

6.7 Noise and vibration

The noise and vibration updated technical report is provided in **Appendix G** and a summary is provided below. This section should be read in conjunction with Section 7.7 of the EIS and the noise and vibration assessment report provided in Appendix K of the EIS.

6.7.1 Assessment methodology

The assessment methodology involved the following:

- A review of the existing noise and vibration environment and potential noise and vibration receivers
- Assessment of potential construction and operational noise and vibration impacts based on option 1 and option 2 for the amended project
- A comparison of impacts between the project as described in the EIS and the amended project
- Assessment of cumulative and consecutive noise and vibration impacts as a result of the amended project
- Identification of additional environmental management measures required to address noise and vibration impacts for the amended project.

No additional ambient noise surveys were carried out for the amended project, as the amended construction and operational footprints are largely consistent with the project as described in the EIS. Monitoring locations and ambient noise survey results are detailed in Section 7.7.5 of the EIS.

6.7.1.1 Construction noise and vibration assessment methodology

Construction scenarios

Representative scenarios have been developed to assess the likely impacts of the main construction phases of the amended project. Construction scenarios for the amended project are largely consistent with those described in the EIS. Changes to the construction scenarios as described in the EIS due to the amended project are shown in **bold text** in **Table 4-1**. A full list of construction scenarios is provided in **Appendix G**.

Table 6-37 Amendments to construction scenario descriptions as described in the EIS (bold text shows change from EIS)

ID	Scenario	Description
1a	Ancillary facility establishment/ decommissioning – Peak impact	Before construction commences, the ancillary facilities would need to be prepared to allow construction work to occur. The work would vary depending on location and the existing conditions but could include: <ul style="list-style-type: none">• Minor clearing• Minor earthwork
1b	Ancillary facility establishment/ decommissioning – Typical impact	<ul style="list-style-type: none">• Installation of office accommodation• Utilities• Amenities• Secure perimeter fencing, including visual screening of construction ancillary facilities where necessary High noise impact work would be required at certain times and would include the use of excavators and frontend loaders. As described in Section 4.1.2, nine additional ancillary facility sites are proposed for the amended project to those described in the EIS (see Figure 4-1).

ID	Scenario	Description
2a	Ancillary facilities – Operation	<p>The ancillary facilities would generally comprise:</p> <ul style="list-style-type: none"> Temporary buildings (generally prefabricated) including offices and meeting rooms, amenities and first aid facilities (the size and number of office facilities at the main ancillary facilities would be greater than at the secondary ancillary facilities) Hardstand parking areas with sufficient space to accommodate the numbers of construction workers expected at any site Materials laydown, storage and handling areas, including purpose-built temporary structures as required Batching plants are currently proposed to be located at AF 2, AF 3, AF 4 and AF 10. The location of the batching plant has been assumed to be all of AF 10 and in the centre of AF 2 and AF 3. Crushing, grinding and screening operations are currently proposed to be located at AF 1, AF 2 and AF 10. <p>The site layout of all ancillary facilities is considered indicative and would be confirmed as the project progresses.</p> <ul style="list-style-type: none"> Bridge construction support areas Workshops with appropriate safety and environmental controls for servicing plant and equipment. <p>The operation of all ancillary sites has been assessed for 24/7 operation. It should be noted that the assessment does not include any source mitigation or localised screening which would be investigated following confirmation of the site layout.</p> <p>Nine additional ancillary facility sites are proposed for the amended project to those described in the EIS (see Figure 4-1)</p>
2b	Ancillary facilities – Stockpiling	
2c	Ancillary facilities – Batching plant	
2d	Ancillary facilities – Crushing activities	

Working hours and work schedule

The proposed construction working hours are described in **Section 4.2.5**. Extended construction hours are proposed for the amended project, consistent with the working hours described in Section 7.7.3 of the EIS.

Activities that are required to be completed out-of-hours for the amended project are consistent with those described in Section 7.7.3 of the EIS. In addition, the amended project would also include the following out-of-hours work activities:

- Stockpiling of soil within ancillary facilities
- Deliveries of concrete to the ancillary facilities
- Deliveries of large prefabricated material (eg bridge girders).

Night-time construction activities would be supported by out-of-hours operation of temporary ancillary facilities. The exact timing of out-of-hours work would depend on construction activities, construction techniques and working with the affected communities or authorities such as utility authorities or North West Roads (M7 Motorway).

The proposed work schedule for the amended project is described in **Section 4.2.8** and **Figure 4-5**.

Construction noise modelling

The noise model of the study area prepared for the EIS has been updated for the amended project, where required, and used to predict noise levels from the construction work to all surrounding receivers. Modelling methodologies for the amended project are consistent with those described in Section 7.7.3 of the EIS.

Construction road traffic

Construction traffic volumes during the peak construction period (around 2024) have been compared to the forecast traffic volumes during the same period (see **Section 6.1.6**).

Construction haulage for the amended project is described in **Section 4.2.6**.

6.7.1.2 Operation noise and vibration assessment methodology

The operational noise and vibration assessment methodology for the amended project is largely consistent with the methodology as described in Section 7.7.4 of the EIS.

The study area for the operational noise assessment extends to a distance of 600 metres on each side of the project roads (measured from the centreline of the outermost traffic lanes). This is consistent with the project as described in the EIS, and in accordance with the Road Noise Policy (RNP) (NSW EPA, 2011) and Noise Criteria Guideline (NCG) ((Roads and Maritime, 2015). However, as the amended project now includes work on Elizabeth Drive and Wallgrove Road, the operational study area for the amended project has been extended. This amended study area is shown on **Figure 6-37**. The change in operational footprint is primarily within noise catchment area (NCA) 03 (NCA03) and NCA04 and includes additional receivers to the north of the amended project.

Operational traffic data for at-opening year (2026) and future design year (2036) has been updated and informed by the data provided in **Section 6.1.6** and **Appendix B**. In summary, the land use and demographics scenario has been updated from LU14 version 4 (developed in 2014 and adjusted for specific developments) to a more recent LU16 (developed in 2016). The modelling package used for the amendment report changed to an updated model as the traffic forecasts for western Sydney from this model are considered to be more robust than the model that was used for the EIS analysis. The changes in forecast land use and improvements in modelling processes have resulted in a major reduction in future trips to the South West Growth Area in western Sydney. Forecast traffic volumes using the amended project and the surrounding network have reduced as a result.

- Forecast operational traffic data has been updated for the following scenarios: No Build (ie without the amended project) – this scenario represents the existing road network in the operational study area in the absence of the amended project
- Build (ie with the amended project) – this scenario assumes that the amended project goes ahead and data provided for both option 1 and option 2.

6.7.2 Existing environment

The existing noise environment, including noise catchment areas and noise and vibration sensitive receivers, has not changed since the preparation of the EIS. The noise environment described in Section 7.7.5 of the EIS is still applicable to the amended project.

Receivers potentially sensitive to construction noise and vibration for the amended project are generally the same as those described in Section 7.7.5 of the EIS, with the exception of additional receivers in NCA10. These additional receivers are located around AF 10 which is now included in the amended study area. The location of sensitive receivers for the amended project is shown in Annexure B of **Appendix G**.

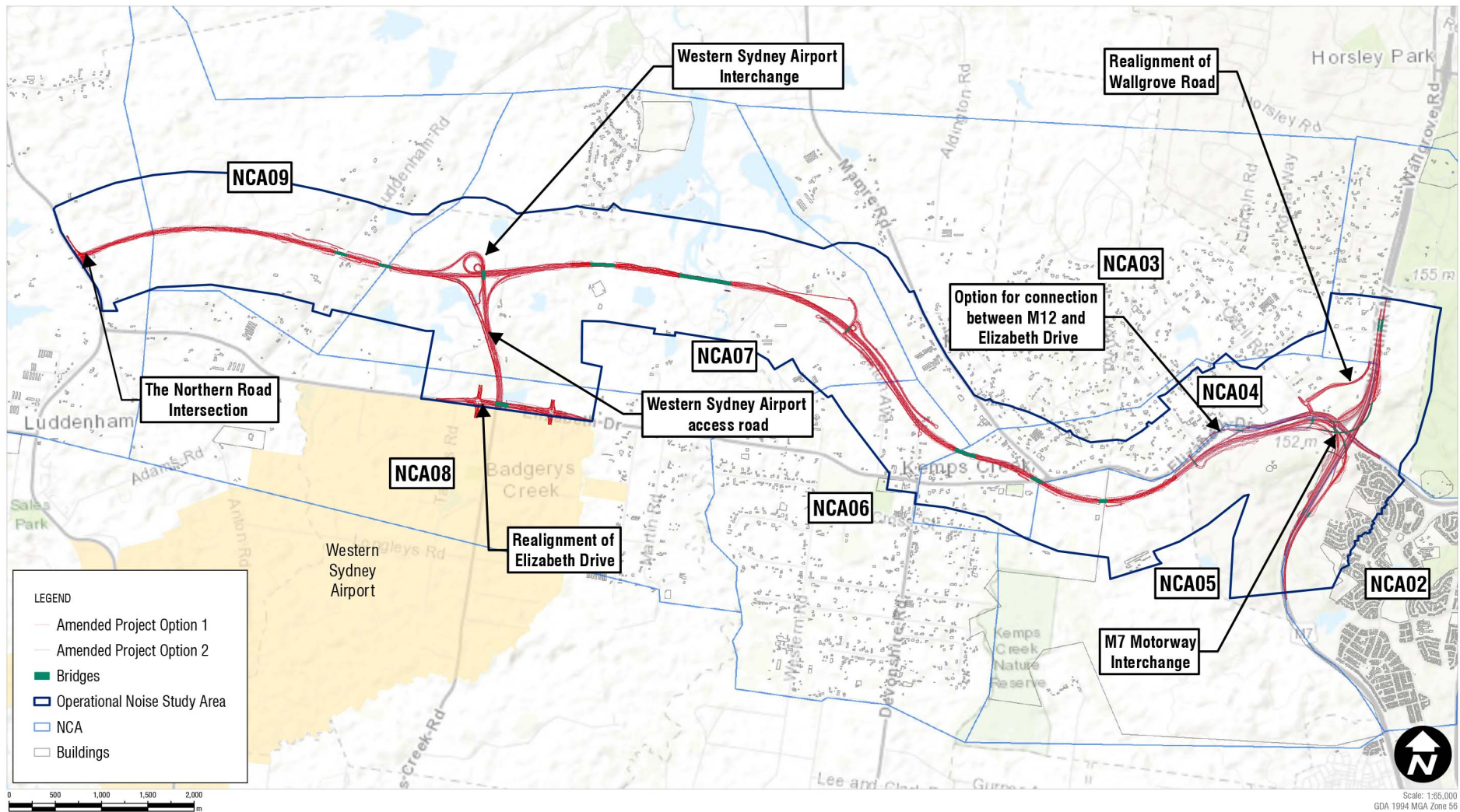


Figure 6-37 Amended noise and vibration study area and sensitive receivers

6.7.3 Construction impacts

6.7.3.1 Construction airborne noise

Predicted worst-case noise impacts

The construction noise impact assessment is based on the predicted noise impacts at the most affected receivers in each NCA and is representative of the worst-case scenario where construction equipment is at the closest point to each receiver.

A summary of the predicted construction noise impacts in each NCA for residential receivers during the extended construction hours (morning shoulder, standard daytime, and evening shoulder) is shown in **Table 6-38** to **Table 6-42**.

For option 1, the assessment for residential receivers shows the following differences from the project as described in the EIS:

- The amended project would result in additional impacts to receivers situated in NCA02, due to work being carried out on Elizabeth Drive, south of the intersection with the M7 Motorway. NCA01 no longer has predicted high impacts, as reported in the EIS, as the closest receivers to the work now lie within the expanded ancillary facility AF 9 and, as such, will not be occupied during construction work.
- The amended project would have a higher impact on receivers in NCA02 which are adjacent to work on Elizabeth Drive. During the standard daytime period, 'high' impacts are predicted in NCA02, NCA06 and NCA07. These are typically limited to receivers immediately adjacent to the works areas, with 'moderate' impacts extending a row or two of properties further away. A relatively small number of receivers are predicted to have 'moderate' impacts in the remaining areas where receivers are in close proximity to the construction footprint, such as east of the M7 Motorway and south of Elizabeth Drive in NCA02.
- During the night-time, construction work is predicted to have 'high' impacts at some receivers near areas where out-of-hours work would be required. The receivers with 'high' or 'moderate' impacts are generally consistent with the EIS, with the exception of a few discrete areas around the Wallgrove Road realignment in NCA04, the Elizabeth Drive work to the east of the M7 Motorway in NCA02 and adjacent to the ancillary facility AF 10 in NCA10. Receivers in these areas typically have 'high' impacts at the first row or two of receivers, with 'moderate' impacts extending a few rows further away.
- Additional batching plants (within AF 4 and AF 10) have been assessed for the amended project. Noise levels from AF 10 are predicted to result in 'moderate' impacts at the nearest residential receivers during the daytime and evening periods, and 'high' impacts during the night-time period. Noise levels from AF 4 are predicted to result in 'moderate' impacts at the nearest receivers during the daytime, evening and night-time periods, primarily at the receivers to the north of the site, and the closest receiver to the south. The site arrangements of the batching plants are considered indicative and would be further assessed as part of detailed design.
- Crushing, grinding and screening activities were not included for the project as described in the EIS. Since the EIS exhibition, additional information has been received from current construction projects indicating these activities may be necessary. These have been assessed for the amended project at AF 1, AF 2 and AF 10. Noise levels from AF 1 and AF 10 are predicted to result in 'moderate' impacts at the nearest residential receivers during the daytime and evening periods, and 'high' impacts during the night-time period. Noise levels from AF 2 are predicted to result in 'moderate' impacts at the nearest residential receivers during the daytime period, and

'high' impacts during the evening and night-time periods. During the night-time period at all three facilities 'moderate' impacts are predicted at receivers up to around one kilometre from the ancillary facilities, depending on the surrounding topography.

- Stockpiling activities are predicted to have higher impacts than the batching plants, as the assessment assumes the work may occur across the entire ancillary facility and therefore maybe closer to the nearest receivers. This is consistent with the project as described in the EIS for AF 1 to AF 8, however, the amended project has expanded the size of AF 9 and added AF 10 to AF 18.
- The assessment identified the following additional worst-case scenarios for the amended project:
 - Scenario 1a, Ancillary facility establishment – peak impact due to the proximity of some of the new ancillary facilities to receivers, particularly AF 10 and AF 14
 - Scenario 2d, Ancillary facility operations – crushing activities due to the high noise level of this work paired with the potential of out-of-hours operation.
- Given the location of the nearest receivers to the amended project, it is likely that there are several areas of the amended project where construction can occur with little or no impact to residential receivers due to the separation distances between the work and receiver.

For option 2 (with Elizabeth Drive connections), the assessment for residential receivers shows the following differences when compared to the project as described in the EIS:

- The design changes between the amended project option 1 and option 2 are limited to the area adjacent to Elizabeth Drive between Wallgrove Road and Duff Road, in NCA04. Therefore, construction airborne noise impacts in all other NCAs for the option 2 would be consistent with the impacts for option 1 detailed in **Table 6-38** to **Table 6-42**.
- Due to the Elizabeth Drive connection extending the required work further north towards NCA04, there are some minor increases to the predicted noise impacts for the immediately surrounding area.
- The closest residential receivers to the additional work for option 2 (with Elizabeth Drive connections) are predicted to have 'moderate impacts' for option 2, where 'minor impacts' are predicted for option 1 during all periods for the 'tie in work' scenario of the road work. A maximum increase of five dB is predicted at these most affected receivers for option 2 compared to option 1.
- An additional three receivers adjacent to this work on Elizabeth Drive are predicted to be potential highly noise affected during the worst-case impacts from the option 2 (with Elizabeth Drive connections) construction.
- The closest school (Irfan College), located in NCA04, is predicted to have 'high impacts' during the worst-case scenarios when noise intensive equipment is being used for option 2, where 'moderate impacts' were predicted for option 1.

Table 6-38 Predicted construction noise exceedances morning shoulder – residential receivers

Period	ID	Scenario	Activity	Project as described in the EIS										Amended project										
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10	
Morning shoulder	1a	Ancillary facility establishment	Peak impact	🟡	🟢	🟢	🟢	⬜	🟢	🔴	⬜	⬜	🟡	🟡	🟢	🟢	🟢	⬜	🔴	🔴	🟡	🟡	🔴	
	1b		Typical impact	🟢	🟢	⬜	🟢	⬜	⬜	🔴	⬜	⬜	🟢	🟢	🟢	⬜	🟢	⬜	🔴	🔴	🟢	🟢	🟡	
	2a	Ancillary facility operations	Operation	🟢	⬜	⬜	⬜	⬜	⬜	🔴	⬜	⬜	🟢	🟢	⬜	⬜	⬜	⬜	🔴	🔴	⬜	🟢	🟢	
	2b		Stockpiling	🟢	🟢	⬜	🟢	⬜	⬜	🔴	⬜	⬜	🟢	🟢	🟢	🟢	🟢	⬜	🔴	🔴	🟢	🟢	🟡	
	2c		Batching plant	⬜	⬜	⬜	⬜	⬜	⬜	🟡	⬜	⬜	⬜	⬜	⬜	🟢	⬜	⬜	⬜	🟡	🟢	⬜	🟡	
	2d		Crushing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	⬜	⬜	⬜	⬜	⬜	⬜	🔴	🟡	🟢	🟡	
	3a	Utilities and drainage	Peak impact	🔴	🟡	🟡	🟡	⬜	🔴	🔴	🟡	🔴	🟡	🔴	🔴	🟡	🔴	⬜	🔴	🔴	🔴	🔴	🟡	
	3b		Typical impact	🟡	🟢	⬜	🟢	⬜	🔴	🔴	🟢	🟢	🟢	🟢	🟡	⬜	🟢	⬜	🔴	🔴	🟢	🟢	🟢	
	4a	Demolition	Peak impact	⬜	⬜	🟡	🟡	⬜	🔴	🔴	🟢	🟢	🟡	🟢	🟢	🟡	🟡	⬜	🔴	🔴	🟢	🟢	🟡	
	4b		Typical impact	⬜	⬜	⬜	🟢	⬜	🟡	🔴	⬜	⬜	🟢	⬜	⬜	⬜	🟢	⬜	🟡	🔴	⬜	⬜	🟢	
	5a	Clearing	Peak impact	🔴	🟡	🟡	🟡	⬜	🔴	🔴	🟡	🟡	🟡	🟡	🟡	🔴	🟡	🔴	⬜	🔴	🔴	🔴	🟡	🟡
	5b		Typical impact	🟡	🟢	⬜	🟢	⬜	🔴	🔴	🟢	🟢	🟢	🟢	🟡	⬜	🟢	⬜	🔴	🔴	🟢	🟢	🟢	
	6a	Earthwork	Peak impact	🔴	🟡	🟡	🟡	⬜	🔴	🔴	🟡	🟡	🟡	🟡	🔴	🟡	🔴	⬜	🔴	🔴	🟡	🟡	🟡	
	6b		Typical impact	🟡	🟢	⬜	🟢	⬜	🔴	🔴	🟢	🟢	🟢	🟢	🟡	⬜	🟢	⬜	🔴	🔴	🟢	🟢	🟢	
	6c		Onsite truck haulage	⬜	⬜	⬜	⬜	⬜	⬜	🟢	⬜	⬜	⬜	⬜	⬜	🟢	⬜	⬜	⬜	⬜	🟢	⬜	⬜	⬜
	7a	Bridge work	Peak impact	⬜	🟢	🟢	🟢	⬜	🟢	🟡	⬜	🟢	⬜	🟢	🟢	🟢	🟢	⬜	🟢	🟡	⬜	🟢	⬜	
	7b		Typical impact	⬜	🟢	⬜	⬜	⬜	⬜	🟢	⬜	⬜	⬜	⬜	⬜	⬜	⬜	⬜	⬜	🟢	⬜	⬜	⬜	
	7c		Concrete work	⬜	🟢	⬜	⬜	⬜	🟢	🟢	⬜	🟢	⬜	🟢	🟢	⬜	⬜	⬜	⬜	🟢	🟢	⬜	🟢	⬜
	7d		Girder lifts	⬜	🟢	⬜	⬜	⬜	⬜	⬜	⬜	⬜	⬜	⬜	🟢	🟢	⬜	⬜	⬜	⬜	⬜	🟢	⬜	⬜
	8a	Road work	Concrete work	🟡	🟢	⬜	🟢	⬜	🔴	🔴	⬜	🟢	🟢	🟢	🟢	⬜	🟢	⬜	🔴	🔴	🟢	🟢	🟢	
	8b		Typical work	🟡	🟢	⬜	⬜	⬜	🔴	🔴	⬜	🟢	🟢	⬜	🟢	⬜	⬜	⬜	🔴	🔴	🟢	🟢	🟢	
	8c		Tie-in work	🔴	🟡	🟢	🟡	⬜	🟢	🟡	🟡	🟡	⬜	🟡	🔴	🟢	🔴	⬜	🔴	🔴	🟡	⬜	⬜	
	9a	Signage, lighting and landscaping		🟡	🟢	🟢	🟢	⬜	🔴	🔴	🟢	🟡	🟢	🟢	🟡	🟢	🟡	⬜	🔴	🔴	🟡	🟡	🟢	
Key to impacts: ⬜ No exceedance 🟢 Marginal to minor (1 dB to 10 dB) 🟡 Moderate (11 dB to 20 dB) 🔴 High (>20 dB)																								

Table 6-39 Predicted construction noise exceedances standard daytime – residential receivers

Period	ID	Scenario	Activity	Project as described in the EIS										Amended project									
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10
Standard Daytime	1a	Ancillary facility establishment	Peak impact	●	●	●	●	•	•	■	•	•	●	◆	●	●	●	•	■	■	●	◆	◆
	1b		Typical impact	●	•	•	•	•	•	■	•	•	●	●	•	•	•	•	■	■	•	●	●
	2a	Ancillary facility operations	Operation	•	•	•	•	•	•	◆	•	•	•	•	•	•	•	•	◆	◆	•	•	●
	2b		Stockpiling	●	•	•	•	•	•	■	•	•	●	●	•	•	•	•	■	■	•	●	●
	2c		Batching plant	•	•	•	•	•	•	◆	•	•	•	•	•	●	•	•	•	◆	●	•	●
	2d		Crushing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	•	•	•	•	•	•	◆	●	•	◆
	3a	Utilities and drainage	Peak impact	■	◆	●	◆	•	■	■	◆	◆	◆	◆	■	●	◆	•	■	■	◆	◆	◆
	3b		Typical impact	●	•	•	•	•	◆	■	•	●	•	●	●	•	●	•	◆	■	●	●	•
	4a	Demolition	Peak impact	•	•	●	●	•	■	■	•	•	◆	●	•	●	●	•	■	■	●	•	◆
	4b		Typical impact	•	•	•	•	•	●	◆	•	•	•	•	•	•	•	•	●	◆	•	•	•
	5a	Clearing	Peak impact	■	◆	●	◆	•	■	■	●	◆	●	◆	■	●	◆	•	■	■	◆	◆	●
	5b		Typical impact	●	•	•	•	•	◆	■	•	●	•	●	●	•	●	•	◆	■	●	●	•
	6a	Earthwork	Peak impact	◆	◆	●	●	•	■	■	●	◆	●	◆	■	●	◆	•	■	■	◆	◆	●
	6b		Typical impact	●	•	•	•	•	◆	■	•	●	•	●	●	•	●	•	◆	■	●	●	•
	6c		Onsite truck haulage	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	7a	Bridge work	Peak impact	•	●	•	•	•	●	●	•	●	•	●	●	•	•	•	●	●	•	●	•
	7b		Typical impact	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	7c		Concrete work	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	7d		Girder lifts	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	8a	Road work	Concrete work	●	●	•	•	•	◆	■	•	●	•	•	•	•	•	•	◆	■	●	●	•
	8b		Typical work	●	●	•	•	•	◆	■	•	●	•	•	•	•	•	•	◆	■	•	●	•
	8c		Tie-in work	◆	●	●	◆	•	•	●	●	●	•	◆	■	●	◆	•	■	◆	◆	•	•
	9a	Signage, lighting and landscaping		◆	●	•	●	•	◆	■	•	●	•	●	◆	•	●	•	◆	■	●	●	•
Key to impacts: ■ No exceedance ● Marginal to minor (1 dB to 10 dB) ◆ Moderate (11 dB to 20 dB) ■ High (>20 dB)																							

Table 6-40 Predicted construction noise exceedances evening shoulder – residential receivers

Period	ID	Scenario	Activity	Project as described in the EIS										Amended project									
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10
Evening shoulder	1a	Ancillary facility establishment	Peak impact	♦	♦	●	♦	•	●	■	●	●	♦	♦	♦	●	♦	•	■	■	♦	■	♦
	1b		Typical impact	●	●	•	●	•	•	■	•	•	●	●	●	•	●	•	■	■	●	♦	●
	2a	Ancillary facility operations	Operation	●	•	•	●	•	•	■	•	•	●	●	•	•	●	•	♦	♦	●	●	●
	2b		Stockpiling	●	●	•	●	•	•	■	•	•	●	●	●	•	●	•	■	■	●	♦	♦
	2c		Batching plant	•	•	•	•	•	•	♦	•	•	•	•	•	●	•	•	•	♦	●	•	●
	2d		Crushing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	•	•	•	•	•	•	■	♦	●	♦
	3a	Utilities and drainage	Peak impact	■	■	♦	■	•	■	■	♦	■	♦	■	■	♦	■	•	■	■	■	■	♦
	3b		Typical impact	♦	●	•	●	•	■	■	●	♦	●	●	♦	•	♦	•	♦	■	♦	♦	•
	4a	Demolition	Peak impact	•	•	♦	♦	•	■	■	●	●	♦	●	●	●	♦	•	■	■	♦	●	♦
	4b		Typical impact	•	•	•	●	•	♦	■	•	•	●	•	•	•	●	•	♦	■	•	•	•
	5a	Clearing	Peak impact	■	♦	♦	■	•	■	■	♦	■	♦	♦	■	●	■	•	■	■	■	■	●
	5b		Typical impact	♦	●	•	●	•	■	■	●	♦	●	●	♦	•	♦	•	♦	■	♦	♦	•
	6a	Earthwork	Peak impact	■	♦	♦	■	•	■	■	♦	■	♦	♦	■	●	■	•	■	■	■	■	●
	6b		Typical impact	♦	●	•	●	•	■	■	●	♦	●	●	♦	•	♦	•	♦	■	♦	♦	•
	6c		Onsite truck haulage	●	•	•	•	•	•	●	•	•	•	•	●	•	●	•	•	●	•	•	•
	7a	Bridge work	Peak impact	•	♦	●	●	•	●	♦	•	♦	•	●	●	●	●	•	●	●	•	♦	•
	7b		Typical impact	•	●	•	•	•	•	●	•	●	•	●	●	•	•	•	•	●	•	●	•
	7c		Concrete work	•	●	•	●	•	●	●	•	●	•	●	●	•	●	•	•	●	•	●	•
	7d		Girder lifts	•	●	•	•	•	•	•	•	●	•	●	●	•	•	•	•	•	●	●	•
	8a	Road work	Concrete work	♦	●	•	●	•	■	■	●	♦	●	●	●	•	●	•	♦	■	●	♦	•
	8b		Typical work	♦	●	•	●	•	■	■	•	♦	●	•	●	•	•	•	■	■	●	●	●
	8c		Tie-in work	■	♦	●	■	•	●	♦	♦	♦	•	♦	■	●	■	•	■	■	♦	•	•
	9a	Signage, lighting and landscaping		♦	♦	♦	●	♦	•	■	■	●	♦	●	♦	●	♦	•	■	■	♦	♦	●
Key to impacts: ■ No exceedance ■ Marginal to minor (1 dB to 10 dB) ♦ Moderate (11 dB to 20 dB) ■ High (>20 dB)																							

Table 6-41 Predicted construction noise exceedances evening – residential receivers

Period	ID	Scenario	Activity	Project as described in the EIS										Amended project									
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10
Evening	1a	Ancillary facility establishment	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1b		Typical impact	●	●	.	●	.	.	■	.	.	●	●	●	.	●	.	■	■	●	◆	●
	2a	Ancillary facility operations	Operation	●	.	.	●	.	.	■	.	.	●	●	.	.	●	.	◆	◆	●	●	●
	2b		Stockpiling	●	●	.	●	.	.	■	.	.	●	●	●	.	●	.	■	■	●	◆	◆
	2c		Batching plant	.	.	.	.	.	.	◆	.	.	.	.	.	●	.	.	.	◆	●	.	●
	2d		Crushing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	.	.	.	.	.	.	■	◆	●	◆
	3a	Utilities and drainage	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	3b		Typical impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	4a	Demolition	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	4b		Typical impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	5a	Clearing	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	5b		Typical impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	6a	Earthwork	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	6b		Typical impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	6c		Onsite truck haulage	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	7a	Bridge work	Peak impact	.	◆	●	●	.	●	◆	.	◆	.	●	●	●	●	.	●	●	.	◆	.
	7b		Typical impact	.	●	.	.	.	.	●	.	●	.	●	●	.	.	.	.	●	.	●	.
	7c		Concrete work	.	●	.	●	.	●	●	.	●	.	●	●	.	●	.	.	●	.	●	.
	7d		Girder lifts	.	●	.	.	.	.	.	.	●	.	●	●	.	.	.	.	.	●	●	.
	8a	Road work	Concrete work	◆	●	.	●	.	■	■	●	◆	●	●	●	.	●	.	◆	■	●	◆	.
	8b		Typical work	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	8c		Tie-in work	■	◆	●	■	.	●	◆	◆	◆	.	◆	■	●	◆	.	■	◆	◆	.	.
	9a	Signage, lighting and landscaping		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Key to impacts: ■ No exceedance ● Marginal to minor (1 dB to 10 dB) ◆ Moderate (11 dB to 20 dB) ■ High (>20 dB)

Table 6-42 Predicted construction noise exceedances night-time – residential receivers

Period	ID	Scenario	Activity	Project as described in the EIS										Amended project									
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10
Night-time	1a	Ancillary facility establishment	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1b		Typical impact	■	■	■	■	.	.	■	.	.	■	■	■	■	■	.	■	■	■	■	■
	2a	Ancillary facility operations	Operation	■	■	.	■	.	.	■	.	.	■	■	■	.	■	.	■	■	■	■	■
	2b		Stockpiling	■	■	■	■	.	.	■	.	.	■	■	■	■	■	.	■	■	■	■	■
	2c		Batching plant	.	.	.	.	.	.	■	■	■	.	.	.	■	.	.	■	■	■	■	■
	2d		Crushing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	.	.	.	.	.	.	■	■	■	■	■
	3a	Utilities and drainage	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	3b		Typical impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	4a	Demolition	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	4b		Typical impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	5a	Clearing	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	5b		Typical impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	6a	Earthwork	Peak impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	6b		Typical impact	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	6c		Onsite truck haulage	■	.	.	■	.	■	■	.	.	.	.	.	.	.	.	.	.	.	.	.
	7a	Bridge work	Peak impact	.	■	■	■	.	■	■	■	■	.	■	■	■	■	.	■	■	.	■	.
	7b		Typical impact	.	■	.	■	.	■	■	■	■	.	■	■	■	■	.	■	■	.	■	.
	7c		Concrete work	.	■	■	■	.	■	■	■	■	.	■	■	■	■	.	■	■	.	■	.
	7d		Girder lifts	.	■	.	■	.	.	■	.	■	.	■	■	.	■	.	.	■	■	■	.
	8a	Road work	Concrete work	■	■	■	■	.	■	■	■	■	■	■	■	■	■	.	■	■	■	■	■
	8b		Typical work	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	8c		Tie-in work	■	■	■	■	.	■	■	■	■	.	■	■	■	■	.	■	■	■	.	.
	9a	Signage, lighting and landscaping		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Key to impacts: ■ No exceedance ■ Marginal to minor (1 dB to 10 dB) ■ Moderate (11 dB to 20 dB) ■ High (>20 dB)

Predicted impacts

Receivers can be highly noise affected when noise intensive equipment is being used close to residents. The following scenarios were assessed for the amended project as they resulted in the highest number of receivers being affected or are representative of work with the longest duration:

- Utilities and drainage, which is the scenario with the predicted worst-case impacts during standard daytime hours (ie the highest predicted NML exceedances and the greatest number of receivers affected)
- Road work – Tie in work, which is the scenario with the predicted worst-case impacts during the night-time period (ie the highest predicted NML exceedances and the greatest number of receivers affected)
- Earthwork and ancillary facility operations (stockpiling), which are the two longest duration scenarios.

The impacts described below are based on all equipment working in each assessed scenario. There would frequently be periods when construction noise levels are much lower than worst-case and there would be times when no equipment is in use and there are no impacts.

Utilities and drainage

For both option 1 and option 2, the assessment for this scenario identified the following differences from the project as described in the EIS:

- The assessment identified an increase in impact for receivers to the south of Elizabeth Drive in NCA02, where 'high' worst-case impacts are predicted at seven receivers (previously 'moderate' impact) and more distant receivers having 'moderate' and 'minor' impacts. These receivers are experiencing a greater impact due to the proximity of works on Elizabeth Drive as a result of the amended project
- Slight reduction in receivers experiencing a 'high' impact in NCA06, around Salisbury Avenue (decrease from two to one receiver). This change is due to one receiver now being within the footprint of the expanded construction footprint including AF 13 and AF 14 in this NCA, and as such, will not be occupied during construction work.

Road work – Tie in work

For option 1, the assessment for this scenario identified the following differences from the project as described in the EIS:

- Eleven receivers to the north of Elizabeth Drive, around the M7 Motorway and Wallgrove Road in NCA01 and NCA04, are predicted to have 'high' worst-case impacts, due to tie in work along Elizabeth Drive (east of Duff Rd), on Cecil Rd, on Wallgrove Road and on the M7 Motorway. Two additional receivers are predicted to have 'high' impacts when compared to the project as described in the EIS, which identified nine receivers. This change is due to the expanded construction footprint around the realigned Wallgrove Road.
- Twenty-six receivers to the south of Elizabeth Drive in NCA02, adjacent to work on Elizabeth Drive, are predicted to have 'high' worst-case impacts due to the tie in work on Elizabeth Drive. In the EIS, no receivers were identified in this area to experience 'high' impacts.
- A further 185 receivers have 'moderate' impacts, due to the tie in work on Elizabeth Drive and the M7 Motorway southbound on ramps. This is an increase of 90 from the 68 'moderate' receivers for the project as described in the EIS due to additional work on Elizabeth Drive associated with the amended project.

- Four receivers to the north of the amended construction footprint adjacent to the utility access road in NCA04 are predicted to have 'high' worst-case impacts with more distant receivers having 'moderate' and 'minor' impacts depending on the distance from the tie-in work. Two additional receivers are affected when compared to the project as described in the EIS due to the adjustment of the work location to accommodate the expanded work on Elizabeth Drive.
- Four receivers to the south of the amended construction footprint, adjacent to the relocated Salisbury Avenue cul-de-sac in NCA06, and five receivers to the north of the construction footprint, adjacent to the realignment of Clifton Avenue in NCA07, are predicted to have 'high' worst-case impacts with more distant receivers having 'moderate' and 'minor' impacts (including around the Mamre Road intersection with Elizabeth Drive). These impacts are generally additional to what was described for the project as described in the EIS due to the more extensive tie in work associated with the establishment of the additional ancillary facilities in this area.

For option 2 (with Elizabeth Drive connections), the impacts described above are mostly consistent. In NCA04 adjacent to the road tie in work at Elizabeth Drive, however, the closest residential receivers to the additional work are predicted to have 'moderate impacts'. A maximum increase of five dB is predicted at these most affected receivers for option 2 when compared to option 1.

Earthwork

For option 1 and option 2, the assessment for this scenario identified the following differences from the project as described in the EIS:

- To the south of Elizabeth Drive in NCA02, where receivers are densely clustered 'high' worst-case impacts are predicted at three receivers, with several more having 'moderate' impacts. These impacts are additional to those described in the EIS due to work on Elizabeth Drive to the east of the M7 Motorway associated with the amended project.
- To the south of the construction footprint in NCA06, around Salisbury Avenue and between the amended project and Elizabeth Drive, where one receiver is predicted to have 'high' impacts and several more having 'moderate' impacts. This is a minor decrease (one receiver) of receivers predicted to have 'high' impacts when compared to the project as described in the EIS as the closest receiver to the work now lies within the expanded ancillary facility AF 13, and, as such, will not be occupied during construction work.

Ancillary facility operations (stockpiling)

For option 1 and option 2, the assessment for this scenario concluded a general increase in impacts when compared to the project as described in the EIS due to the additional ancillary facilities impacting a greater number of receivers. 24-hour operation of a number of the ancillary facilities is anticipated to occur for the duration of the amended project. Consistent with the project as described in the EIS, 24-hour operations have conservatively been modelled at all ancillary facilities.

The assessment identified the following:

- Near AF 7, AF 9, AF 17 and AF 18 in NCA01 and NCA04, four receivers are predicted to have 'moderate' impacts with receivers further from the ancillary facilities having 'minor' impacts
- Near AF 8 in NCA02, the nearby receivers are predicted to have 'minor' impacts
- Near AF 6 in NCA04, five receivers are predicted to have 'moderate' impacts with receivers further from the ancillary facility having 'minor' impacts
- Near AF 5, AF 15 and AF 16 in NCA04, eight receivers are predicted to have 'moderate' impacts with receivers further from the ancillary facilities (including in NCA03) having 'minor' impacts

- Near AF 13 and AF 14 in NCA06 two receivers are predicted to have 'high' impacts with a further seven receivers with 'moderate' impacts; receivers further from the ancillary facilities (including in NCA03 and NCA04) generally have 'minor' impacts
- Near AF 4 and AF 12 in NCA07, five receivers are predicted to have 'moderate' impacts with receivers further from the ancillary facilities having 'minor' impacts
- Near AF 2 and AF 3 in NCA07, three receivers are predicted to have 'moderate' impacts with receivers further from the ancillary facilities (north of the amended project) having 'minor' impacts
- Near AF 11 in NCA09, three receivers are predicted to have 'moderate' impacts with receivers further from the ancillary facility (including in NCA08) having 'minor' impacts
- Near AF 1 in NCA10, three receivers are predicted to have 'moderate' impacts with receivers further from the ancillary facility having 'minor' impacts
- Near AF 10 in NCA10, one receiver is predicted to have 'high' impacts with a further nine receivers with 'moderate' impacts; receivers further from the ancillary facility generally have 'minor' impacts.

Work in one location

The assessment identified that when highly noise intensive work is occurring in a single location, the impacts are limited to receivers within 800 metres of the work. Receivers in the rest of the study area are predicted to be compliant with the noise management levels.

Highly noise affected residential receivers

Residential receivers that are subject to noise levels of 75 dBA or greater are considered highly noise affected. Highly noise affected impacts may occur during work associated with the 'Utilities and drainage', 'Clearing', 'Earthwork' and 'Road work' scenarios.

Eleven receivers in total (an increase of four from seven receivers for the project as described in the EIS) may be subject to construction noise levels above the highly noise affected threshold due to the amended project. This increase occurs primarily in NCA02 due to the amended project work on Elizabeth Drive. It is noted that two receivers in NCA01 are no longer highly noise affected as the closest receivers to the work now lie within the expanded ancillary facility AF 9, and as such, will not be occupied during construction work. The location of highly affected receivers are shown in

Figure 6-38.

Highly noise affected receivers are mostly consistent between option 1 and option 2. An additional three receivers on in NCA04 adjacent to the additional work on Elizabeth Drive for option 2 (with Elizabeth Drive connections) are predicted to potentially be highly noise affected during the worst-case impacts from the option 2 construction.

'Other' sensitive receivers

There are several categories of 'other' sensitive receivers in the study area, including educational facilities, places of worship and outdoor areas.

In general, impacts on 'other' sensitive receivers for the amended project are generally consistent with the impacts as described in the EIS. However for option 1, the assessment for this scenario identified minor exceedances of up to seven dB (an increase of one dB from six dB as described in the EIS) are predicted at two outdoor sensitive receiver areas (Kemps Creek Sporting and Bowling Club and Western Sydney Parklands) adjacent to the amended project in NCA04 and NCA05. Minor increases are due to expansion of the construction footprint for the amended project including the new ancillary facilities.

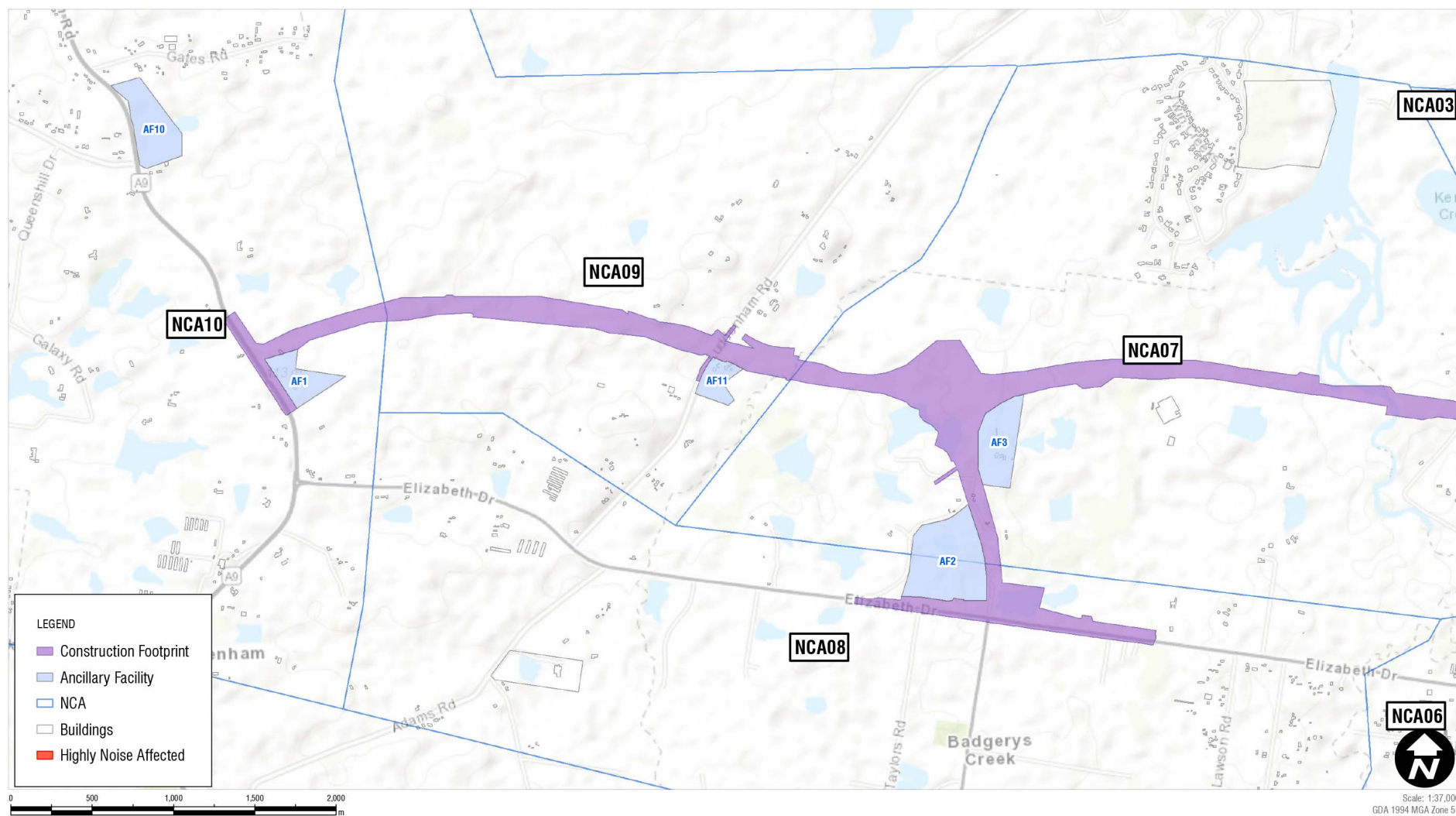
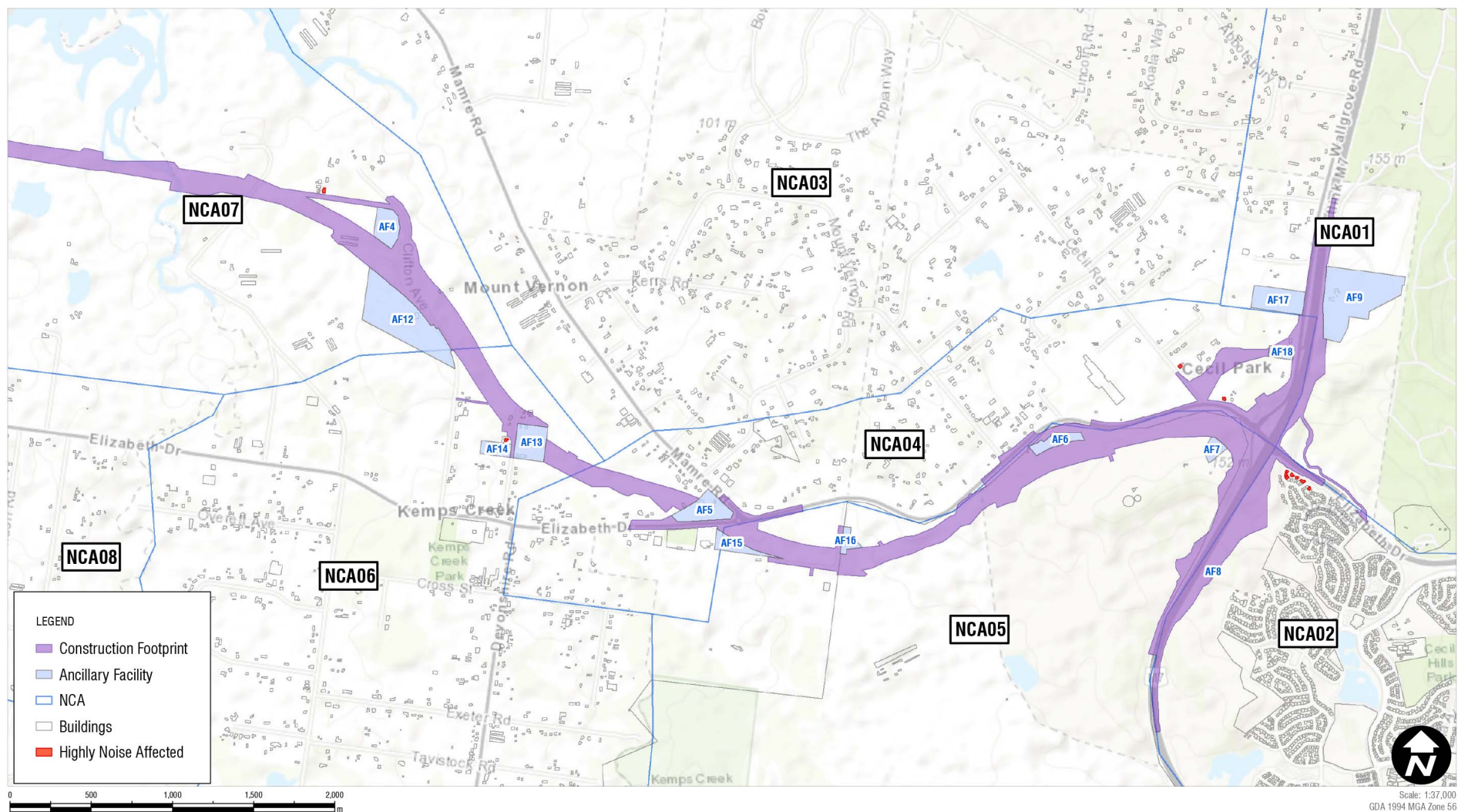


Figure 6-38 Highly noise affected residential receivers during construction of the amended project



For option 2 (with Elizabeth Drive connections), the assessment is mostly consistent for option 1 and 2 however, the closest school (Irfan College), located in NCA04, is predicted to have 'high impacts' during the worst-case scenarios when noise intensive equipment is being used for option 2, where 'moderate impacts' were predicted for option 1. This is due to the additional work on Elizabeth Drive associated with option 2. Other sensitive receivers, such as schools, would be consulted prior to and throughout the construction of the amended project to appropriately manage predicted impacts.

Commercial receivers

In general, impacts on commercial receivers for the amended project are generally consistent with the impacts of the project as described in the EIS, with the exception of additional minor impacts in NCA04 due to the addition of ancillary facility AF 15 adjacent to commercial receivers. This is consistent between option 1 and option 2 of the amended project.

6.7.3.2 Sleep disturbance

A sleep disturbance screening assessment has been carried out for the construction work and a summary is provided in the assessment tables in **Appendix G** (Annexure C). Review of the predictions shows that the sleep disturbance screening criterion is likely to be exceeded when night-time work are occurring near to residential receivers. This is consistent for both option 1 and option 2.

The need for night-time work on consecutive nights is not fully understood at this stage of the project. The requirements for night-time work would be determined as the amended project progresses and the likelihood of sleep disturbance impacts would be reviewed during detailed design.

Where night-time work is located close to residential receivers, a detailed assessment of the potential noise impacts would be carried out prior to the work commencing and site-specific environmental management measures to control the impacts would be developed and implemented.

6.7.3.3 Construction vibration

The main sources of vibration from construction work within the study area are vibratory rollers and rock-breakers are consistent with those described in the EIS. The assessment assumes that a vibratory roller is required across the study area and the assessment is summarised in **Figure 6-40**.

Cosmetic damage

Based on the amended construction footprint, there has been a change in the number of structures located within the recommended minimum working distance when compared to the project as described in the EIS.

In total, about 21 structures (an increase from 19 structures as described in the EIS) are now located within the recommended minimum working distance spread across NCA02, NCA04, NCA05, NCA06, NCA07 and NCA10 where receivers are located close to the work.

In some locations additional structures are now located within the recommended minimum working distance and in other locations are no longer included due to changes in the amended construction footprint. Additional structures located within the minimum working distance when compared to the project as described in the EIS are detailed below:

- Three additional structures in NCA02 adjacent to the work on Elizabeth Drive
- Six additional structures in NCA04 adjacent to the expanded construction footprint associated with work on Elizabeth Drive around AF 6 and Cecil Road

- Two additional structures in NCA04 and NCA05 adjacent to the expanded construction footprint around AF 5 and AF 15
- One additional structure in NCA06 adjacent to the expanded construction footprint around AF 13 and AF 14.

However, there are also a few structures that are now either inside the amended project construction footprint (and therefore no longer receivers to be impacted by the project), or are outside the cosmetic damage minimum working distance due to a change in the construction footprint. These comprise:

- One in NCA01 (now inside AF9)
- Six in NCA04
 - Four now inside construction footprint
 - Two now outside the cosmetic damage minimum working distance
- Three in NCA06 and NCA07
 - Two now inside construction footprint
 - One now outside the cosmetic damage minimum working distance.

Where work is within the minimum working distances, construction work would not proceed unless:

- A different construction method with lower source vibration levels is used, where feasible
- Attended vibration measurements are carried out at the start of the work to determine the risk of exceeding of the vibration objectives.

Where buildings are potentially affected by vibration, building condition surveys would be completed before and after work.

Human comfort vibration

Certain receivers which are near the construction footprint are within the human comfort minimum working distance and occupants of affected buildings may be able to perceive vibration impacts at times when vibration generating equipment is in use. Where impacts would be perceptible, they would likely only be apparent for relatively short durations when equipment such as rock-breakers or vibratory rollers are in use nearby.

The requirement for vibration intensive work and associated potential for impacts on human comfort would be reviewed during detailed design once finalised details of the work are available.

Heritage structures

The location of heritage structures is shown in **Figure 6-40**. Heritage buildings are to be considered on a case by case basis and further investigation would be carried out during detailed design for all potentially affected structures. Where buildings or structures are considered sensitive to vibration, appropriate vibration criteria would be determined after detailed inspections have been completed.

Potential vibration impacts to heritage structures for the amended project are consistent with those described in the EIS.

6.7.3.4 Construction ground-borne noise

The majority of receivers are sufficiently distant from the work for ground-borne noise impacts to be minimal. Where residential receivers are located near to construction work, airborne noise levels would typically be dominant over the ground-borne component.

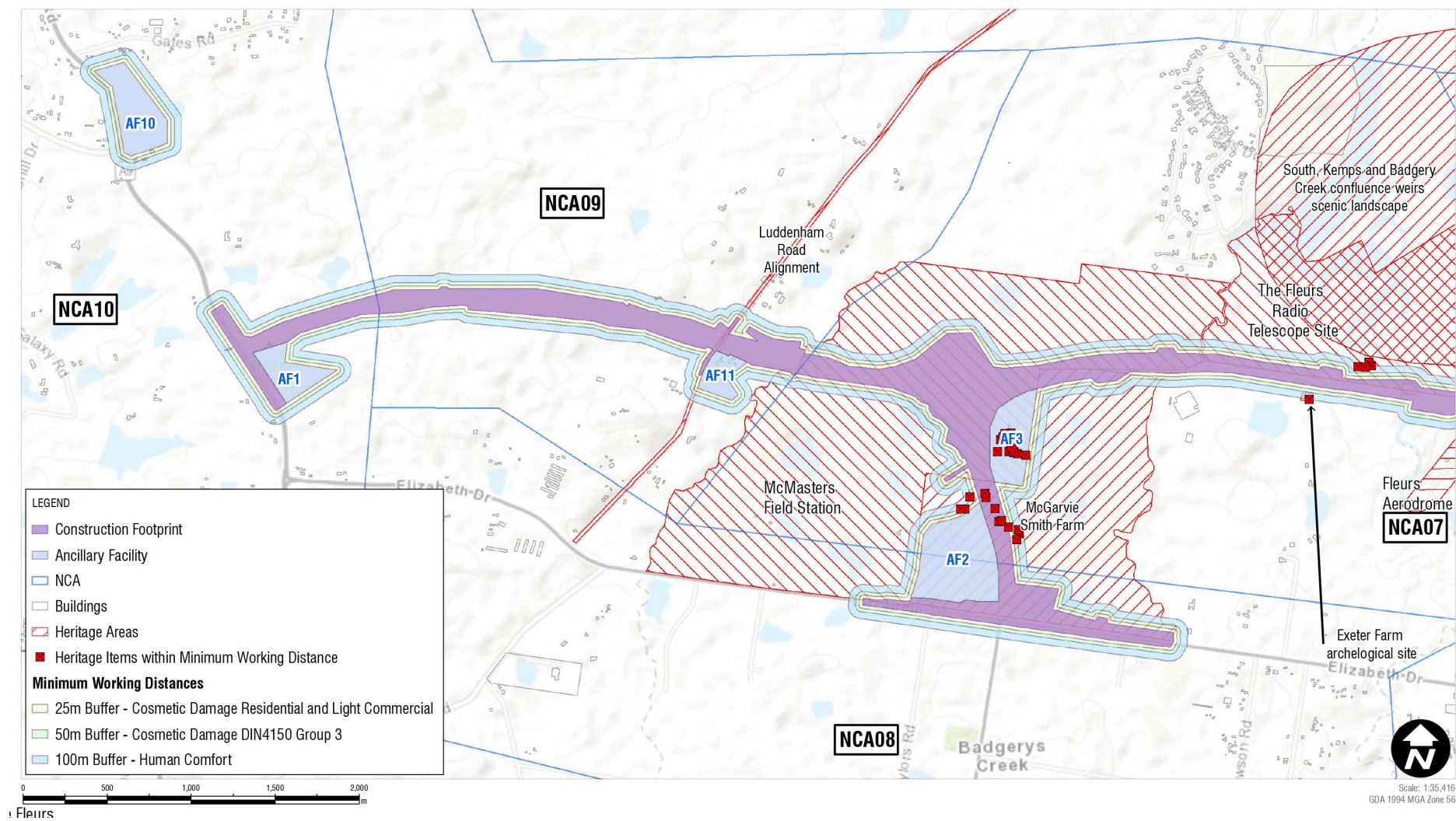


Figure 6-40 Construction vibration assessment for the amended project

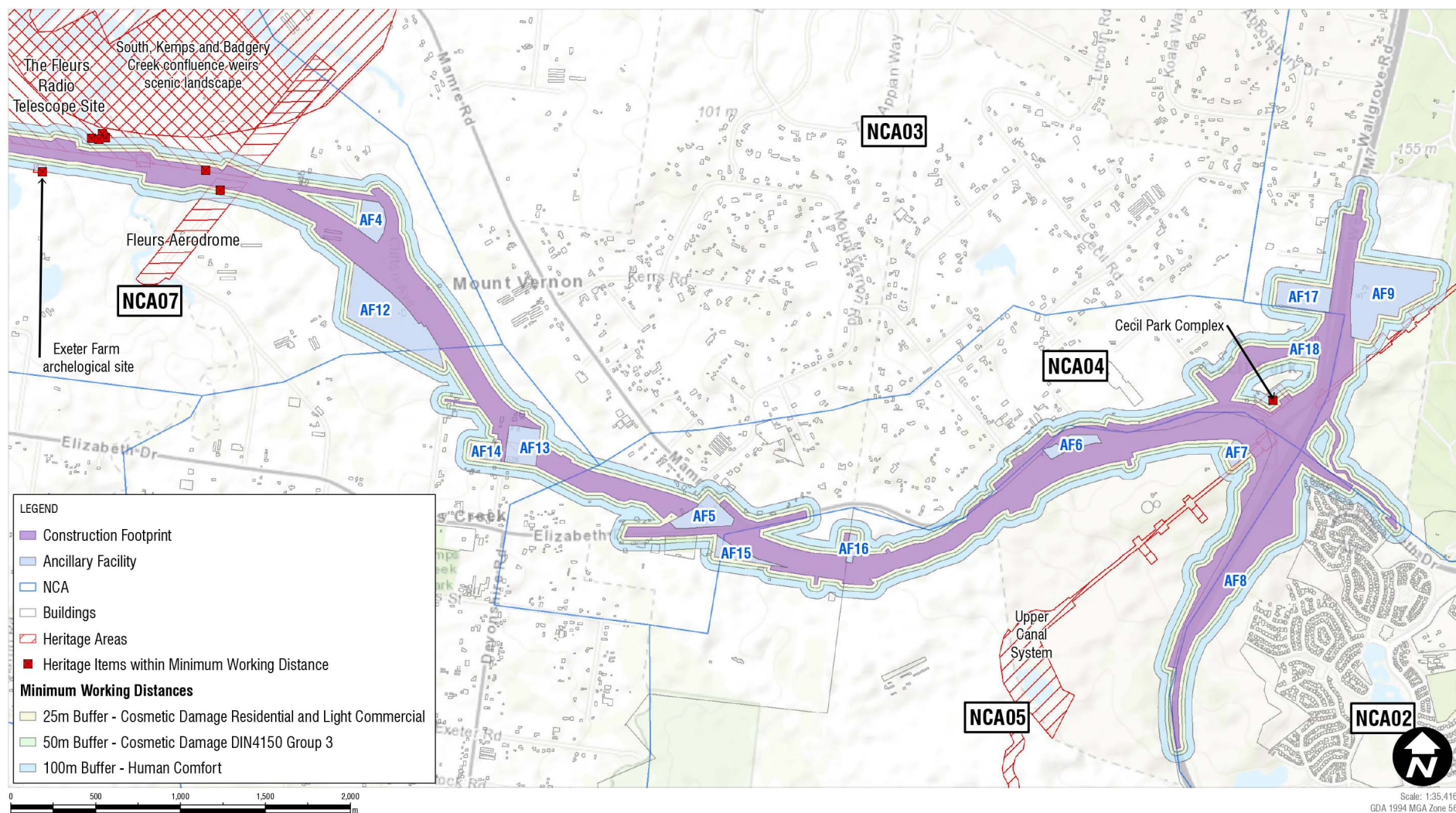


Figure 6-41 Construction vibration assessment for the amended project

6.7.3.5 Construction traffic noise

A comparison of the proposed construction traffic volumes to the forecast traffic volumes during the construction period has been used to determine where noticeable increases in road traffic noise (ie a greater than two decibel increase over the existing noise level) may be likely to occur.

The assessment identified that construction traffic is unlikely to result in a noticeable increase in noise levels where vehicles use major roads. This is because of the high volumes of traffic that already use these routes.

Based on the proposed construction traffic routes and the forecast redistribution of traffic during construction, no noticeable increases in road traffic noise are predicted. The results are generally consistent with the findings for the project as described in the EIS.

Where local roads are used to access compounds, an assessment will be required once detailed vehicle movements are confirmed. In the event that an increase greater than two dB is predicted, existing road traffic noise levels will be further evaluated to determine if the receiver is also above the relevant RNP base criteria. If the receiver is above the RNP base criteria and predicted to experience an increase in noise greater than two dB from construction traffic, mitigation options will be required to be further investigated. Mitigation may include the earlier installation of operational treatments to provide a noise benefit during the construction phase of the amended project.

6.7.3.6 Cumulative and consecutive construction noise impacts

The amended construction footprint has not substantially changed in the vicinity of recently completed, ongoing and proposed projects. As a result, the cumulative and consecutive construction noise impacts associated with the amended project would likely remain consistent with the assessment described in Section 7.7.8 and Section 7.7.9 of the EIS.

These would be investigated further as the project progresses when detailed construction planning is developed. Specific additional management measures would then be designed in consultation with the community to address potential cumulative and consecutive impacts to minimise impacts as far as practicable.

6.7.4 Operational impacts

6.7.4.1 Operational road noise predictions

Forecast traffic volume data for the amended project has been provided for the at-opening year (2026) and future design year (2036). As part of the transport and traffic updated technical report (see **Appendix B**) land use and demographics scenario has been updated to a more recent model (developed in 2016). The modelling package used for the amendment report changed to an updated model as the traffic forecasts for western Sydney from this model are considered to be more robust than the model that was used for the EIS analysis.

The changes in forecast land use and improvements in modelling processes have resulted in a major reduction in future trips to the South West Growth Area in western Sydney. Forecast traffic volumes using the amended project and the surrounding network have reduced as a result.

Operational noise impacts in the operational study area were predicted 'without mitigation' and compared to the NCG criteria (Roads and Maritime, 2015). The 'without mitigation' noise predictions are used to identify receivers which qualify for consideration of additional noise mitigation using guidance from the Noise Mitigation Guideline (NMG) (Roads and Maritime 2015a), noting that receivers which are above the NCG criteria do not necessarily qualify for additional noise mitigation.

Option 1

For option 1 the assessment identified that increases in road traffic noise levels are predicted at receivers within most NCAs across the operational study area, which is consistent with the project as described in the EIS. At certain locations within the NCAs, there would be an increase in traffic noise levels with the amended project due to:

- The alignment of the amended project being relatively close to receivers resulting in impacts to facades of houses which were previously not affected by road traffic noise for NCA01, NCA03, NCA04 and NCA06
- The amended project would be constructed in an area which has low existing road traffic noise levels and affects receivers which were previously not affected for NCA07 and NCA09
- The amended project would be constructed in an area where receivers are in close proximity to existing roads for NCA10.

When compared to the project as described in the EIS, the amended project does not have receivers within NCA02 which qualify for consideration of mitigation. This is primarily due to a reduction in night-time noise levels (generally around one dB to two dB) across the NCA. The EIS identified two buildings which qualified for consideration of mitigation, with both buildings being marginally over the night-time NCG criteria. With the predicted reduction in night-time noise levels for the amended design, these receivers do not trigger consideration of mitigation as part of the amended project.

Overall, the amended project option 1 generally results in a reduction in the predicted night-time noise levels (between three and four decibels) when compared to the corresponding period in the EIS, however there are pockets where the realignment or changes to localised traffic volumes (Wallgrove Road, Salisbury Avenue and Duff Road) result in increased road noise levels. Daytime noise levels are consistent (within 0 dB to 0.5 dB) with the EIS predictions for option 1, with the exception of receivers in NCA04 where an increase is predicted.

The predicted operational road noise levels at residential receivers under option 1 are summarised in **Table 6-43** for the 2026 at-opening and 2036 future design scenarios.

The time period in which the project is predicted to have the highest number of impacted receivers is the 2036 day-time scenario. This is different to the project as described in the EIS where 2036 night-time scenario has the highest number of impacted receivers. The maps in **Figure 6-42** and **Figure 6-43** present the impacts for the controlling 2036 day-time scenario, while maps for the other time periods are included in **Appendix G**.

Table 6-43 Predicted worst-case change in road traffic noise level in each NCA without mitigation – option 1 (triggered residential receivers only)

NCA	Project as per EIS										Amended project – option 1									
	Predicted noise level (dBA) ¹								Change in noise levels (dBA) ²		Predicted noise level (dBA) ¹								Change in noise levels (dBA) ²	
	At-Opening 2026				Future Design 2036						At-Opening 2026				Future Design 2036					
	No Build (without project)		Build (with project)		No Build (without project)		No Build (without project)				No Build (without project)		Build (with project)		No Build (without project)		No Build (without project)			
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
NCA01	62	58	67	63	63	59	69	64	5	5	61	56	64	59	62	57	66	60	4	3
NCA02	52	47	53	50	53	49	55	52	2	2	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
NCA03	49	44	59	55	49	45	60	56	11	11	49	39	59	51	48	37	60	50	12	13
NCA04	54	53	66	65	53	51	66	64	12	12	52	42	65	58	52	42	68	60	16	17
NCA05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA06	51	47	67	63	53	49	67	63	16	16	52	42	66	60	52	43	66	58	15	18
NCA07	33	28	53	48	36	31	55	51	20	20	45	37	63	57	46	35	66	58	20	23
NCA08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA09	44	40	57	53	45	41	59	55	14	15	43	42	58	57	44	37	59	55	15	17
NCA10	53	49	55	51	54	50	57	53	3	3	54	49	56	51	56	49	57	51	2	2

Note 1: Daytime and night-time are LAeq(15hour) and LAeq(9hour) noise levels, respectively.

Note 2: The change in noise level is based on the worst-case noise level

Note 3: No triggered receivers within NCA02 in the amended project

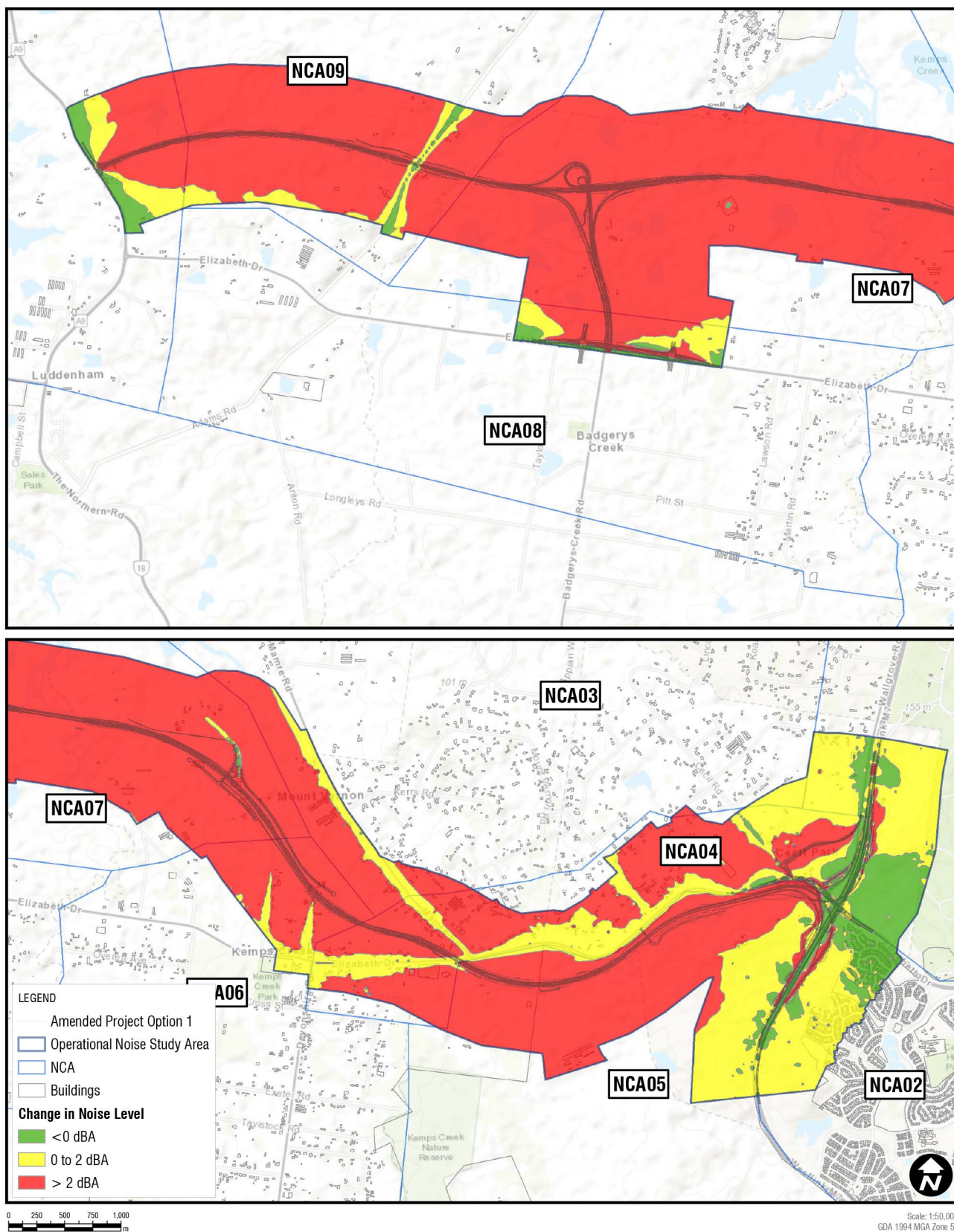


Figure 6-42 Predicted change in operational noise without mitigation – 2036 Daytime – option 1

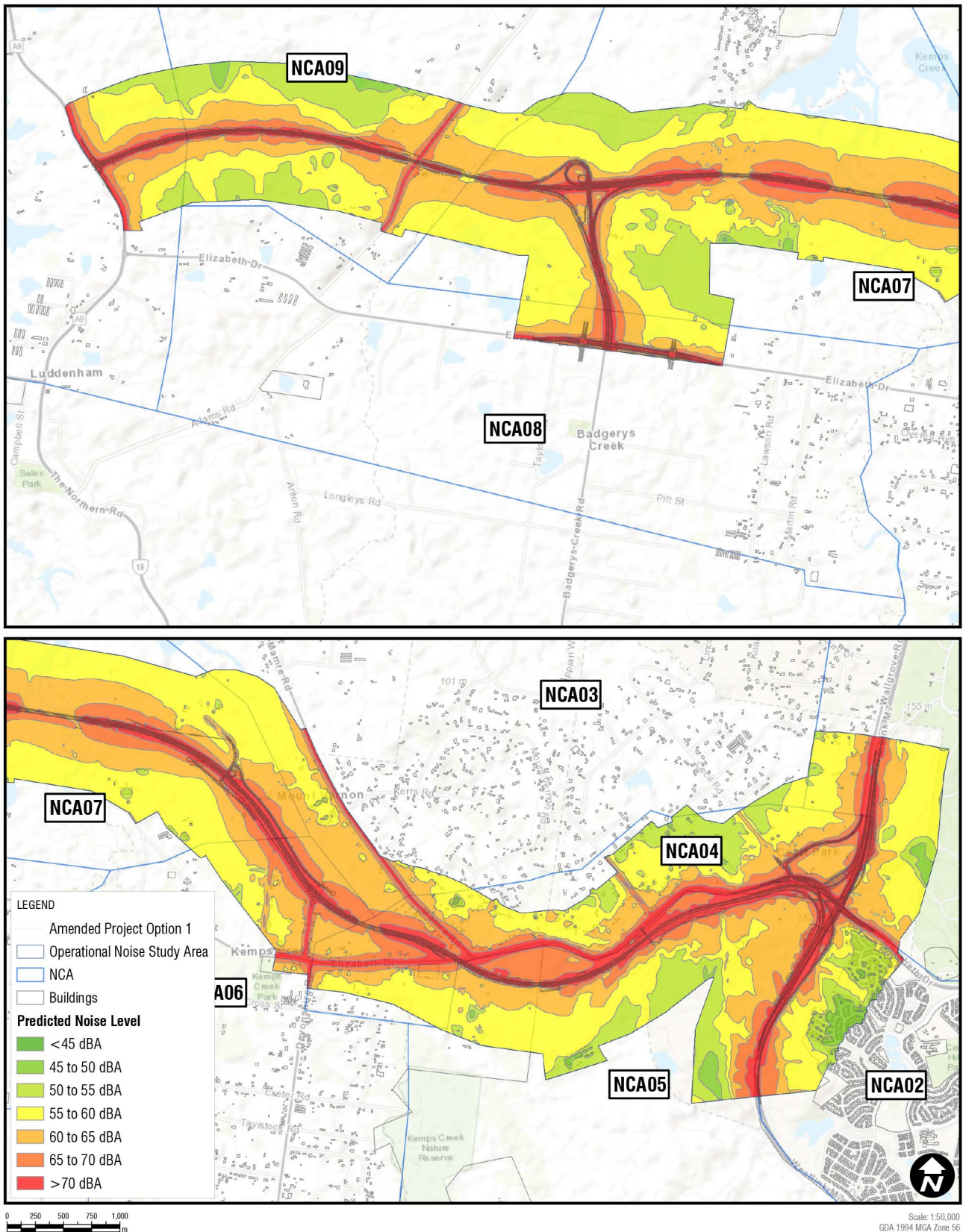


Figure 6-43 Predicted Build operational noise levels without mitigation – LAeq(15hour) – 2036 Daytime – option 1

Option 2

The predicted 'without mitigation' operational road noise levels at residential receivers for the amended project option 2 (with Elizabeth Drive connections) are summarised in **Table 6-44** for the 2026 at-opening and 2036 future design scenarios. Like for option 1, **Table 6-44** summarises the worst-case change in noise levels in each NCA, which typically affect receivers which are nearest to the amended project.

For option 2, these results show that, consistent with the project as described in the EIS and option 1, increases in road traffic noise levels are predicted at receivers within most NCAs across the operational study area for the amended project option 2. The reasons for the increases in the different NCAs are mostly consistent with the project as described in the EIS and option 1 above.

Similar to option 1, option 2 does not have impacted receivers within NCA02 which qualify for consideration of mitigation. This is primarily due to a reduction in night-time noise levels (generally around 1 dB to 2 dB) across the NCA. The EIS identified two buildings which qualified for consideration of mitigation, with both buildings being marginally over the night-time NCG criteria. With the predicted reduction in night-time noise levels for the amended design, these receivers do not trigger consideration of mitigation as part of the amended project.

Overall, the amended project option 2 generally results in a reduction in the predicted night-time noise levels (between three and four decibels) when compared to the corresponding period in the EIS. This is due to the night-time vehicle volumes across the amended option 2 design decreasing along with a change in the percentage of heavy vehicles when compared to the EIS (see **Chapter 4**). Daytime noise levels for option 1 are consistent (within 0 to 0.5 dB) with the EIS predictions, apart from receivers in NCA04 where an increase is predicted. **Figure 6-44** and **Figure 6-45** illustrate the predicted change in noise levels (ie the Build minus No Build) and the predicted Build noise levels for the 2036 daytime timeframe for the amended project option 1.

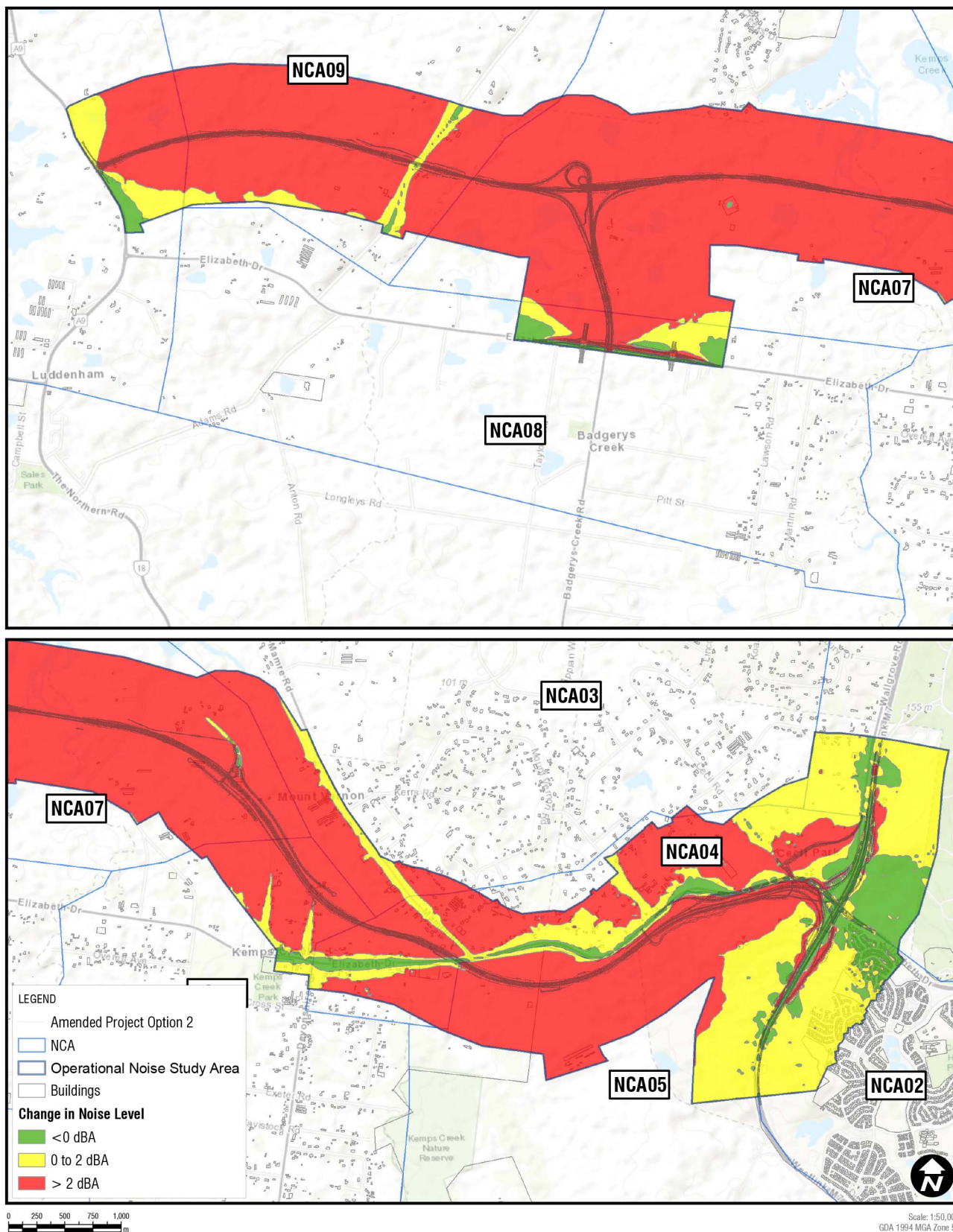
Table 6-44 Predicted worst-case change in road traffic noise level in each NCA without mitigation – option 2

NCA	Project as described in EIS										Amended project – option 2									
	Predicted noise level (dBA) ¹								Change in noise levels (dBA) ²		Predicted noise level (dBA) ¹								Change in noise levels (dBA) ²	
	At-Opening 2026				Future Design 2036						At-Opening 2026				Future Design 2036					
	No Build (without project)		Build (with project)		No Build (without project)		No Build (without project)				No Build (without project)		Build (with project)		No Build (without project)		No Build (without project)			
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
NCA01	62	58	67	63	63	59	69	64	5	5	61	56	64	59	62	57	66	60	4	3
NCA02	52	47	53	50	53	49	55	52	2	2	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
NCA03	49	44	59	55	49	45	60	56	11	11	49	39	60	51	48	37	61	50	12	13
NCA04	54	53	66	65	53	51	66	64	12	12	52	42	66	58	52	42	68	60	17	18
NCA05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA06	51	47	67	63	53	49	67	63	16	16	52	42	68	60	52	43	67	59	16	19
NCA07	33	28	53	48	36	31	55	51	20	20	45	32	65	52	46	35	67	59	21	23
NCA08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA09	44	40	57	53	45	41	59	55	14	15	43	42	58	58	44	37	59	55	15	17
NCA10	53	49	55	51	54	50	57	53	3	3	54	49	56	51	56	49	57	52	2	3

Note 1: Daytime and night-time are LAeq(15hour) and LAeq(9hour) noise levels, respectively.

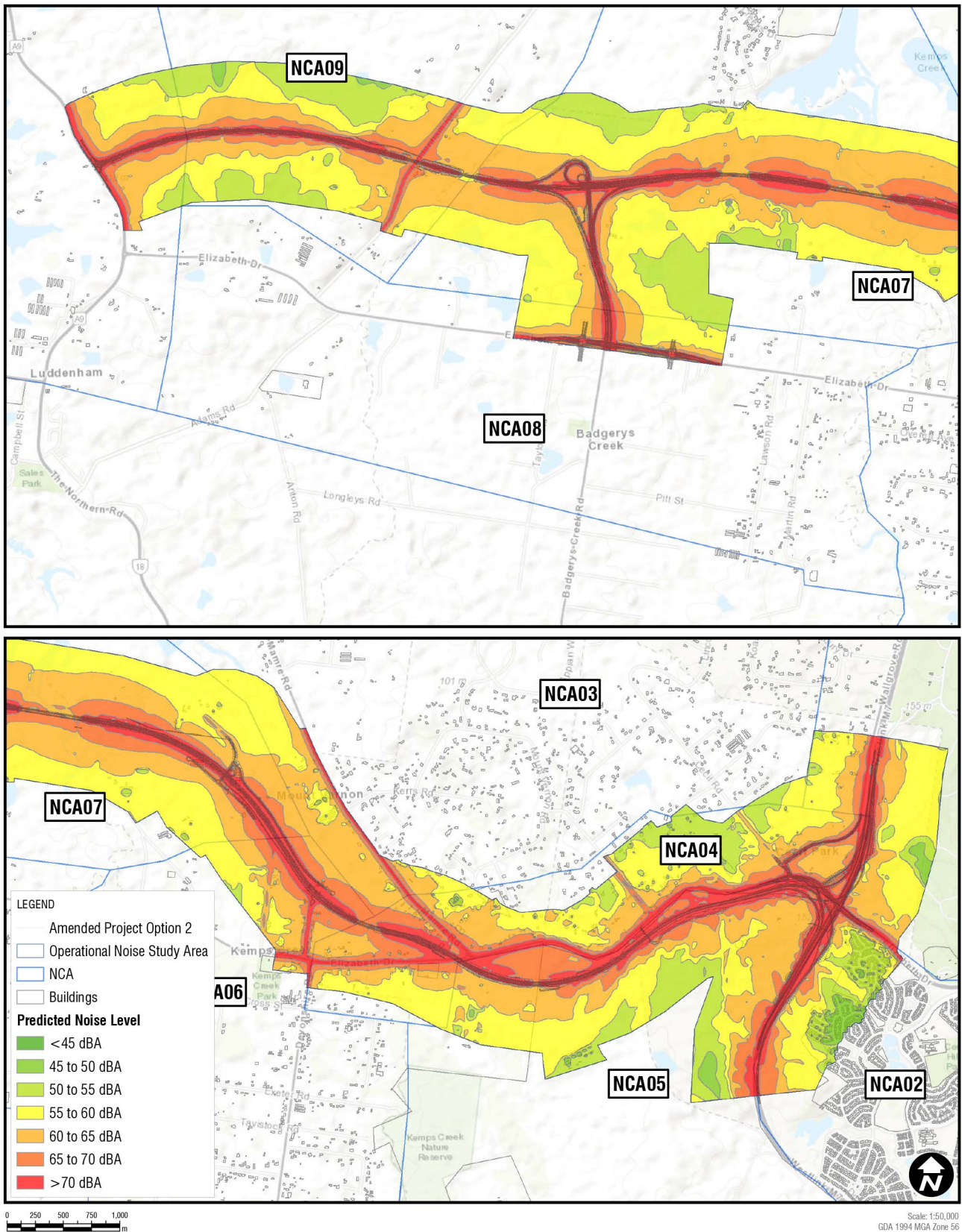
Note 2: The change in noise level is based on the worst-case noise level

Note 3: No triggered receivers within NCA02 in the amended project



Note 1: Predicted change in noise levels (Build minus No Build) are for 2036 daytime scenario at a height of 1.5 metres above local ground (ground floor level).

Figure 6-44 Predicted change in operational noise without mitigation – 2036 Daytime – option 2



Note 1: Predicted free field noise levels are for Build 2036 daytime scenario at a height of 1.5 metres above local ground (ground floor level).

Figure 6-45 Predicted Build operational noise levels without mitigation – $L_{Aeq}(15\text{hour})$ – 2036 Daytime – option 2

6.7.4.2 Receivers considered for additional noise mitigation

Under both option 1 and option 2, additional receivers have been identified as eligible for consideration of additional noise mitigation using guidance from the NMG (Roads and Maritime 2015a), when compared to the project as described in the EIS (see **Table 6-45**).

For option 1 (without Elizabeth Drive connections), there are a total of 310 floors (212 individual buildings) eligible for consideration of additional noise mitigation. This is an increase of 48 floors (29 individual buildings) from the project as described in the EIS. The increase in the number of qualifying receivers is largely controlled by the increase to the operational assessment boundary in NCA04.

For option 2 (with Elizabeth Drive connections), there are a total of 320 floors (220 individual buildings) eligible for consideration of additional noise mitigation. This is an increase of 58 floors (37 individual buildings) from the project as described in the EIS, and an increase from option 1 by 10 floors (eight individual buildings). The increase in the number of qualifying receivers is largely controlled by the increase to the operational assessment study area in NCA04.

The receivers which were identified as eligible for consideration of additional noise mitigation for option 1 and option 2 are shown in **Figure 6-46** and **Figure 6-47** respectively.

Operational noise mitigation measures are discussed in **Section 6.7.5**.

Table 6-45 Trigger receiver exceedance categories

Trigger category	Project as described in EIS		Amended project – option 1		Amended project – option 2	
	Number of triggers		Number of triggers		Number of triggers	
	Floors	Building	Floors	Building	Floors	Building
Trigger 1 (greater than 2 dB increase)	218	151	306	210	312	215
Trigger 2 (exceeds cumulative limit)	228	162	218	147	239	164
Trigger 3 (acute)	50	36	47	34	69	47
TOTAL	262	183	310	212	320	220

Note 1: The Relative Increase Criteria is included in the assessment of Trigger 1 and Trigger 2 as it adjusts the RNP base criteria for each receiver where existing road traffic noise levels are more than 12 dB below the RNP criteria.

Note 2: The total number of triggers may be lower than the sum of each type of trigger as individual receivers can trigger multiple types.

Sensitivity analysis

Modelling indicated that an additional 12 receivers for option 1 and 10 receivers for option 2 (decrease from 15 receivers described in the EIS) would be eligible for consideration of property treatment if a +1 dBA correction were to be added to the noise model predictions. Under both option 1 and option 2, a reduction of nine receivers (decrease from 19 receivers described in the EIS) would be apparent if 1 dBA was subtracted from the noise model predictions.

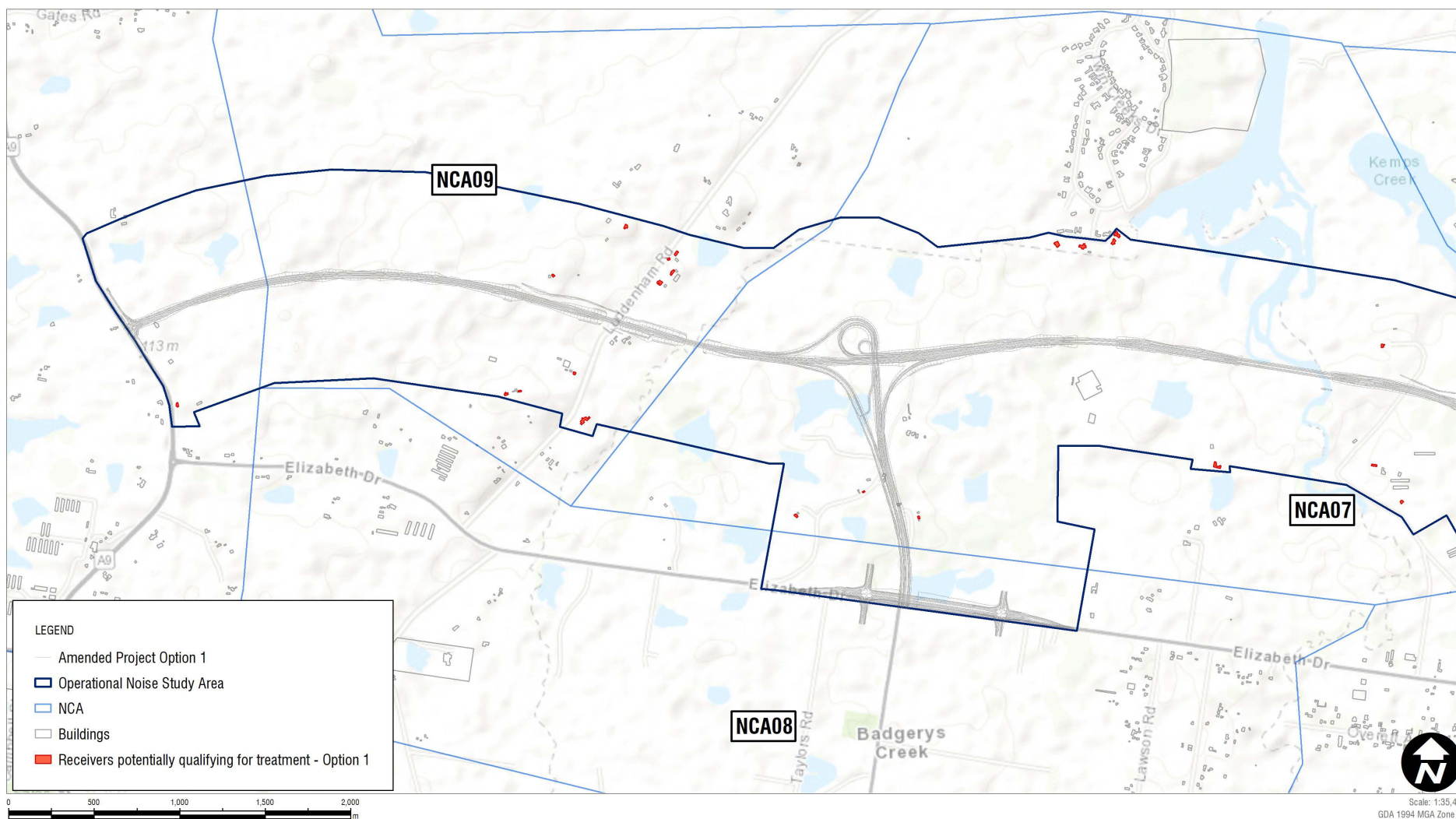


Figure 6-46 Receivers identified as eligible for consideration of additional mitigation – option 1

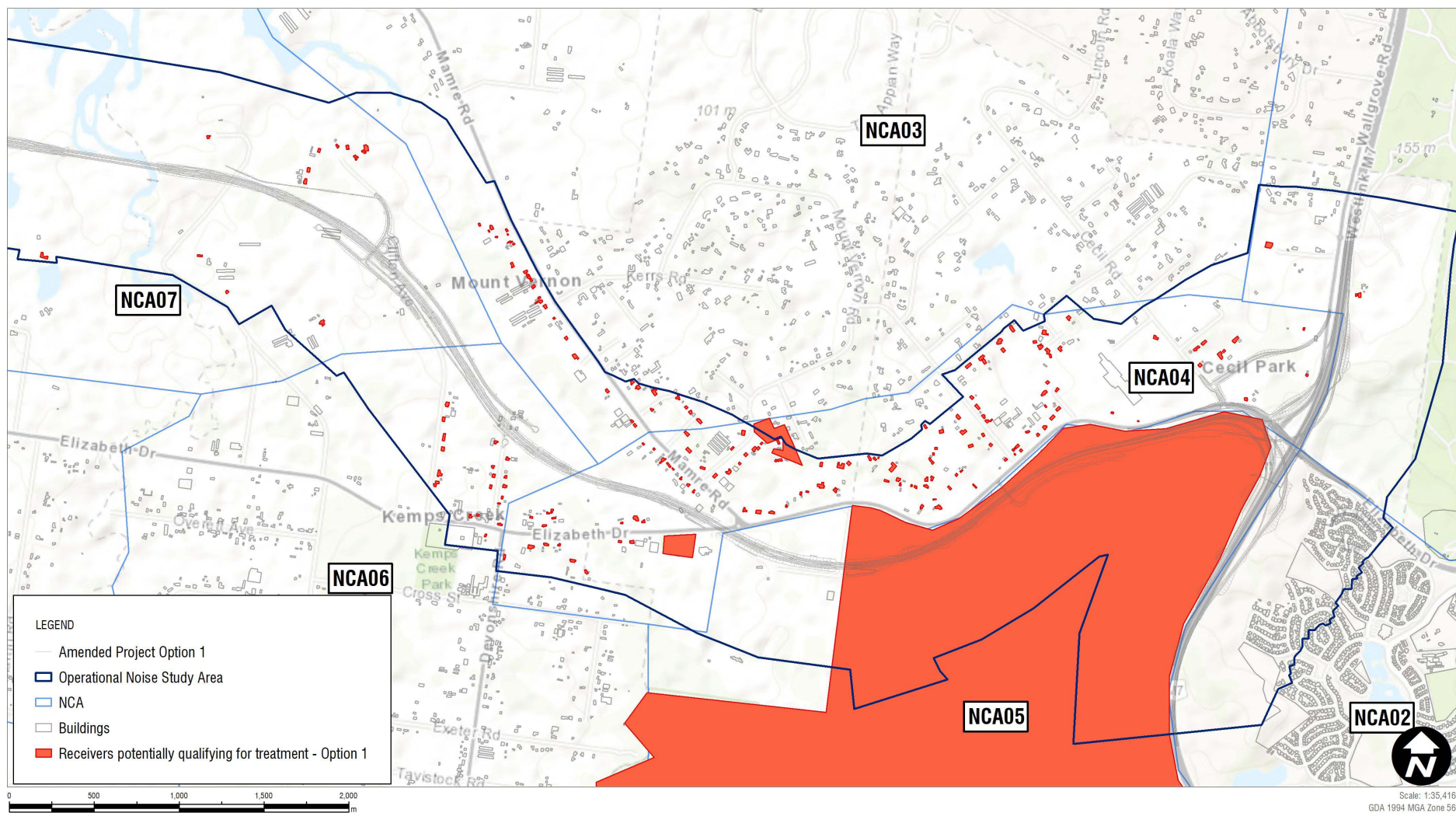


Figure 6-46 Receivers identified as eligible for consideration of additional mitigation – option 1

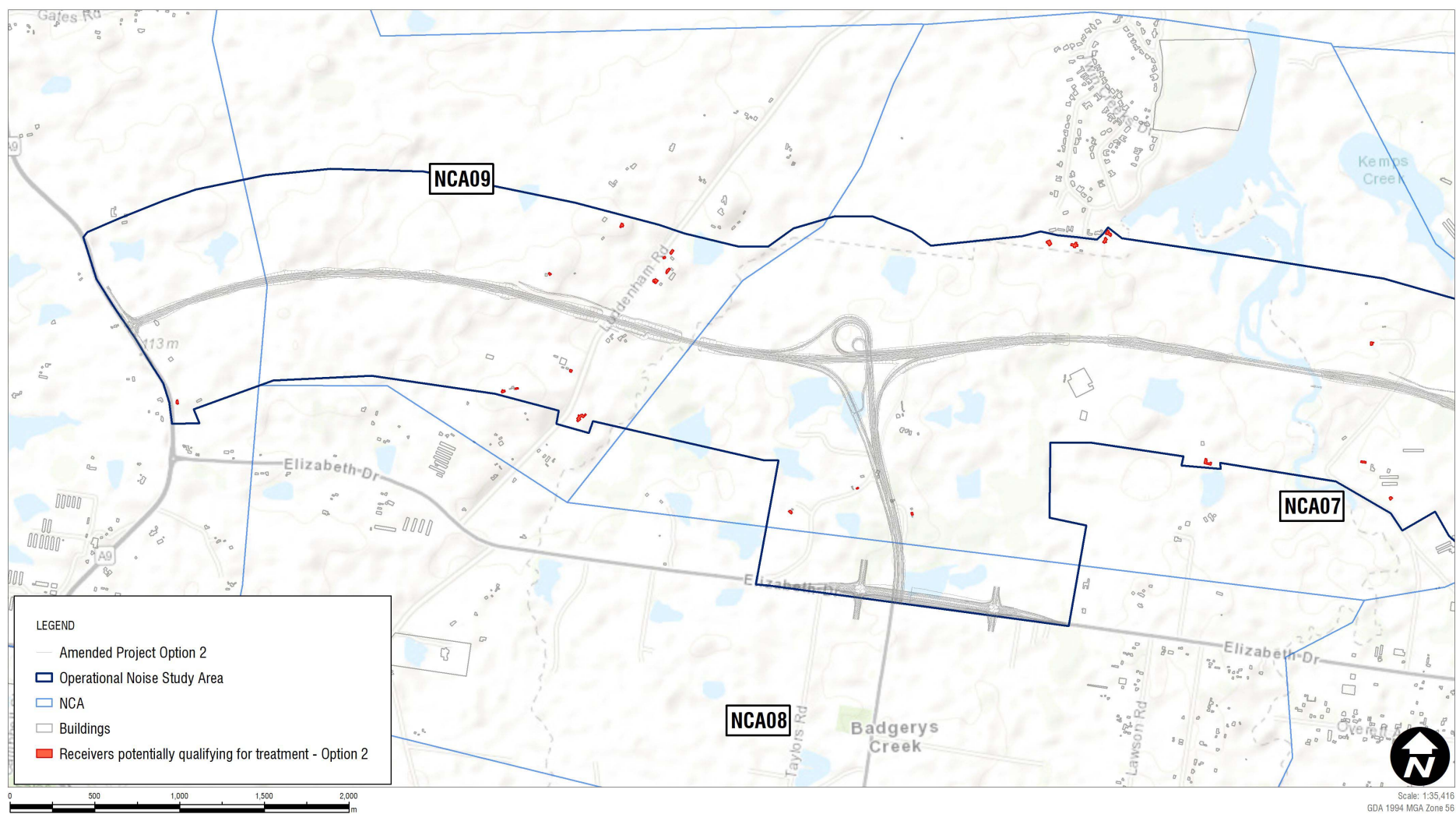


Figure 6-47 Receivers identified as eligible for consideration of additional mitigation – option 2

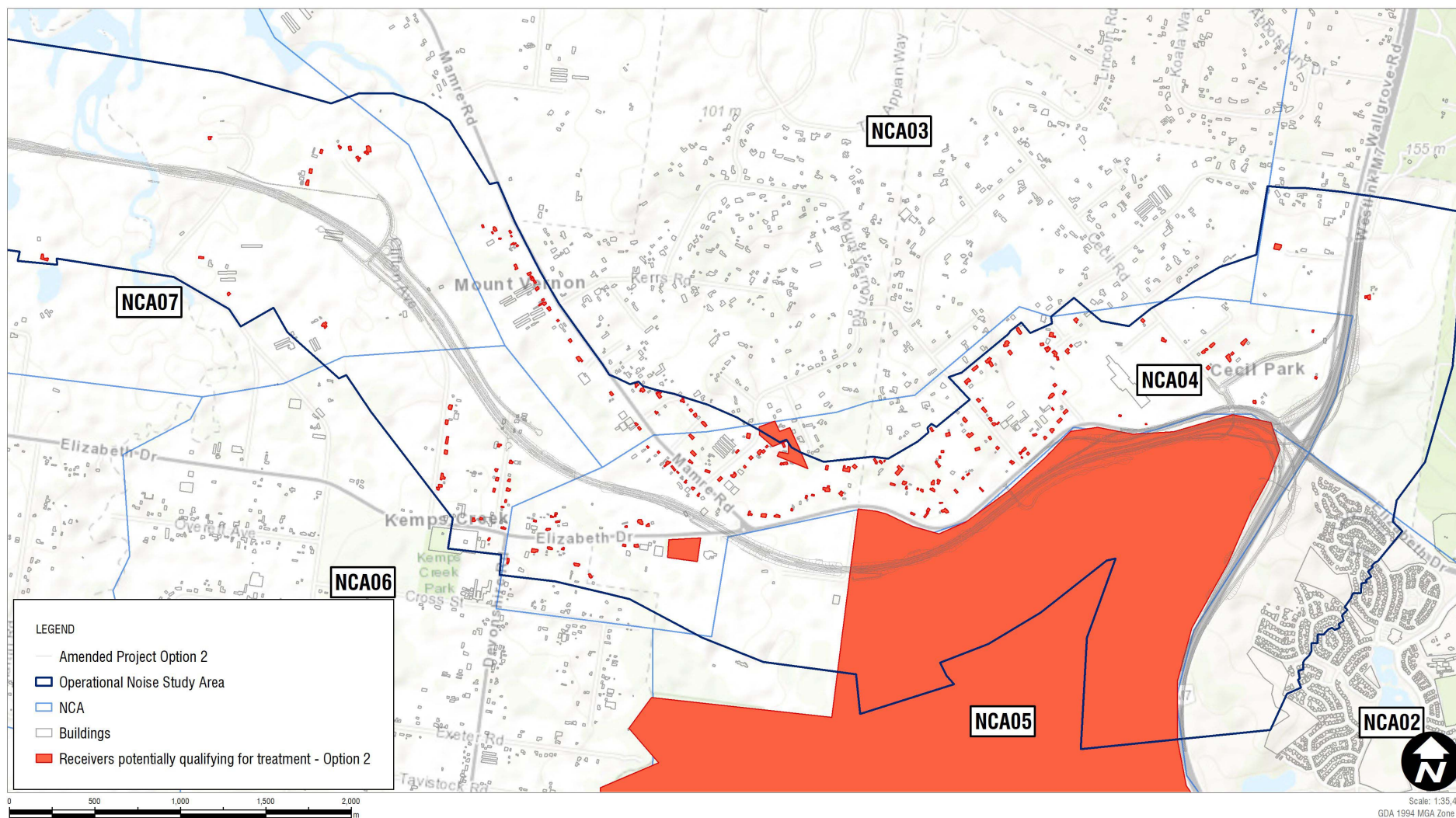


Figure 6-47 Receivers identified as eligible for consideration of additional mitigation – option 2

6.7.4.3 Maximum noise level assessment

Maximum noise levels resulting from amended project would be generally consistent with those described in Section 7.7.7 of the EIS.

However, maximum noise levels are predicted to increase by up to 15 dB at dwellings adjacent to the realigned Wallgrove Road in NCA04, compared to up to eight dB at these receivers in the EIS. This is due to the realigned Wallgrove Road moving closer to the dwellings in the amended project than the project as described in the EIS.

Some of the receivers identified in the assessment may be eligible for consideration of additional noise mitigation based on the predicted L_{Aeq} road traffic noise levels. While receivers are not triggered for consideration of additional noise mitigation by maximum noise levels alone, selection of feasible and reasonable mitigation measures during the detailed design stage would take the change in maximum noise levels into consideration where a receiver qualifies for consideration of additional mitigation

A full breakdown of the highest predicted change in maximum noise level for option 1 and option 2 is described in Table 6-5 of **Appendix G**.

6.7.4.4 Cumulative and consecutive impacts

The amended operational footprint has not substantially changed in the vicinity of recently completed, ongoing and proposed projects. As a result, the cumulative and consecutive construction noise impacts associated with the amended project would be likely to remain unchanged from the assessment carried out as per Section 7.7.8 and Section 7.7.9 of the EIS.

6.7.5 Environmental management measures

Noise and vibration impacts associated with the amended project are generally consistent with impacts described in the EIS and would therefore be managed through the implementation of the proposed management measures described in Section 7.7.9 of the EIS. Where management measures differ from those listed in the EIS, these are described in the sections below.

6.7.5.1 Operational noise mitigation management measures

Road traffic noise levels would be reduced to meet the NCG noise criteria through the use of feasible and reasonable mitigation. An assessment of operational mitigation measures in **Appendix G** forms a preliminary feasible and reasonable assessment to inform the detailed design stage of the project. A summary of the preliminary assessment for pavement selection, noise barriers and architectural treatment is provided below.

A preferred noise mitigation option (low noise pavement, noise barriers, architectural treatments, or a combination of these) will be determined during detailed design taking into account whole-of-life engineering considerations and the overall social, economic and environmental benefits. The preference will be given to noise mitigation measures that reduce outdoor noise levels and the overall number of at-property treatments.

At-source mitigation – Pavement

To investigate the potential benefit that quieter road surfaces could provide to the amended project the following scenarios have been assessed:

- Dense graded asphalt (DGA) on the main carriageway and bridges/ramps (with a +0 dB surface correction)
- Open graded asphalt (OGA) on the main carriageway (with a -2 dB surface correction) and DGA on the bridges/ramps.

Quieter pavements are predicted to reduce the number of triggered buildings:

- For option 1 (without Elizabeth Drive connections), DGA results in a total of 203 triggered buildings (a decrease of nine buildings from the project as described in the EIS) and OGA results in a total of 188 triggered buildings (decrease of 24 buildings from the project as described in the EIS)
- For option 2 (with Elizabeth Drive connections), DGA results in a total of 212 triggered buildings (decrease of eight buildings from the project as described in the EIS) and OGA results in a total of 201 triggered buildings (decrease of 19 buildings from the project as described in the EIS).

The assessment noted that if diamond ground concrete surface were used for pavement, the reduction in triggered receivers would be comparable to the performance of DGA.

Overall, quieter noise pavements are predicted to provide a minor benefit to triggered receivers and would be considered in conjunction with other mitigation options during detailed design, subject to feasible and reasonable considerations.

In-corridor mitigation – noise barriers

The process for considering the use of noise barriers is described in the NMG (Roads and Maritime 2015a) and would be considered where there are four or more closely spaced triggered receivers. As a guide, noise barriers are considered to be a reasonable noise mitigation option where they are capable of providing a noise attenuation benefit (referred to as an insertion loss) of:

- Five dBA at representative receivers for barrier heights of up to five metres
- Ten dBA at representative receivers for barrier heights above five metres high and up to eight metres high.

In certain situations, the requirements for the barrier cannot always be met. In this case, further feasible and reasonable assessment is undertaken to identify alternative noise mitigation options.

At this early stage in the amended project, the barrier analysis has used the predicted noise levels from the concrete road surface scenario, as this results in the highest road traffic noise levels and represents a worst-case assessment.

During the assessment of the EIS, several barrier arrangements were investigated throughout the alignment. Two additional barriers (NW.07 and NW.08) which were not investigated as part of the EIS that have been included in the amended design assessment due to either additional triggered receivers being identified as part of the amended assessment or, design changes as part the amended assessment which allows barriers in new locations to be considered. The assessment concluded that three noise barrier locations (NW.02, NW.03, NW.04) would be considered further in detailed design based on the predicted noise benefit. These are described in **Table 6-46** and the indicative locations for option 2 (with Elizabeth Drive connections) are shown in **Figure 6-48** as this is the worst case scenario.

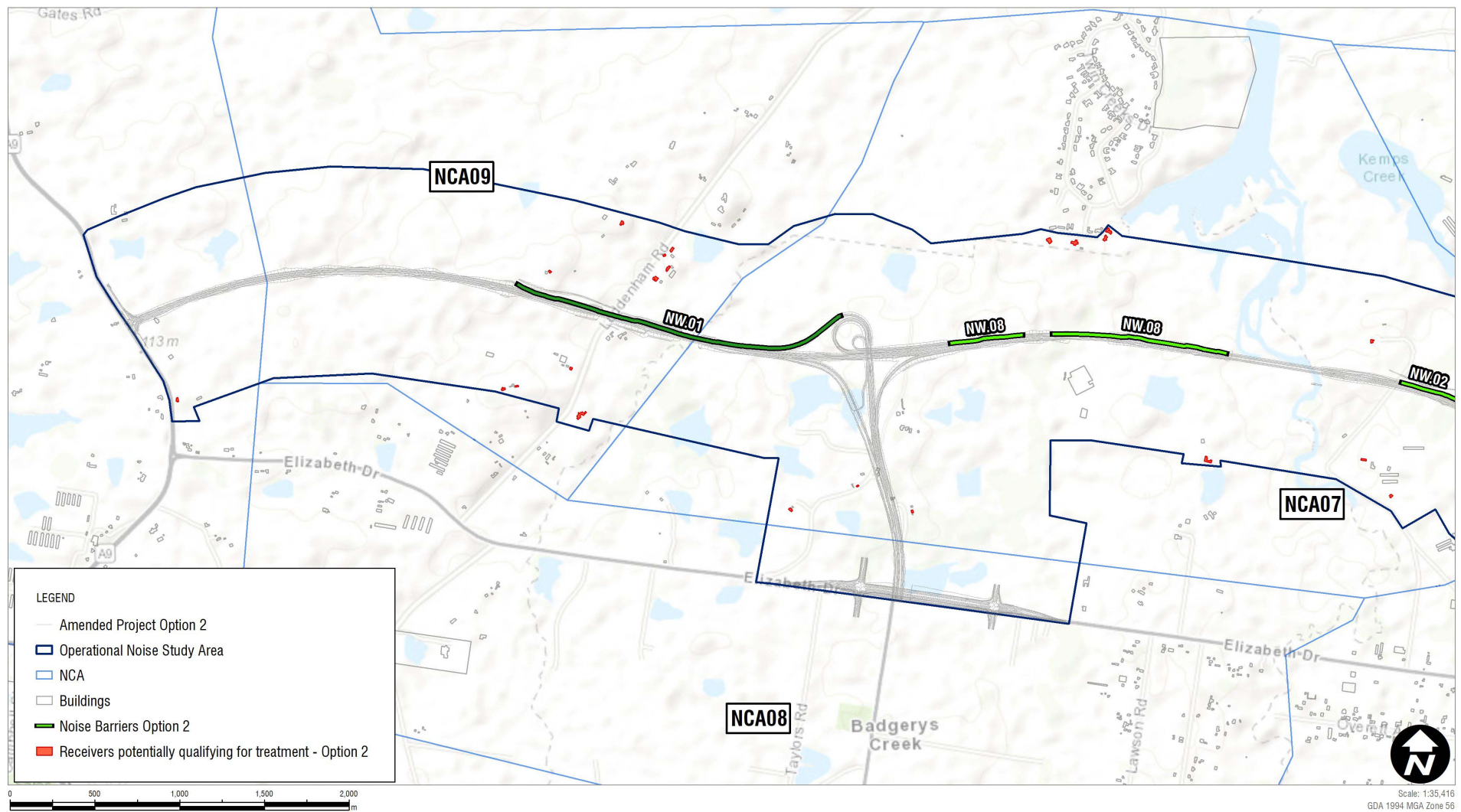


Figure 6-48 Potential noise barrier locations – option 2

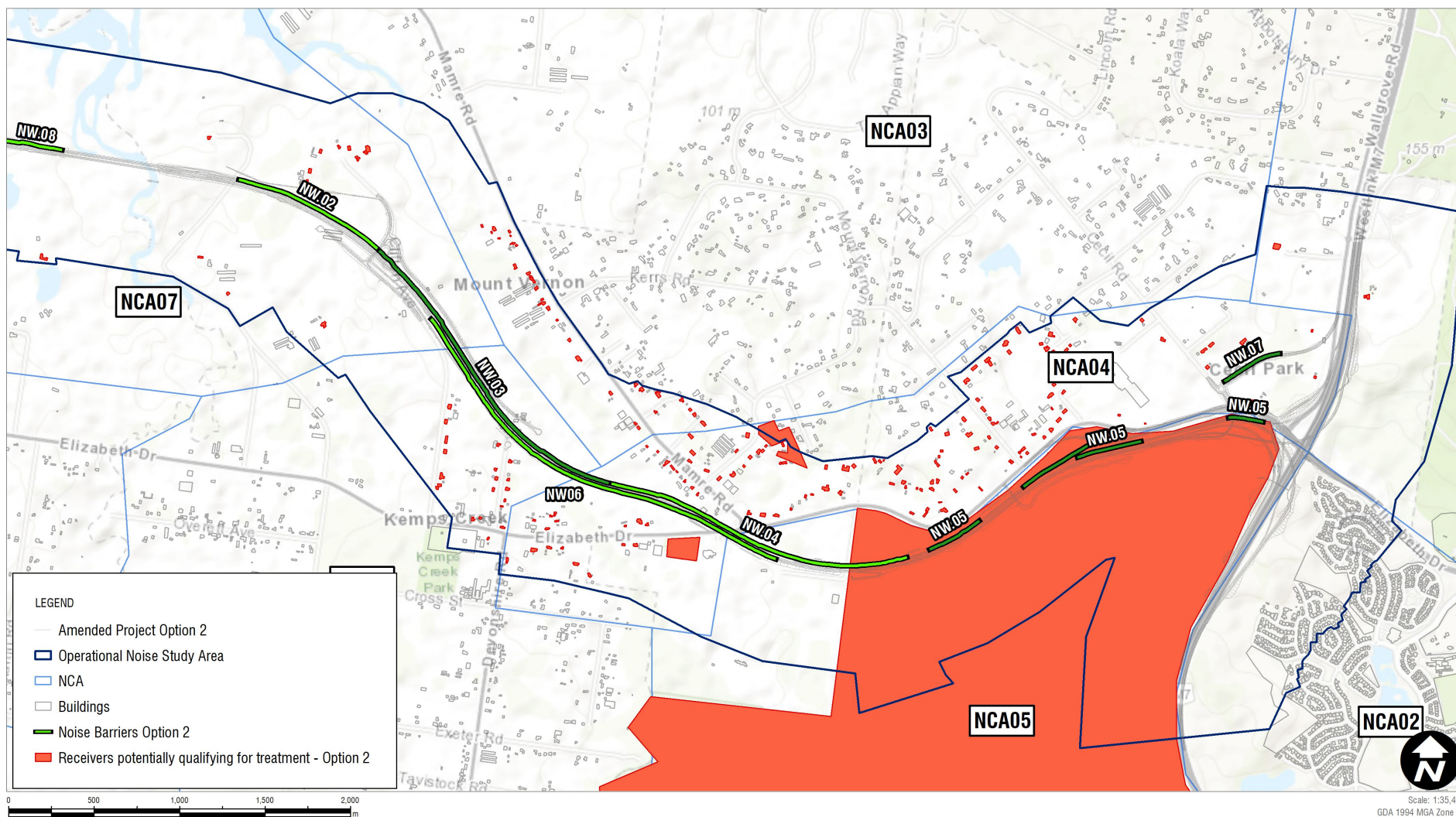


Figure 6-48 Potential noise barrier locations – option 2

Other design factors such as cost to benefit ratio, constructability, and overhead power line clearance may result in these barriers being considered unfeasible and/or unreasonable. The noise barriers identified as potentially reasonable will be considered in conjunction with other mitigation measures for their feasibility and reasonability during the detailed design stage of the amended project.

Table 6-46 Noise barrier arrangement in the EIS and amended project design

EIS Barrier ID	Length (m)	Findings as per EIS	Corresponding amended project barrier (length m)		Location	Amended project findings
			Option 1	Option 2		
NW.01	2019	Not found to be reasonable	NW.01 (2018)	NW.01 (2018)	Along the northern boundary of the amended project west of Luddenham Road to the Western Sydney International Airport interchange	Not found to be reasonable as it does not achieve the principles of the NMG
NW.02	923	Referred to detailed design at a height of 5 m	NW.02 (914)	NW.02 (914)	Along the northern boundary of the amended project, east of South Creek to Clifton Avenue overbridge	Referred to detailed design for further reasonable and feasible assessment at a height of 5 m (option 1) and 5.5 m (option 2)
NW.03	1978	Referred to detailed design at a height of 5 m	NW.03 (1978)	NW.03 (1978)	Along the northern boundary of the amended project, from Clifton Avenue overbridge to Kemps Creek	Referred to detailed design for further reasonable and feasible assessment at a height of 5 m (option 1) and 6 m (option 2)
NW.04	1907	Referred to detailed design at a height of 7 m	NW.04 (2170)	NW.04 (2170)	Along the northern boundary of the amended project, from Kemps Creek to Western Sydney Parklands	Referred to detailed design for further feasible and reasonable assessment at a height of 8 m (both options). Consideration would be given for a lower height.
NW.05	809	Not found to be reasonable	NW.05 (961)	NW.05 (1331)	Along the northern boundary of the amended project, within the Western Sydney Parklands	Not found to be reasonable as it does not achieve the principles of the NMG.

EIS Barrier ID	Length (m)	Findings as per EIS	Corresponding amended project barrier (length m)		Location	Amended project findings
			Option 1	Option 2		
NW.06	2552	Referred to detailed design at a height of 5 m	NW.06 (2552)	NW.06 (2552)	Along the southern boundary of the amended project, between Clifton Avenue overbridge and Elizabeth Drive	Not found to be reasonable as it does not achieve the principles of the NMG.
-			NW.07 (365)	NW.07 (365)	Along the northern boundary of the realigned Wallgrove Road, extending 360 m from Cecil Road	Not found to be reasonable as it does not achieve the principles of the NMG.
			NW.08 (1466)	NW.08 (1466)	Along the northern boundary of the amended project, east of the interchange with the future Western Sydney International Airport	Not found to be reasonable as it does not achieve the principles of the NMG.

Where a barrier has been identified as being referred to detailed design for further reasonable and feasible assessment, this will be done in accordance with the NMG. A barrier's feasibility can include engineering considerations, such as road corridor site constraints, maintenance access requirements, and wind loading and ground conditions. The consideration of what is considered reasonable in the NMG typically means looking at cost and equity considerations. There is no set monetary limit for noise mitigation but the NMG provides guiding principles to gauge whether costs are reasonable and equitable.

In addition, the community perspective and opinion must be considered.

The key areas which would be further evaluated for each barrier identified as requiring further consideration are as follows:

- Barrier NW.02 – The noise barrier removes triggered receivers at various heights and provides a five dB insertion loss to at least one receiver.
 - Lowering barrier height to 3.5 metres
 - Would still provide a five dB insertion loss to at least one receiver and provides a two dB insertion loss at the majority of receivers
 - Would still require between eight (option 1) and 11 (option 2) of the 12 triggered receivers to be considered for at property treatments
 - Would still provide an external amenity benefit

- Shortening barrier length
 - Would provide at least five dB insertion loss to the receivers located within 100 metres of the barrier and a two dB benefit to the second cluster of receivers situated approximately 400 metres from the barrier
- Other factors which may influence the barrier design, such as future development and interconnectivity with other projects.
- Barrier NW.03 –The noise barrier removes triggered receivers at various heights and provides a five dB insertion loss to at least one receiver
 - Lowering barrier height
 - A five metre noise barrier would still require between 27 (option 1) and 31 (option 2) of the 36 triggered receivers to be considered for at property treatments
 - Other factors which may influence the barrier design such as future development and interconnectivity with other projects would also be further evaluated during detailed design.
- Barrier NW.04 –The noise barrier only removes one triggered receiver at a height of eight metres
 - Lowering barrier height
 - A barrier at lower height of four metres would still provide a five dB insertion loss to at least one receiver and provides a two dB insertion loss at the majority of receivers
 - Whilst the barrier would provide the required insertion loss for a barrier which is greater than five metres in height, the wider noise reduction provided to the community for each incremental height after four metres becomes less; as such, a lower height barrier would still provide an acceptable noise reduction (benefit) to the wider community
 - Constructability of the proposed noise barrier, including clearance to transmission powerlines, must be considered when evaluating the feasibility of the noise barriers length.

At-property – architectural treatment

As described in **Section 6.7.4.2**, receivers have been identified as eligible for consideration of additional noise mitigation using guidance from the NMG (Roads and Maritime, 2015a). Architectural treatments provided by TfNSW, where feasible and reasonable, are typically limited to:

- Fresh air ventilation systems that meet the Building Code of Australia requirements with the windows and doors shut
- Upgraded windows and glazing and solid core doors on the exposed facades of the substantial structures only (eg masonry or insulated weather board cladding with sealed underfloor)
- Upgrading window or door seals and appropriately treating sub-floor ventilation
- The sealing of wall vents
- The sealing of the underfloor below the bearers and appropriately treating sub-floors ventilation
- Roof insulation
- The sealing of eaves.