* (phase one). Compliance with *the Project* Approval Conditions was to be assessed against the pre-uprate noise levels.

Table 3. Predicted Baseline and Project Noise Contributions

L_{Aeq} re: 20 x 10⁻⁶ Pa

Operating Plant Conditions	Predicted Sound Pressure Level dBA					
	R1	R2	R3	R4	R5	R6
Pre Uprate	50.4	52.1	49.9	66.3	62.6	59.1
Uprate Plant (Phase one) Ammonia Plant Compressor and 183L Generator	19.7	22.3	21.1	23.5	32.9	41.7

5.2 Site Attended Noise Measurement Results (May/June 2021)

For noise compliance purposes attended audit measurements were undertaken during the night of Thursday 27 May 2021. The noise measurements were conducted in accordance procedures referenced in Australian Standard AS1055-1997 '*Acoustics - Description and Measurement of Environmental Noise*' and the DECCW '*Industrial Noise Policy (2000)*'.

5.2.1 Measurement Instrumentation

Instrumentation for the attended audit measurements comprised a SVAN 949 Sound Level Meter. The unattended noise measurements were conducted with SVAN 957 Sound Level Meters.

Instrumentation reference calibration levels were checked with a portable Bruel & Kjaer calibrator before and after the audit measurements to verify that the variation remained within ± 0.5 dB. Copies of the meter calibration certificates are available on request.

5.2.2 Meteorological Conditions

Prevailing weather conditions during noise monitoring were extracted from the onsite meteorological station. During the attended audit, meteorological conditions were clear sky variable winds <2.7m/sec from the west to north-west, air temperature 12-13°C, relative humidity 54%. Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data.

5.2.3 Site Operating Conditions

During the attended night audit *Orica's* processing plants were reported as normal operations.

5.2.4 Review of Incident Reports

As part of reporting procedures the *Sustainability Manager* confirmed one (1) noise incident was reported on 27 December 2020 and investigated by Orica staff. The incident related to normal start-up procedures associated with the Ammonia Plant.

5.2.5 Site Attended Noise Measurement Results

Table 4 presents a summary of attended noise measurements and noted observations. During the night audit the ambient background L_{A90} levels at Stockton were influenced by Orica, ship unloading, coal transfer conveyors, industrial noise from Kooragang Island and localised intermittent road traffic.

Attended audits on Kooragang Island confirmed noise from *Orica* was steady state. The measurements confirmed that Orica related maximum (L_{Amax}) levels were not observed to cause exceedances greater than 5dBA above the L_{Aeq} levels.

Orica noise sources identified at the Stockton/Kooragang Island monitoring locations during attended audit included:

- Ammonia Plant - low frequency noise, quench valves, steam pipes, steam pipe hammer;
- Ammonia Nitrate Plant 1 (AN1). - CDC Fan, steam venting, steam pipe hammer;
- General operational noise NAP and AN Plants;
- Cooling towers and intermittent steam pipe hammer

Table 4. Attended Noise Measurement Results/Observations

Location	Sound Pressure Level dBA						Comment
	L_{Amax}	L_{A1}	L_{A10}	L_{A50}	L_{A90}	L_{Aeq}	
R1-284 Fullerton Street	54.5	53.6	52.0	50.7	49.1	50.8	Coal conveyors; Ammonia plant; Steam pipe hammer, Orica plant general; Intermittent passing road traffic.
R2-218 Fullerton Street	55.6	54.3	52.9	51.5	50.2	51.7	Coal conveyors; Ship unloading; Intermittent trucks on Greenleaf Road; Orica plant general; Steam pipe hammer; Intermittent road traffic.
R3-184 Fullerton Street	52.7	51.8	50.8	49.7	48.9	49.8	Ship unloading; Intermittent trucks on Greenleaf Road; Orica plant general; Steam pipe hammer; Intermittent road traffic.
R4-Roadside (South)	62.2	61.5	60.8	59.9	59.1	60.0	Ship unloading; AN 1 (CDC fan); NAP 1 (low frequency), Steam pipe hammer; Orica plant general.
R5-Riverside (Central)	65.5	59.7	58.5	57.3	56.2	57.4	Ship unloading; Steam pipe hammer; Orica plant general; Ammonia plant; Cooling towers.
R6-Roadside (North)	72.1	63.8	62.8	61.7	61.0	61.9	Coal conveyors; Ammonia Plant; Steam pipes, Orica plant general.

5.2.6 Unattended Noise Measurement Results

Table 5 presents a summary of the L_{A90} and L_{Aeq} sound pressure levels measured from Thursday 27 May to Thursday 4 June 2021. Attachment 1 presents a summary of the measurement results in graphical form. Prevailing meteorological conditions reported for the audit period show that the prevailing winds during nighttime hours (10.00pm to 7.00am) were generally less than 5m/sec.

Table 5. Summary of Rating Background (RBL) and Ambient Levels

(Thursday 27 May - Thursday 4 June 2021)

dBA re: 20×10^{-6} Pa

Measurement Location	Ambient Sound Pressure Levels dBA					
	RBL			Ambient Levels L_{Aeq} , period		
	Day	Evening	Night	Day	Evening	Night
R1. 284 Fullerton Road (Residential)						
RBL	49.0	47.5	49.3			
Logarithmic Average L_{Aeq}				63.9	59.3	58.3
R2. 218 Fullerton Road (Residential)						
RBL	46.7	45.6	45.4			
Logarithmic Average L_{Aeq}				65.2	59.5	54.9
R3. 184 Fullerton Road (Residential)						
RBL	46.8	44.3	47.4			
Logarithmic Average L_{Aeq}				60.5	55.4	55.4
R4. Greenleaf Road Roadside (South)						
RBL	58.7	59.2	59.5			
Logarithmic Average L_{Aeq}				61.8	61.5	61.9
R5. Greenleaf Road Riverside (Centre)						
RBL	52.7	53.1	54.0			
Logarithmic Average L_{Aeq}				56.2	55.3	56.6
R6. Greenleaf Road Roadside (North)						
RBL	60.3	60.8	61.2			
Logarithmic Average L_{Aeq}				64.6	63.5	63.8

Notes: Daytime: 7.00am to 6.00pm Monday to Saturday, 8.00am to 6.00pm Sunday and Public Holidays.
 Evening: 6.00pm to 10.00pm.
 Night: 10.00pm to 7.00am Monday to Saturday, 10.00pm to 8.00am Sunday and Public Holidays.

5.2.7 Assessment of Noise Trends

For assessing noise trends associated with *Orica*, the *NMP* recommends that future noise monitoring on Kooragang Island (R4, R5 and R6) be considered. Baseline RBL's established for the Kooragang Island monitoring locations are referenced in *Atkins Acoustic (September 2012)*.

The results summarised in Table 6 show that the nighttime RBL's at R4 (59.5) is equivalent to the long-term median level of 54.9dBA; at R5 (54.0) and R6 (61.2) the 2021 levels are marginally lower than the median levels of 55.5dBA and 62.7dBA, respectively.

Table 6. Baseline RBL Noise Trends

Reference Measurement Location	Ambient Background RBL's dBA		
	Range	Median	June 2021
R4 - Roadside (South)	55.6 to 63.0	59.4	59.5
R5 - Riverside (Central)	49.3 to 60.7	55.8	54.0
R6 - Roadside (North)	60.1 to 65.4	62.7	61.2

6.0 SUMMARY

Atkins Acoustics was retained by *Orica* to conduct an environmental noise audit for the Kooragang Island plant. The audit included attended and unattended measurements at Stockton and on Kooragang Island during May/June 2021.

Inquires with the *Sustainability Manager* confirmed one (1) noise incident was reported on 27 December 2020 and investigated by Orica staff. The incident related to normal start-up procedures associated with the Ammonia Plant.

Prevailing weather conditions during noise monitoring were extracted from the onsite meteorological station. During the attended audit, meteorological conditions were clear sky variable winds <2.7m/sec from the west to north-west, air temperature 12-13°C, relative humidity 54%.

During the attended night audit Orica's processing plants were reported as normal operations. Observations during the audit identified noise from the Ammonia Plant, the Ammonia Nitrate Plant 1 CDC Fan and steam, Nitric Acid Plant 1 low frequency fan and steam pipe hammer.

The results summarised in *Table 6* show that the nighttime RBL's at R4 (59.5) is equivalent to the long-term median level of 54.9dBA, at R5 (54) and R6 (61.2) the 2021 levels are marginally lower than the long-term median levels of 55.8dBA and 62.7dBA, respectively.

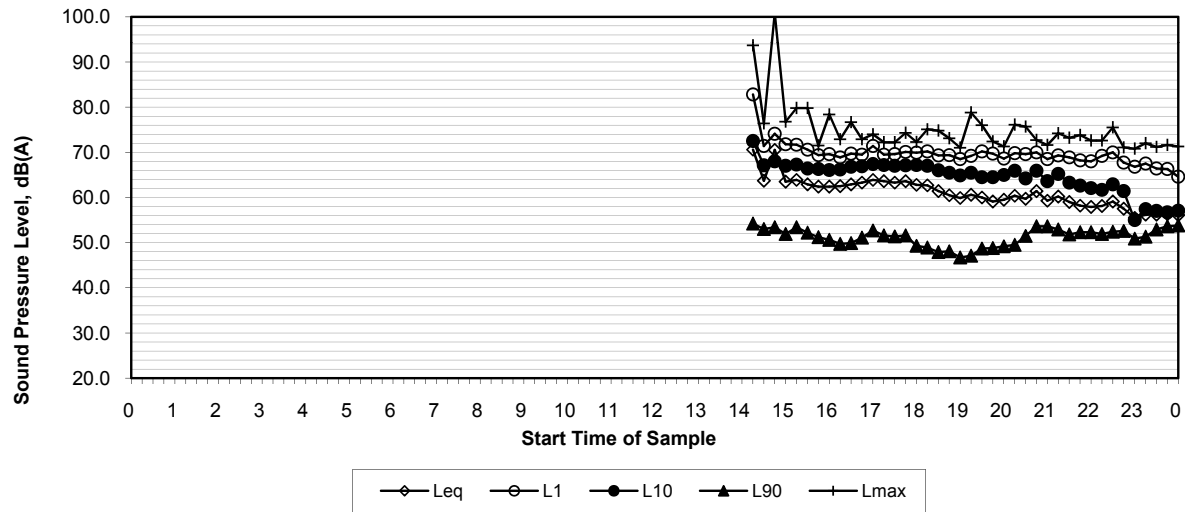
The findings from the May/June 2021 audit demonstrate that noise contributions from *the Project* satisfied the project noise criteria (*Table 3*).

Attended night audits confirmed that *Orica* related maximum (L_{Amax}) levels were not observed to cause exceedances greater than 5dBA above the measured L_{Aeq} levels at the referenced residential monitoring locations.

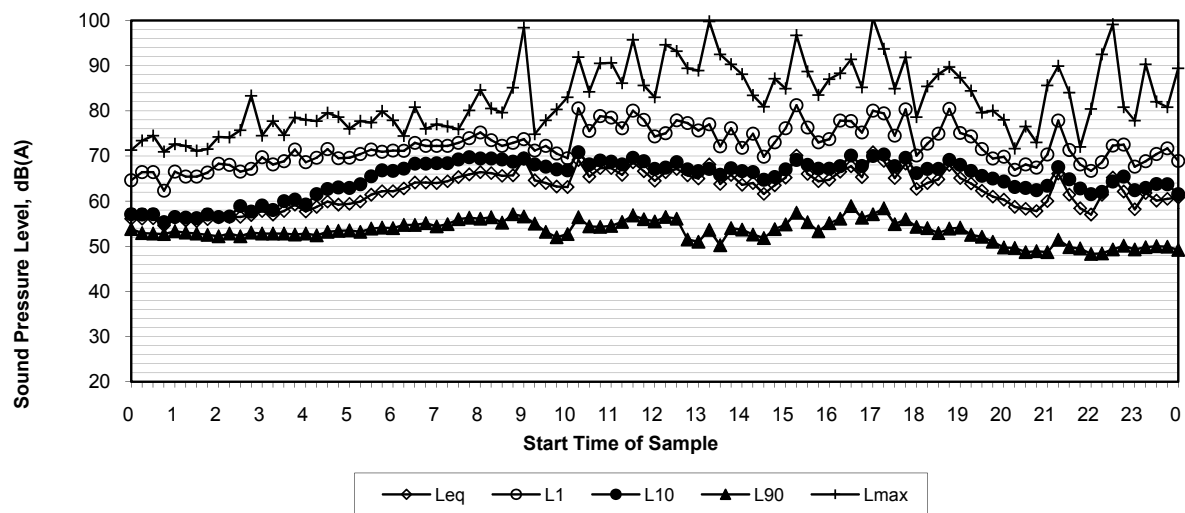
ATTACHMENT 1. AMBIENT SOUND PRESSURE LEVEL MEASUREMENT RESULTS

Ambient Sound Pressure Levels

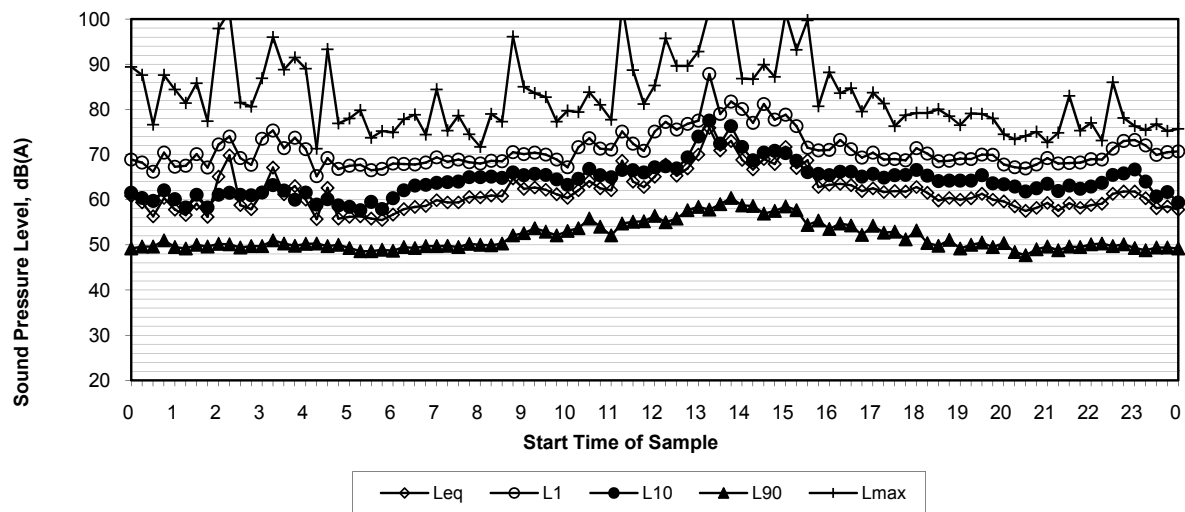
Thursday, 27 May 2021



Friday, 28 May 2021



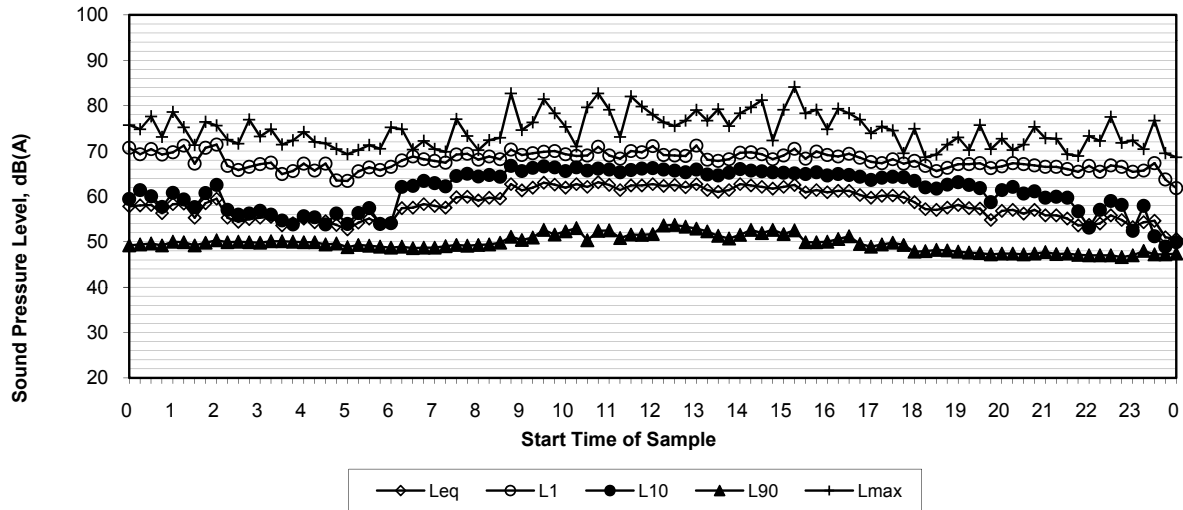
Saturday, 29 May 2021



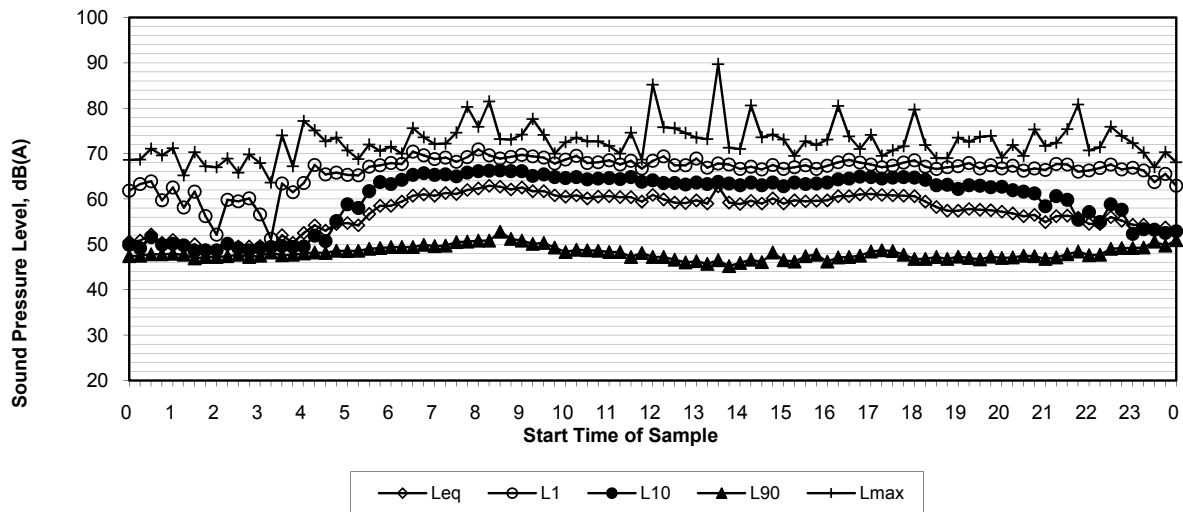
Reference Measurement Location R1
284 Fullerton Road

Ambient Sound Pressure Levels

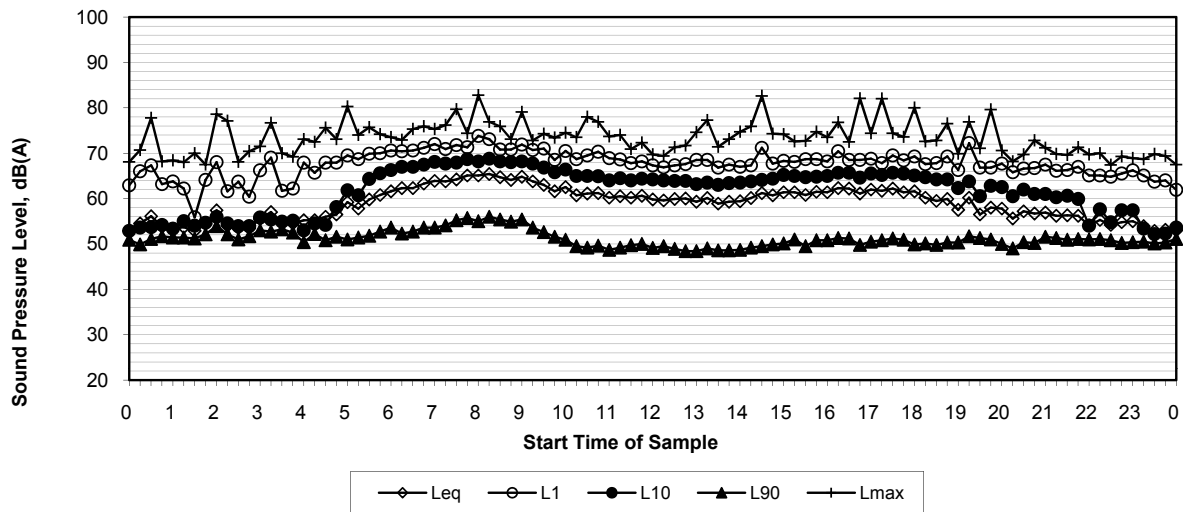
Sunday, 30 May 2021



Monday, 31 May 2021



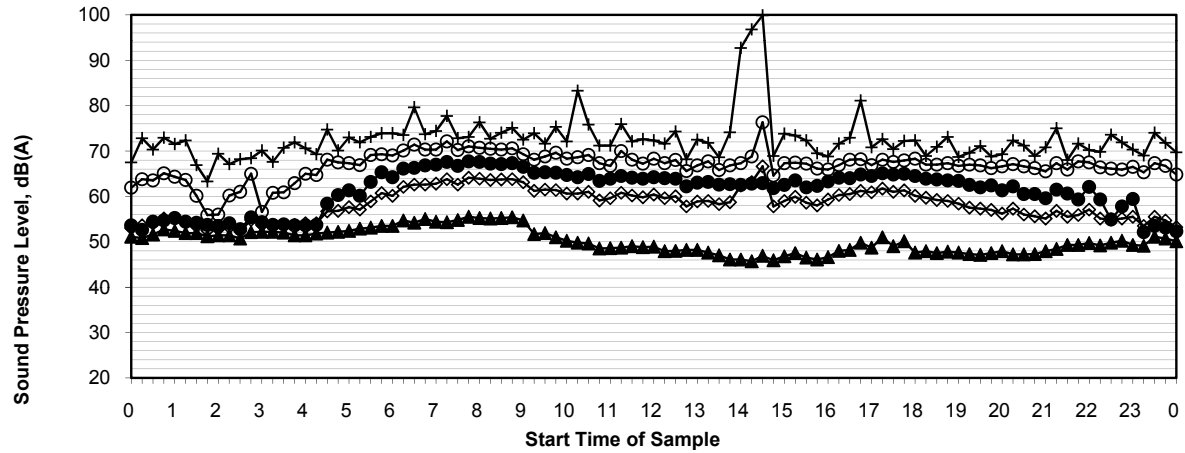
Tuesday, 1 June 2021



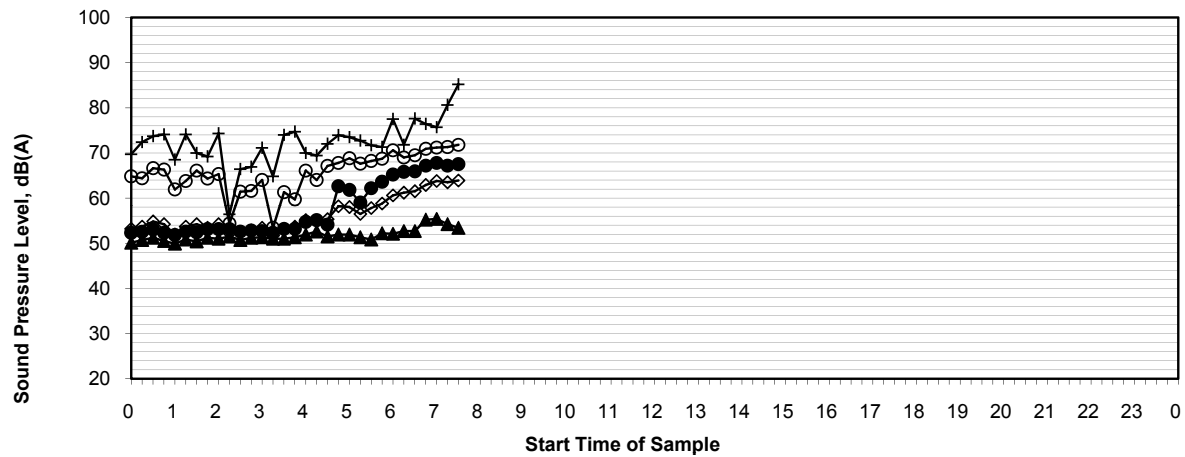
Reference Measurement Location R1
284 Fullerton Road

Ambient Sound Pressure Levels

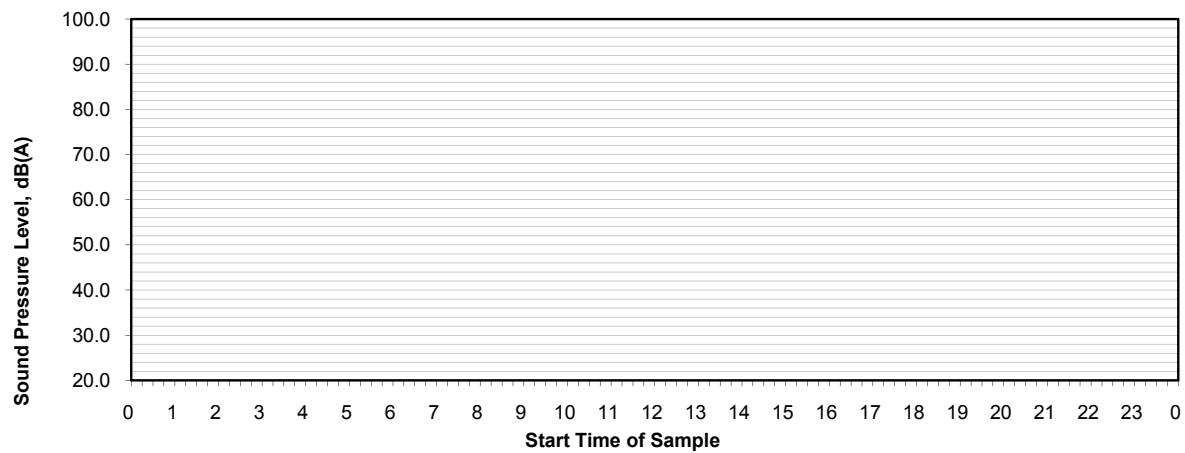
Wednesday, 2 June 2021



Thursday, 3 June 2021



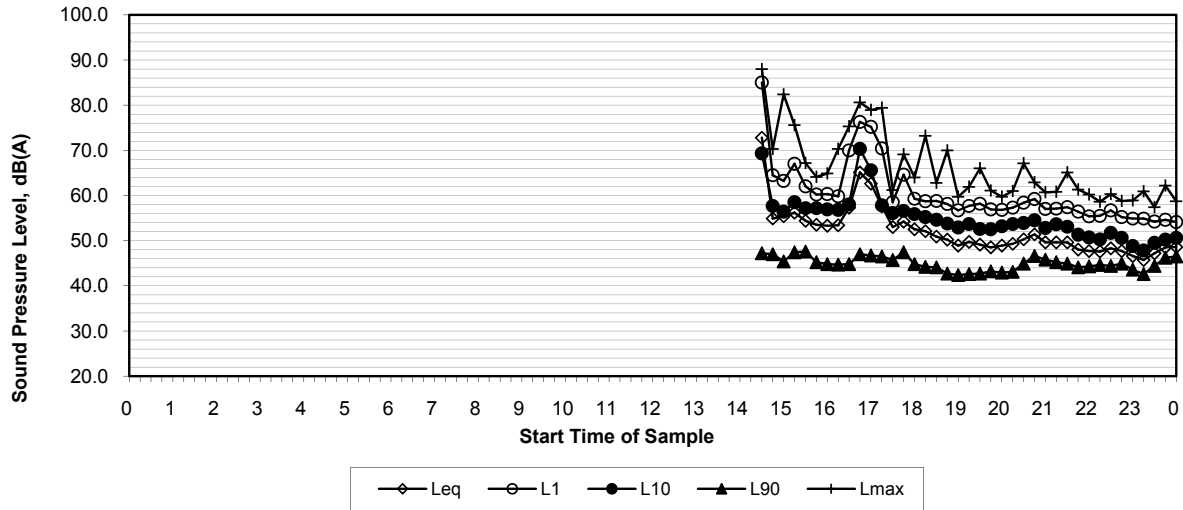
Friday, 4 June 2021



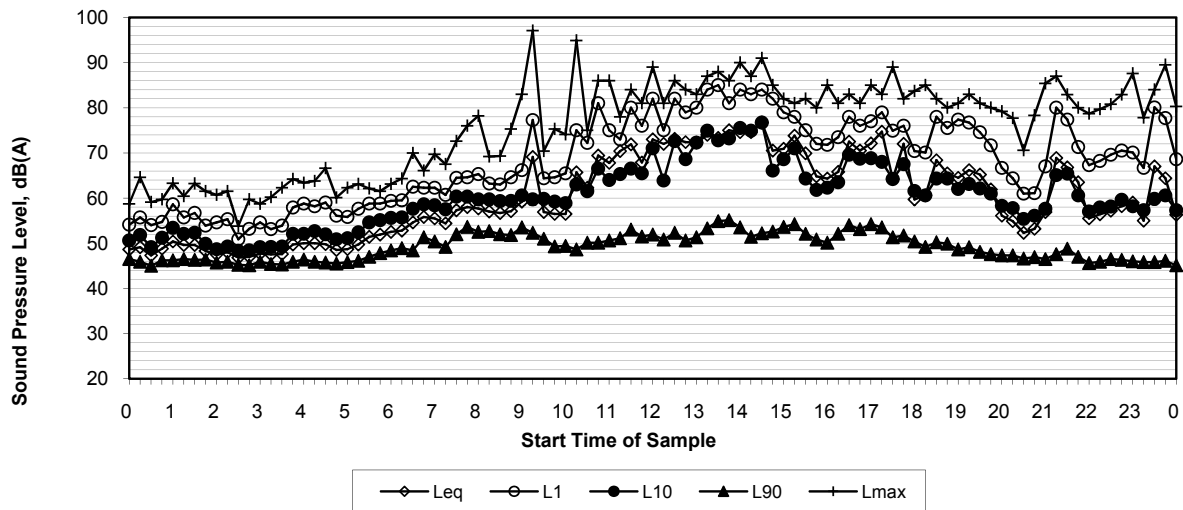
Reference Measurement Location R1
284 Fullerton Road

Ambient Sound Pressure Levels

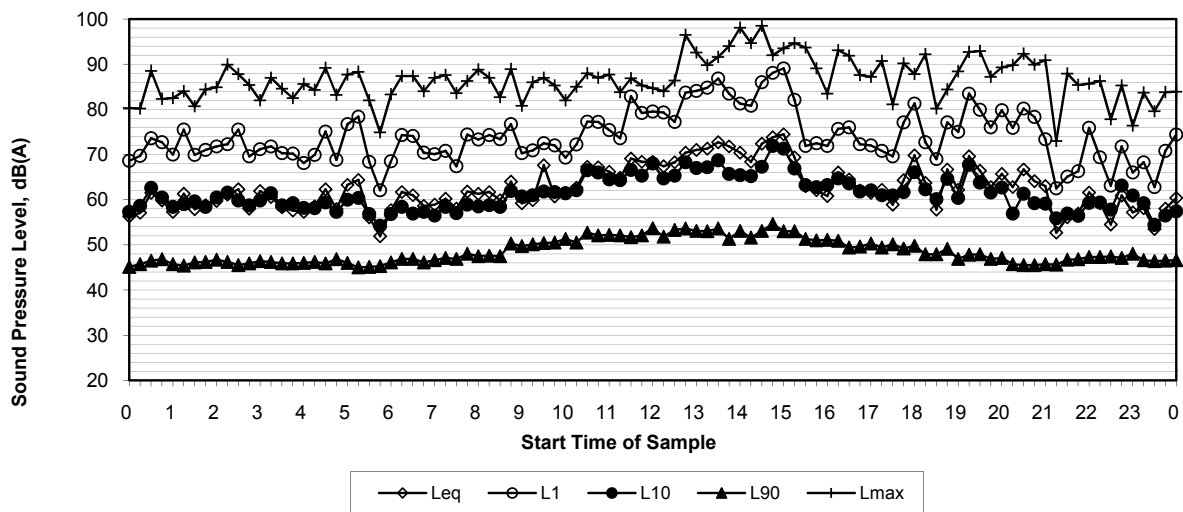
Thursday, 27 May 2021



Friday, 28 May 2021



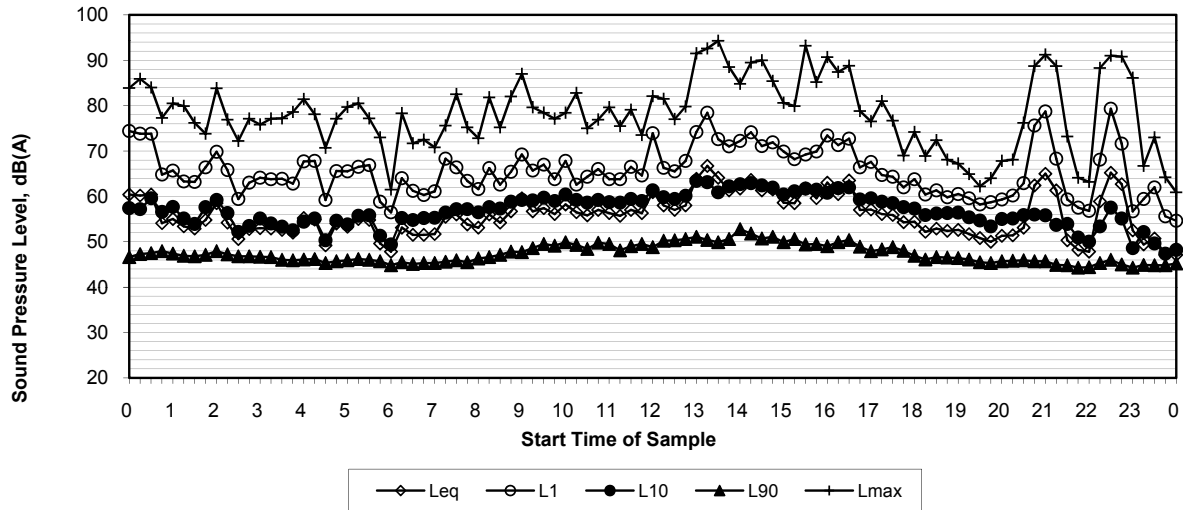
Saturday, 29 May 2021



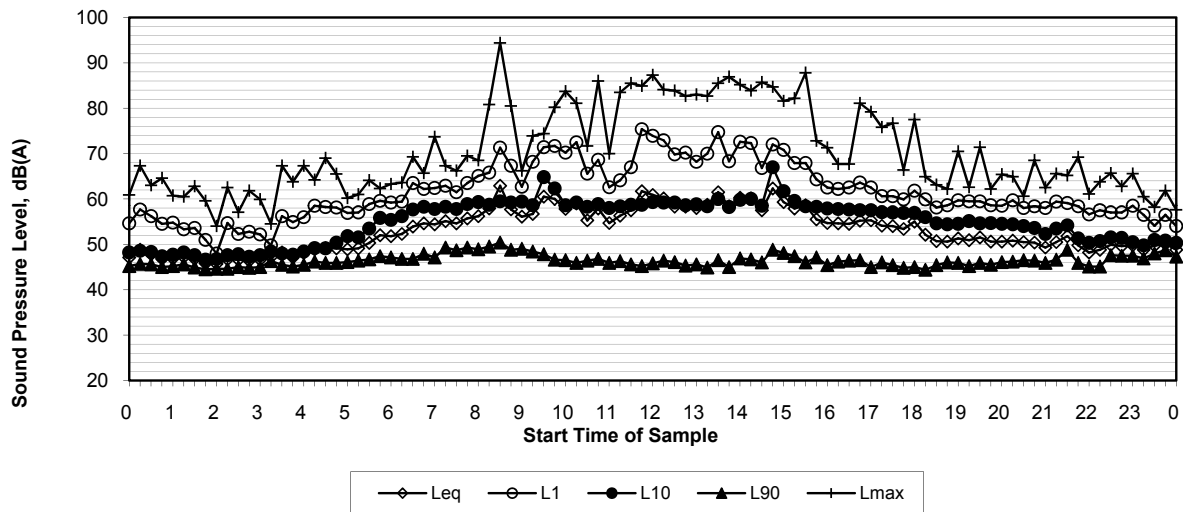
Reference Measurement Location R2
218 Fullerton Road

Ambient Sound Pressure Levels

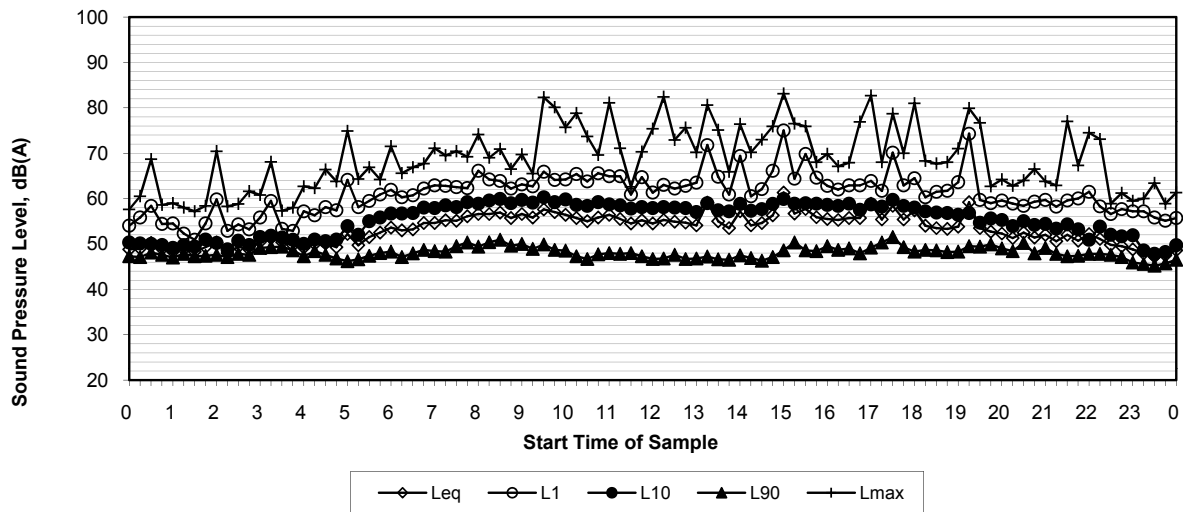
Sunday, 30 May 2021



Monday, 31 May 2021



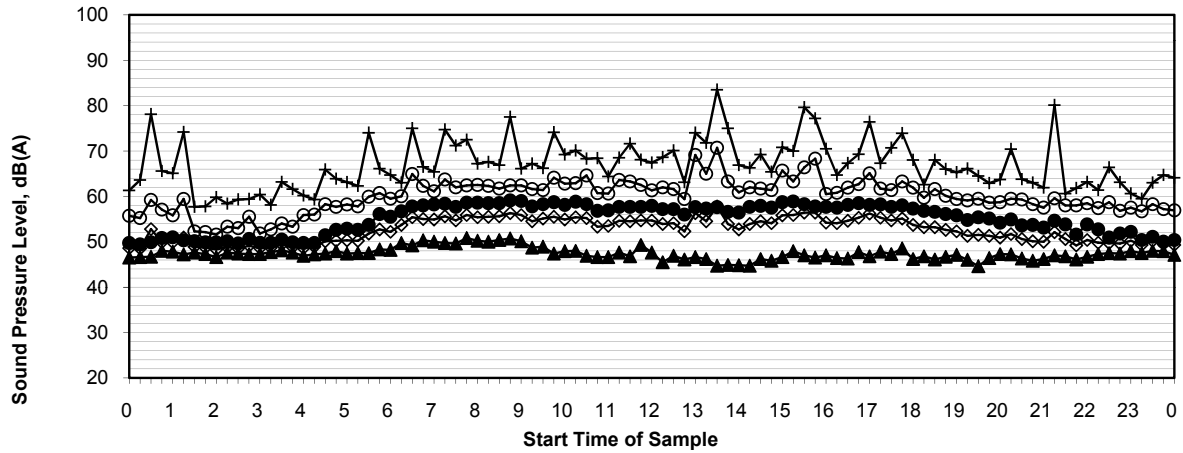
Tuesday, 1 June 2021



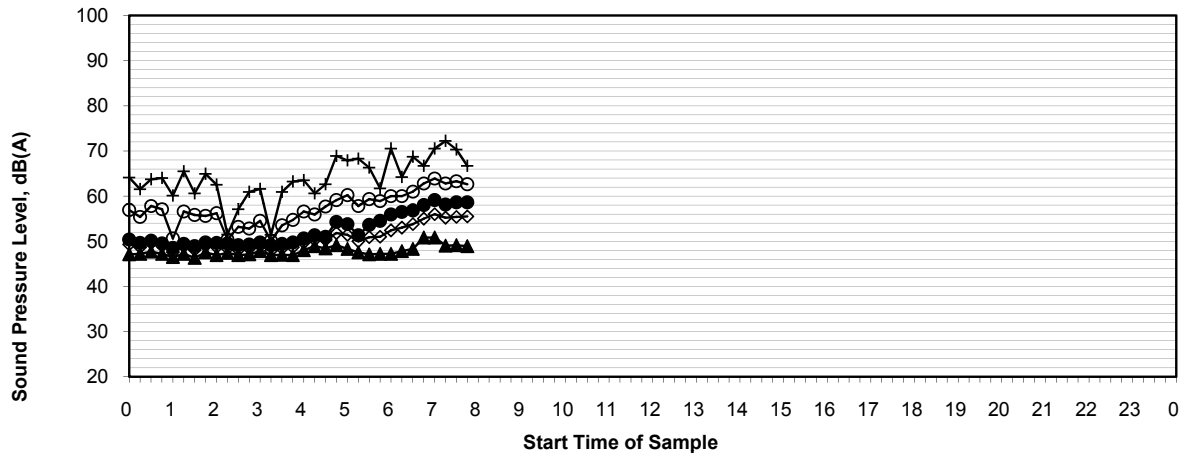
Reference Measurement Location R2
218 Fullerton Road

Ambient Sound Pressure Levels

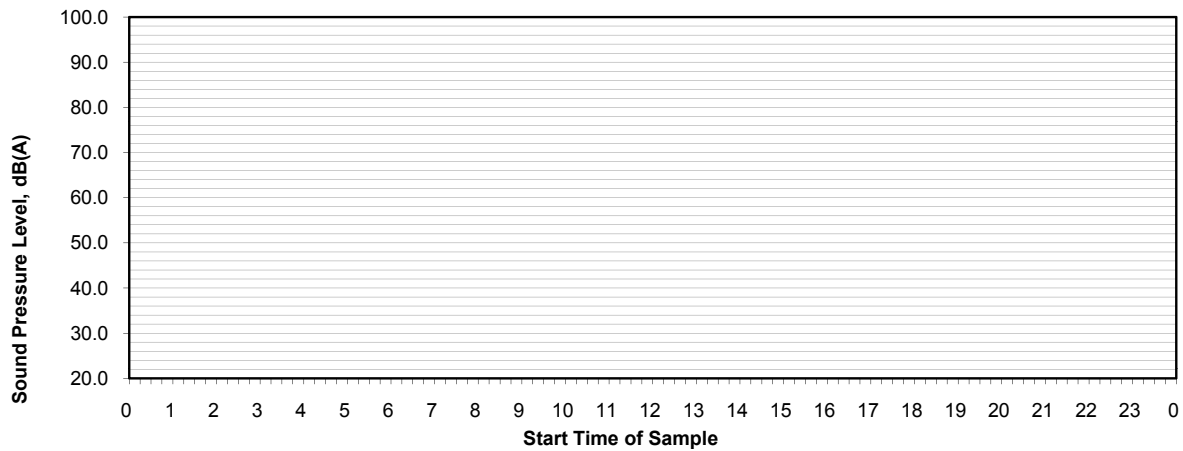
Wednesday, 2 June 2021



Thursday, 3 June 2021



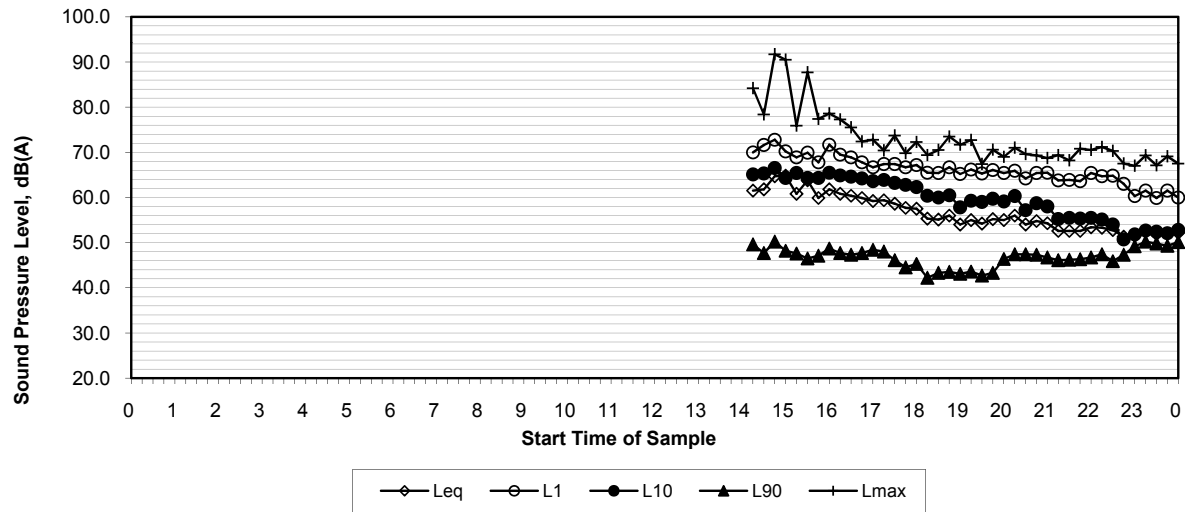
Friday, 4 June 2021



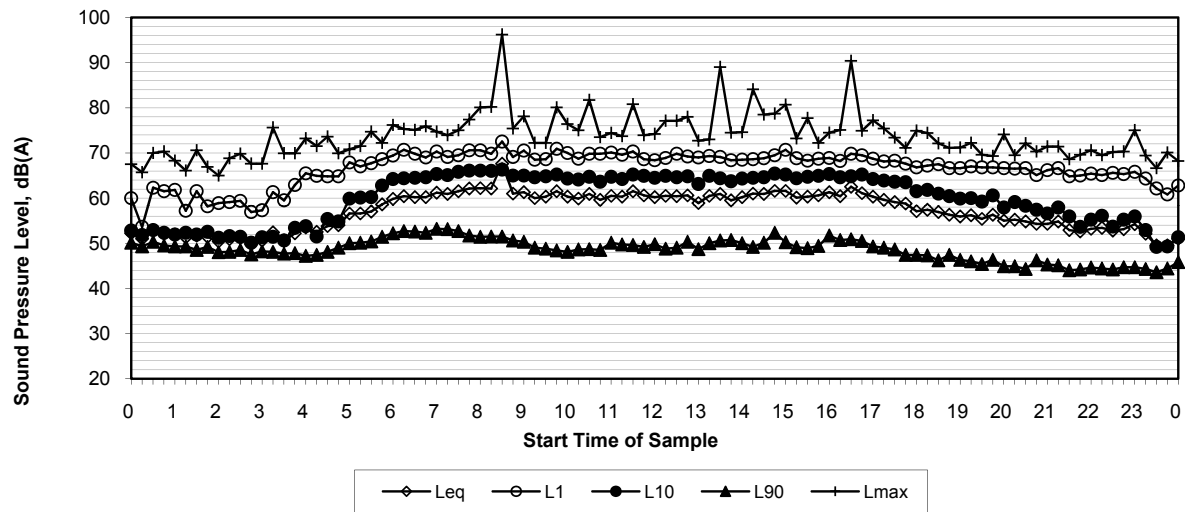
Reference Measurement Location R2
218 Fullerton Road

Ambient Sound Pressure Levels

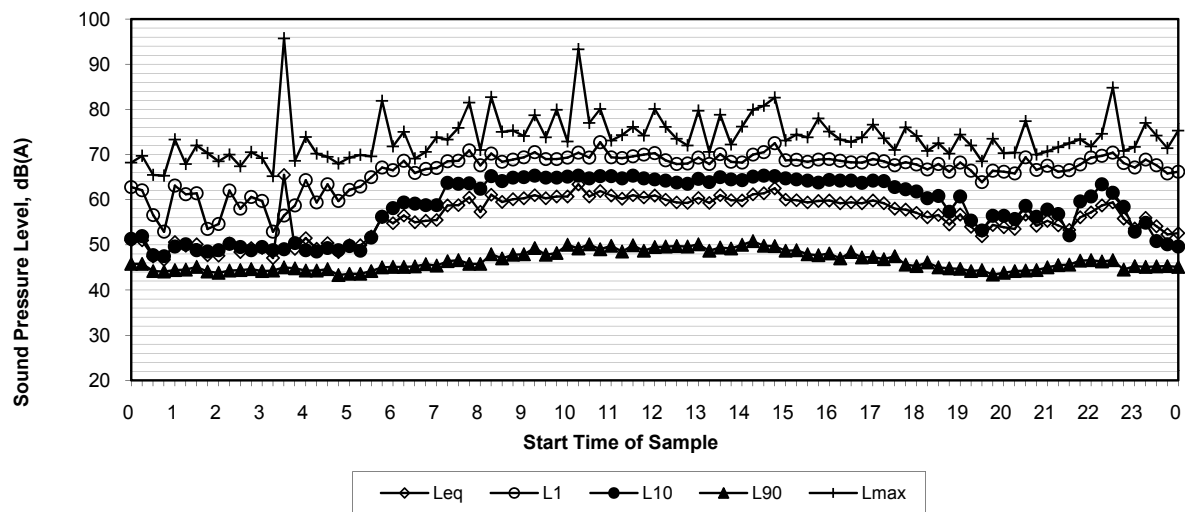
Thursday, 27 May 2021



Friday, 28 May 2021



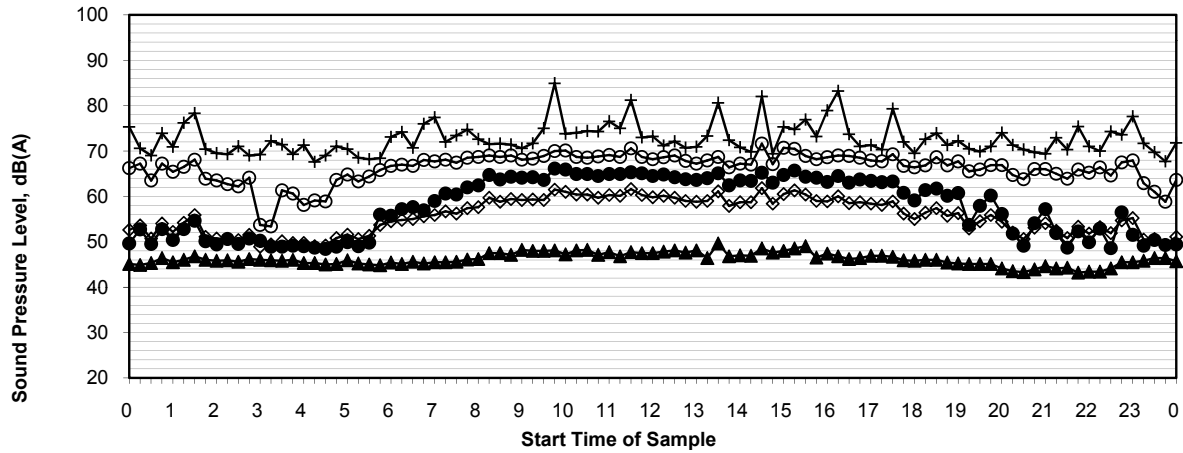
Saturday, 29 May 2021



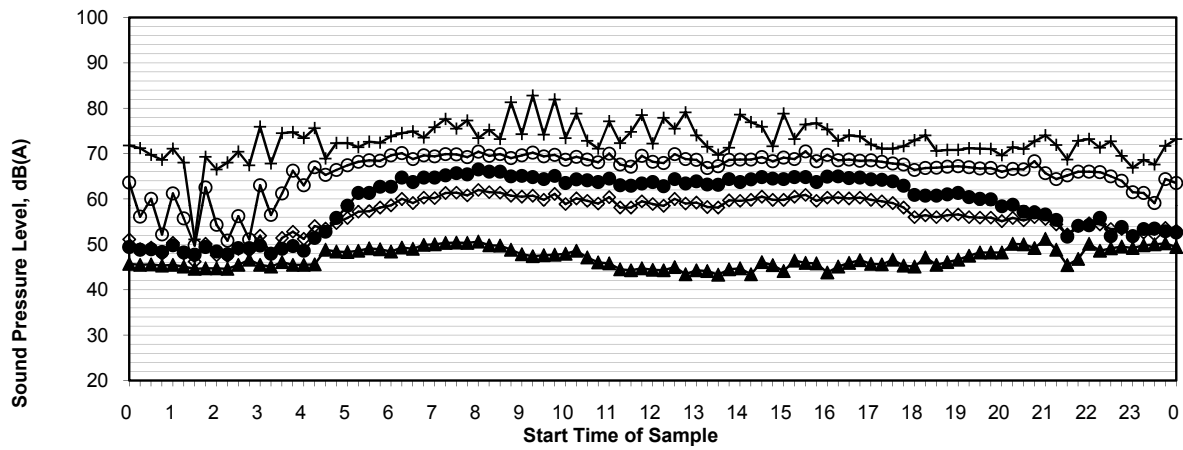
Reference Measurement Location R3
184 Fullerton Road Stockton

Ambient Sound Pressure Levels

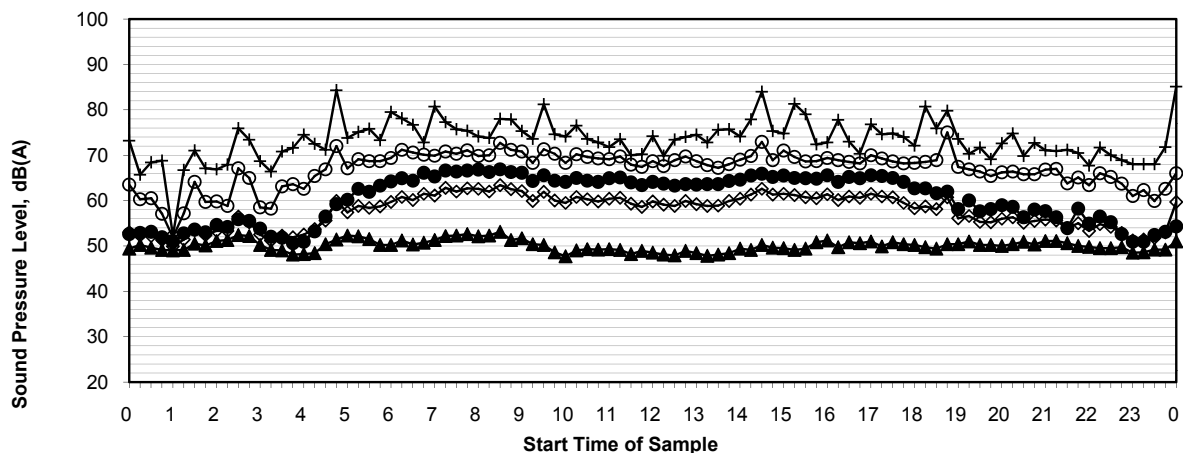
Sunday, 30 May 2021



Monday, 31 May 2021



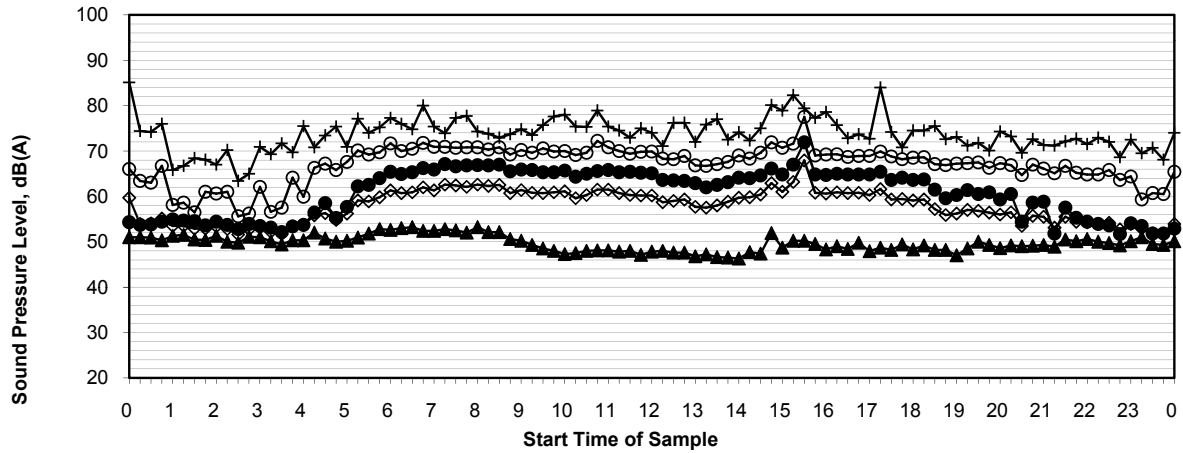
Tuesday, 1 June 2021



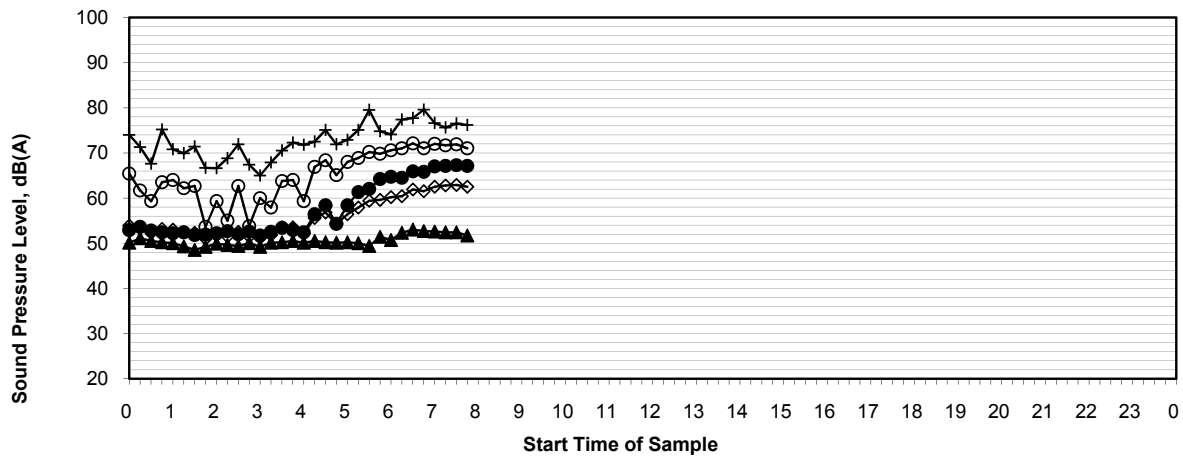
Reference Measurement Location R3
184 Fullerton Road Stockton

Ambient Sound Pressure Levels

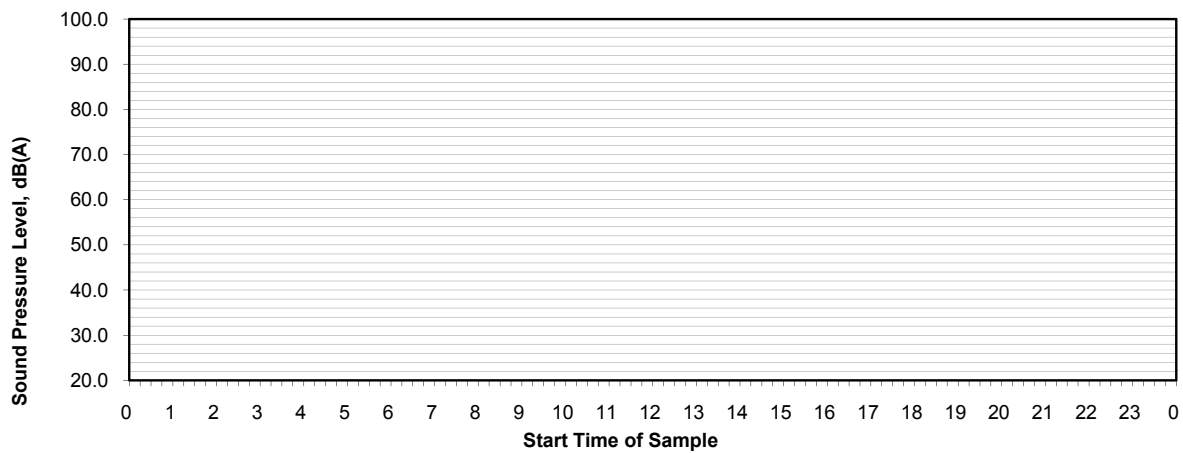
Wednesday, 2 June 2021



Thursday, 3 June 2021



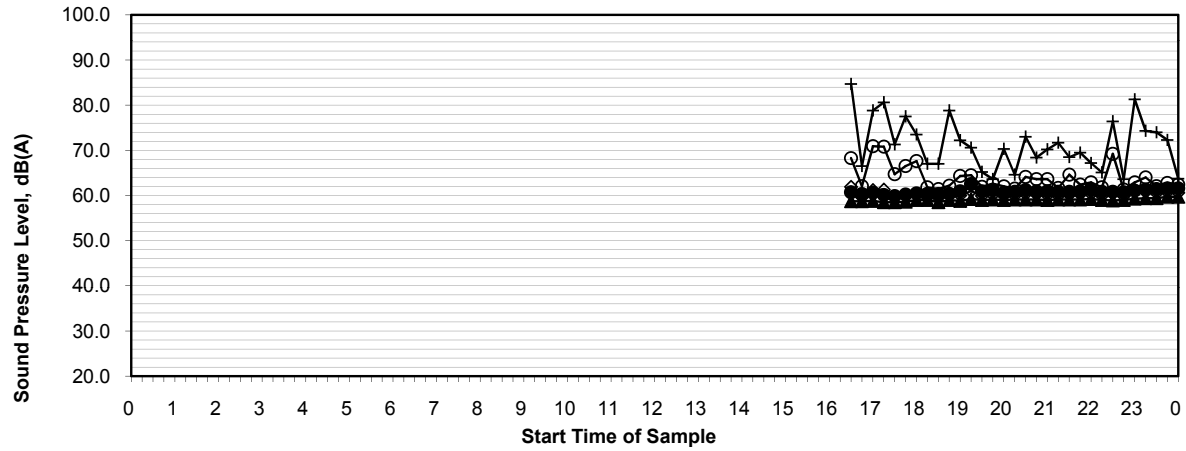
Friday, 4 June 2021



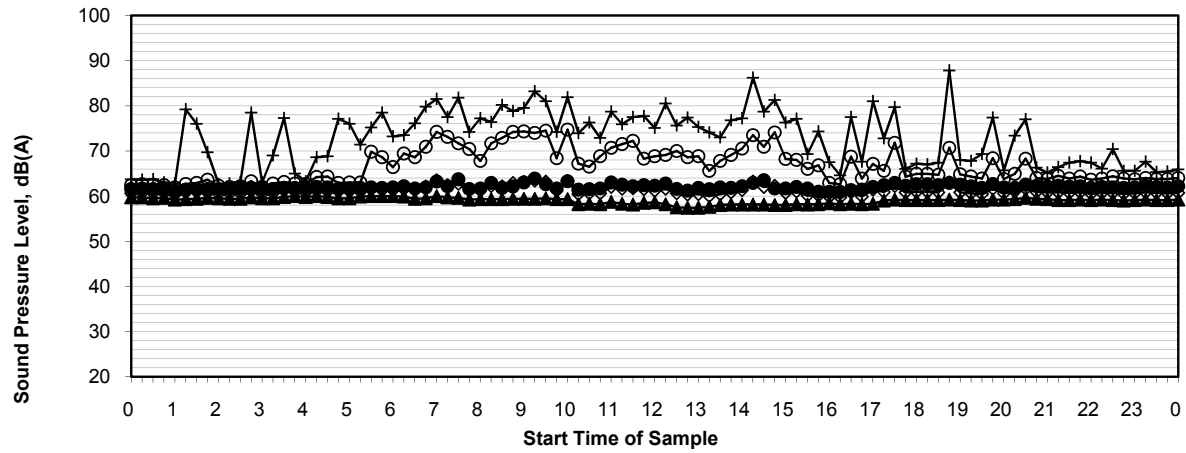
Reference Measurement Location R3
184 Fullerton Road Stockton

Ambient Sound Pressure Levels

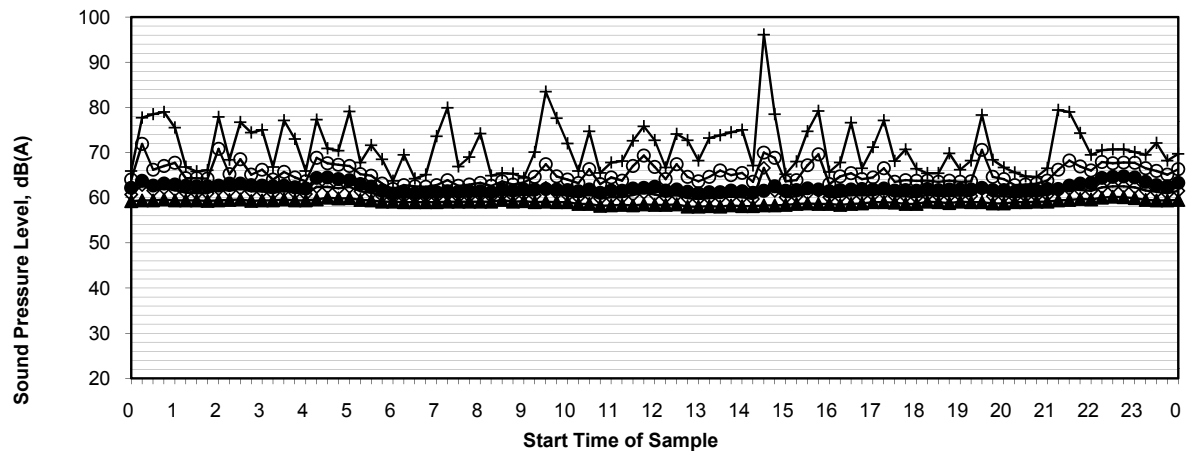
Thursday, 27 May 2021



Friday, 28 May 2021



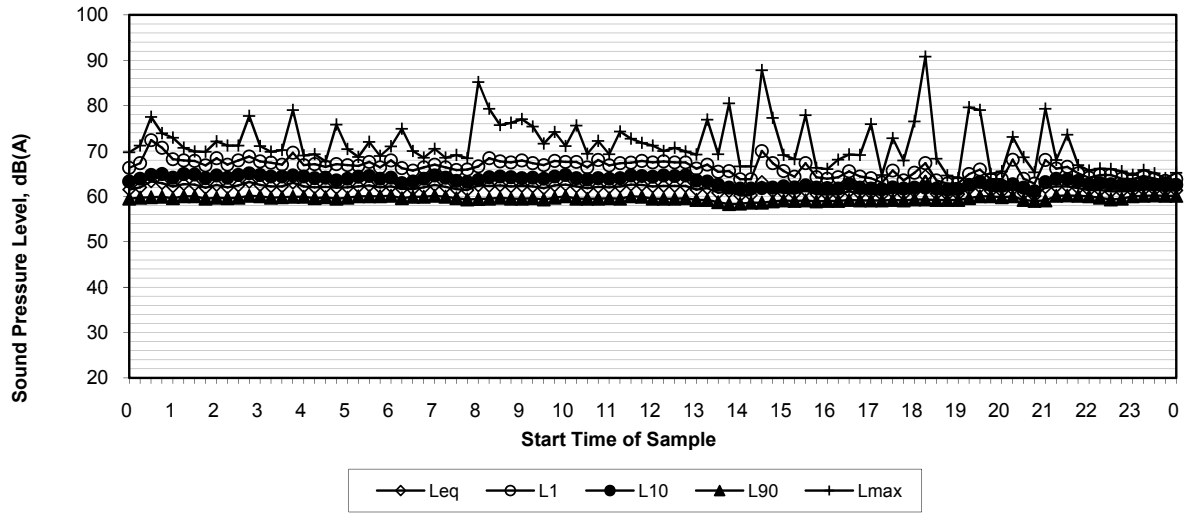
Saturday, 29 May 2021



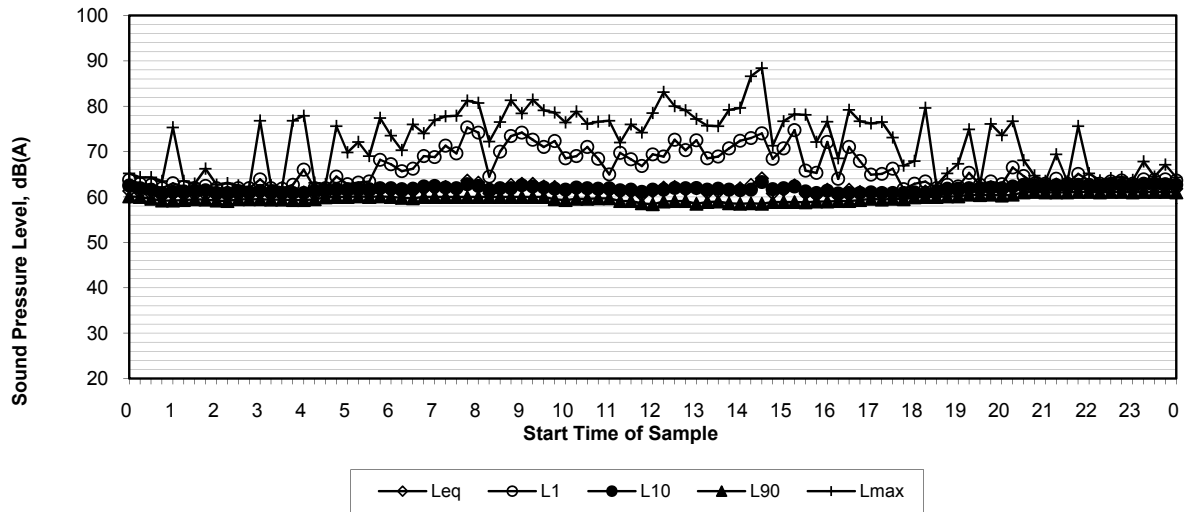
Reference Measurement Location R4
Greenleaf Road (Roadside South)

Ambient Sound Pressure Levels

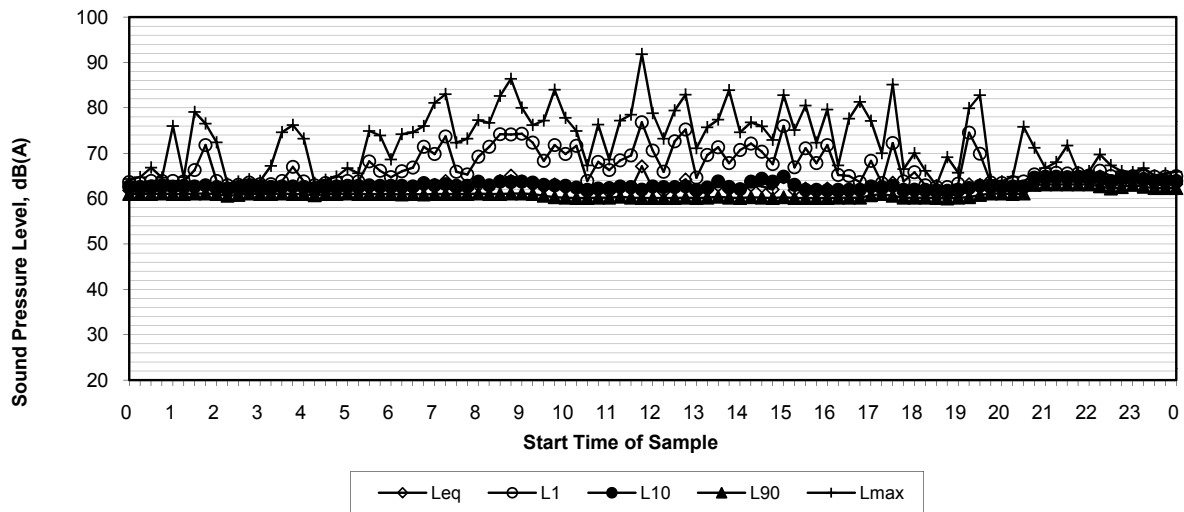
Sunday, 30 May 2021



Monday, 31 May 2021



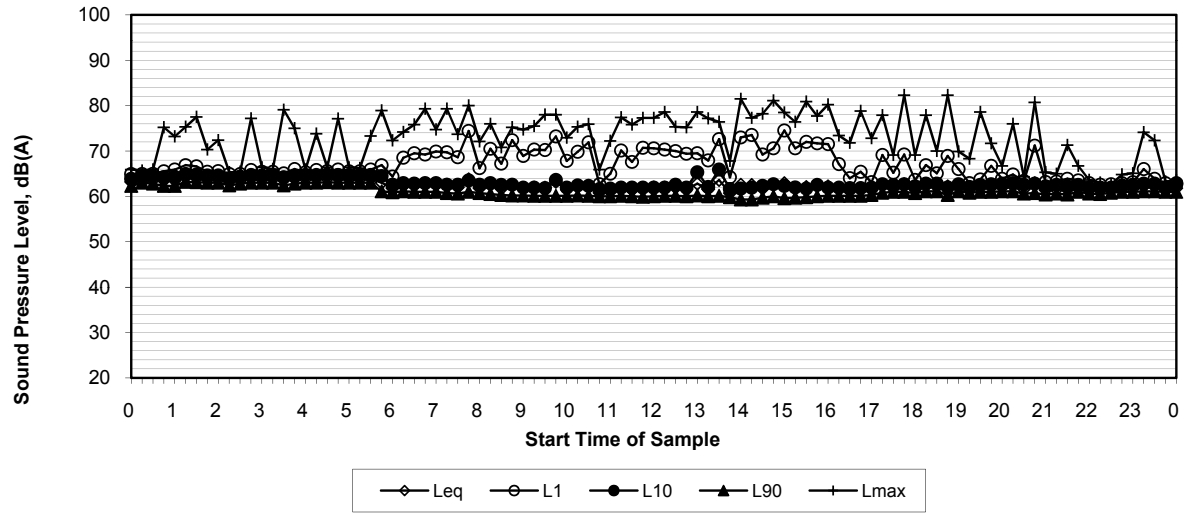
Tuesday, 1 June 2021



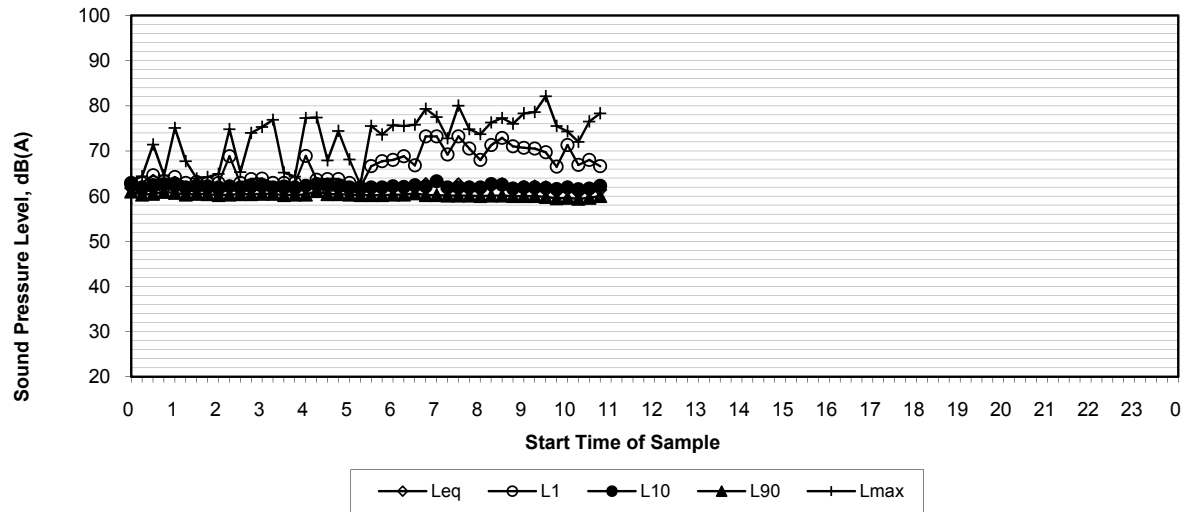
Reference Measurement Location R4
Greenleaf Road (Roadside South)

Ambient Sound Pressure Levels

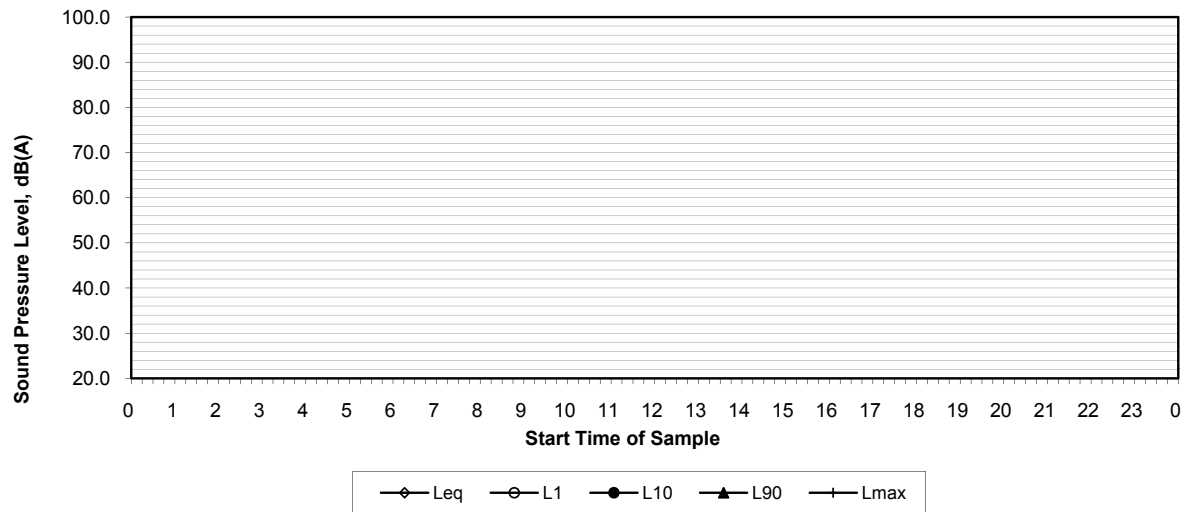
Wednesday, 2 June 2021



Thursday, 3 June 2021



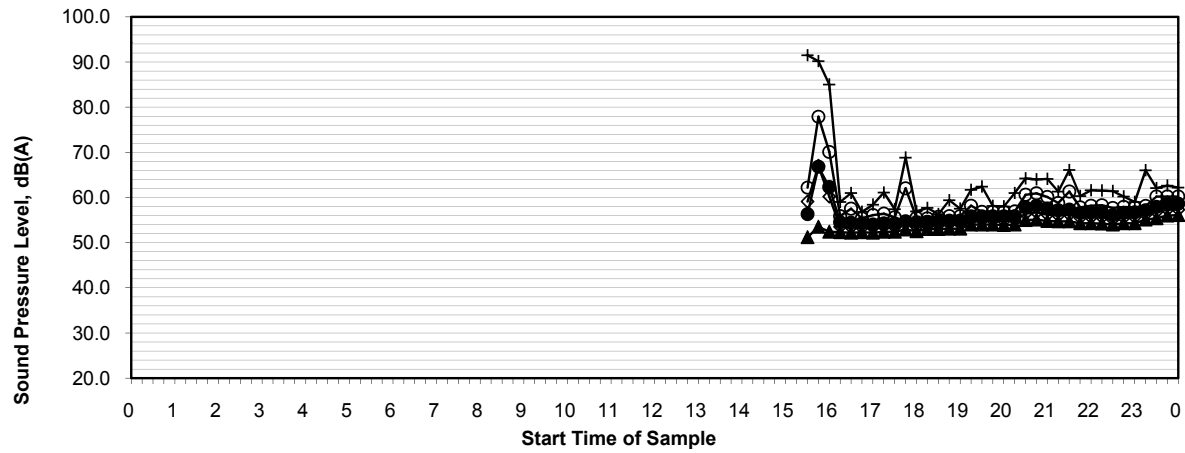
Friday, 4 June 2021



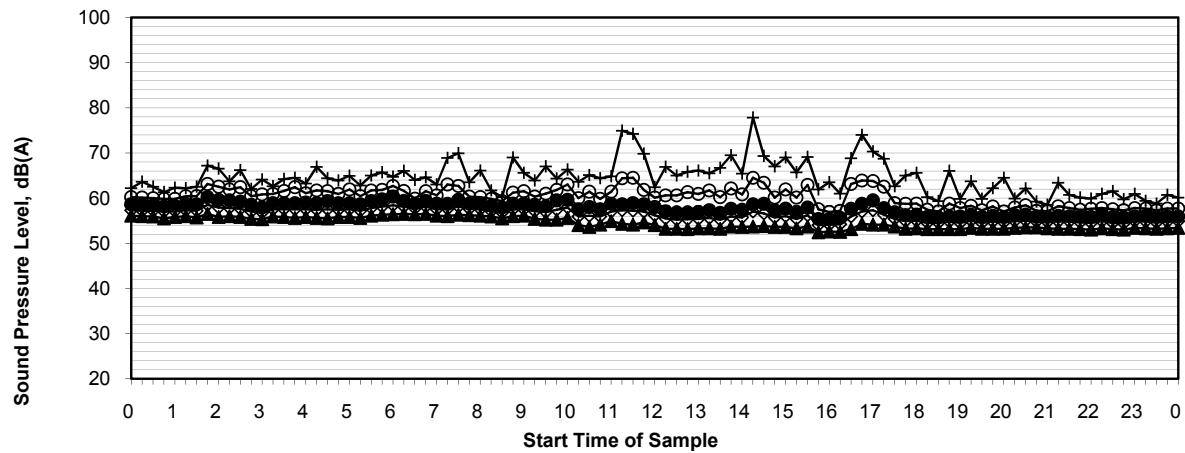
Reference Measurement Location R4
Greenleaf Road (Roadside South)

Ambient Sound Pressure Levels

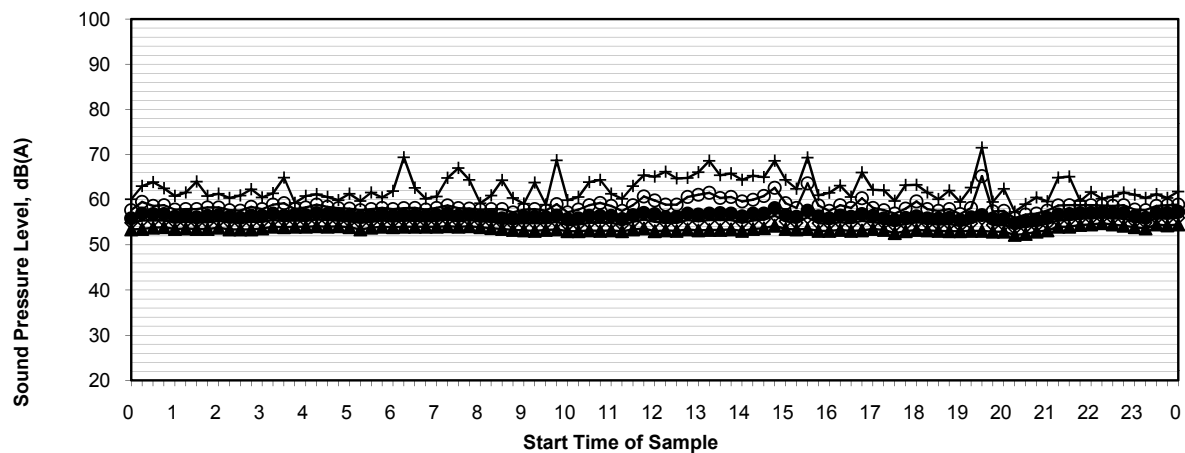
Thursday, 27 May 2021



Friday, 28 May 2021



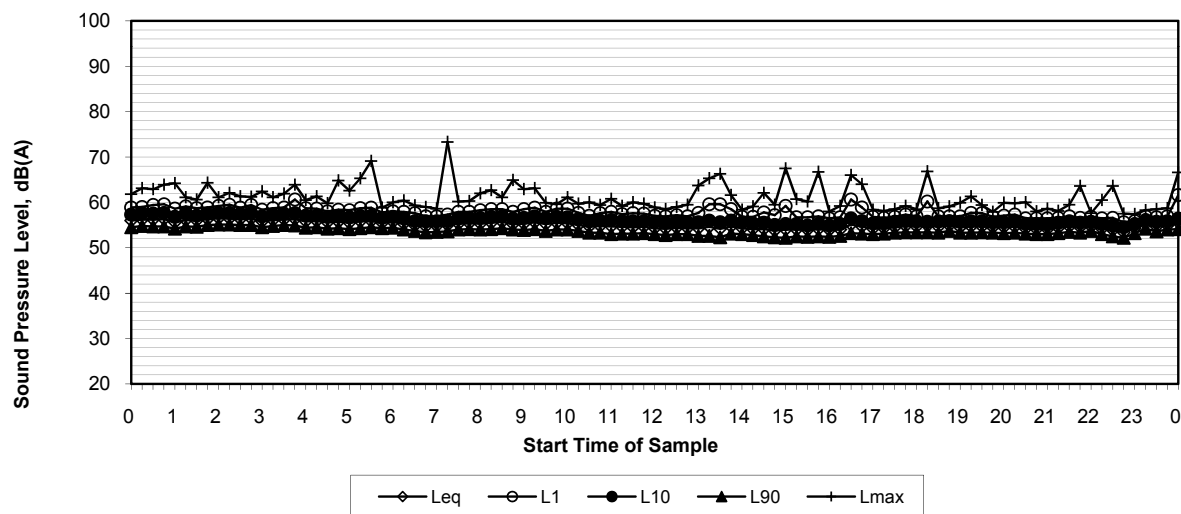
Saturday, 29 May 2021



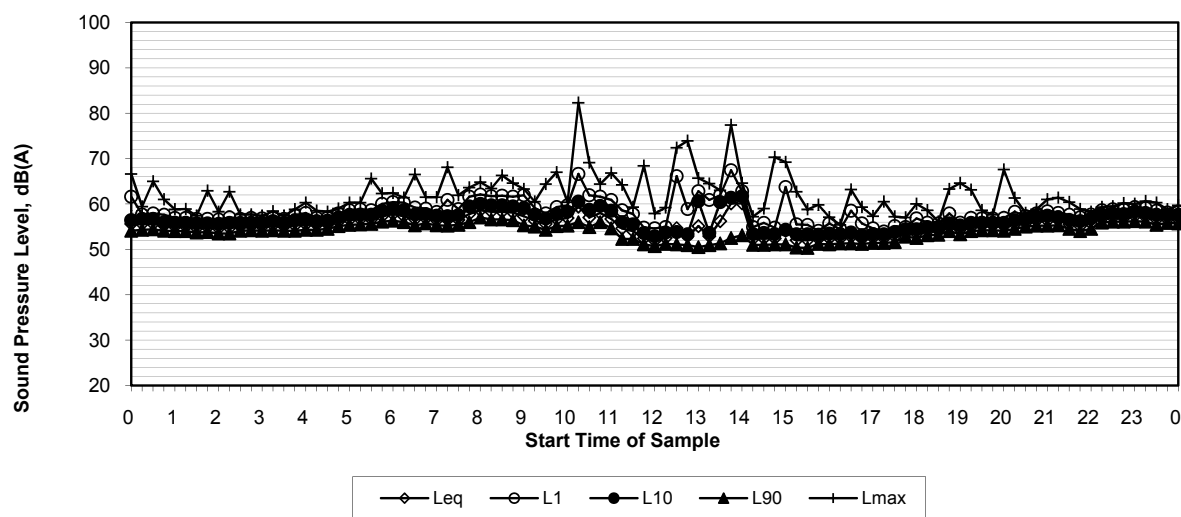
Reference Measurement Location R5
Greenleaf Road (Water Station Riverside)

Ambient Sound Pressure Levels

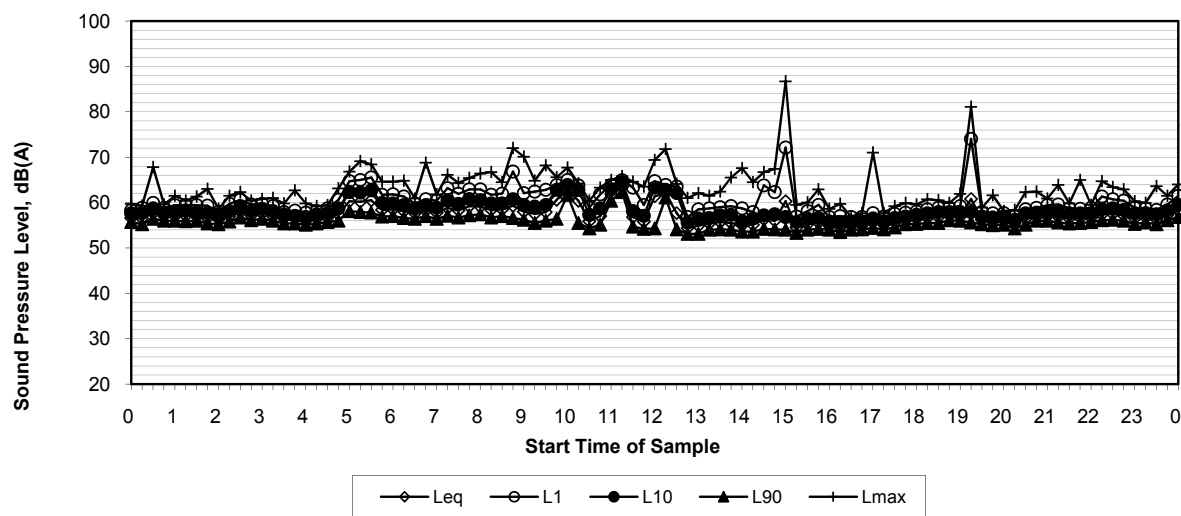
Sunday, 30 May 2021



Monday, 31 May 2021



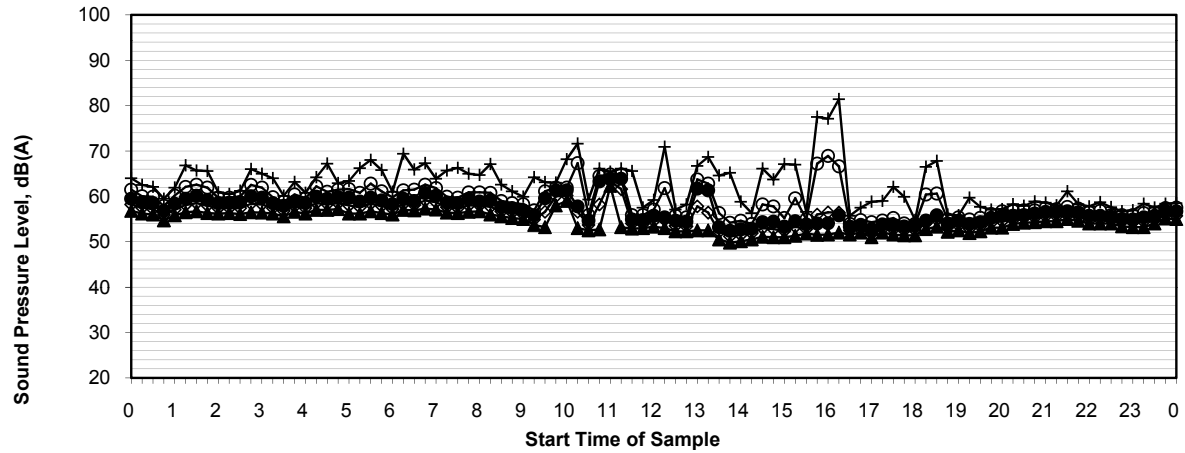
Tuesday, 1 June 2021



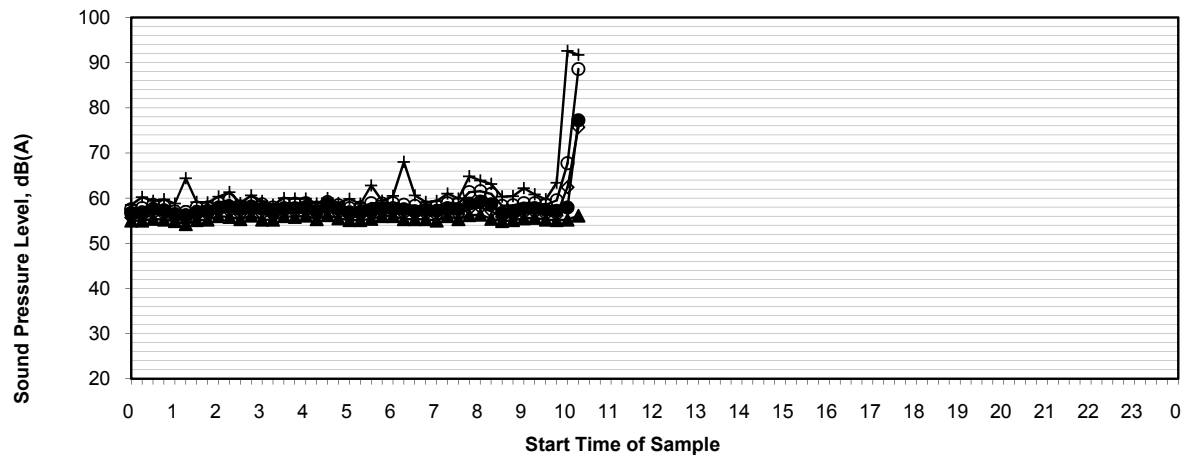
Reference Measurement Location R5
Greenleaf Road (Water Station Riverside)

Ambient Sound Pressure Levels

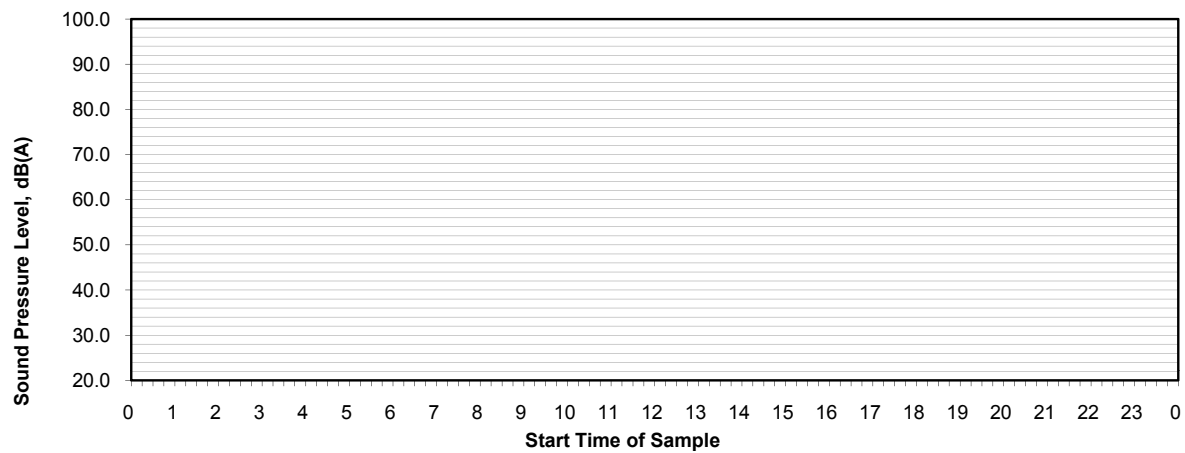
Wednesday, 2 June 2021



Thursday, 3 June 2021



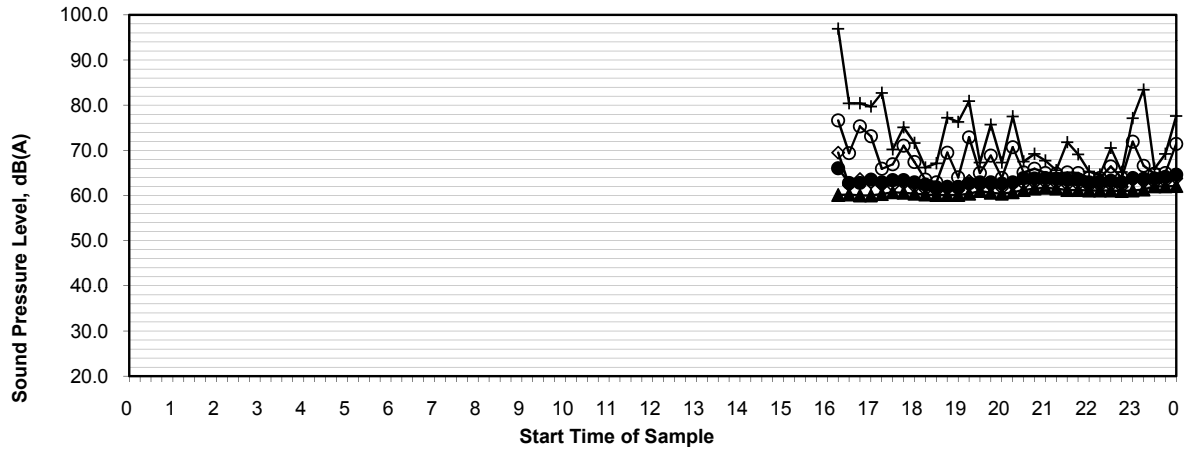
Friday, 4 June 2021



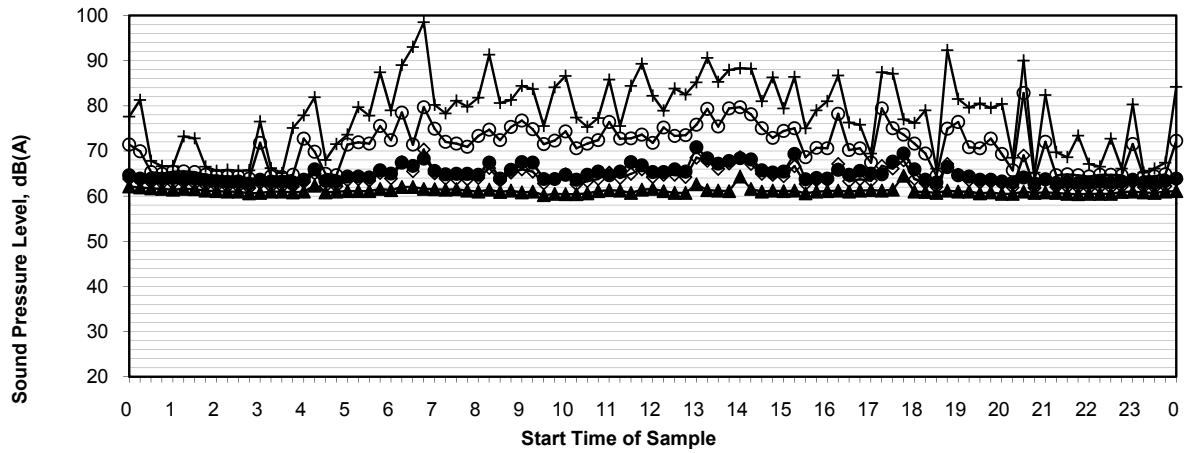
Reference Measurement Location R5
Greenleaf Road (Water Station Riverside)

Ambient Sound Pressure Levels

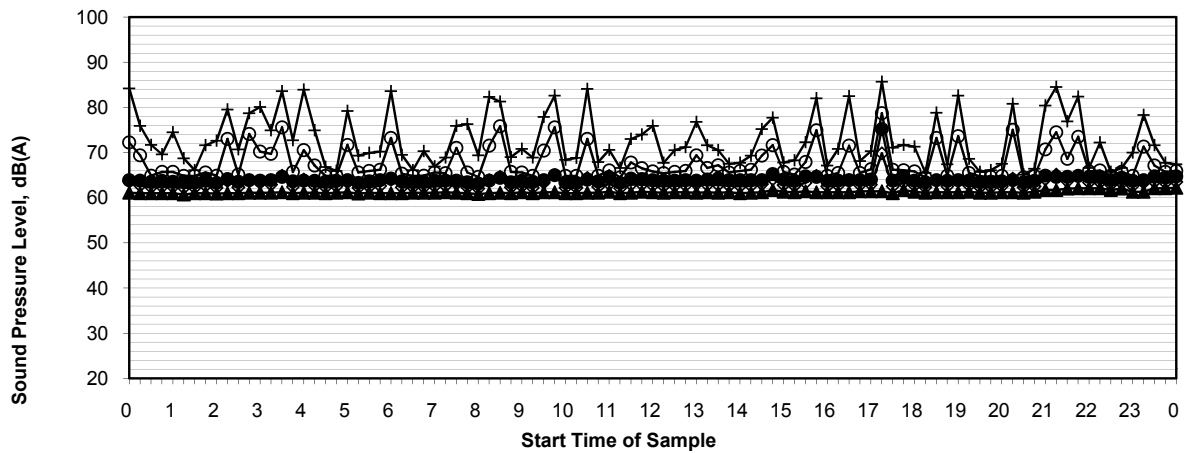
Thursday, 27 May 2021



Friday, 28 May 2021



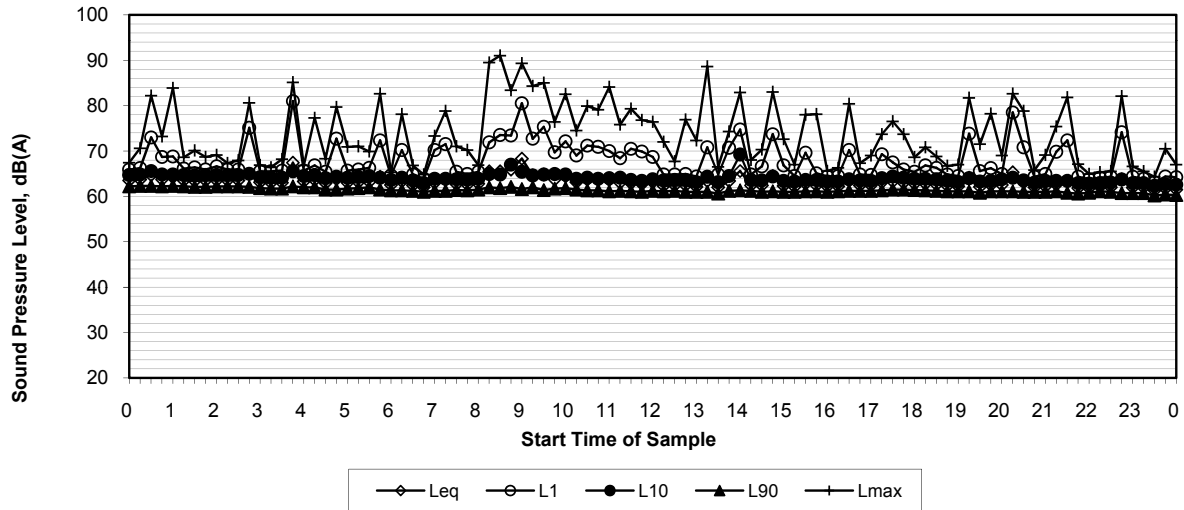
Saturday, 29 May 2021



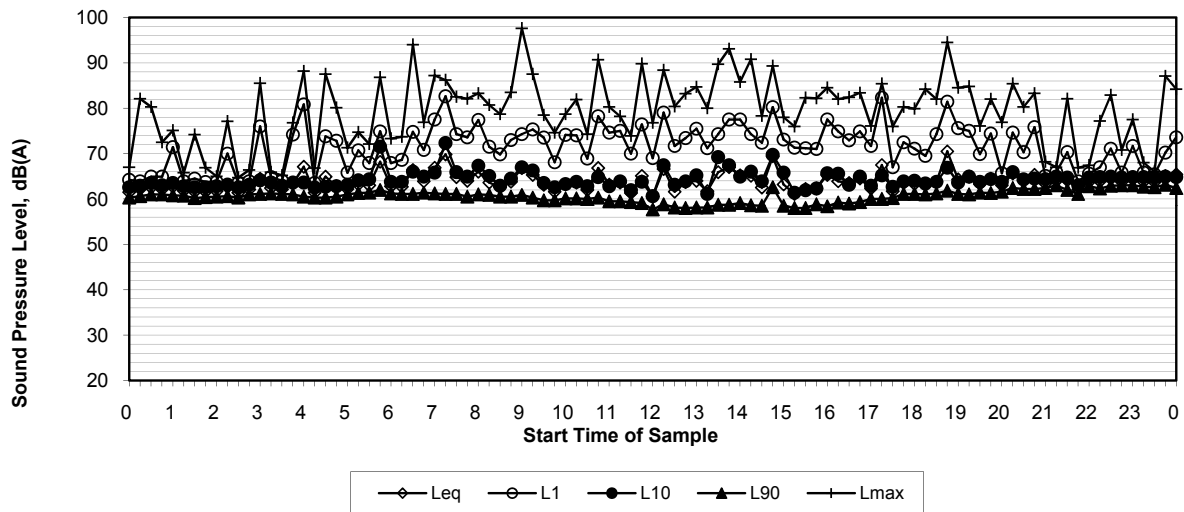
Reference Measurement Location R6
Greenleaf Road (Roadside North)

Ambient Sound Pressure Levels

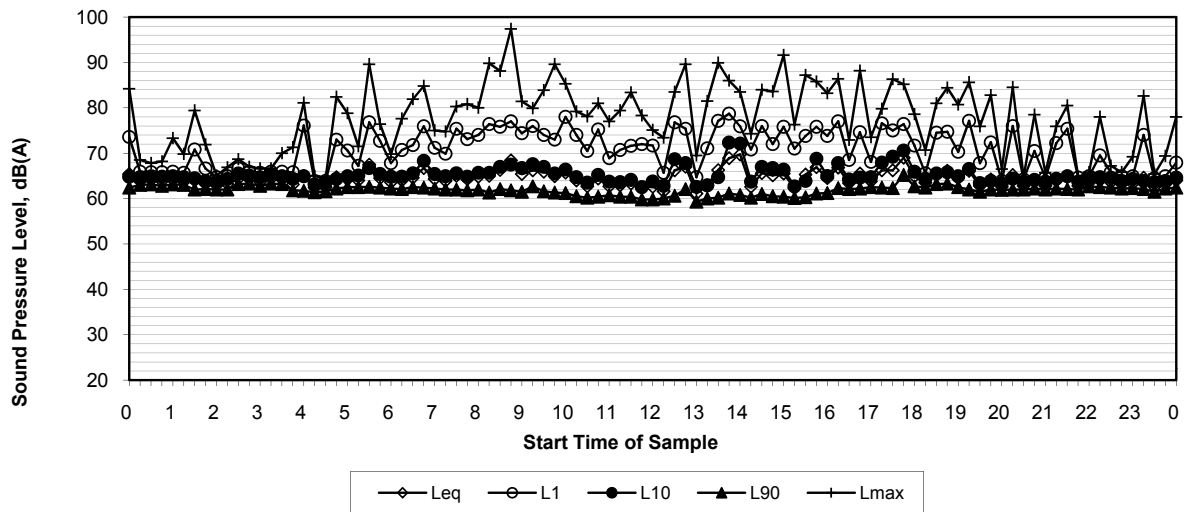
Sunday, 30 May 2021



Monday, 31 May 2021



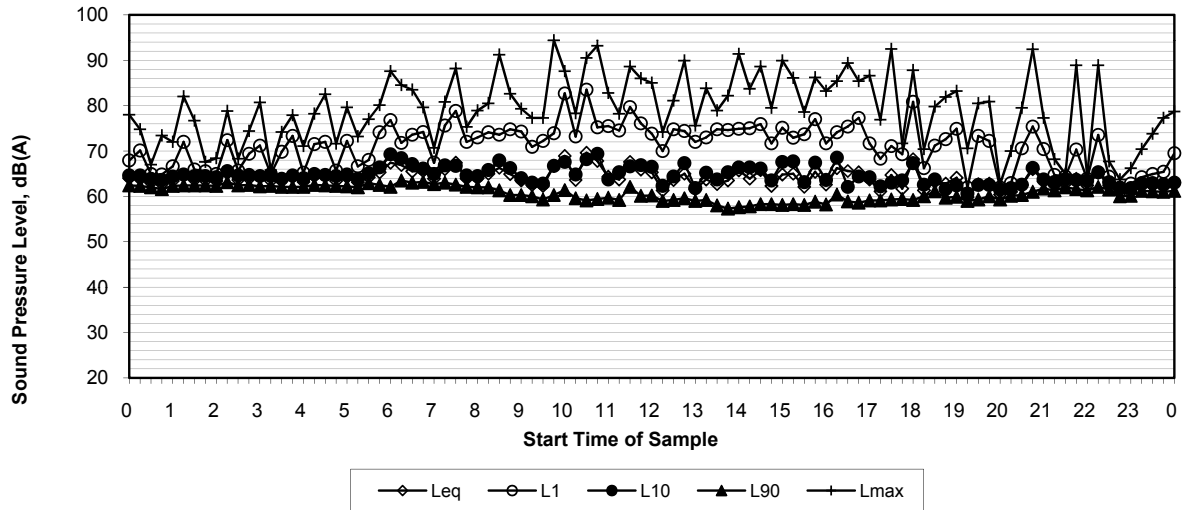
Tuesday, 1 June 2021



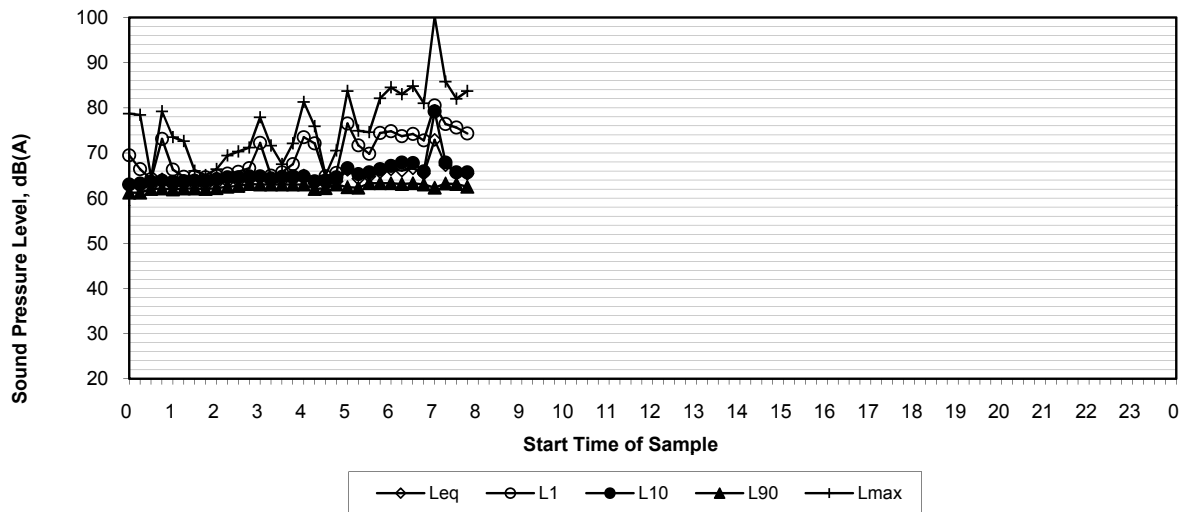
Reference Measurement Location R6
Greenleaf Road (Roadside North)

Ambient Sound Pressure Levels

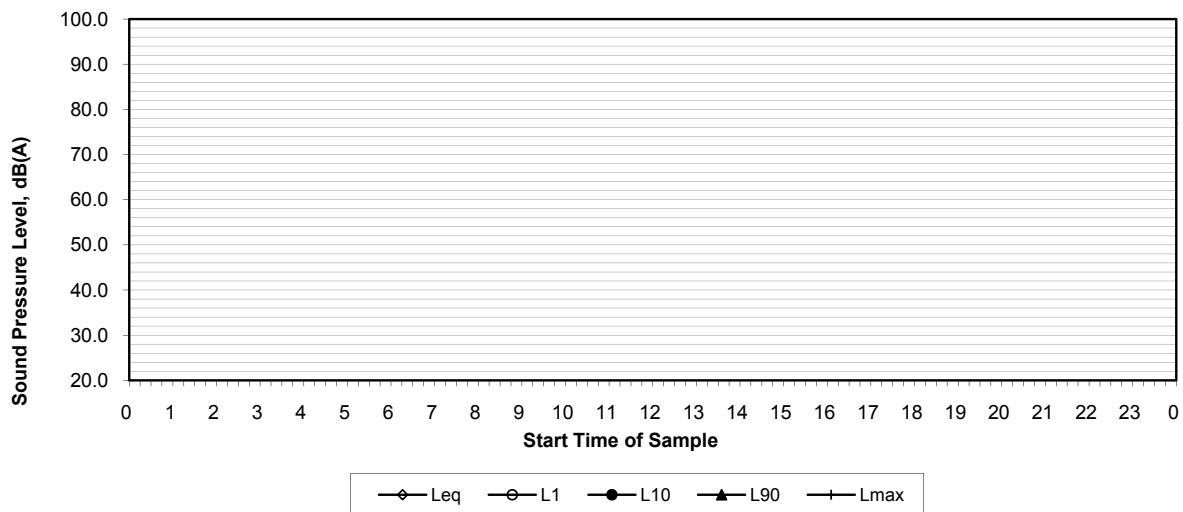
Wednesday, 2 June 2021



Thursday, 3 June 2021



Friday, 4 June 2021



Reference Measurement Location R6
Greenleaf Road (Roadside North)

ATTACHMENT 2. SUMMARY of REPORTED NOISE INCIDENTS

Incident No	Incident Date	Impact Classification	Type	Area	Severity
2021-000366124	27/12/2020	Community	Real	Ammonia Plant Start-up	1-COM Minor