

Kurnell Terminal SSD-5544 MOD-7

Appendix M - Noise & Vibration Impact Assessment

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Kurnell Terminal SSD-5544 MOD-7

Appendix M - Technical Report - Noise & Vibration Impact Assessment

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Executive summary

The Kurnell Terminal ('the Site') is located on the southern side of Botany Bay, in Kurnell, New South Wales (NSW). The main purpose of the Site is as a fuel import terminal, although other ancillary and related operations also occur.

Ampol Refineries (NSW) Pty Ltd (Ampol) intends to consolidate operational infrastructure, remove redundant assets, and undertake remediation and grading. Completion of these works (the 'proposed modification', MOD-7) would continue the safe, viable, and reliable operation of the Kurnell Terminal, whilst preparing the land for future uses. The location within the Site that these works would occur is referred to as the 'Project Area.'

This assessment of the construction and operational noise and vibration impact of the proposed modification has been prepared in support of a modification to the existing State Significant Development (SSD) consent reference 5544 (SSD-5544)

The construction activities have been assessed against the Noise Management Levels (NML) outlined in this report. The predicted construction noise levels are expected to exceed the construction noise management levels at some noise sensitive receivers during the construction works. Construction mitigation measures have been recommended to manage the construction noise impacts.

Construction noise levels at some residential receivers are predicted to exceed the 'highly noise affected' level of 75 dB(A). This is primarily due to works occurring in close proximity to residents (i.e. Zone 1A). However, the works in Zone 1A are expected to be minimal in duration (three months in duration).

Minimal vibration intensive works are expected to take place. Vibration intensive works to occur onsite are likely to be within safe working distances. For vibration intensive works to occur within Zone 1A, the minimum safe working distances provided in this report should be adhered to.

An assessment of the likely construction traffic indicated that noise increases on Captain Cook Drive is likely to be less than 2 dB(A) during the peak construction periods and therefore no further consideration of construction traffic noise is required, in accordance with the NSW Road Noise Policy.

Some cumulative construction noise impact may be experienced by noise sensitive receivers located within the Kurnell township area. These receivers may experience noise levels up to 3 dB higher than presented in this report for future project construction that may overlap with the subject development works. Cumulative impacts from other onsite operational projects are not expected to significantly impact the same nearby noise sensitive receivers during typical operation.

Results show predicted operational noise emissions from the proposed modification comply with the most stringent (night-time) operational noise criteria at all locations for typical operations. The operational noise assessment considers all existing and proposed operational equipment operating simultaneously at full capacity during the night-time period.

The FWS would be relocated within the FWS Relocation Area in Zone 1, including a new firewater tank and pipework to allow it to service the terminal infrastructure, with specific siting selected during detailed design. For the purpose of assessment in this *Technical Report – Noise and Vibration Impact Assessment*, two indicative locations have been considered in the FWS Relocation Area. Additional operational scenarios entailing the monthly and annual testing of the system (daytime only) have been included. Operation would include three diesel engines that would be tested individually on a monthly basis, and simultaneously on an annual basis.

The predicted operational noise emissions from the proposed modification for the Option 1 monthly FWS testing scenario comply with the operational noise criteria for the daytime period under both neutral and noise-enhancing meteorological conditions. The predicted operational noise emissions from the Option 1 annual testing scenario may lead to non-compliances during the daytime at some residential and recreation receivers under both neutral and noise enhancing meteorological conditions. However, it is noted that this testing only occurs once per year for a limited time.

The predicted operational noise emissions from the proposed modification for the Option 2 monthly FWS testing scenario comply with the daytime operational noise criteria at all receivers under both

neutral and noise enhancing meteorological conditions. The predicted operational noise emissions for the Option 2 annual scenario comply with the daytime operational noise criteria at all receivers under neutral meteorological conditions. Under noise enhancing meteorological conditions noise levels exceed the criteria at one recreational receiver. Since this scenario only occurs once per year for a limited time it is not considered reasonable to apply noise mitigation measures.

On this basis, the modified operation of the approved project would not affect the ability of the terminal to meet the operational noise limits contained within the development consent for SSD-5544.

1.0 Introduction

1.1 Overview

The Kurnell Terminal ('the Site') is located on the southern side of Botany Bay, in Kurnell, New South Wales (NSW) (Figure 1-1). In 2012, Ampol Refineries (NSW) Pty Ltd (Ampol) announced that the oil refinery and fuel terminal would be converted to a finished product terminal (the 'approved project'), ceasing refinery operations in 2014.

Development consent was received to complete the approved project under State Significant Development (SSD) application reference 5544 (SSD-5544). Ampol has modified SSD-5544 six times to complete the conversion and demolition works.

Currently, the operational infrastructure is primarily located in the northern part of the Site (Zones 1 and 1A, as shown in Figure 1-1). Other parts of Ampol's landholdings at Kurnell include largely vacant areas of previously developed land (Zones 2 and 3) and areas of undeveloped land containing extensive native vegetation (Zones 4 and 5).

Ampol intends to consolidate operational infrastructure, remove redundant assets, and undertake remediation and grading. Completion of these works (the 'proposed modification', MOD-7) would continue the safe, viable, and reliable operation of the Kurnell Terminal, whilst preparing the land for future uses. The location within the Site that these works would occur is referred to as the 'Project Area.'

A Modification Report has been prepared to support a modification application to SSD-5544. This *Technical report – Noise & Vibration* is one of a number of technical documents that forms part of the Modification Report. In line with the requirements of Section 4.55 of the *Environmental Planning & Assessment Act 1979* (EP&A Act), the Modification Report provides the information required by Section 100 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation).



Legend

- Site Boundary
- Ampol Ownership
- Project Area
- Former Refinery Area
- Operational Fuel Terminal
- Undeveloped Land
- Watercourse
- Primary Road
- Local Road



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Figure 1-1 Ampol Kurnell Terminal (the Site)

1.2 The proposed modification

1.2.1 Key elements of the proposed modification

To support the continued safe, viable, and reliable operation of the Site and to facilitate the future use of the Site, the proposed modification works involve:

- **Stage 1 – Preparation works:** Preparing the Project Area for proposed modification works
- **Stage 2 – Removal, relocation and/or augmentation of infrastructure,** including:
 - Relocation and/ or augmentation of firewater systems (FWS) and oily water sewer (OWS) systems and construction of new operational facilities, including replacement warehouses
 - Decommissioning and removal of non-operational assets, redundant structures and electrical assets
- **Stage 3 – Remediation:** Addressing legacy ground contamination, including asbestos-contaminated soil (ACS)
- **Stage 4 – Grading:** Landforming the Project Area following removal of infrastructure and ground remediation activities and preparing Zones 2 and 3 for future use
- **Stage 5 – Demobilisation:** Demobilisation of construction and remediation equipment.

These stages may occur sequentially or concurrently, depending on site requirements.

A summary of project elements requiring modification and how they relate to the approved project is provided in Table 1-1. The proposed modification works would be undertaken within the Project Area shown on Figure 1-2. All activities would adhere to the Kurnell Terminal permit to work system to ensure compliance with environmental and safety protocols.

Table 1-1 Modified Project summary table

Stage	Element	Approved project	Modified project
Stage 1	Project Area	Project Area delineation	<ul style="list-style-type: none"> • Prepare the Project Area for the proposed modification works required under Stages 2, 3 and 4 and exclude other parts of the Site from proposed modification works.
Stage 2	Oily water sewer (OWS)	Maintain location in Zones 2 and 3	<ul style="list-style-type: none"> • Divert surface water runoff from potentially contaminated areas in Zone 2 to Zone 1 via new OWS interception pits/ lines until Stage 3 remediation is complete. • Divert potential leachate from ACS containment cell in Zone 2 to Zone 1 OWS system. • Remove all redundant OWS infrastructure.
	Fire-water systems (FWS)	Maintain location in Zone 2 and 3	<ul style="list-style-type: none"> • Augment or remove FWS infrastructure from Zones 2 and 3. • If removed from Zone 2, augment existing FWS in Zone 1 with a new firewater tank and pipework to service the terminal infrastructure. • Locate the new firewater tank and pumphouse within the FWS Relocation Area (specific siting selected during detailed design).
	Electrical assets	Maintain location in Zone 2 and 3	<ul style="list-style-type: none"> • Remove redundant electrical assets in Zones 2 and 3, including five substations.

Stage	Element	Approved project	Modified project
	Structures	Maintain location in Zone 2 and 3	<ul style="list-style-type: none"> Demolish remaining structures in Zones 2 and 3. Construct new 'fit for purpose' warehouse and Oil Spill Equipment Storeroom within Zone 1. Construct new storage shed in Zone 1A.
Stage 3	Remediation	Removal of ACS from pipeways and either containment onsite or offsite disposal	<ul style="list-style-type: none"> Remediate land in Zones 2 and 3 as necessary. Remediate land in Zone 1 where infrastructure is relocated and/ or augmented as necessary. Conduct remediation to a commercial/ industrial land use under the ASC NEPM (2013).
Stage 4	OWS	Maintain location in Zones 2 and 3	<ul style="list-style-type: none"> Disconnect and remove remaining underground OWS lines from Zones 2 and 3, except for lines connecting to the ACS Containment Cell. Install a new pump adjacent to the ACS Containment Cell. Two site options have been identified (specific siting selected during detailed design).
	Grading	Grading following demolition of structures and removal of infrastructure across the Site and relevant Project Areas	<ul style="list-style-type: none"> Construct new onsite detention (OSD) basins in Zone 3 to attenuate runoff and maintain pre-construction surface water flow rates. Grade Zone 2 following Stage 2 and Stage 3 activities to manage stormwater and prepare for future land uses. Grade Zones 1 and 3 as necessary.
Stage 5	Demobilisation	Demobilisation of construction equipment.	<ul style="list-style-type: none"> Demobilisation of construction equipment.

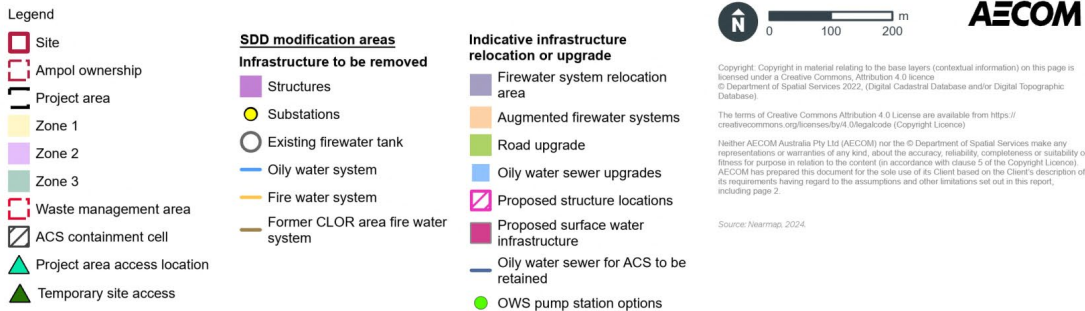
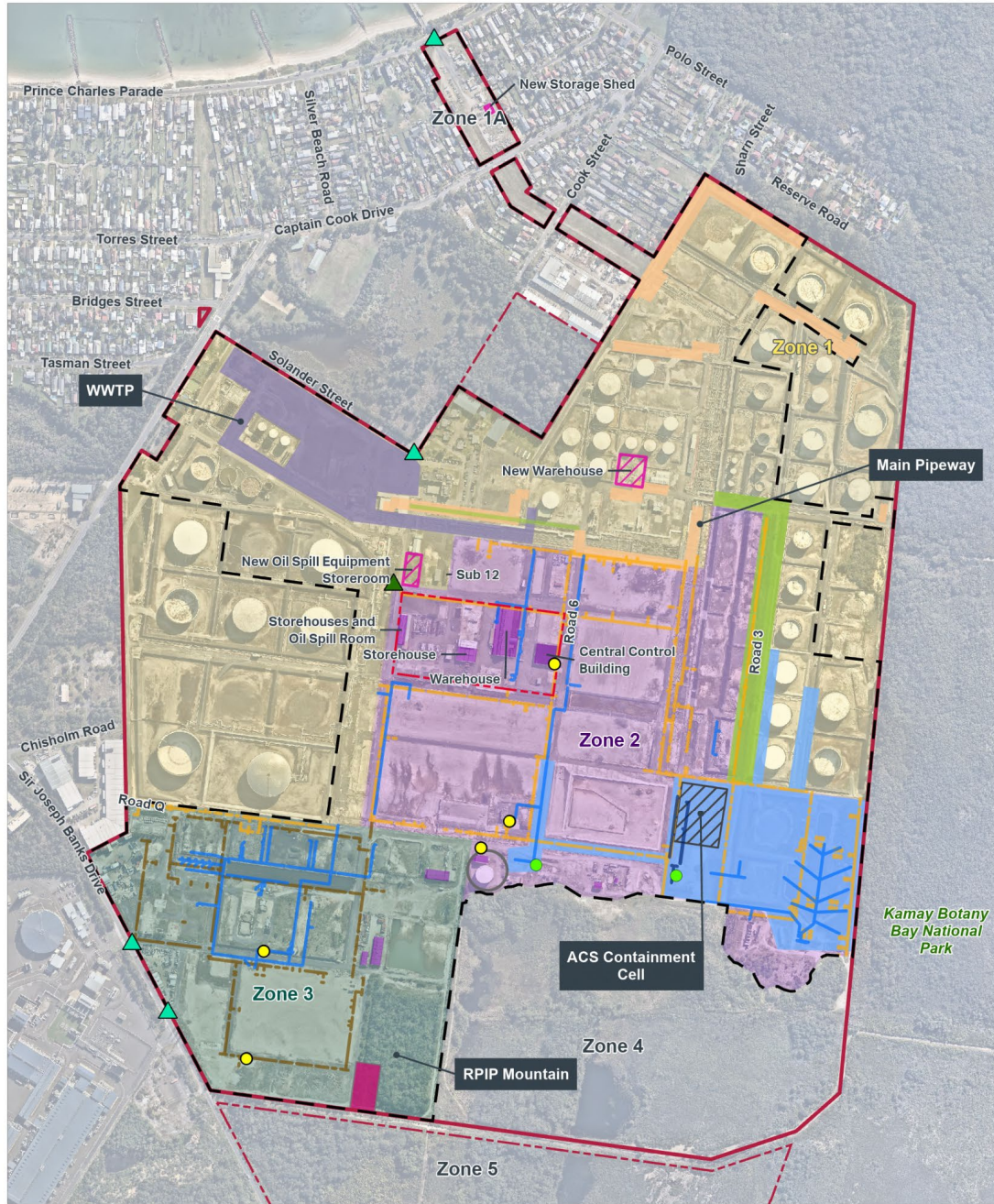


Figure 1-2 The proposed modification

Once the modification works are complete, the Site would continue to operate as described in the approval documentation for the approved project and would be consistent with the development consent for SSD-5544.

In line with Figure 1-2, relocated equipment would operate in their new locations.

1.2.2 Construction timeline and equipment

Works are planned to commence in August 2025 and would continue for about 12 months for infrastructure removal scopes and up to four years for remediation works in accordance with the schedule in Table 1-2.

In line with Condition C18 of SSD-5544, construction works would comply with following hours:

- Monday to Sunday – 7am to 10pm.

High noise generating construction works, including those in the Eastern Right of Way (Zone 1A), would be confined to less sensitive times of the day and not undertaken on Sundays, public holidays, or outside of the hours 7am and 6pm Monday to Saturday (in line with Condition C19)¹.

Construction works outside of the work hours identified above would only be undertaken in the following circumstances (in line with Condition C20):

- Works that are inaudible at nearest sensitive land receivers
- Works that are consistent with Ampol's existing maintenance procedures and are in accordance with the existing Environmental Protection Licence (No. 837) (EPL)
- Works agreed to in writing by the Environment Protection Authority (EPA) or the Department of Planning, Housing, and Infrastructure (DPHI)
- For the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons
- Where it is required in an emergency to avoid the loss of lives, property and/ or to prevent environmental harm.

Biopiling blowers may operate on a 24 hour basis in identified Biopiling and Stabilisation Areas (see Figure 4-2 of the Modification Report). Given their location within the Site, noise from the blowers would be inaudible at the nearest noise sensitive receivers.

Table 1-2 Proposed modification program

Stage	Timeframe
Stage 1 – Preparation works	August 2025
Stage 2 – Removal and/or relocation of infrastructure ¹	August 2025 – August 2026
Stage 3 – Remediation	August 2025 – July 2029
Stage 4 – Grading	Zone 2: August 2026 – December 2026 Zone 3: up to July 2029
Stage 5 – Demobilisation	September 2026 (for all works except remediation)
<i>Notes:</i>	
1. Construction in Zone 1A expected to last 3 months.	

¹ Definitions of times of day are provided in Glossary and Abbreviations list.

Plant and equipment that would be used to deliver the modification works is shown in Table 1-3.

Table 1-3 Indicative plant and equipment

Plant/ equipment	Maximum number required per day (all stages except Stage 3)	Maximum number required per day (Stage 3)
Front end loader	6	6
20 t excavator	6	6
Dump truck	6	6
Grader (up to 7 m blade)	-	4
Large crane (60 t)	4	-
Elevated work platform	6	-
Franna crane (30 t)	6	-
Cement truck	6	-
Bobcat	6	2
Water cart	6	6
Concrete crusher	2	-
Telehandler	6	-
Truck and dog (offsite disposal)	6	6
Truck and dog (imported fill)	-	12
Generator	2	2
Biopiling blower	-	8

1.2.3 Other relevant elements of the proposed modification

Operation

The FWS would be relocated within the FWS Relocation Area in Zone 1, including a new firewater tank and pipework to allow it to service the terminal infrastructure, with specific siting selected during detailed design.

For the purpose of assessment in this *Noise & Vibration Impact Assessment*, two indicative locations have been considered for the relocation of the FWS, which have been selected based on optioneering completed in the concept design phase in consultation with key stakeholders, including Firewater and Process Safety Subject Matter Experts. The location of each option is shown Figure 1-3.

Operation and maintenance of the relocated FWS would be consistent with existing operations. The FWS would include three diesel engines used to operate FWS pumps housed within an enclosed area. Regular maintenance testing of the pumps would include:

- Operation of all three pumps separately for approximately half an hour once a month
- One annual maintenance test of all three pumps simultaneously conducted over a two hour period once per year.



1.3 Purpose of this report

This Noise and Vibration Impact Assessment (NVIA) is one of a number of technical documents that forms part of the Modification Report. The purpose of this report is to understand potential impacts of the proposed modification upon noise and vibration.

2.0 Assessment methodology

2.1 Relevant legislation and guidelines

Applicable legislation, regulation, and policy for this NVIA for the construction assessment include:

- *Interim Construction Noise Guideline*, Department of Environment and Climate Change, NSW (ICNG, DECC 2009)
- *Assessing Vibration: a technical guideline*, Department of Environment and Conservation (AVTG, DEC 2006)
- *NSW Road Noise Policy*, Department of Climate Change, Environment and Water, NSW (RNP, DECCW 2011)
- Australian Standard 1055 *Acoustics – Description and measurement of environmental noise – Part 2: Application to specific situations*, AS 1055.2-1997.

Applicable legislation, regulation, and policy for this NVIA for the operational assessment include:

- *NSW Protection of the Environment Operations Act 1997* (POEO Act 1997)
- *NSW Noise Policy for Industry*, NSW Environment Protection Authority (NPfl, EPA 2017).

2.2 Construction noise criteria

2.2.1 Construction noise limits

Construction noise limits for the Project Area are defined in Development Consent SSD-5544, dated 7 January 2013. Condition C16 of SSD-5544 states that construction noise generated by the development shall not exceed the criteria in Table 2-1.

Table 2-1 Construction noise limits

Location	Day	Evening
	$L_{Aeq}(15 \text{ min}), \text{ dB}$	$L_{Aeq}(15 \text{ min}), \text{ dB}$
30D Cook Street	45	40
At any other residence or other noise sensitive receiver	50	45

Condition C16 of SSD-5544 applies to residences only, non-residential criteria have been determined from the *Interim Construction Noise Guideline*, as provided in Table 2-10.

Table 2-2 Construction noise management levels for non-residential sensitive receivers

Type of receiver	Recommended L_{Aeq} noise level dB(A) (external)
Classrooms at schools and other educational institutions	55 ¹
Community centre	55 ¹
Active recreation area	65
Passive recreation area	60
Commercial premises	70
Industrial premises	75

Notes:

1. Internal criteria given in the *Interim Construction Noise Guideline*. For the purposes of this assessment, it is assumed that an open window will achieve a 10 dB noise reduction from outside to inside.

Noise levels resulting from construction activities are predicted at nearby noise sensitive receivers using environmental noise modelling software and compared to the construction noise criteria in SSD-5544. All residential and non-residential receivers located within the Kurnell township, and/or up to 2,000 m from the approximate centre of the construction works have been considered in the construction noise assessment. Building usages of each receiver are shown in Figure 3-1.

The *Interim Construction Noise Guideline* (DECC 2009) is a NSW Government document that identifies ways to manage impacts of construction noise on residences and other sensitive land uses. It is the principal guideline for the assessment and management of construction noise in NSW and is used to establish construction noise management levels and assessment methodology. Where an exceedance of the noise criteria is predicted, the *Interim Construction Noise Guideline* advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially affected residents of the nature of the works to be carried out, the expected noise level and duration, as well as provide contact details to facilitate feedback from affected residents during construction.

Where construction noise levels at a receiver reach 75 dB(A), residential receivers are considered to be 'highly noise affected' and the proponent should, in consultation with the community, consider restrictions to the hours of construction to provide respite periods.

The *Interim Construction Noise Guideline* defines what is considered to be feasible and reasonable as follows:

Feasible

A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.

Reasonable

Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic, and environmental effects, including the cost of the measure.

2.2.2 Construction hours

In line with Condition C18 of SSD-5544, construction works would comply with following hours:

- Monday to Sunday – 7am to 10pm.

Refer to Section 1.2.2 (Construction timeline and equipment) for exclusions to this in line with Conditions C19 and C20 of SSD-5544.

2.2.3 Sleep disturbance

Biopiling blowers may operate on a 24 hour basis in identified Biopiling and Stabilisation Areas (see Figure 4-2 in the Modification Report). Given their location within the Site, noise from the blowers would be inaudible at the nearest noise sensitive receivers.

The remaining construction works are not proposed to be conducted at night-time; therefore, a sleep disturbance assessment for the construction works is not required.

2.2.4 Construction road traffic noise criteria

Noise from construction traffic on public roads is not covered by the *Interim Construction Noise Guideline*. However, the *Interim Construction Noise Guideline* does refer to the *Environmental Criteria for Road Traffic Noise* (ECRTN), now superseded by the *Road Noise Policy* (RNP), for the assessment of noise arising from construction traffic on public roads.

In accordance with the *Road Noise Policy*, to assess noise impacts from construction traffic, an initial screening test should be undertaken by evaluating whether existing road traffic noise levels will increase by more than 2 dB(A). Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion, then noise mitigation should be considered for those receivers affected. The road category specific criteria are presented in Table 2-3 below. The *Road Noise Policy* does not require assessment of noise impacts to commercial or industrial receivers.

Table 2-3 Road traffic noise assessment criteria

Road category	Type of land use	Assessment criteria, dB(A)	
		Day (7am-10pm)	Night (10pm-7am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/ arterial/ sub-arterial roads generated by land use developments	L _{Aeq} (15 hour) 60 dB(A)	L _{Aeq} (9 hour) 55 dB(A)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	L _{Aeq} (1 hour) 55 dB(A)	L _{Aeq} (1 hour) 50 dB(A)

2.3 Construction vibration criteria

2.3.1 Construction vibration objectives

The relevant standards and guidelines for the assessment of construction vibration are summarised in Table 2-4.

Table 2-4 Standards/ guidelines used for assessing construction vibration

Item	Standard/ guideline
Structural damage	<ul style="list-style-type: none"> Heritage structures – <i>German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures</i> Non-heritage structures – <i>Evaluation and Measurement for Vibration in Buildings Part 2, (British Standard (BS) 7385:Part 2-1993)</i>
Human comfort (tactile vibration)	<ul style="list-style-type: none"> <i>Assessing Vibration: A Technical Guideline</i>¹
<p>Notes:</p> <p>1. This document is based upon the guidelines contained in British Standard 6472:1992, “Evaluation of human exposure to vibration in buildings (1-80 Hz).” This British Standard was superseded in 2008 with BS 6472-1:2008 “Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting” and the 1992 version of the Standard was withdrawn. Although a new version of BS 6472 has been published, the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.</p>	

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive, or intermittent as follows:

- Continuous vibration continues uninterrupted for a defined period and includes sources, such as machinery and continuous construction activities
- Impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities

- Intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

2.3.2 Structural damage

At present, no Australian Standards exist for the assessment of building damage caused by vibration. DIN 4150 and BS 7385-2 provide recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in Table 2-5 and Table 2-6. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage. Structural damage criteria for heritage items have been taken from DIN 4150, whilst criteria for commercial/ residential items have been taken from BS 7385.

Table 2-5 Structural damage safe limits (DIN 4150) for building vibration

Group	Type of structure	At foundation Less than 10 Hz	At foundation 10 Hz to 50 Hz	At foundation 50 Hz to 100 Hz ¹	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order/ heritage listed)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

Notes:

1. At frequencies above 100 Hz, the values given in this column may be used as minimum values

Table 2-6 BS 7385-2: Transient vibration guide values for cosmetic damage

Group	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

2.3.3 Human comfort

Humans are sensitive to vibration such that they can detect vibration levels well below those required to cause any risk of damage to a building or its contents. Criteria to avoid annoyance are therefore more stringent than those to prevent structural damage.

Intermittent vibration

The assessment of intermittent vibration outlined in *Assessing Vibration: A Technical Guideline* is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in Table 2-7. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 2-7 Preferred and maximum vibration dose values for intermittent vibration (m/s^{1.75})

Location	Day time		Night time	
	Preferred	Max	Preferred	Max
Critical areas ¹	0.10	0.20	0.10	0.20
Residences ²	0.20	0.40	0.13	0.26
Offices, schools, educational institutions, and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60
<p><i>Notes:</i></p> <p>1 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria.</p> <p>2 Criteria for residences are lower than schools as people expect to be able to relax/sleep in their homes without annoyance and are generally more concerned about structural damage than would be the case within schools and offices.</p>				

Continuous and impulsive vibration

Acceptable levels of human exposure to continuous and impulsive vibration are dependent on the time of day and the activity taking place in the occupied space. *Assessing Vibration: A Technical Guideline* provides the preferred values for continuous and impulsive vibration. These are presented in Table 2-8. There is low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values in Table 2-8. Situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances and infrequent events of short duration. Vibration levels above those indicated in Table 2-8 may be dealt with through negotiation with the regulator of the affected community.

Table 2-8 Peak particle velocity for continuous and impulsive vibration (mm/s)

Location	Assessment period	Preferred	Maximum
Continuous vibration			
Residences ¹	Day	0.28	0.56
	Night	0.20	0.40
Offices, schools, educational institutions, and places of worship	When in use	0.56	1.10
Impulsive vibration			
Residences ¹	Day	8.60	17.0
	Night	2.80	5.60
Offices, schools, educational institutions, and places of worship	When in use	18.0	36.0
<i>Notes:</i>			
1 Criteria for residences are lower than schools as people expect to be able to relax/ sleep in their homes without annoyance and are generally more concerned about structural damage than would be the case within schools and offices.			

2.4 Operational noise criteria

2.4.1 Development Consent SSD-5544

Operational noise limits for the Project Area are defined in SSD-5544, dated 7 January 2013. Condition C17 of the Consent states that noise generated by the Site shall not exceed the criteria in Table 2-9.

Operational noise is assessed at the boundary of the noise sensitive receiver site in accordance with the NSW *Noise Policy for Industry*. These criteria apply to environmental noise emissions from any plant installed as part of the proposed modification.

Table 2-9 Operational noise limits

Location	Day	Evening	Night	
	L _{Aeq} (15 min), dB	L _{Aeq} (15 min), dB	L _{Aeq} (15 min), dB	L _{Amax} , dB
At any private residential receiver	60	50	50	55
<i>Notes:</i>				
1. These criteria were developed for original use of the site specifically. However, it is recognised that the site is zoned for heavy industrial purposes and that ultimately the amenity of the area should be controlled by the criteria contained in Table 2-1 of the <i>Industrial Noise Policy</i>				

2.4.2 Environmental Protection Authority – NSW Noise Policy for Industry

Condition C17 of SSD-5544 applies to residences only, non-residential criteria have been determined from the *Noise Policy for Industry*, as provided in Table 2-10.

Table 2-10 Recommended L_{Aeq} amenity noise levels for non-residential receivers

Type of receiver	Time of day	Recommended L_{Aeq} noise level dB(A) (external)
School classroom	Noisiest 1-hour Period When in use	45 ¹
Active recreation area	When in use	55
Commercial premises	When in use	65
Industrial premises	When in use	70
<p><i>Notes</i></p> <p>1. Internal criteria given in the Noise Policy for Industry. For the purposes of this assessment, it is assumed that an open window will achieve a 10 dB noise reduction from outside to inside. This is the criteria that has been presented.</p>		

2.4.3 Tonality and Noise Policy for Industry modifying factors

The *Noise Policy for Industry* provides additional guidance and criteria for assessing noise emissions from sources with “annoying characteristics” such as tonality, intermittency, or dominant low-frequency content. Penalties of up to a maximum of 10 dB(A) may be applied where the subject noise has such characteristics at the receiver.

2.4.4 Maximum noise level assessment

The criteria for maximum noise level events under SSD-5544 are presented in Table 2-9. Onsite equipment is proposed to operate during the night-time period. Noise from the new plant and equipment and other equipment onsite is predicted to be steady-state and non-impulsive. Given this, compliance with the SSD-5544 Condition C17, L_{Aeq} noise criteria will imply compliance with the maximum noise level and sleep disturbance criteria for these steady-state noise sources.

2.4.5 Operational vibration

Operational vibration is not expected to be an issue as a result of the proposed modification as the operational activities would be in line with the existing development consent for SSD-5544 and would not involve activities that would create vibration levels at nearby sensitive receivers or adjacent properties. Therefore, an assessment of the operational vibration impacts was not undertaken.

3.0 Existing environment

3.1 The surrounding area

The Site is located in the Sutherland Shire Local Government Area (LGA), on the Kurnell Peninsula in Sydney, NSW. The closest residential area to the Project Area is Kurnell, which is located approximately adjacent to the north and north west of the Site.

The Site is bounded by the Kamay Botany Bay National Park to the south and east, Captain Cook Drive to the north west, and St Joseph Banks Drive to the south west. The northern Site boundary is bordered by Solander Street, a small southern section of Cook Street, light industry, residential dwellings off the eastern side of Cook Street, and undeveloped land on the southern side of Reserve Road. The Eastern Right of Way (Zone 1A) is bounded by Prince Charles Parade to the north, and residential dwellings along Prince Charles Parade, Captain Cook Drive, and Cook Street along the east and west.

There are a number of reserves in proximity of the Site. Marton Park, comprising a developed recreational park area and an undeveloped wetland area, is located adjacent to the northern boundary of the Site on the northern side of Solander Street. Captain Cook's Landing Place Park is located approximately 500 m to the north of the Site, while Bonna Point Reserve is located approximately 1.4 km north west of the Site. Towra Point Nature Reserve is a Ramsar wetland and located west of the Site, on the opposite side of Captain Cook Drive. Quibray Bay also includes Towra Point Aquatic Reserve which, whilst not part of Towra Point Nature Reserve or Ramsar wetland, forms a wider ecosystem with it. To the north of Kurnell is Botany Bay, a large bay with a diverse number of uses and habitats and where the Georges and Cooks Rivers meet before joining the Pacific Ocean.

3.2 Noise sensitive receivers

Residential receivers which could potentially be affected by the proposed modification are located within the Kurnell township. The closest residential receivers directly adjoin some works areas (within Zone 1A). The assessment receiver locations for the operational noise assessment, along with the land use classification (as defined in the *Noise Policy for Industry*), of each receiver are presented in Table 3-1. All receivers within the Kurnell township area have been considered for the construction noise assessment as per the methodology presented in Section 2.2.

Table 3-1 Operational noise assessment receiver locations

Receiver	Address	Land use classification
R1	16 Tasman Street, Kurnell	Residential – Suburban
R2	3 Torres Street, Kurnell	Residential – Suburban
R3	127 Captain Cook Drive, Kurnell	Residential – Suburban
R4	41 Cook Street, Kurnell	Residential – Suburban
R5	30D Cook Street, Kurnell	Residential – Suburban
R6	7 Jeffrey Street, Kurnell	Residential – Suburban
R7	8 Bridges Street, Kurnell	Residential – Suburban
R8	9 Bridges Street, Kurnell	Residential – Suburban
E1	96 Captain Cook Drive, Kurnell (Marton Community Hall)	Education
AR1	92-94 Captain Cook Drive, Kurnell (Marton Park)	Active Recreation Area
PR1	Kamay Botany Bay National Park	Passive Recreation Area
PR2	Kamay Botany Bay National Park	Passive Recreation Area
C1	160 Captain Cook Drive, Kurnell (Kurnell Recreation Club)	Commercial

Receiver	Address	Land use classification
I1	171-189 Captain Cook Drive, Kurnell (Ausgrid substation)	Industrial
I2	58-64 Cook Street, Kurnell	Industrial
I3	18-28 Sir Joseph Banks Drive, Kurnell	Industrial
I4	21 Sir Joseph Banks Drive, Kurnell	Industrial

Compliance with the relevant operational noise criteria at the receivers outlined in Table 3-1 would result in compliance with the criteria at other residential and non-residential receivers located further away from the Site. Noise sensitive receivers are shown in Figure 3-1.

Operational receivers have been selected based on the primary operational areas of the Site. Operational activities occurring in satellite areas external to the main site (i.e. Zone 1A) must operate within the noise limits outlined in EPL 837.



Legend

- Project Area
- Site
- Ampol Land Ownership
- Watercourse
- Existing Noise Wall
- X Sensitive Receivers

Sensitive Receivers - Construction

- Commercial
- Community
- Education
- Industrial
- Place of Worship
- Residential
- Terminal Infrastructure



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Figure 3-1 Site location and assessment receivers (operational and construction)

3.3 Attended noise measurements

Attended noise measurements were conducted within the Ampol Kurnell Terminal on 5 September 2023 and 21 August 2024. Each source measurement was conducted over a period deemed to be representative of typical operation. Weather conditions were clear and calm on each day of monitoring.

Attended noise measurements were conducted using a Brüel & Kjær Type 2250 sound level meter. The sound level meter used is designated as a Class 1 instrument and has accuracy suitable for laboratory and field use. The sound level meter was calibrated before and after the measurements with a no drift in calibration exceeding ± 0.5 dB.

All the acoustic instrumentation employed during the noise measurements comply with the requirements of “AS IEC 61672.1-2019 Electroacoustics - Sound level meters – Specifications” and were within their current National Association of Testing Authorities, Australia (NATA) certified in-calibration period (i.e. calibration in the last two years).

Table 3-2 presents the attended noise measurements of existing sources within the Site.

Table 3-2 Attended noise measurements

No.	Date and time	L _{Aeq} dB(A)	L _{A90} dB(A)	Comments
1	05/09/2023 12:15	80	79	Adjacent to Tank 166, 1 of 2 jet fuel pumps operating (measured at 5 m from operating pump)
2	05/09/2023 12:23	84	83	Adjacent to Tank 204, 1 of 4 gasoline transfer pumps operating (measured at 4 m from operating pump)
3	05/09/2023 12:33	84	84	Adjacent to Aerobic Digester Tank, wastewater treatment air blower exhaust (measured at 8 m from exhaust, at ground level)
4	05/09/2023 12:35	81	80	Adjacent to Aerobic Digester Tank, wastewater treatment air blower outlet (measured at 6 m from outlet)
5	05/09/2023 12:48	78	73	Wastewater pumping area, 1 of 2 small pumps operating (measured at 3 m from operating pump)
6	05/09/2023 12:52	87	86	Wastewater pumping area, 1 of 3 treated effluent pumps operating (measured at 1.5 m from operating pump)
7	21/08/2024 11:18	90	89	Southern firewater system pumphouse with one diesel powered pump operating (measured 3 m from side of engine case, with access panel closed)
8	21/08/2024 11:22	92	92	Southern firewater system pumphouse with one diesel powered pump operating (measured 3 m from air intake)
9	21/08/2024 11:24	94	93	Southern firewater system pumphouse with one diesel powered pump operating (measured 2 m from exhaust)

4.0 Assessment of construction impacts

4.1 Construction noise modelling scenarios

Construction of the proposed modification is proposed to take place over a period of 12 months for infrastructure removal scopes, and up to five years for remediation works. Construction of the new shed in Zone 1A is expected to take three months only.

Construction scenarios are based on the following:

- Scenario 1 – All works up to mid-2026, including preparation works and relocation of critical infrastructure, construction of new infrastructure in Zone 1, and early capping works (Stages 1 to 5)
- Scenario 2 – All works from mid-2026 onwards, including remediation and grading works (Stages 3 to 5)
- Scenario 3 – Construction of the new shed in Zone 1A (three months only)
- Scenario 4 – All works up to mid-2026, including preparation works and relocation of critical infrastructure, construction of new infrastructure in Zone 1, construction of the new shed in Zone 1A (three months only), and early capping works (Stages 1 to 5).

Evening works have not been considered for Scenarios 3 and 4 as they involve works in Zone 1A. Works in Zones 1 to 3 in the evening are considered to be part of Scenario 1.

Table 4-1 provides a summary of the construction activities including the proposed construction equipment and associated sound power levels.

Table 4-1 Construction activities and equipment

Plant/equipment	SWL, dB(A)	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Front end loader	104	X	X	X	Scenario 1 equipment noise levels in Zone 1, and Scenario 3 equipment noise levels in Zone 1A
20 t excavator	99	X	X	X	
Dump truck	110	X	X	X	
Grader (up to 7 m blade)	113	X	X	X	
Large crane (60 t)	98	X	-	-	
Elevated work platform	95	X	-	X	
Franna crane (30 t)	98	X	-	X	
Cement truck	109	X	-	X	
Bobcat	97	X	X	X	
Water cart	107	X	X	X	
Concrete crusher	112	X	X	-	
Telehandler	99	X	-	X	
Truck and dog (off-site disposal)	108	X	X	X	
Truck and dog (imported fill)	108	X	X	X	
Generator	103	X	X	X	
Biopiling blower ²	86	X	X		
Total¹		119	118	118	
Notes:					
1. It is highly unlikely that all plant/equipment would be generating noise simultaneously.					

Plant/equipment	SWL, dB(A)	Scenario 1	Scenario 2	Scenario 3	Scenario 4
2. <i>Biopiling blowers may operate on a 24 hour basis in identified Biopiling and Stabilisation Areas (see Figure 4-2 in the Modification Report). Given their location within the Site, noise from the blowers would be inaudible at the nearest noise sensitive receivers. Therefore, they have not be assessed in a night-time scenario.</i>					

4.2 Noise modelling methodology

Noise levels due to the construction activities, shown in Section 4.1, have been predicted at nearby noise sensitive receivers using SoundPLAN 8.2 noise modelling software.

The noise model was created to represent 'reasonable' worst periods of construction works.

The following features were included in the noise model:

- Ground topography
- Buildings and structures
- Ground absorption and reflection
- Receivers
- Construction noise sources.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant/ equipment.

4.2.1 Construction modelling assumptions

The following assumptions have been made in modelling all construction noise scenarios:

- For all construction scenarios, all equipment would be operating at the same time, which is unlikely, and is a conservative assumption
- Construction activities would be occurring at all work fronts concurrently, which is unlikely, and is a conservative assumption
- Equipment is assumed to be operating at the closest point within the construction boundary to each receiver, in order to present the worst-case scenario for each receiver. In reality the equipment would only be at the closest point to each receiver for very limited periods
- Neutral atmospheric conditions, i.e. relatively calm, no wind.

4.3 Predicted construction noise levels

Predicted construction noise levels associated with the proposed modification are presented in Table 4-2. Construction noise contours calculated at 1.5 m above ground level are presented in Annexure A. These contours are indicative only and should not be referred to for noise levels at specific receivers, rather reference should be made to Table 4-2.

4.3.1 Residential receivers

Table 4-2 presents the construction noise modelling results for residential properties and shows the number of properties where the construction noise management levels (NMLs) are likely to be exceeded during the daytime period (7am to 6pm). Scenarios 1 and 2 may also occur during the evening period, therefore these scenarios have also been compared against the evening construction noise management levels as presented in Table 2-1.

The tables also present the number of receivers where noise levels are predicted to exceed the highly affected level, 75 dB(A). It is important to consider that this assessment is representative of the worst case 15-minute period of construction activity, while the construction equipment is at the nearest location to each sensitive receiver location. In reality, this scenario is highly unlikely to occur for extended periods. As such, the assessed scenarios do not represent the ongoing day to day noise impact at noise sensitive receivers for an extended period of time.

Particularly noisy activities, such as grading or concrete crushing, are likely to persist for only a fraction of the overall construction period. In addition, the predictions use the shortest separation distance to each sensitive receiver; however, in reality separation distances would vary between plant and sensitive receivers, with most works being a greater distance from receivers than modelled. Typical noise levels could be 5 to 10 dB(A) lower dependent on the location and nature of works.

Feasible and reasonable mitigation measures would be detailed in the Construction Noise and Vibration Management Plan (refer to Section 7.0).

Table 4-2 Number of residential buildings where noise levels may exceed NML/HALs – worst case scenario

Phase	Exceedance of NML daytime construction hours			Exceedance of NML during evening construction hours				Highly noise affected (>75dB(A))
	1 10 dB	11 20 dB	> 20 dB	1 5 dB	6 15 dB	16 25 dB	> 25 dB	
Scenario 1 (up to mid-2026, no Zone 1A works)	405	120	33	185	423	120	33	5
Scenario 2 (after mid-2026)	30	0	0	304	51	0	0	0
Scenario 3 (Zone 1A works only)	179	94	34	-	-	-	-	19
Scenario 4 (up to mid-2026, including Zone 1A works)	312	190	67	-	-	-	-	24

During Scenario 1, a total of 558 receivers within Kurnell could experience noise levels above the SSD-5544 daytime noise criteria (45 dB(A) at 30D Cook St, and 50 dB(A) at all other residential receivers). A total of 761 receivers within Kurnell could experience noise levels above the SSD-5544 evening noise criteria (40 dB(A) at 30D Cook St, and 45 dB(A) at all other residential receivers). It is noted that exceedances are mostly considered to be ‘clearly audible’ at receivers during the daytime and evening periods, with some receivers experiencing moderately and highly intrusive noise levels. Up to five receivers for Scenario 1 are expected to be highly affected.

During Scenario 2, up to 30 residential receivers may experience noise above the SSD-5544 daytime noise criteria, as less intense infrastructure works would be occurring (remediation, grading, etc.). However, a total of 355 residential receivers may experience noise above the SSD-5544 evening noise criteria. Exceedances are considered to be ‘noticeable’ or ‘clearly audible’ at receivers during both periods. No receivers for Scenario 2 are expected to be highly affected.

During Scenario 3, up to 307 receivers may experience noise levels above the SSD-5544 construction daytime noise criteria. Scenario 3 works are not expected during the evening and therefore have not been assessed during this period. A total of 19 residential receivers are expected to be highly affected. The large number of highly affected receivers is due to the close proximity of the works to the residential areas within the Kurnell township. The works within Zone 1A would be conducted over a period of three months only and would be intermittent.

For Scenario 4, a worse-case scenario has been considered, where works in Zone 1 would be occurring at the northern boundary of the main Site concurrently with the shorter term works in Zone 1A. The implication of this is that some receivers within the Kurnell township area would be affected by noise from both Zone 1 and Zone 1A concurrently. For this scenario, up to 569 receivers may experience noise levels above the SSD-5544 construction noise criteria during the daytime. It is noted that exceedances are mostly considered to be ‘clearly audible’ at receivers, with some receivers experiencing moderately and highly intrusive noise levels. Of the 569 receivers, 24 are expected to be highly affected. However, the full impact of Scenario 4 would last for three months only, whilst the Zone 1A shed construction works are undertaken.

4.3.2 Other receivers

Table 4-3 presents the construction noise modelling results for non-residential properties which shows the number of properties where the NMLs are likely to be exceeded during their hours of use. It is important to consider that this assessment is representative of the worst case 15-minute period of construction activity, while the construction equipment is at the nearest location to each receiver location.

Table 4-3 Number of non-residential buildings where noise levels may exceed NMLs – Worst case scenario

Phase	Exceedance of NML		
	1 10 dB	11 20 dB	> 20 dB
Scenario 1	11	1	1
Scenario 2	1	1	-
Scenario 3	5	-	-
Scenario 4	12	1	1

Noise levels at 13 non-residential receivers are expected to exceed the construction NMLs for Scenario 1. These receivers include Marton Park, Kurnell Preschool, Marton Community Hall, and Kurnell Recreation Club. NML for non-residential receivers do not vary between the daytime and evening periods. Education receivers are not expected to operate during the evening, therefore the number of non-residential receivers where noise levels may exceed NML would be reduced during the evening.

4.4 Construction traffic noise assessment

The traffic generated by the proposed modification would incorporate a mix of construction plant vehicles, delivery vehicles and construction personnel movements that would scale up and down throughout construction. A summary of the construction vehicles and associated staff numbers that would be required during the works is summarised in Table 4-4.

Table 4-4 Workforce and plant requirements for construction

Description		Daily movements (return trips)	Peak hour trips ¹
Heavy vehicles	Construction vehicles (cranes, semi-trailers, etc.)	10	0
	Truck and Dog (offsite disposal and imported fill)	120	12
	Equipment/ material delivery vehicles	6	2
	Subtotal	136	14
Private vehicles	Construction personnel ²	200	100
Total		336	114
Heavy vehicle proportion		40%	12%
<p><i>Notes:</i></p> <ol style="list-style-type: none"> <p><i>Assumptions include:</i></p> <p><i>Conservatively, it has been assumed that all personnel would arrive to Site during the AM Peak Hour and depart during the PM Peak Hour</i></p> <p><i>Personnel would utilise their own private vehicle with no use of car-pooling or public transport</i></p> <p><i>Heavy vehicle movements would be evenly distributed throughout the hours of operation (10-hour workdays)</i></p> <p><i>All plant delivery vehicles are assumed to occur on the same day in order to produce a 'worst-case' scenario.</i></p> <p><i>Maximum number of construction staff</i></p> 			

Captain Cook Drive would provide primary access to the Project Area for construction traffic. Traffic surveys were undertaken conducted in 2012 along Captain Cook Drive (east of Gannons Road). These counts determined an average annual daily traffic flow of 38,810 vehicles per day in both directions. Traffic data available for the assessment from 2012 represents a conservative approach, as it is expected that existing traffic volumes will be higher due to increased development within the area. The addition of construction traffic on a busier road network will yield a lower overall impact.

Given the existing traffic levels, additional traffic due to the construction of the proposed modification is expected to be negligible; see the Traffic and Transport Impact Assessment (TTIA) (Appendix L of the Modification Report) for further information. Therefore, noise increase on Captain Cook Drive Road is likely to be less than 2 dB(A) during the peak construction period for a worst-case scenario. No further consideration to construction traffic noise is required, in accordance with the *Road Noise Policy*.

4.5 Construction vibration assessment

Vibrations may be generated by the equipment proposed to be utilised. The minimum working distances of these items of equipment from off-site receivers are shown in Table 4-5. This is based on recommendations of the *Construction Noise and Vibration Guideline (Roads)* (Transport for NSW, 2023) and AECOM's previous project experience. If these minimum working distances are complied with, no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage. Equipment size would be selected by the construction contractor and would take into account the minimum working distances and the distance between the area of construction and the nearest receiver.

Table 4-5 Recommended safe working distances for vibration intensive plant

Plant	Rating/ Description	Minimum working distance	
		Cosmetic damage (BS7385) Light framed structures	Human response
Small hydraulic hammer	(300 kg – 5 to 12 t excavator)	2 m	5 m
Medium hydraulic hammer	(900 kg – 12 to 18 t excavator)	7 m	19 m
Large hydraulic Hammer	(1,600 kg – 18 to 34 t excavator)	22 m	60 m
Jackhammer	Handheld	1 m (nominal)	2 m

5.0 Assessment of operational impacts

Once the modification works are complete, the Site would continue to operate as described in the approval documentation for the approved project and would be consistent with the development consent for SSD-5544.

In line with Figure 1-2, relocated equipment would operate in their new locations.

Noise sources from the proposed modification that have the potential to affect nearby receivers include the new OWS pump, relocated FWS, and existing onsite equipment, as shown on Figure 5-1. The existing FWS, currently located in the southern pumphouse, is proposed to be relocated to the FWS Relocation Area in the north western end of the Site. There are two indicative location options for the relocated FWS, as shown on Figure 1-3.

5.1 Modelled operational scenarios

In order to assess a reasonable worst-case operational scenario, it is assumed that all of the proposed equipment within the Site would operate at full capacity, 24 hours a day, seven days a week. However, new onsite OWS operational plant would only operate after rainfall events to transfer potentially contaminated stormwater to the OWS system. Operation of the FWS would include three diesel engines that are subject to regular (monthly and annual) testing.

Three operational scenarios have been assessed, which include:

- Typical operation without FWS equipment operating
- Typical operation with the FWS equipment operating:
 - Monthly testing and maintenance activities for both options of the relocated FWS equipment, where the three diesel engines are tested individually; as such, only one pump has been included in this scenario
 - Annual testing and maintenance activities for both options of the relocated FWS equipment, where all three diesel engines are tested simultaneously; as such, three pumps have been included in this scenario.

Given that the night-time residential project noise criteria are the most stringent, the worst-case operational scenario has been assessed against the night-time residential criteria as per SSD-5544. Compliance with the night-time noise criteria would demonstrate compliance during the day and evening periods for all residential receivers for typical operation.

The new OWS management system is proposed to include two electric pumps in a duty/standby arrangement, meaning that only one pump would be operational at any one time. At this stage, two location options are being considered for the OWS pump station. Conservatively, the location option that places the pump station closer to noise sensitive receivers has been assessed. If the alternative pump station option is selected, noise levels are predicted to be lower than what is presented in this report. The assessment OWS pump location and the 'alternate' pump location are shown in Figure 5-1. The proposed pumps would be submersible and therefore be mounted below the existing ground level in a sealed chamber submerged in liquid. Noise egress on this account is expected to be negligible.

The operational equipment are generally categorised as steady-state or quasi steady-state noise sources which typically produce continuous and consistent noise levels.

Operational noise impacts at non-residential receivers were compared with the relevant amenity noise trigger levels for non-residential receivers (refer to Section 2.4).

Maintenance of the FWS is only proposed during the daytime period, and therefore typical operation with the FWS equipment operating has been assessed against daytime criteria as per SSD-5544. Both FWS relocation options have been assessed with an assumed 5 m high barrier around three sides of each of the proposed pumphouse areas.



Legend

- Project Area
- Site
- Ampol Land Ownership
- Existing Equipment
- OWS Pump Station
- Firewater System Relocation Area
- Pumphouse Indicative Location
- Relocated Firewater System indicative location



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Source: Neermai, 2022

Figure 5-1 Operational noise assessment equipment locations

5.1.1 Assessment noise source levels

The sound power level inputs presented in Table 5-1 were used in the noise modelling and were assumed to be operating continuously for the entire 15-minute period.

Table 5-1 Plant items sound power levels – Worst case scenario

Plant item/ Operation	Calculated Sound power level, L_{Aeq} , dB(A)
Electric OWS pump	95 ¹
Relocated diesel FWS pump engine intake	109 ²
Relocated diesel FWS pump engine exhaust	108 ²
Relocated diesel FWS pump case noise	107 ²
<p><i>Notes:</i></p> <p>1 Calculated sound power level based on SPL of 87 dBA @ 1 metre. Conservatively this prediction is based on a 35 kW pump operating at high RPM (3000-3600 RPM). Any noise source levels that differ from what has been provided in this report should be verified by a qualified acoustic engineer prior to commissioning.</p> <p>2 Based on onsite measurements of the existing CAT 3406B powered fire pump located in the southern pumphouse with existing noise treatment.</p> <p>3 Two of the three required FWS pumps are proposed to be relocated from their existing location. A third new pump will be procured to make up the new FWS. Procurement of the third pump will require an equivalent or lower noise level than the existing FWS pumps.</p>	

Locations of existing and proposed noise generating sources included in the operational noise assessment are shown in Figure 5-1². Noise levels of existing operational noise sources are presented in Section 3.3.

5.1.2 Maximum noise levels

In AECOM's experience, L_{Amax} sound power levels of steady state pumping equipment are typically not greater than 5 dB above L_{Aeq} sound power levels. Given that the sleep disturbance criterion is 5 dB less stringent than the noise criteria, compliance with the noise criteria would result in compliance with the sleep disturbance criteria and therefore the L_{Amax} criteria given in Condition C17 of SSD-5544. Therefore, no further consideration has been given to the sleep disturbance assessment.

5.2 Modelling methodology

5.2.1 General modelling assumptions

Noise levels due to the operational activities at the Site were predicted to nearby noise sensitive receivers using SoundPLAN version 8.2 (industry standard) noise modelling software. The operational noise levels were predicted using an implementation of CONCAWE³ algorithms in the SoundPLAN noise propagation software. It is especially suited to predicting noise propagation over large distances because it accounts for a range of atmospheric conditions that can significantly influence the propagation of noise over large distances.

² Proposed locations of diesel pumps in the relocated FWS have been modelled only.

³ CONCAWE – The oil companies' international study group for conservation of clean air and water – Europe (established in 1963) Report 4/81 "The propagation of noise from petroleum and petrochemical complexes to neighbouring communities."

5.2.2 Meteorological conditions

Standard weather and noise enhancing meteorological conditions were considered for this assessment. This accounted for the following parameters:

- Standard meteorological conditions – Pasquill-Gillford stability category D with wind speed up to 0.5 m/s at 10 m
- Noise enhancing meteorological conditions – Pasquill-Gillford stability category D with wind speed up to 3 m/s at 10 m.

The noise modelling includes:

- Ground topography
- Buildings and structures
- All sources behave as point, or moving point sources
- Ground absorption
- Representative operational noise sources as required.

The noise model considers significant noise sources and locations, screening effects, receiver locations, ground topography and noise attenuation due to geometrical spreading, air absorption, ground absorption and the effects of the prevailing weather conditions. The noise model was based on ground topography, and indicative plant equipment sound power levels. All predicted noise levels are free field and 1.5 m above ground level at the most-affected point within a residential property boundary within 30 m of the nearest facade.

The location, quantity, and specification of equipment is subject to change during the detailed design stage. Operational noise levels should be verified at the detailed design stage.

5.3 Predicted operational noise levels

Predicted noise levels at nearby noise sensitive receivers are presented in Table 5-2 and Table 5-3. Compliance with the night-time noise criteria implies compliance to the less stringent daytime and evening criteria for the operation of the Modified Project.

Operational noise contours calculated at 1.5 m above ground are provided in Annexure B. These contours are indicative only and should not be referred to for noise levels at specific receiver locations. Operational noise levels presented here have been calculated under neutral and noise enhancing weather conditions.

5.3.1 Night-time standard operational scenario

Results of the night-time standard operational scenario are presented in Table 5-2 and Table 5-3. This scenario considers all existing typically operating equipment onsite with the addition of the proposed new OWS pumps.

This scenario does not consider the testing of FWS as this is not proposed to occur at night.

Table 5-2 Predicted operational noise levels under standard meteorological conditions

Receiver type	Receiver	Night time noise criteria, $L_{Aeq,15\text{minute}}$, dB(A)	Predicted L_{Aeq} noise levels, dB(A)	
			Standard weather ¹	Exceedance
Residential	R1	50	30	-
	R2		34	-
	R3		36	-
	R4		37	-
	R5		41	-
	R6		34	-
	R7		44	-
	R8		40	-
Education	E1	45	32	-
Active recreation	AR1	55	37	-
Passive recreation	PR1	50	22	-
	PR2		22	-
Commercial	C1	65	33	-
Industrial	I1	70	34	-
	I2		44	-
	I3		33	-
	I4		27	-
<i>Notes:</i>				
1. Neutral weather considers 0.5 m/s winds source to receiver				

Table 5-3 Predicted operational noise levels under noise enhancing meteorological conditions

Receiver type	Receiver	Night time noise criteria, L _{Aeq,15minute} , dB(A)	Predicted L _{Aeq} noise levels, dB(A)	
			Noise enhancing weather ¹	Exceedance
Residential	R1	50	33	-
	R2		37	-
	R3		39	-
	R4		40	-
	R5		44	-
	R6		37	-
	R7		46	-
	R8		43	-
Education	E1	45	35	-
Active Recreation	AR1	55	39	-
Passive Recreation	PR1	50	25	-
	PR2		26	-
Commercial	C1	65	34	-
Industrial	I1	70	36	-
	I2		46	-
	I3		36	-
	I4		31	-

Notes:

1. Noise enhancing weather considers the worst case of 3 m/s source to receiver wind and temperature inversions.

It can be seen in Table 5-2 and Table 5-3 that the predicted operational noise emissions from the proposed modification comply with the most stringent (night-time) operational noise criteria at all locations under both neutral and noise-enhancing meteorological conditions.

No penalties have been added to the pump noise levels at this stage. Despite pumps generally producing tonal noise, the total noise level at noise sensitive receivers is unlikely to be tonal due to existing background noise and environmental attenuation. If noise penalties were to be applied to the proposed new OWS pump equipment, noise levels are predicted to still be compliant with the relevant noise criteria.

5.3.2 Daytime FWS testing operational scenario – Option 1

The Option 1 FWS testing scenario considers all existing typically operating equipment onsite with the addition of the proposed new OWS pumps and the testing of the relocated FWS at the Option 1 location. Monthly testing assumes the noise impact of one FWS engine operating. Annual testing assesses the noise impact of all three FWS engines operating.

Monthly FWS testing

Monthly testing assesses the noise impact of one FWS engine operating. Results of the daytime FWS testing operational scenario for Option 1 are presented in Table 5-4 and Table 5-5 for monthly testing.

Table 5-4 Predicted operational noise levels for monthly FWS testing under standard meteorological conditions (Option 1)

Receiver type	Receiver	Daytime noise criteria, $L_{Aeq,15minute}$, dB(A)	Predicted L_{Aeq} noise levels, dB(A)	
			Standard weather ¹	Exceedance
Residential	R1	60	54	-
	R2		54	-
	R3		48	-
	R4		38	-
	R5		41	-
	R6		34	-
	R7		58	-
	R8		57	-
Education	E1	45	37	-
Active recreation	AR1	55	55	-
Passive recreation	PR1	50	32	-
	PR2		29	-
Commercial	C1	65	49	-
Industrial	I1	70	49	-
	I2		45	-
	I3		34	-
	I4		28	-
<i>Notes:</i>				
1. Neutral weather considers 0.5 m/s winds source to receiver				

Table 5-5 Predicted operational noise levels for monthly testing under noise enhancing meteorological conditions (Option 1)

Receiver type	Receiver	Daytime noise criteria, L _{Aeq,15minute} , dB(A)	Predicted L _{Aeq} noise levels, dB(A)	
			Noise enhancing weather ¹	Exceedance
Residential	R1	60	56	-
	R2		56	-
	R3		50	-
	R4		41	-
	R5		44	-
	R6		37	-
	R7		59	-
	R8		58	-
Education	E1	45	39	-
Active Recreation	AR1	55	57	2 ²
Passive Recreation	PR1	50	35	-
	PR2		33	-
Commercial	C1	65	50	-
Industrial	I1	70	51	-
	I2		47	-
	I3		37	-
	I4		32	-
<i>Notes:</i>				
1. Noise enhancing weather considers the worst case of 3 m/s source to receiver wind and temperature inversions.				
2. In accordance with the EPA Noise Policy for Industry, exceedances of up to 2 dB are considered negligible. They would not be discernible to the average listener and therefore would not warrant receiver-based treatments or controls				

It can be seen in Table 5-4 and Table 5-5 that the predicted operational noise emissions from the proposed modification under the Option 1 monthly FWS testing scenario generally comply with the operational noise criteria for the daytime period under both neutral and noise-enhancing meteorological conditions. One minor exceedance of 2 dB is predicted for an active recreation area, however exceedances of up to 2 dB are generally not discernible to the average listener.

Annual FWS testing

Results of the daytime FWS testing operational scenario for Option 1 are presented in Table 5-6 and Table 5-7 for annual testing. Annual testing assesses the noise impact of all three FWS engines operating.

Table 5-6 Predicted operational noise levels for annual testing under standard meteorological conditions (Option 1)

Receiver type	Receiver	Daytime noise criteria, $L_{Aeq,15minute}$, dB(A)	Predicted L_{Aeq} noise levels, dB(A)	
			Standard weather ¹	Exceedance
Residential	R1	60	59	-
	R2		58	-
	R3		53	-
	R4		44	-
	R5		41	-
	R6		37	-
	R7		63	3
	R8		61	1 ²
Education	E1	45	40	-
Active recreation	AR1	55	60	5
Passive recreation	PR1	50	35	-
	PR2		33	-
Commercial	C1	65	53	-
Industrial	I1	70	54	-
	I2		46	-
	I3		36	-
	I4		30	-

Notes:

1. Neutral weather considers 0.5 m/s winds source to receiver
2. In accordance with the EPA Noise Policy for Industry, exceedances of up to 2 dB are considered negligible. They would not be discernible to the average listener and therefore would not warrant receiver-based treatments or controls.

Table 5-7 Predicted operational noise levels for annual testing under noise enhancing meteorological conditions (Option 1)

Receiver type	Receiver	Daytime noise criteria, L _{Aeq,15minute} , dB(A)	Predicted L _{Aeq} noise levels, dB(A)	
			Noise enhancing weather ¹	Exceedance
Residential	R1	60	61	1 ²
	R2		61	1 ²
	R3		55	-
	R4		46	-
	R5		44	-
	R6		40	-
	R7		64	4
	R8		63	3
Education	E1	45	42	-
Active Recreation	AR1	55	61	6
Passive Recreation	PR1	50	38	-
	PR2		36	-
Commercial	C1	65	55	-
Industrial	I1	70	56	-
	I2		48	-
	I3		39	-
	I4		33	-
<i>Notes:</i>				
1. Noise enhancing weather considers the worst case of 3 m/s source to receiver wind and temperature inversions.				
2. In accordance with the EPA Noise Policy for Industry, exceedances of up to 2 dB are considered negligible. They would not be discernible to the average listener and therefore would not warrant receiver-based treatments or controls				

It can be seen in Table 5-6 and Table 5-7 that the predicted operational noise emissions from the proposed modification under the Option 1 annual testing scenario may lead exceedance of criteria during the daytime at some residential and recreation receivers under both neutral and noise-enhancing meteorological conditions. It is noted that this testing only occurs once per year for a limited time and it is not considered reasonable to apply noise mitigation measures.

5.3.3 Daytime FWS testing operational scenario – Option 2

The Option 2 FWS testing scenario considers all existing typically operating equipment onsite with the addition of the proposed new OWS pumps and the testing of the relocated FWS when located in the Option 2 location.

Monthly FWS testing

Monthly testing assesses the noise impact of one FWS engine operating. Results of the daytime FWS testing operational scenario for Option 2 are presented in Table 5-8 and Table 5-9.

Table 5-8 Predicted operational noise levels for monthly testing under standard meteorological conditions (Option 2)

Receiver type	Receiver	Daytime noise criteria, $L_{Aeq,15\text{minute}}$, dB(A)	Predicted L_{Aeq} noise levels, dB(A)	
			Standard weather ¹	Exceedance
Residential	R1	60	32	-
	R2		42	-
	R3		47	-
	R4		47	-
	R5		41	-
	R6		39	-
	R7		50	-
	R8		48	-
Education	E1	45	39	-
Active recreation	AR1	55	51	-
Passive recreation	PR1	50	27	-
	PR2		23	-
Commercial	C1	65	47	-
Industrial	I1	70	34	-
	I2		48	-
	I3		33	-
	I4		28	-
Notes:				
1. Neutral weather considers 0.5 m/s winds source to receiver.				

Table 5-9 Predicted operational noise levels for monthly testing under noise enhancing meteorological conditions (Option 2)

Receiver type	Receiver	Daytime noise criteria, L _{Aeq,15minute} , dB(A)	Predicted L _{Aeq} noise levels, dB(A)	
			Noise enhancing weather ¹	Exceedance
Residential	R1	60	35	-
	R2		44	-
	R3		50	-
	R4		49	-
	R5		44	-
	R6		42	-
	R7		52	-
	R8		51	-
Education	E1	45	41	-
Active Recreation	AR1	55	53	-
Passive Recreation	PR1	50	30	-
	PR2		27	-
Commercial	C1	65	50	-
Industrial	I1	70	36	-
	I2		50	-
	I3		37	-
	I4		32	-
<i>Notes:</i>				
1. Adverse weather considers the worst case of 3 m/s source to receiver wind and temperature inversions.				

It can be seen in Table 5-8 and Table 5-9 that the predicted operational noise emissions from the proposed modification under the Option 2 monthly FWS testing scenario comply with the daytime operational noise criteria at all receivers under both neutral and noise enhancing meteorological conditions.

Annual FWS testing

Annual testing assesses the noise impact of three FWS engines operating. Results of the daytime FWS testing operational scenario for Option 2 are presented in Table 5-10 and Table 5-11.

Table 5-10 Predicted operational noise levels for annual testing under standard meteorological conditions (Option 2)

Receiver type	Receiver	Daytime noise criteria, $L_{Aeq,15minute}$, dB(A)	Predicted L_{Aeq} noise levels, dB(A)	
			Standard weather ¹	Exceedance
Residential	R1	60	38	-
	R2		47	-
	R3		52	-
	R4		52	-
	R5		42	-
	R6		42	-
	R7		54	-
	R8		52	-
Education	E1	45	41	-
Active recreation	AR1	55	55	-
Passive recreation	PR1	50	30	-
	PR2		24	-
Commercial	C1	65	52	-
Industrial	I1	70	34	-
	I2		51	-
	I3		34	-
	I4		32	-
<i>Notes:</i>				
1. Neutral weather considers 0.5 m/s winds source to receiver				

Table 5-11 Predicted operational noise levels for annual testing under noise enhancing meteorological conditions (Option 2)

Receiver type	Receiver	Daytime noise criteria, $L_{Aeq,15\text{minute}}$, dB(A)	Predicted L_{Aeq} noise levels, dB(A)	
			Noise enhancing weather ¹	Exceedance
Residential	R1	60	41	-
	R2		49	-
	R3		54	-
	R4		54	-
	R5		44	-
	R6		44	-
	R7		56	-
	R8		55	-
Education	E1	45	44	-
Active Recreation	AR1	55	58	3
Passive Recreation	PR1	50	33	-
	PR2		28	-
Commercial	C1	65	54	-
Industrial	I1	70	37	-
	I2		53	-
	I3		37	-
	I4		35	-
<i>Notes:</i>				
1. Noise enhancing weather considers the worst case of 3 m/s source to receiver wind and temperature inversions.				

It can be seen in Table 5-10 and Table 5-11 that the predicted operational noise emissions from the proposed modification for the FWS testing scenario comply with the daytime operational noise criteria at all receivers under neutral meteorological conditions.

Under noise enhancing meteorological conditions noise levels exceed the criteria at one recreational receiver. A minor exceedance of 3 dB is predicted at the Marton Park recreational area. It is noted that this testing only occurs once per year for a limited time, and it is not considered reasonable to apply noise mitigation measures.

Equipment specifications and noise mitigation measures would be verified at the detailed design stage.

6.0 Assessment of cumulative impacts

Cumulative impacts have the potential to occur when benefits or impacts from a project overlap or interact with those of other projects, potentially resulting in a larger overall effect (positive or negative) on the environment or local communities. Cumulative impacts may occur when projects are constructed or operated concurrently or consecutively.

Projects were reviewed against the following screening criteria for this cumulative impact assessment:

- Spatially relevant (i.e. the development or activity overlaps with, is adjacent to or within two kilometres of the Project Area)
- Scale (i.e. large-scale major development or infrastructure projects that have the potential to result in cumulative impacts with the proposed modification, as listed on the NSW Government Major Projects website and on the relevant council websites)
- Timing (i.e. the expected timing of its construction and/or operation overlaps or occurs consecutively to construction and/or operation of the proposed modification)
- Status (i.e., projects in development with sufficient publicly available information to inform this noise impact assessment, with an adequate level of detail to assess the potential cumulative impacts).

Projects identified as contributing to potential cumulative impacts have met these criteria and include:

- Kamay Ferry Wharves
- Kurnell Stormwater Separation Improvement Project
- Breen Resource Recovery Facility
- Woolooware to Kurnell Tower Replacement Project
- Kurnell Planning Proposal.

The locations of these projects are shown on Figure 6-1.

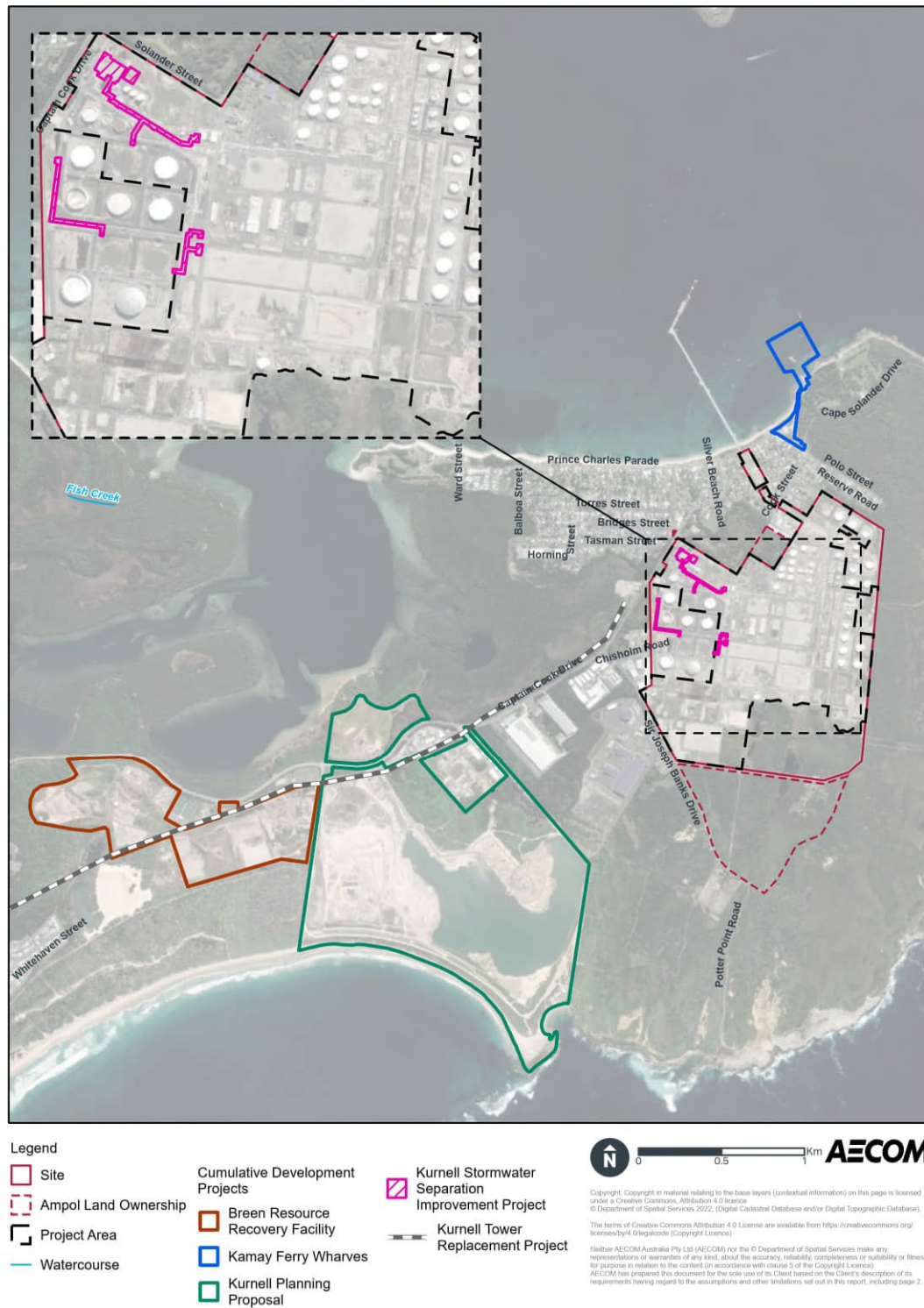


Figure 6-1 Cumulative development projects

6.1 Construction

The projects shown in Table 6-1 are considered relevant under the criteria set out above, and overlapping construction programs have potential to lead to cumulative construction noise impacts for nearby receivers. Generally, where any receiver is affected by construction noise from more than one project at any one time, it is possible that an increase of up to 3 dB(A) of the highest noise level predicted for any project may occur (assuming that at any one location equal noise levels from two projects are experienced).

Table 6-1 Cumulative construction noise screening assessment

Future project	Distance to proposal	Project status and potential overlap	Potential cumulative impact
Kamay Ferry Wharves	350 m north	Approved and currently under construction. Under construction until late 2024.	No overlap in construction schedule, therefore null cumulative construction noise impact.
Kurnell Stormwater Separation Improvement Project	Onsite	Approved May 2024. Construction to complete late 2024	No overlap in construction schedule, therefore null cumulative construction noise impact.
Breen Resource Recovery Facility	2 km west	Currently under assessment. Construction expected to continue until 2028.	Cumulative noise impact is expected to be negligible based on the large distance of recovery facility from the Project Area.
Woolooware to Kurnell Tower Replacement Project	120 m south west	Preparation of Review of Environmental Factors (REF) underway. Work expected to commence in late 2024 and finish in 2028.	Overlap in construction may lead to a 3 dB increase in noise for industrial receivers surrounding the Project Area. However, as noise levels are not expected to exceed established criteria for industrial receivers, cumulative impacts are not anticipated.
Kurnell Planning Proposal	860 m south west	Planning proposal submitted. Once approved, construction would be completed in a phased manner in 10-20 years.	Cumulative noise impact is expected to be negligible based on the large distance of planning proposal area from the proposed modification.

6.2 Operation

The projects shown in Table 6-2 are considered relevant under the criteria set out above, and simultaneous operations may lead to cumulative operational noise impact for nearby receivers. The operational noise assessment has considered the cumulative impact of existing Terminal noise sources and plant and equipment for the proposed modification.

Table 6-2 Cumulative operational noise screening assessment

Future Project	Distance to proposal	Project status and potential overlap	Potential cumulative impact
Kurnell Stormwater Separation Improvement Project	Onsite	Approved May 2024. Construction to complete mid-2025.	Kurnell Stormwater equipment is proposed to only operate during adverse weather events, i.e. during storms or other high precipitation events. At these times, background noise levels in the area will be heightened. This will provide significant masking of noise generated from the stormwater equipment and the operation of the project modification.

7.0 Management of impacts

Environmental mitigation measures to manage potential Noise and Vibration impacts of the proposed modification are outlined in Table 7-1. Additional and/ or modified environmental safeguards and management measures to those presented in the approved SSD-5544 are shown in **bold**. Deleted measures, or parts of measures, have been ~~struck out~~. Where approved measures have been consolidated to reduce duplication, previously agreed text that has been brought into existing or new measures has been underlined.

Table 7-1 Management and mitigation measures – Noise and vibration

ID	Issue	Mitigation measure
G1	Noise and vibration	<p>The CEMP/DEMP for the Project would include a Noise and Vibration Management Plan (NVMP). The NVMP would outline:</p> <ul style="list-style-type: none"> • The locations of noise sensitive receivers • Potential significant noise and vibration generating activities associated with the proposed modification • <u>Relevant feasible and reasonable noise mitigation measures as per the <i>NSW Interim Construction Noise Guideline</i></u> • Measures to be implemented during construction to minimise noise and vibration impacts, such as restrictions on working hours, staging, placement and operation of work compounds, parking and storage areas, temporary noise barriers, haul road maintenance and controlling the location and use of vibration generating equipment • Construction noise monitoring procedures; and • Construction equipment maintenance to ensure good working order • A monitoring program to assess performance against relevant noise and vibration criteria • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures.
G2	Noise	Low-noise plant and equipment would be selected, where practicable, in order to minimise potential for noise and vibration. All equipment would be regularly checked to ensure that the mufflers and other noise reduction equipment are working correctly.
G3	Noise and vibration	Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. Prior to the proposed modification demolition works commencing within the Eastern and Western Right of Ways, at Silver Beach, on the Wharf or prior to particularly loud demolition works occurring on the main terminal site, potentially affected residents within Kurnell would be notified in advance. Should complaints be received, the complaints register would continue to be maintained and managed in line with the existing feedback process at the Site.
G4	Noise	Any noise complaint(s) would be investigated immediately. Reasonable and feasible measures would to be implemented to reduce noise impacts.
G5	Noise	Construction/ demolition equipment would be located to reduce noise emission to sensitive receptors, where practicable.

ID	Issue	Mitigation measure
G6	Noise and vibration	<p>Condition C18 of SSD-5544 states that construction works should comply with following hours:</p> <ul style="list-style-type: none"> Monday to Sunday 7am until 10pm. <p>High noise generating construction works, including works within the Eastern Right of Way (Zone 1A), would be confined to less sensitive times of the day and not undertaken on Sundays, public holidays, or outside of the hours 7am and 6pm Monday to Saturday (in line with Condition C19).</p> <p>Construction works outside of the work hours identified above would only be undertaken in the following circumstances (in line with Condition C20 of SSD 5544):</p> <ul style="list-style-type: none"> Works that are inaudible at nearest sensitive land receivers Works that are consistent with Ampol's existing maintenance procedures and are in accordance with the existing Environment Protection Licence (No. 837) (EPL) Works agreed to in writing by the Environment Protection Authority or the Department of Planning, Housing and Infrastructure For the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons. <p>The majority of the conversion works for the Project would typically be completed between 7.00am to 10.00pm seven days a week. Some works consistent with Caltex Ampol's existing day-to-day operational and maintenance procedures would occur over a 24 hour period as regulated by the Environment Protection Licence (No. 837) (EPL) for the Site.</p>
G7	Noise and vibration	<p>Construction/Demolition staff and contractors would undergo training in environmental noise issues including:</p> <ul style="list-style-type: none"> Minimising the use of horn signals and maintaining a low volume. Alternative methods of communication should be considered Avoiding any unnecessary noise when carrying out manual operations and when operating plant Switching off any equipment not in use for extended periods during construction work Ensuring works occur within approved hours.
G8	Noise and vibration	<p>Should any unexpected construction activities occur which could potentially generate significant noise not described in this report, monitoring would be undertaken to ensure construction noise emission levels do not exceed EPL limits.</p>
G12	Noise	<p>Caltex Ampol would ensure that the noise generated by the proposed modification demolition works does not exceed the criteria defined in Table 2 (from Condition of Consent C16 of SSD-5544) unless the reasonable and feasible noise mitigation strategies outlined within the DNVMP have been implemented.</p> <p>Reasonable and feasible noise mitigation strategies would include appropriate respite periods during particularly noisy or prolonged activities.</p>
G16	Vibration	<p>Vibration intensive equipment would be selected and minimum working distances, as presented in Table 4-5 of the Noise and Vibration Impact Assessment, would be adhered to. The use of less vibration intensive methods of construction or equipment would be considered where feasible and reasonable.</p>

ID	Issue	Mitigation measure
G17	Noise	<p>Equipment associated with the relocated firewater system would be treated so that operational noise levels do not exceed the criteria defined in Condition of Consent C17 of SSD-5544. Maintenance and testing activities associated with the firewater system would be conducted during standard daytime hours only:</p> <ul style="list-style-type: none">Monday to Saturday – 7am to 6pmSunday – 8am to 6pm.

8.0 Conclusion

This report presents the results of an assessment of the construction and operational noise and vibration impact of the proposed modification to existing state significant development consent (SSD-5544).

8.1 Construction noise and vibration

The construction activities have been assessed against the construction noise management levels outlined in this report. Under a worst-case scenario, the predicted construction noise levels may exceed the construction noise management levels at some noise sensitive receivers during the construction works. Construction mitigation measures have been recommended to manage the construction noise impacts.

Additionally, under a worst-case scenario, construction noise levels at some residential receivers are predicted to exceed the 'highly noise affected' level of 75 dB(A). This is primarily due to works occurring in close proximity to residents (i.e. Zone 1A). These works are expected to be minimal in duration.

Minimal vibration intensive works are expected to take place. Vibration intensive works to occur onsite are likely to be within safe working distances. For vibration intensive works to occur within Zone 1A, the minimum safe working distances provided in this report should be adhered to.

An assessment of the likely construction traffic indicated that noise increases on Captain Cook Drive are likely to be less than 2 dB(A) during the peak construction periods and therefore no further consideration of construction traffic noise is required, in accordance with the *Road Noise Policy*.

Some cumulative construction noise impact may be experienced by noise sensitive receivers located within the Kurnell township area. These receivers may experience noise levels up to 3 dB higher than presented in this report for future project construction that may overlap with the subject development works.

8.2 Operational noise

Results show predicted operational noise emissions from the proposed modification comply with the most stringent (night-time) operational noise criteria at all locations for typical operations. The operational noise assessment considers all existing and proposed typical operational equipment operating simultaneously, and at full capacity during the night-time period.

Additional operational scenarios entailing the monthly and annual testing of the proposed new firewater tank and pumphouse within the FWS Relocation Area have been included in the assessment. For the purpose of assessment in this *Technical Report – Noise and Vibration Impact Assessment*, two indicative locations have been considered for the relocation of the FWS.

The predicted operational noise emissions from the proposed modification for the Option 1 monthly FWS testing scenario generally comply with the operational noise criteria for the daytime period under both neutral and noise-enhancing meteorological conditions. The predicted operational noise emissions from the Option 1 annual testing scenario may lead exceedance of criteria during the daytime at some residential and recreation receivers. However, it is noted that this testing only occurs once per year for a limited time.

The predicted operational noise emissions from the proposed modification for the Option 2 monthly FWS testing scenario comply with the daytime operational noise criteria at all receivers under both neutral and noise enhancing meteorological conditions. The predicted operational noise emissions for the Option 2 annual scenario comply with the daytime operational noise criteria at all receivers under neutral meteorological conditions. Under noise enhancing meteorological conditions noise levels exceed the criteria at one recreational receiver. Since this scenario only occurs once per year for a limited time it is not considered reasonable to apply noise mitigation measures.

Equipment specifications and noise mitigation measures would be verified at the detailed design stage.

On this basis, the modified operation at the Site would not affect the ability of the Terminal to meet the operational noise limits contained within the development consent for SSD-5544.

Cumulative impacts from other projects are not expected to significantly impact the same nearby noise sensitive receivers during typical operation.

References

Australian Standard 1055 *Acoustics – Description and measurement of environmental noise – Part 2: Application to specific situations*, AS 1055.2-1997.

Australian Standard AS2436 2010 *Guide to noise and vibration control on construction, demolition and maintenance sites*, 2010

British Standard 5228: Part 1 2009 – *Code of Practice for Noise and Vibration Control on Construction and Open Sites* Part 1: Noise.

British Standard 7385: Part 2 1993 – *Evaluation and Measurement of Vibration in Buildings*, 1993

British Standard 6472: Part 1 2008 – *Evaluation of Human Exposure to Vibration in Buildings*, 2008

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Roads and Maritime Services. (2016, August). *Construction Noise and Vibration Guideline*. Retrieved January 2023, from <https://roads-waterways.transport.nsw.gov.au/business-industry/partners-suppliers/documents/guides-manuals/construction-noise-and-vibration-guideline.pdf>

Glossary and abbreviations

Term	Definition
Sound power level	The total sound emitted by a source.
Sound pressure level	The amount of sound at a specified point.
Decibel [dB]	The measurement unit of sound.
A Weighted decibels [dB(A)]	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1 kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB(A) increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB(A) increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows: 0 dB(A) Threshold of human hearing 30 dB(A) A quiet country park 40 dB(A) Whisper in a library 50 dB(A) Open office space 70 dB(A) Inside a car on a freeway 80 dB(A) Outboard motor 90 dB(A) Heavy truck pass-by 100 dB(A) Jack hammer / subway train 110 dB(A) Rock concert 115 dB(A) Limit of sound permitted in industry 120 dB(A) 747 take off at 250 m
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [L _{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Insertion loss	Reduction in noise by inserting a barrier between the source and receiver.
L _{max}	The maximum sound pressure level measured over the measurement period.
L _{min}	The minimum sound pressure level measured over the measurement period.
L ₁₀	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L ₁₀ .
L ₉₀	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L ₉₀ .
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.

Term	Definition
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{90} sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Daytime	<i>Industrial/ construction noise:</i> The period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and public holidays. <i>Road traffic noise:</i> The period from 0700 to 2200 h every day of the week.
Evening	<i>Industrial/ construction noise:</i> The period from 6pm to 10pm Monday to Sunday and Public Holidays. <i>Road traffic noise:</i> Not applicable.
Night-time	<i>Industrial/ construction noise:</i> The period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and public holidays. <i>Road traffic noise:</i> The period from 10pm to 7am every day of the week.
Standard construction hours	Between 7:00 am and 6:00 pm, Monday-Friday; 8:00 am and 1:00 pm, Saturday; No works on Sunday or Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.
Noise management level [NML]	The level which represents the point above which there may be some community reaction to noise.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 "Acoustics – Glossary of terms and related symbols", the EPA's Noise Policy for Industry and Road Noise Policy.

Annexure A

Construction Noise Contours

Annexure B

Operational Noise Contours

