Noise and Vibration Technical Report Addendum

Muswellbrook Bypass - Construction and Operation Noise and Vibration Assessment

August 2025
Doc No. 60619756_RPNV_02-B

aecom.com

Delivering a better world

Noise and Vibration Technical Report Addendum

Muswellbrook Bypass - Construction and Operation Noise and Vibration Assessment

Client: Transport for NSW

ABN: 18 804 239 602

Prepared by

AECOM Australia Pty Ltd
Gadigal Country, Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8008 1700 www.aecom.com
ABN 20 093 846 925

17-Jul-2023

Job No.: 60619756

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 and ISO45001.

Quality Information

Document	Noise and Vibration Technical Report Addendum
Ref	60619756
Date	17-Jul-2023
Originator	Laura Keen & Jack Robinson
Checker/s	Gayle Greer
Verifier/s	

Revision History

Rev	Revision Date	Details	Approved	
			Name/Position	Signature
A	08-May-2023	Addendum	Justin Shields Project Manager	
B	17-Jul-2023	Addendum	Justin Shields Project Manager	

Table of Contents

Glossary of Acoustic Terminology i
Executive Summary iv
1.0 Introduction 1
1.1 Purpose of this addendum report 1
1.1 Description of the proposed modification 1
1.2 Main features of the modifications 1
1.2.1 Modification Area 1 – New England Highway, northern project extent 1
1.2.2 Modification Area 2 – Sandy Creek Road Intersection (near chainage 89600) 1
1.2.3 Modification Area 3 – Around Ausgrid Station (near Chainage 88800) 2
1.2.4 Modification Area 4 – Existing Dam and Channel (near chainage 89000) 2
1.2.5 Modification Area 5 – Coal Road Interchange (north) 2
1.2.6 Modification Area 6 – Coal Road (west) 2
1.2.7 Modification Area 7 – Coal Road Interchange (south side) 2
1.2.8 Modification Area 8 – Coal Road Interchange (south side) 3
1.2.9 Modification Area 9 – Existing dam and channel (near chainage 84800) 3
1.2.10 Modification Area 10 – Muscle Creek Rail Bridge (near chainage 83200) 3
1.2.11 Modification Area 11 – Muscle Creek Road (between New England Highway and Bridge 02) 3
1.2.12 Modification Area 12 – New England Highway (west of Muscle Creek Road) 3
1.2.13 Modification Area 13 – Milperra Drive (North) 3
1.2.14 Modification Area 14 – Milperra Drive (south) (near chainage 83200) 3
1.2.15 Modification Area 15 – Southern extent of project boundary (near chainage 81095) 4
1.3 Ancillary Facilities 4
2.0 Noise and vibration criteria 9
2.1 Existing environment 9
2.2 Construction noise and vibration criteria 9
2.3 Operational noise and vibration criteria 9
3.0 Assessment of construction noise and vibration impacts 10
3.1 Construction works 10
3.2 Construction hours 11
3.3 Construction noise modelling and prediction 11
3.3.1 Activities within standard hours 11
3.3.2 Activities outside standard hours 16
3.4 Sleep disturbance 17
3.5 Construction road traffic noise 18
3.6 Construction vibration 18
3.6.1 Surface works 18
3.6.2 Residential buildings and receivers 19
3.6.3 Heritage and other sensitive structures 19
3.7 Overall impact of modification on construction noise and vibration 19
4.0 Assessment of operational noise impacts 22
4.1 Road traffic noise assessment 22
4.2 Overall impact of modification on road traffic noise 22
5.0 Conclusion 23
5.1 Construction Impacts 23
5.2 Operational impacts 24

Appendix A A
Construction noise contours A

List of Tables

Table 3-1 Ancillary facility construction works 10
Table 3-2 Alignment construction works 10
Table 3-3 Modification Area 10 ancillary facility – Standard hours work 12
Table 3-4 Modification Area 13 ancillary facility – Standard hours work 13
Table 3-5 Modification Area 14 ancillary facility – Standard hours work 14
Table 3-6 Works along the alignment – Standard hours work 15
Table 3-7 Modification Area 10 construction compound – Out of hours work 16
Table 3-8 Modification Area 13 construction compound – Out of hours work 16
Table 3-9 Modification Area 14 construction compound – Out of hours work 16
Table 3-10 Works along the alignment – Out of hours work 17
Table 3-11 Modification Area 10 construction compound – Out of hours work – Sleep disturbance 17
Table 3-12 Modification Area 10 construction compound – Out of hours work – Sleep disturbance 17
Table 3-13 Modification Area 14 construction compound – Out of hours work – Sleep disturbance 18
Table 3-14 Works along the alignment – Out of hours work – Sleep disturbance 18
Table 3-15 Recommended minimum working distances for vibration intensive plant 19
Table 3-16 Consistency assessment of proposed modification on construction noise and vibration impacts 20

List of Figures

Figure 1-1: Location of the proposed modification 5
Figure 1-2: Proposed modification (north) 6
Figure 1-3: Proposed modification (south) 7
Figure 1-4: Approved and proposed construction ancillary facilities 8

Glossary of Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

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 1kHz 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 increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

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.
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.
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.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and 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.
Existing road traffic noise model	A model of the existing roads that calculates existing road traffic noise levels. This is used for model validation purposes with concurrently measured road traffic noise levels and traffic counts.
Design noise model	A model of the proposal as it was designed, that calculates road traffic noise levels.
Year of opening	The year that the proposal opens (2026).
Design year	Ten years after the proposal opens (2036).
'Do minimum' option	The 'do minimum' option represents the scenario if the proposal was not to proceed. It is called 'Do Minimum' rather than Do Nothing as it assumes that ongoing improvements would be made to the broader road and public transport network including some new infrastructure and intersection improvements to improve capacity and cater for traffic growth.
Design option	This scenario includes the proposal design alignment. The Road Noise Policy, Road Noise Criteria Guideline, and Road Noise Mitigation Guideline refer to this as the 'Build' scenario.

*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 the EPA's NSW Road Noise Policy.

Abbreviations

Term	Meaning
AADT	Annual Average Daily Traffic
CNVMP	Construction Noise and Vibration Management Plan
dB	Decibel
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2000 (NSW)
EPL	Environment Protection Licence
Heritage Act	*Heritage Act 1977* (NSW)
ICNG	*Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009).
Transport and Infrastructure SEPP	*State Environmental Planning Policy (Transport and Infrastructure) 2021* (NSW)
LEP	Local Environmental Plan
LGA	Local Government Area
NCA	Noise Catchment Area
NML	Noise Management Level
NPfI	*Noise Policy for Industry* (Environment Protection Authority, 2017)
NSW	New South Wales
OEH	NSW Office of the Environment and Heritage
OOHW	Out of Hours Works
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
RBL	Rating Background Level
REF	Review of Environmental Factors
RNP	*Road Noise Policy*, (DECCW, 2011)
RNCG	*Road Noise Criteria Guideline* (Transport, 2022)
RNMG	*Road Noise Mitigation Guideline* (Transport, 2022)
RNMVG	*Road Noise Model Validation Guideline* (Transport, 2022)
Roads and Maritime	Roads and Maritime Services
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
Transport	Transport for NSW
VDV	Vibration Dose Value

Executive Summary

The New England Highway is a major freight and commuter route forming part of the Sydney to Brisbane corridor of the National Land Transport Network and the primary route connecting the Upper Hunter with Newcastle. The highway currently passes through Muswellbrook, forming the main road access through the town.

Highway traffic passes through multiple sets of traffic lights, a roundabout, a school zone and under a narrow railway overpass, which all impact on travel time. The current route causes a restriction to the efficiency of freight/heavy vehicle movements, which also leads to safety and local amenity concerns.

Transport for NSW proposes to build a New England Highway bypass of Muswellbrook to aim to remove conflicts between local and through vehicles, significantly improving the efficiency of through freight movements along the New England Highway, while also improving safety and local amenity.

A review of environmental factors (REF) was prepared for the New England Highway bypass of Muswellbrook in October 2021 (referred to in this addendum REF as the project REF). The project REF was placed on public display between Monday 8 November 2021 and Friday 17 December 2021 for community and stakeholder comment. A submissions report dated June 2022 was prepared to respond to issues raised.

Following public display of the REF, changes have been made to the Proposal to assist with construction staging and access requirements. This report is an addendum to the Technical Report and assesses these changes (the proposed modification). This addendum should be read in conjunction with the Technical Report.

Construction of the Proposal would primarily occur during standard construction hours with some activities taking place outside of these hours. Activities to be carried out outside of standard construction hours include intersection tie-in activities, construction of the upgraded Sandy Creek Road/New England Highway intersection and operation of the proposed construction compound sites. This is to minimise disruption to daily traffic and disturbance to surrounding landowner and businesses.

Construction noise

A construction noise impact assessment has been completed in accordance with the *Interim Construction Noise Guideline* and *Construction Noise and Vibration Guideline*. Reasonable worst-case construction scenarios have been assessed. Construction would comprise works at construction ancillary facilities and works which would progress along the alignment. The assessment was undertaken for both standard hours and for applicable out of hours works.

To facilitate the assessment at nearby noise and vibration sensitive receivers, noise catchment areas were identified (i.e. areas in which receivers are considered to experience a similar noise environment). Noise and vibration sensitive receivers include residential properties, places of worship and recreational areas. Background noise levels were monitored at three locations to determine appropriate construction noise management levels.

The assessment indicates exceedances of the *Interim Construction Noise Guideline* noise management levels at some sensitive receivers during standard hours. No receivers are predicted to be highly noise affected close to the construction ancillary facilities. The noisiest ancillary facility construction works would be site establishment works. Noise levels from the works associated with the alignment would exceed the noise management levels at nearby receivers during a number of scenarios. The earthworks and pavement works are likely to cause the largest number of exceedances of the noise management levels. Most exceedances would be less than 10 dB(A), however some residences are predicted to be highly noise affected and the number of these residences has increased from the number presented in the Technical Report. The number of highly affected residences predicted are as follows:

- Up to 12 residences are predicted to be highly noise affected during earthworks. This is six more residences affected compared to the determined Proposal.
- Up to nine residences are predicted to be highly noise affected during pavement works. This is an increase of eight compared to the determined Proposal.

- Up to eight residences are predicted to be highly noise affected during finishing works and seven residences during utility relocations. No residences were predicted to be highly affected for these scenarios in the determined Proposal.
- The majority of highly affected residences are located in the NCA3 catchment area. This is due to the works associated with the upgrade of the Sandy Creek Road intersection in Modification Area 2.

During out of hours works exceedances of the noise management levels would occur at some sensitive receivers. Exceedances would be less than 15 dB(A) at ancillary facilities. The noisiest out of hours construction works at ancillary facilities would be associated with the laydown, storage and delivery of materials and plant. Noise levels from the works associated with the alignment would exceed the noise management levels at nearby receivers during a number of scenarios. Pavement and utility relocation works are likely to cause the largest number of exceedances of the NMLs and awakening reactions. Most exceedances of the NMLs would be less than 15 dB(A), however up to 15 residences are predicted to have exceedances of greater than 25 dB(A).

Overall, earthworks would have the greatest impacts (considering timing, duration, and noise impacts). This work would be undertaken during standard hours. As these works are progressive in nature, however, receivers would not be affected for the whole duration of construction works. Effective noise mitigation and management measures would need to be developed by the contractor to reduce the potential noise impacts from the works.

Minimum working distances for vibration intensive construction works have been presented and are up to 25 m for residential structures when considering the most vibration-intensive plant. Equipment size would be selected by the contractor considering the minimum working distances and the distance between the area of construction and the most affected sensitive receiver. If works need to be undertaken within cosmetic damage minimum working distances, vibration monitoring would be undertaken and site specific minimum working distances determined.

Noise from construction vehicle movements would be consistent with that predicted in the determined Proposal.

The magnitude of these impacts is consistent with other major works projects and highlights the need for effective noise mitigation and management planning. Measures have been recommended which would reduce construction noise impacts. The number, degree and nature of these measures would ultimately be selected by the contractor and be largely dependent on the construction strategy and work undertaken. Specific noise management and mitigation measures would be detailed in the contractor's Construction Noise and Vibration Management Plan.

Operational Impacts

An operational road traffic impact noise assessment has been completed in accordance with the Environment Protection Authority's *NSW Road Noise Policy* and Transport for NSW's *Road Noise Criteria Guideline* and *Road Noise Mitigation Guideline* and documented in the Technical Report.

The proposed modification has been reviewed to consider how it would affect operational road traffic noise. Given that traffic is not moving closer to the noise sensitive receivers located to the west of the New England Highway and speed limits are not increasing, it can be determined that road traffic noise levels will not increase by more than 2 dB(A). No additional operational noise mitigation measures are required as a result of this proposed modification.

1.0 Introduction

1.1 Purpose of this addendum report

Transport for New South Wales (Transport) proposes to build a New England Highway bypass of Muswellbrook. The Proposal is located to the east of Muswellbrook and connects the New England Highway to the north and south of Muswellbrook. AECOM Australia Pty Ltd (AECOM) prepared a Review of Environmental Factors (REF) for the New England Highway bypass of Muswellbrook (the Proposal) (AECOM, 2021a), including a Noise and Vibration Technical Report (Technical Report) (September 2021) (AECOM, 2021b).

Following public display of the REF, ongoing design development and construction planning resulted in design changes to the Proposal. These changes are detailed in Section 1.2 below.

This report is an addendum to the Technical Report to assess these changes (the proposed modification). This addendum should be read in conjunction with the Technical Report.

1.1 Description of the proposed modification

The proposed modifications are as follows:

- Upgrading the intersection of Sandy Creek Road and the New England Highway
- Widening Milpera Drive and installing pipe culverts units along the western edge of Milpera Drive
- Maintenance of existing roadway along Muscle Creek Road, Milpera Drive and Coal Road
- Construction of new dams and relocation of existing dams further from the proposed road corridor
- Construction of additional temporary ancillary facilities
- Construction of new access tracks and working platforms and use of existing access tracks
- Relocation of utilities and vegetation trimming where required
- Installation of directional signage
- Temporary instream crossing structures.

1.2 Main features of the modifications

Locations of the Modification Areas are provided in Figure 1-1, Figure 1-2 and Figure 1-3.

1.2.1 Modification Area 1 – New England Highway, northern project extent

Installation of southbound directional signage in advance of the northern connection. This would include ground clearance/excavation and installation of poles and signs.

1.2.2 Modification Area 2 – Sandy Creek Road Intersection (near chainage 89600)

To improve the safety profile of the intersection to cater for increased traffic volumes during construction of the bypass and to allow access to water and copper utilities along Sandy Creek to allow extended relocation footprint (if required)

Construction of upgraded intersection and relocation of utilities along Sandy Creek Road including:

- Left-hand and right-hand turn lanes
- Intersection resealing
- Line marking adjustments
- Extension of utility pits and relocation of light pole.

1.2.3 Modification Area 3 – Around Ausgrid Station (near Chainage 88800)

To enable access along existing tracks within private lands but outside of the assessed boundary and construction footprint and to enable relocation of utilities (including establishment of new accesses and working platforms)

Utilisation of existing access tracks and construction of new access tracks and working platforms. This would include:

- Laying gravel on existing tracks, if required, and on new tracks
- Relocating existing utility assets
- Trimming/removing vegetation as required.

1.2.4 Modification Area 4 – Existing Dam and Channel (near chainage 89000)

To enable modification of the existing dam and realignment of the watercourse to move them away from the permanent road alignment to reduce the risk of saturation and failure of the road embankment.

Modification of the existing dam and realignment of the watercourse feeding the dam to outside of the proposed road corridor. This would include:

- Draining the dam
- Realigning the dam walls
- Installing additional earth between the proposed road corridor (toe of the batter) and the edge of the dam.

1.2.5 Modification Area 5 – Coal Road Interchange (north)

To allow access to High Voltage power lines using existing access tracks for relocation as early works (avoid constructing new accesses over steep terrain) and to enable construction of replacement overhead electrical utilities between the MCC Substation and MCC offices to replace the lines proposed for removal at Skelatar Cut (part of the determined Proposal)

Utilisation of existing access tracks and construction of new access tracks and working platforms. This would include:

- Laying gravel on existing tracks, if required, and on new tracks
- Relocating existing utility assets
- Trimming/removing vegetation as required.

1.2.6 Modification Area 6 – Coal Road (west)

To allow construction of utilities along Coal Rd, maintenance of Coal Rd access during construction and an extension of tie in works (if required by detailed design).

Pavement maintenance and reconstruction along Coal Road. This would include the relocation of existing utility and assets and vegetation trimming/removal as required.

1.2.7 Modification Area 7 – Coal Road Interchange (south side)

To allow access along the existing access track from Coal Rd along the eastern side of the alignment for early works, to allow relocation of the farm dam and to provide opportunities to refine the Coal Road Interchange design to include a northbound off-ramp on the southern side of Coal Road.

Utilisation of the existing access tracks and construction of new access tracks and working platforms. This would include:

- Laying gravel on existing tracks, if required, and on new tracks
- Relocation of existing utility assets
- Trimming/removal of vegetation as required
- Removal and relocation of existing dam further from the proposed road corridor.

1.2.8 Modification Area 8 – Coal Road Interchange (south side)

To allow access to relocate electrical utilities over Skelatar Cut.

Utilisation of existing access tracks and construction of new access tracks and working platforms. This would include:

- Laying gravel on existing tracks, if required, and on new tracks
- Relocation of existing utility assets
- Trimming/removal of vegetation as required.

1.2.9 Modification Area 9 – Existing dam and channel (near chainage 84800)

To enable reconstruction of the existing dam outside of the road boundary.

Construction of a new dam. This would include stripping topsoil, constructing the dam wall and realigning the upstream earth to feed into the dam (if required).

1.2.10 Modification Area 10 – Muscle Creek Rail Bridge (near chainage 83200)

To provide an alternate access past the rail line for use during construction and to provide an alternate location for a construction compound site.

Construction of access track from Muscle Creek Road to the northern side of the railway, extending beneath the existing rail bridge over Muscle Creek.

Construction of temporary construction compound site (including storage, laydown area, offices, parking and material construction yard).

Relocation of utilities, if required, for safe operation and access.

1.2.11 Modification Area 11 – Muscle Creek Road (between New England Highway and Bridge 02)

Extension of assessment footprint and construction boundary along Muscle Creek Road.

Maintenance of Muscle Creek Road, including pavement repair, sealing, line-marking signage/delineation and vegetation trimming as required.

1.2.12 Modification Area 12 – New England Highway (west of Muscle Creek Road)

Identified area for the installation of road signage as per Concept Directional Signage roll plot.

Installation of directional signage, which would include ground clearance/excavation and installation of poles and signs.

1.2.13 Modification Area 13 – Milperra Drive (North)

Enable establishment of additional site compound/storage area within Lot 7 DP 249566, to allow widening of Milperra Drive if needed to access the additional site compound/storage area and to allow maintenance of Milperra Drive during construction (if needed) in response to pavement damage due to construction vehicle usage

Maintenance of Milperra Drive including pavement repair, sealing, line-marking signage/delineation and vegetation trimming as required.

Construction of temporary construction compound site (including storage, laydown area, offices, parking and material construction yard).

1.2.14 Modification Area 14 – Milperra Drive (south) (near chainage 83200)

To allow construction of local road improvements between the existing and proposed intersections of Milpera Drive, to allow construction of continued access along the Travelling Stock Route (TSR) once the new Milpera Drive intersection is constructed and to enable a construction compound site to be constructed in the area between the existing and proposed Milpera Drive intersections

Widening of Milperra Drive between the existing and proposed intersection including the installation of pipe culvert units in the drain on the western edge of Milperra Drive.

Construction of temporary construction compound site (including storage, laydown area, offices, parking and material construction yard)

1.2.15 Modification Area 15 – Southern extent of project boundary (near chainage 81095)

Installation of northbound directional signage in advance of the southern connection. This would include ground clearance/excavation and installation of poles and signs.

1.3 Ancillary Facilities

As part of the proposed modification, an additional three areas (modification areas 10, 13 and 14) have been identified for the use of ancillary facilities.

All three areas would be used for the installation and use of a temporary construction compound site including storage, laydown area, offices, parking and material construction yard. These construction compound sites may also include asphalt and concrete batching plants.

Consistent with the project REF, construction compound sites would include portable buildings with amenities such as toilets, secure and bunded storage areas for site materials including fuel and chemicals, office space for on-site personnel and associated parking. Construction compound sites would be securely fenced with temporary fencing and signage erected advising the general public of access restrictions.

Upon completion of construction, the proposed ancillary facilities would be removed, cleared of all rubbish and construction materials and rehabilitated.

No other changes to the number and placement of construction ancillary facilities are required for the proposed modification. The noise and vibration impacts of the other proposed construction ancillary facilities that have not changed are provided in Section 4.3 of the Technical Report.

The location of all ancillary facilities for the project are shown in Figure 1-4.

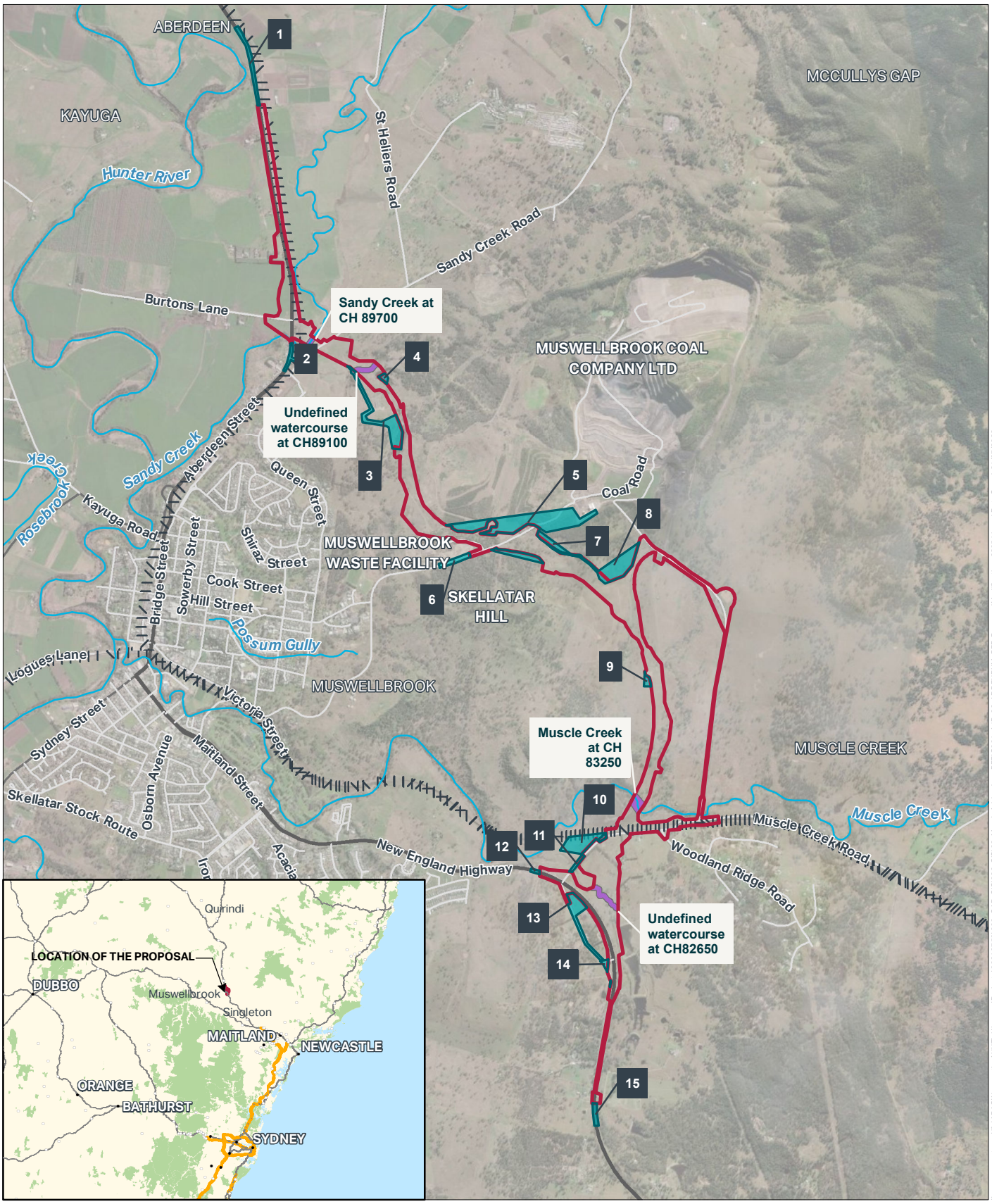


FIGURE 1-1: LOCATION OF THE PROPOSED MODIFICATION

Legend

- Construction Footprint
- Proposed Modification Area
- Indicative location of temporary instream structures
- State Road
- Regional Road
- Local Road
- Railway
- Watercourse

N

0 0.5 1 km

AECOM

\\naaecomne1cc\mfs\APAC\Newcastle-AUNTL1\Legacy\Projects\60619756\900_CAD_GIS\920_GIS\02_Maps_Addendum_REF\G001_A4P_02_ADDENDUM_REF_ProposedModification_230511.mxd Date Saved: 31/07/2023

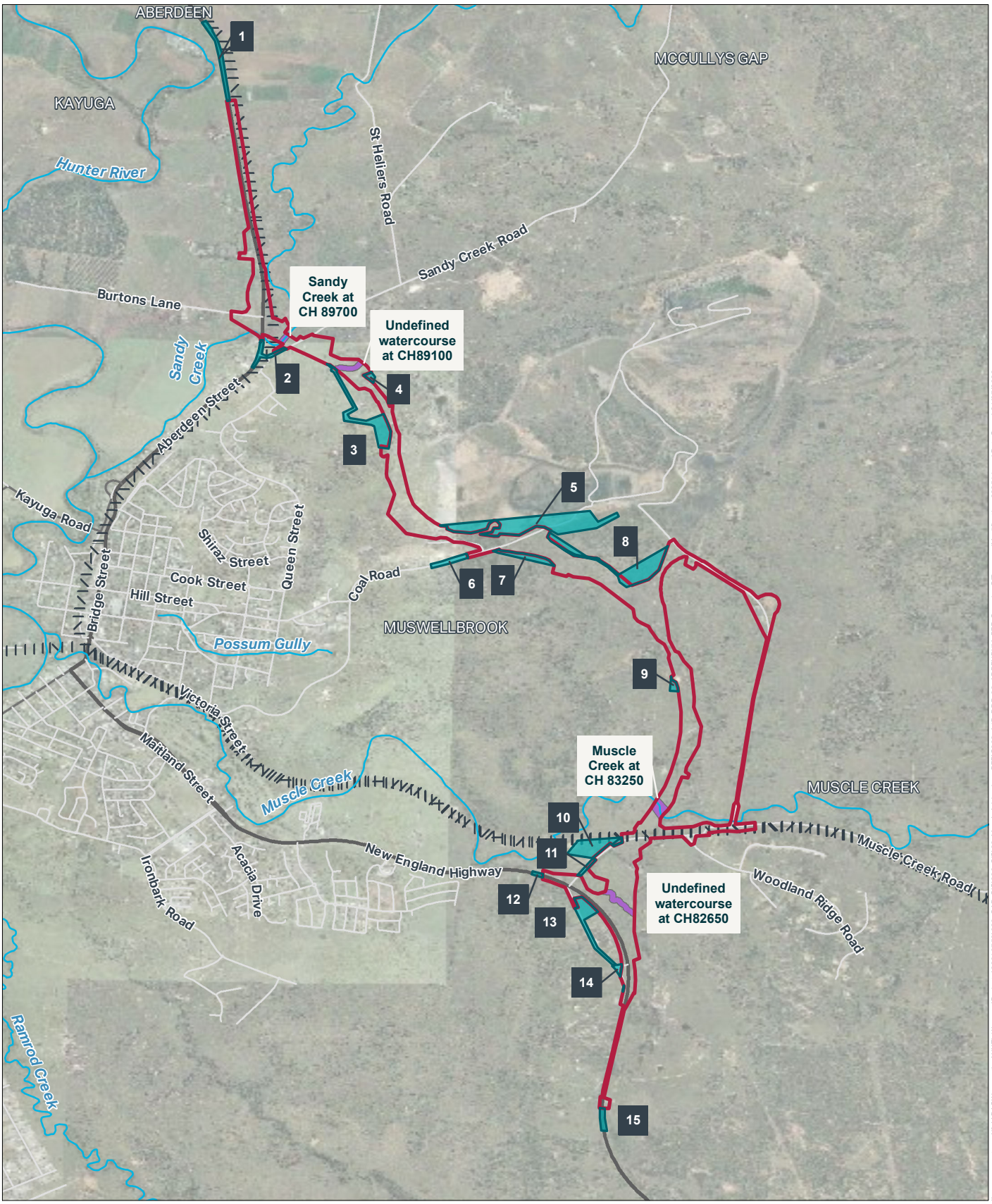


FIGURE 1-2: OVERVIEW OF THE PROPOSED MODIFICATION

Legend

- Construction footprint
- Proposed modification figures
- Indicative location of temporary instream structures
- State Road
- Regional Road
- Local Road
- Railway
- Watercourse

N

0 0.5 1 km

AECOM

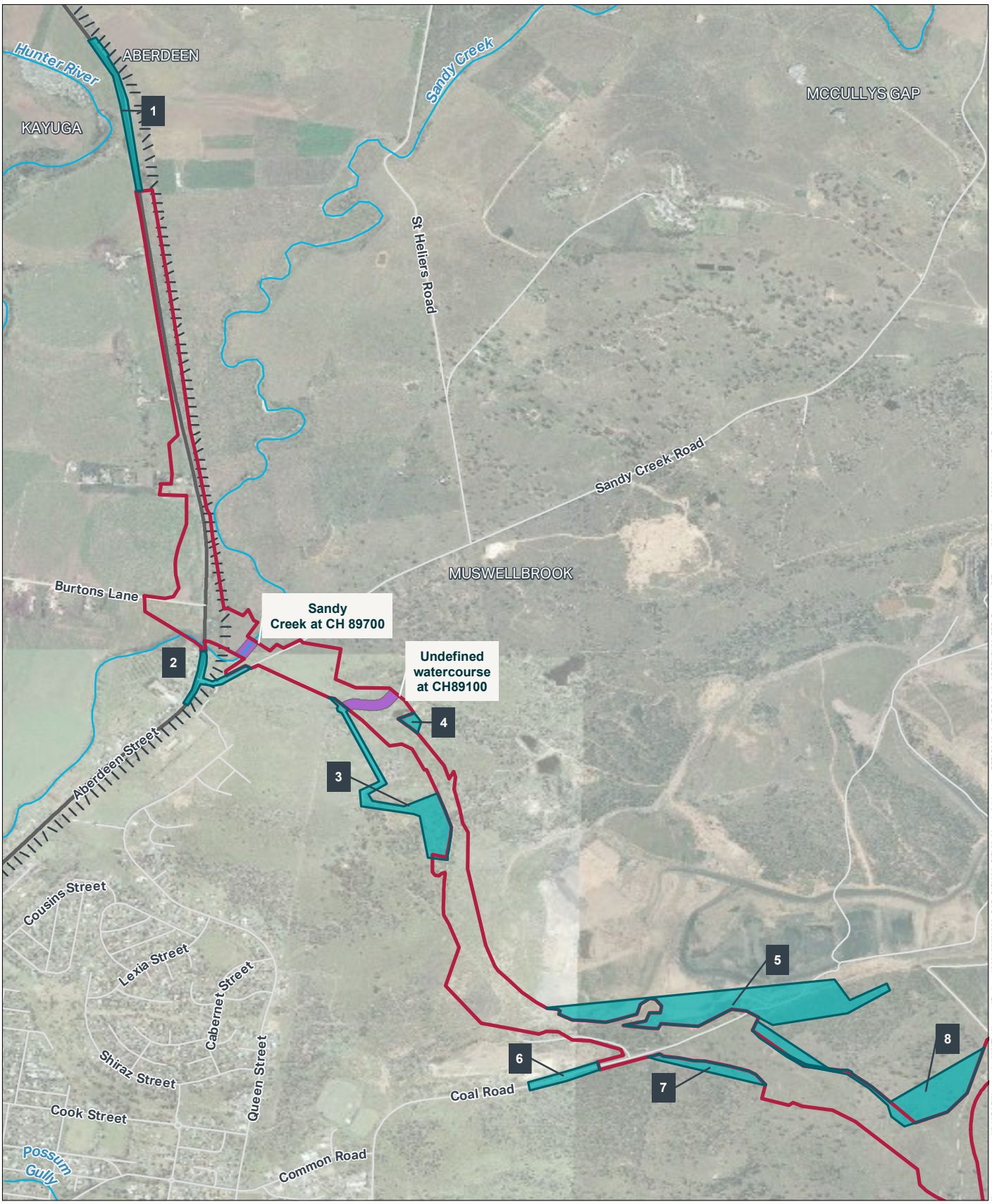


FIGURE 1-2: PROPOSED MODIFICATION (NORTH)

N 0 0.5 1 km

AECOM

Legend

- Construction footprint
- Proposed modification figures
- Indicative location of temporary instream structures
- State Road
- Local Road
- Railway
- Watercourse

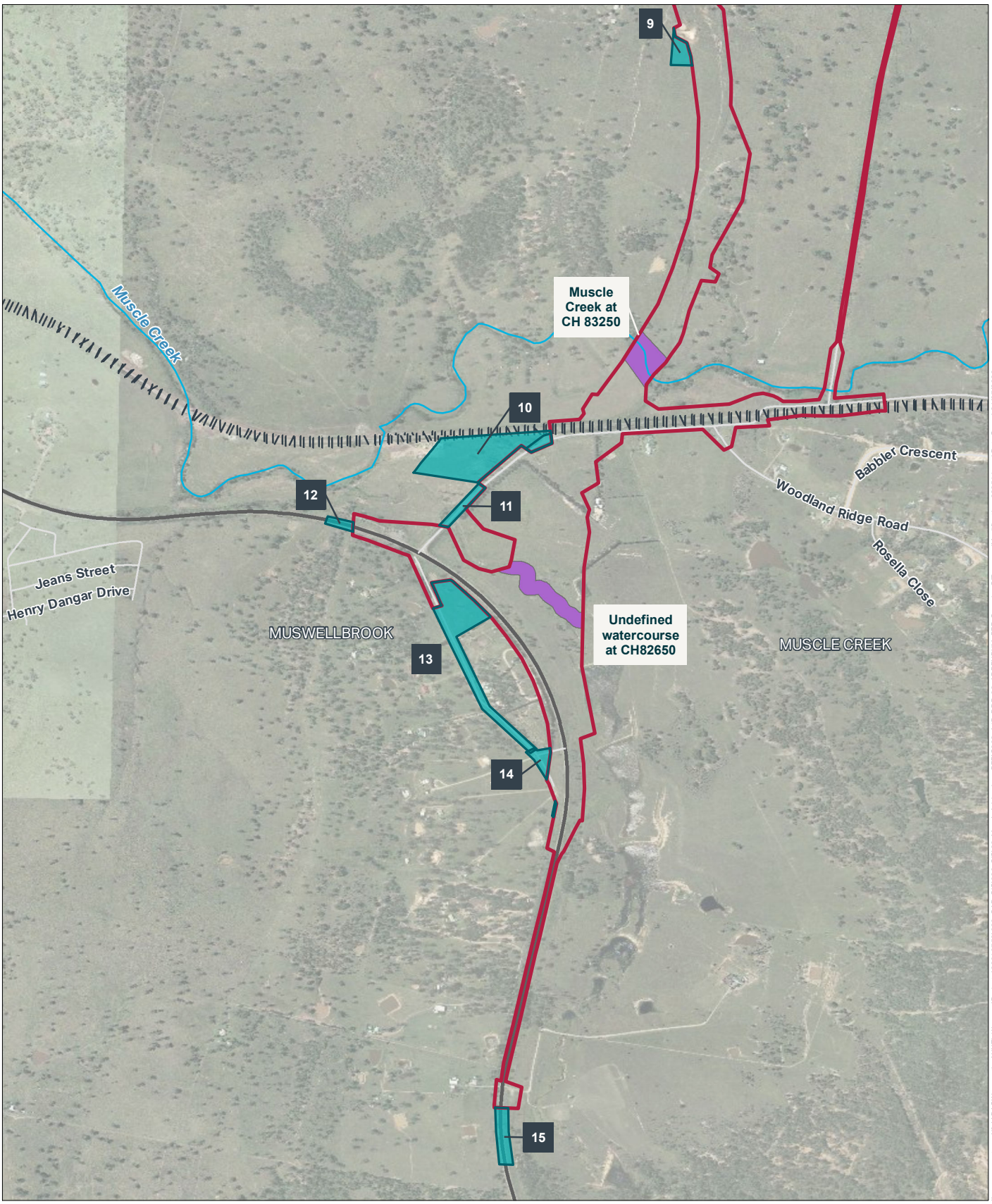


FIGURE 1-3: PROPOSED MODIFICATION (NORTH)

N

0 0.5 1 km

AECOM

Legend

- Construction footprint
- Proposed modification figures
- Indicative location of temporary instream structures
- State Road
- Local Road
- Railway
- Watercourse

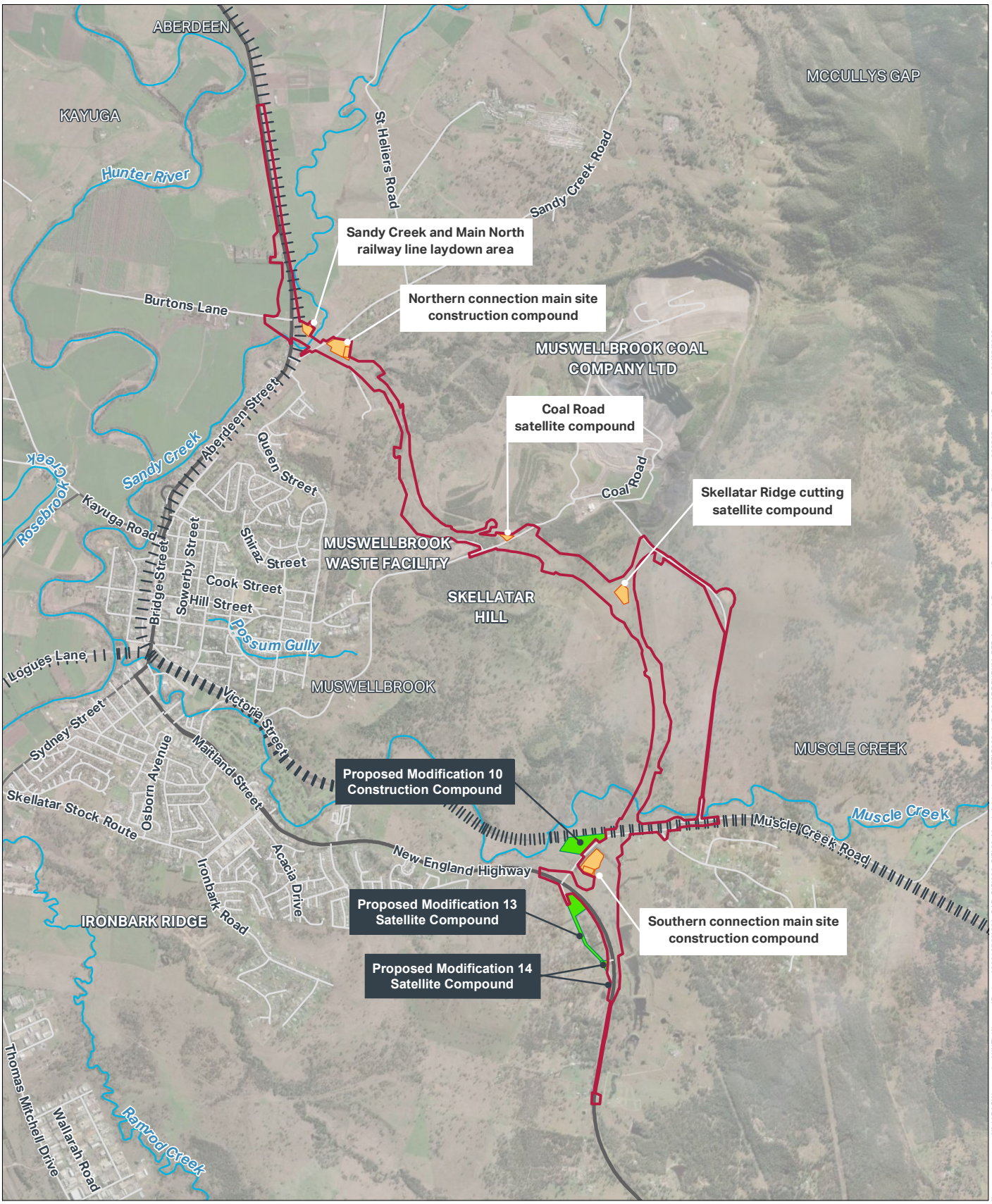


FIGURE 1-4: APPROVED AND PROPOSED ANCILLARY FACILITIES

Legend

- Construction Footprint
- Proposed Modification Ancillary Facilities
- Project REF Ancillary Facilities
- State Road
- Regional Road
- Local Road
- Railway
- Watercourse

N

0 1 2 km

AECOM

\\naaecomnet.com\fs\APAC\Newcastle-AUNTL1\Legacy\Projects\60619776\1900_CAD_GIS\920_GIS\02_Maps_Addendum_REF\G003_A4P_02_ADDENDUM_REF_ApprovedvsProposedConstructionAncillaryFacilities_230505.mxd Date Saved: 31/07/2023

2.0 Noise and vibration criteria

2.1 Existing environment

A description of the existing acoustic environment around the Muswellbrook Bypass was presented in Chapter 2 of the Noise and Vibration Technical Report – Muswellbrook Bypass – Construction and Operational Noise and Vibration Assessment (Technical Report) (Doc No. 60619756_REP_EV_05) Revision E dated 1 September 2021.

2.2 Construction noise and vibration criteria

Construction noise and vibration criteria were presented in Section 3.2, 3.3, 3.4 and 3.5 of the Technical Report and are unchanged.

2.3 Operational noise and vibration criteria

Operational noise criteria were presented in Section 3.6 of the Technical Report and are unchanged.

3.0 Assessment of construction noise and vibration impacts

3.1 Construction works

As noted in Section 1.3, changes to the construction footprint are proposed to assist with construction staging and access requirements.

Table 3-1 and Table 3-2 provide matrix summaries of the works to be undertaken at modified areas.

Table 3-1 Ancillary facility construction works

Construction activities	Modification Area 10	Modification Area 13	Modification Area 14
Vegetation clearing[1]	✓	✓	✓
Utility relocations	✓	✓	✓
Establishment of site offices, amenities and temporary infrastructure including fencing	✓	✓	✓
Laydown, storage and delivery of materials and plant	✓	✓	✓
Stockpiling	✓	✓	✓
Demobilisation	✓	✓	✓

Notes:

1. *Vegetation removal at ancillary sites is likely to be minimal and take around one day to complete.*

Table 3-2 Alignment construction works

Construction activities	Modification Area 2	Modification Area 3	Modification Area 4	Modification Area 5	Modification Area 6	Modification Area 7	Modification Area 8	Modification Area 9	Modification Area 10	Modification Area 11	Modification Area 13	Modification Area 14
Earthworks	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
Drainage												✓
Pavement works	✓				✓	✓				✓	✓	✓
Finishing works	✓				✓	✓				✓	✓	✓
Utility relocations	✓	✓		✓	✓		✓		✓			

The works to be undertaken at Modification Areas 1, 12 and 15 comprise installation of signage, which would be undertaken during standard construction hours only. These works would occur adjacent to the area of works presented in the Technical Report. Given the relatively low noise levels produced by these works, noise levels at sensitive receivers would be substantially lower than noise levels from construction activities modelled in the Technical Report. Modification Areas 1, 12 and 15 have therefore not been considered further in this Addendum Report.

In addition to the works outlined above, up to four temporary instream crossing structures have been identified. These structures are within the works zone assessed for Earthworks in the Technical Report. Based on the construction of the temporary instream crossings utilising equivalent plant to the Earthworks the impact of the temporary instream crossings have not been considered further in this report. However, the Construction Contractor will determine the final structure based on detailed designs and may require additional impact assessment should plant differ from that used for Earthworks.

Construction equipment and associated sound power levels typically used in these work packages are identified in Section 3 of the Technical Report.

3.2 Construction hours

Construction hours were presented in Section 4.2 of the Technical Report. No changes are proposed to construction hours.

3.3 Construction noise modelling and prediction

The construction noise and vibration impact assessment methodology and assumptions were presented in Section 4.3 of the Technical Report.

The following sections present the construction noise impact assessment due to the proposed modifications. Discussion regarding the impacts to any other sensitive receivers (such as schools and places of worship) is presented below the tables.

3.3.1 Activities within standard hours

The noise modelling results for standard hours of construction are provided in Table 3-3 to Table 3-6. For the ancillary facilities only the vegetation removal works, stockpiling and the demobilisation scenarios have been modelled as these represent the worst case scenarios. Noise levels from the laydown and storage of materials would be slightly lower than the stockpiling scenario and would occur infrequently throughout the daytime period.

The tables present the noise management levels and the highest predicted construction noise levels at a noise sensitive receiver for each noise catchment area. The tables also present the number of receivers where the construction noise levels are predicted to exceed the noise management level (and to what extent) and the highly noise affected level for each noise catchment area. The predicted construction noise levels are also provided graphically in Appendix 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. The assessed scenario does not represent the ongoing day to day noise impact at noise sensitive receivers for an extended period of time.

Particularly noisy activities, such as piling and use of concrete saws, would not persist for the entire 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.

For linear works (works that move along the road alignment, rather than works located at a construction ancillary facility), noise exposure at each receiver would reduce due to increases in distance loss as the works progress along the alignment.

The reported maximum noise level is for the highest noise level during that construction scenario. The reported number of receivers where noise levels are expected to exceed the noise management levels is based on the reported maximum noise level. Typically the number of sensitive receivers exceeding the noise management levels would be reduced appreciably depending on instantaneous operating conditions.

The *Interim Construction Noise Guideline* states that where a construction noise impact level of greater than 75 dB(A) is predicted, a receiver is considered to be ‘highly noise affected’ and afforded additional consideration for mitigation. The receivers where noise levels exceed 75 dB(A) can be identified on the noise contours provided in Appendix A. The potential for highly noise affected receivers would be

confirmed during detailed construction planning. Respite periods would also be considered for these receivers in accordance with the *Interim Construction Noise Guideline*.

The predictions outlined below indicate that noise levels at commercial and industrial receivers would generally remain compliant with the applicable noise management levels. This would be confirmed in more detail by the contractor in the Construction Noise and Vibration Management Plan (CNVMP).

3.3.1.1 Modification Area 10

Table 3-3 Modification Area 10 ancillary facility – Standard hours work

NCA	L_{Aeq} NML dB(A)	Maximum L_{Aeq} noise level dB(A)	NML exceedance			Highly noise affected
			1 10 dB(A)	11 20 dB(A)	> 20 dB(A)	
Utility relocations						
NCA1	43	44	1	0	0	0
Vegetation clearing						
NCA1	43	46	2	0	0	0
Establishment work						
NCA1	43	48	5	0	0	0
Laydown, storage and delivery of materials and plant						
NCA1	43	37	0	0	0	0
Stockpiling						
NCA1	43	37	0	0	0	0
Demobilisation						
NCA1	43	42	0	0	0	0

Noise levels from the works associated with additional compound within Modification Area 10 would slightly exceed the noise management levels at nearby receivers during a number of scenarios. The affected catchment area would be NCA 1. The predicted exceedances are less than 10 dB(A). No residences are predicted to be highly noise affected.

3.3.1.2 Modification Area 13

Table 3-4 Modification Area 13 ancillary facility – Standard hours work

NCA	L_{Aeq} NML dB(A)	Maximum L_{Aeq} noise level dB(A)	NML exceedance			Highly noise affected
			1 10 dB(A)	11 20 dB(A)	> 20 dB(A)	
Utility relocations						
NCA1	43	51	4	1	0	0
Vegetation clearing						
NCA1	43	53	6	1	0	0
Establishment work						
NCA1	43	55	5	3	0	0
Laydown, storage and delivery of materials and plant						
NCA1	43	44	2	0	0	0
Stockpiling						
NCA1	43	44	2	0	0	0
Demobilisation						
NCA1	43	49	5	0	0	0

Noise levels from the work associated with the additional compound within Modification Area 13 would exceed the noise management levels at nearby receivers during a number of scenarios. The affected catchment area would be NCA1. The majority of exceedances are less than 10 dB(A). Exceedances of less than 20 dB(A) are expected at one residence during utility relocations and vegetation clearing and at three residences during establishment works. These three activities are very limited in duration. No residences are predicted to be highly noise affected.

3.3.1.3 Modification Area 14

Table 3-5 Modification Area 14 ancillary facility – Standard hours work

NCA	L_{Aeq} NML dB(A)	Maximum L_{Aeq} noise level dB(A)	NML exceedance			Highly noise affected
			1 10 dB(A)	11 20 dB(A)	> 20 dB(A)	
Utility relocations						
NCA1	43	53	7	0	0	0
Vegetation clearing						
NCA1	43	55	7	1	0	0
Establishment work						
NCA1	43	57	9	1	0	0
Laydown, storage and delivery of materials and plant						
NCA1	43	46	1	0	0	0
Stockpiling						
NCA1	43	46	1	0	0	0
Demobilisation						
NCA1	43	51	4	0	0	0

Noise levels from the work associated with the additional compound within Modification Area 14 would exceed the noise management levels at nearby receivers during a number of scenarios. The affected catchment area would be NCA1. The majority of exceedances are less than 10 dB(A). Exceedances of less than 20 dB(A) are expected at one residence during vegetation clearing and establishment. These two activities are very limited in duration. No residences are predicted to be highly noise affected.

3.3.1.4 Alignment works

Table 3-6 Works along the alignment – Standard hours work

NCA	L_{Aeq} NML dB(A)	Maximum L_{Aeq} noise level dB(A)	NML exceedance			Highly noise affected
			1 10 dB(A)	11 20 dB(A)	> 20 dB(A)	
Earthworks						
NCA1	43	83	7	17	6	2
NCA2	46	48	15	0	0	0
NCA3	42	83	71	23	15	10
Drainage						
NCA1	43	61	14	5	0	0
NCA2	46	45	0	0	0	0
NCA3	42	57	65	2	0	0
Utility relocation						
NCA1	43	52	12	0	0	0
NCA2	46	49	14	0	0	0
NCA3	42	83	65	31	11	7
Pavement works						
NCA1	43	83	12	11	7	1
NCA2	46	52	92	0	0	0
NCA3	42	83	39	54	16	8
Finishing works						
NCA1	43	83	10	7	1	1
NCA2	46	44	0	0	0	0
NCA3	42	83	75	9	10	7

Noise levels from the works associated with the alignment would exceed the NMLs at nearby receivers during a number of scenarios. The pavement works, utility relocations and earthworks are likely to cause the largest number of exceedances of the noise management levels. The majority of exceedances are less than 10 dB(A), however a number of exceedances are also expected in the 11-20 dB(A) range with some exceedances greater than 20 dB(A) predicted.

Up to 12 residences are predicted to be highly noise affected during earthworks. This is six more residences affected compared to the determined Proposal.

Up to nine residences are predicted to be highly noise affected during pavement works. This is an increase of eight compared to the determined Proposal.

Up to eight residences are predicted to be highly noise affected during finishing works and seven residences during utility relocations. No residences were predicted to be highly affected for these scenarios in the determined Proposal.

The majority of highly affected residences are located in the NCA3 catchment area. This is due to the works associated with the upgrade of the Sandy Creek Road intersection in Modification Area 2.

3.3.2 Activities outside standard hours

The out of hours work construction noise modelling results are provided in Table 3-7 to Table 3-10. The results are also provided graphically in Appendix A.

3.3.2.1 Modification Area 10

Table 3-7 Modification Area 10 construction compound – Out of hours work

NCA	L_{Aeq} NML dB(A)	Maximum L_{Aeq} noise level dB(A)	NML exceedance			NML exceedance
			1 5 dB(A)	6 15 dB(A)	16 25 dB(A)	> 25 dB(A)
Laydown, storage and delivery						
NCA1	35	37	2	0	0	0

Noise levels from the works associated with the Modification Area 10 additional compound may slightly exceed the noise management levels at nearby receivers during the laydown, storage and delivery works. The affected catchment area would be NCA1. The exceedances are less than 5 dB(A).

3.3.2.2 Modification Area 13

Table 3-8 Modification Area 13 construction compound – Out of hours work

NCA	L_{Aeq} NML dB(A)	Maximum L_{Aeq} noise level dB(A)	NML exceedance			
			1 5 dB(A)	6 15 dB(A)	16 25 dB(A)	> 25 dB(A)
Laydown, storage and delivery						
NCA1	35	47	1	5	0	0

Noise levels from the works associated with the Modification Area 13 additional compound would exceed the noise management levels at nearby receivers during the laydown, storage and delivery works. The affected catchment area would be NCA1. The exceedances are less than 15 dB(A).

3.3.2.3 Modification Area 14

Table 3-9 Modification Area 14 construction compound – Out of hours work

NCA	L_{Aeq} NML dB(A)	Maximum L_{Aeq} noise level dB(A)	NML exceedance			
			1 5 dB(A)	6 15 dB(A)	16 25 dB(A)	> 25 dB(A)
Laydown, storage and delivery						
NCA1	35	46	5	2	0	0

Noise levels from the works associated with the Modification Area 14 additional compound would exceed the noise management levels at nearby receivers during the laydown, storage and delivery works. The affected catchment areas would be NCA1. The exceedances are less than 15 dB(A).

3.3.2.4 Alignment works

Table 3-10 Works along the alignment – Out of hours work

NCA	L_{Aeq} NML dB(A)	Maximum L_{Aeq} noise level dB(A)	NML exceedance			
			1 5 dB(A)	6 15 dB(A)	16 25 dB(A)	> 25 dB(A)
Utility relocation						
NCA1	35	52	6	14	8	0
NCA2	40	49	21	0	0	0
NCA3	37	83	47	46	10	2
Pavement works						
NCA1	35	83	0	13	10	7
NCA2	40	52	69	92	0	0
NCA3	37	83	0	67	34	8

Noise levels from the works associated with the alignment would exceed the noise management levels at nearby receivers during a number of scenarios. The pavement works are likely to cause the largest number of exceedances of the noise management levels. The majority of exceedances are less than 15 dB(A), however a number of exceedances of greater than 25 dB(A) are predicted. It should be noted that the majority of works along the alignment will be undertaken during standard hours, however works may be carried out outside these hours to minimise traffic and rail disruptions and to offset wet weather delays.

3.4 Sleep disturbance

Sleep disturbance is assessed using an $L_{A1(1\ min)}$ parameter, which is considered to be the maximum noise level excluding extraneous noise events. A sleep disturbance assessment has been undertaken for the proposed night works with the construction information available to date. The noise modelling results are provided in Table 3-11 to Table 3-14 with predicted noise levels compared with the sleep disturbance screening criteria and the awakening reaction criteria.

3.4.1.1 Modification Area 10 construction compound

Table 3-11 Modification Area 10 construction compound – Out of hours work – Sleep disturbance

NCA	Sleep disturbance criteria dB(A)	Maximum $L_{A1(1min)}$ noise level dB(A)	Number of Sleep disturbance exceedances	Awakening reaction
Laydown, storage and delivery				
NCA1	45	44	0	0

No exceedances of the sleep disturbance criteria have been predicted due to the laydown works.

3.4.1.2 Modification Area 13 construction compound

Table 3-12 Modification Area 10 construction compound – Out of hours work – Sleep disturbance

NCA	Sleep disturbance criteria dB(A)	Maximum $L_{A1(1min)}$ noise level dB(A)	Number of Sleep disturbance exceedances	Awakening reaction
Laydown, storage and delivery				
NCA1	45	54	5	0

No exceedances of the sleep disturbance criteria have been predicted due to the laydown works.

3.4.1.3 Modification Area 14 construction compound

Table 3-13 Modification Area 14 construction compound – Out of hours work – Sleep disturbance

NCA	Sleep disturbance criteria dB(A)	Maximum $L_{A1(1min)}$ noise level dB(A)	Number of Sleep disturbance exceedances	Awakening reaction
Laydown, storage and delivery				
NCA1	45	46	1	0

No exceedances of the sleep disturbance criteria have been predicted due to the laydown works.

3.4.1.4 Alignment works

Table 3-14 Works along the alignment – Out of hours work – Sleep disturbance

NCA	Sleep disturbance criteria dB(A)	Maximum $L_{A1(1min)}$ noise level dB(A)	Number of Sleep disturbance exceedances	Awakening reaction
Utility relocation				
NCA1	45	59	2	0
NCA2	50	56	95	0
NCA3	47	90	108	7
Pavement works				
NCA1	45	87	30	8
NCA2	50	56	92	0
NCA3	47	87	109	17

The pavement and utility relocation construction works are likely to cause the largest number of exceedances of the sleep disturbance criterion. Exceedances of the awakening reaction criterion are expected within NCA1 and NCA3. As the alignment works are progressive in nature receivers would not be affected for the whole duration of construction works.

3.5 Construction road traffic noise

Traffic numbers, management and access during construction would be consistent with the arrangements for the determined Proposal with the addition of the use of some new and existing access tracks. The predicted relative increase in traffic noise levels due to construction vehicle movements therefore remains unchanged from that presented for the determined Proposal.

Construction traffic is not anticipated to exceed the +2 dB(A) screening criterion for construction road traffic noise.

3.6 Construction vibration

3.6.1 Surface works

In order to comply with the cosmetic/structural damage and human discomfort criteria presented in Section 3.3 of the Technical Report vibration intensive works should not be undertaken within the minimum working distances presented in Table 3-15.

Table 3-15 Recommended minimum working distances for vibration intensive plant

Plant	Rating/ description	Heritage (metres)	Cosmetic damage (metres)	Human response (metres)
Vibratory roller	< 50 kN (typically 1-2T)	8	5	15
	< 100 kN (typically 2-4T)	10	6	20
	< 200 kN (typically 4-6T)	20	12	40
	< 300 kN (typically 7-13T)	25	15	100
	> 300 kN (typically 13-18T)	30	20	100
	> 300 kN (>18T)	38	25	100
Drop hammer	3t enclosed (30kJ per blow assumed)	40	23	100
	5kJ per blow	17	10	35
Vibratory rig	50kJ per cycle	50	30	100
	10kJ per cycle	23	15	100
Pile boring	≤ 800 mm	4	2 nominal	N/A
Jack hammer	Handheld	1 nominal	Avoid contact with structure	Avoid contact with structure

Note:

1. *More stringent conditions may apply to heritage or other sensitive structures. Any heritage property would need to be considered on a case by case basis and assessed in accordance with DIN4150:3 Structural vibration - Effects of vibration on structures.*

3.6.2 Residential buildings and receivers

With the current Proposal and construction methodology, it is unlikely that vibration intensive works would be undertaken within the cosmetic damage minimum working distances (up to 30 metres for vibratory pile drivers). However, this should be confirmed during the detailed detail with specific attention given to residential properties around the Sandy Creek Road intersection works. Where vibration intensive works are proposed within minimum working distances, vibration monitoring should be undertaken to determine site specific minimum working distances and to ensure that appropriate thresholds are not exceeded.

Other recommendations within the Technical Report regarding vibration at residential buildings remain relevant.

3.6.3 Heritage and other sensitive structures

Heritage and other sensitive structures (including any with Aboriginal significance) have the potential to be more sensitive to vibration than standard buildings.

Vibration control recommendations regarding heritage structure contained within the Technical Report remain relevant.

3.7 Overall impact of modification on construction noise and vibration

The proposed modification described in Section 1.1 relevant for construction work has been reviewed with reference to the construction activities assessed in the Technical Report (September 2021). Table 3-16 provides an assessment of whether the proposed modification is consistent with the work packages assessed in the Technical Report (September 2021) and identifies if additional mitigation measures are required.

Table 3-16 Consistency assessment of proposed modification on construction noise and vibration impacts

Proposed modification	Consistency with work assessed in Technical Report (September 2021)	Mitigation measures
• Installation of directional signage: - New England Highway northern project extent - New England Highway west of Muscle Creek Road	• these works are considered to be minor in nature, would occur over a period less than three weeks and be undertaken during standard construction hours. Therefore, a quantitative assessment for these works has not been undertaken.	No additional mitigation measures are required.
• Upgrade of Sandy Creek Road Intersection • Pavement maintenance and reconstruction along Coal Road • Pavement maintenance along - Muscle Creek Road - Milperra Drive	• this work is consistent with work previously assessed in the Technical Report (September 2021) • there are no substantial changes to the type of work or equipment • the works occur in an additional location	Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with this activity. No additional mitigation measures are required.
• Usage of existing access tracks including laying of additional gravel	• this work is consistent with work previously assessed in the Technical Report (September 2021) • there are no substantial changes to the type of work or equipment • the works occur in an additional location	Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with this activity. No additional mitigation measures are required.
• Construction of new access tracks and working platforms	• this work is consistent with work previously assessed in the Technical Report (September 2021) • there are no substantial changes to the type of work or equipment • the works occur in an additional location	Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with this activity. No additional mitigation measures are required.
• Relocation of utility assets	• this work is consistent with work previously assessed in the Technical Report (September 2021) • there are no substantial changes to the type of work or equipment • the works occur in an additional location	Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with this activity. No additional mitigation measures are required.

Proposed modification	Consistency with work assessed in Technical Report (September 2021)	Mitigation measures
• Modification of, removal of or construction of a new dam	• this work is consistent with work previously assessed in the Technical Report (September 2021) • there are no substantial changes to the type of work or equipment • the works occur in an additional location	Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with this activity. No additional mitigation measures are required.
• Additional site compounds	• this work is consistent with work previously assessed in the Technical Report (September 2021) • there are no substantial changes to the type of work or equipment • the works occur at additional locations	Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with this activity. No additional mitigation measures are required.
• Installation of pipe culverts	• this work is consistent with work previously assessed in the Technical Report (September 2021) • there are no substantial changes to the type of work or equipment • the works occur in an additional location	Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with this activity. No additional mitigation measures are required.

4.0 Assessment of operational noise impacts

4.1 Road traffic noise assessment

The road traffic noise assessment methodology and assumptions were presented in Chapter 5.0 of the Technical Report.

Only modification 2 has the potential to affect operational road traffic noise levels. Modification 2 as described in Section 1.2.2 is considered to be 'minor works' and comprises the following:

- Construction of upgraded intersection and relocation of utilities along Sandy Creek Road including:
  - Left-hand and right-hand turn lanes
  - Intersection resealing
  - Line marking adjustments.

The *Road Noise Criteria Guideline* applies existing road criteria from the *Road Noise Policy* where the minor works increase noise levels by more than 2 dB(A), relative to the existing noise levels at the worst affected receiver. Given the traffic is not moving closer to the noise sensitive receivers located to the west of the New England Highway and speed limits are not increasing, it can be determined that road traffic noise levels would not increase by more than 2 dB(A). On this basis the operational road traffic noise model was not updated.

No additional operational noise mitigation measures are required as a result of this proposed modification.

4.2 Overall impact of modification on road traffic noise

The proposed modification described in Section 1.1 relevant for road traffic noise has been reviewed with reference to the assessment detailed in the Technical Report (September 2021). Table 4-1 provides an assessment of whether the proposed modification is consistent with the work packages assessed in the Technical Report and identifies if additional mitigation measures are required.

Table 4-1 Consistency assessment of proposed modification on road traffic noise impacts

Proposed modification	Consistency with work assessed in Technical Paper (September 2021)	Mitigation measures
• Construction of upgraded intersection and relocation of utilities along Sandy Creek Road including - Left-hand and right-hand turn lanes - Intersection resealing - Line marking adjustments.	• No additional receivers beyond those identified in the Technical Report are anticipated to be impacted.	Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with road traffic noise.

5.0 Conclusion

Transport for NSW proposes to modify the New England Highway bypass of Muswellbrook. AECOM prepared a REF for the New England Highway bypass of Muswellbrook (the Proposal) (AECOM, 2021a), including a Noise and Vibration Technical Report (Technical Report) (September 2021) (AECOM, 2021b).

Following public display of the REF, ongoing design development and construction planning resulted in design changes to the Proposal. This report is an addendum to the Technical Report and assesses these changes (the proposed modification). This addendum should be read in conjunction with the Technical Report.

5.1 Construction Impacts

A construction noise and vibration impact assessment has been completed in accordance with the Environment Protection Authority's *Interim Construction Noise Guideline* and the *Construction Noise and Vibration Guideline* and was documented in the Technical Report. The assessment has been updated to consider the proposed modifications.

The assessment indicates exceedances of the *Interim Construction Noise Guideline* noise management levels at some sensitive receivers during standard hours works. Exceedances of the construction noise management levels would be generally less than 10 dB(A) at the additional compounds in Modification Areas 10, 13 and 14. Three receivers are predicted to have exceedances of the noise management levels in the range of 11-20 dB(A) due to the compound in Modification Areas 13 and one receiver is predicted to have exceedances in this range due to the compound in Modification Area 14. The noisiest construction works would be site establishment activities.

Noise levels from the works associated with the alignment would exceed the noise management levels at nearby receivers during a number of scenarios. The pavement and earthworks are likely to cause the largest number of exceedances of the noise management levels. Most exceedances would be less than 10 dB(A), however some would be greater than 20 dB(A). Up to 12 residences would be highly noise affected during these works.

During out of hours works at compounds exceedances of the noise management levels would occur at some sensitive receivers. Exceedances would be less than 15 dB(A). The noisiest construction works would be the laydown works.

Noise levels from the works associated with the alignment would exceed the noise management levels at nearby receivers during a number of scenarios. The pavement works are likely to cause the largest number of exceedances and sleep awakening reactions. Most exceedances would be less than 25 dB(A), however some would be greater.

Overall, the pavement works would have the greatest impacts (considering timing, duration, and noise impacts). This work would be undertaken during standard hours and out of hours at times. As the pavement works are progressive in nature, receivers would not be affected for the whole duration of construction works. As recommended in the Technical Report noise mitigation and management measures would need to be developed by the contractor to reduce the potential noise impacts from the works.

Noise levels from construction vehicle movements will be consistent with that presented for the determined Proposal and are unlikely to exceed the screening criterion for construction traffic noise.

The Technical Report recommended minimum working distances for vibration intensive construction works, these remain unchanged. For the alignment works vibration intensive activities may occur within the human comfort minimum working distances during earthworks, bridge construction and pavement works. Advance notification should be given to all potentially affected receivers.

Mitigation measures outlined in the Technical Report (September 2021) would manage potential noise impacts associated with this activity. No additional mitigation measures are required, however the areas where these mitigation measures are required has been updated.

5.2 Operational impacts

An operational road traffic impact noise assessment has been completed in accordance with the Environment Protection Authority's *NSW Road Noise Policy* and Transport for NSW's *Road Noise Criteria Guideline* and *Road Noise Mitigation Guideline* and documented in the Technical Report.

The proposed modification has been reviewed to consider how it would affect operational road traffic noise. Given that traffic is not moving closer to the noise sensitive receivers located to the west of the New England Highway and speed limits are not increasing, it can be determined that road traffic noise levels would not increase by more than 2 dB(A). No additional operational noise mitigation measures are required as a result of this proposed modification.

Appendix A

Construction noise contours

Muswellbrook Bypass - Ancillary Modification Area 10 - Utility relocations - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69

NCAs

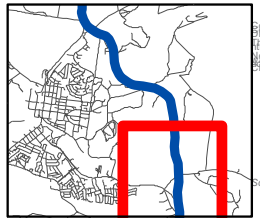
Exceedance of NML, dB

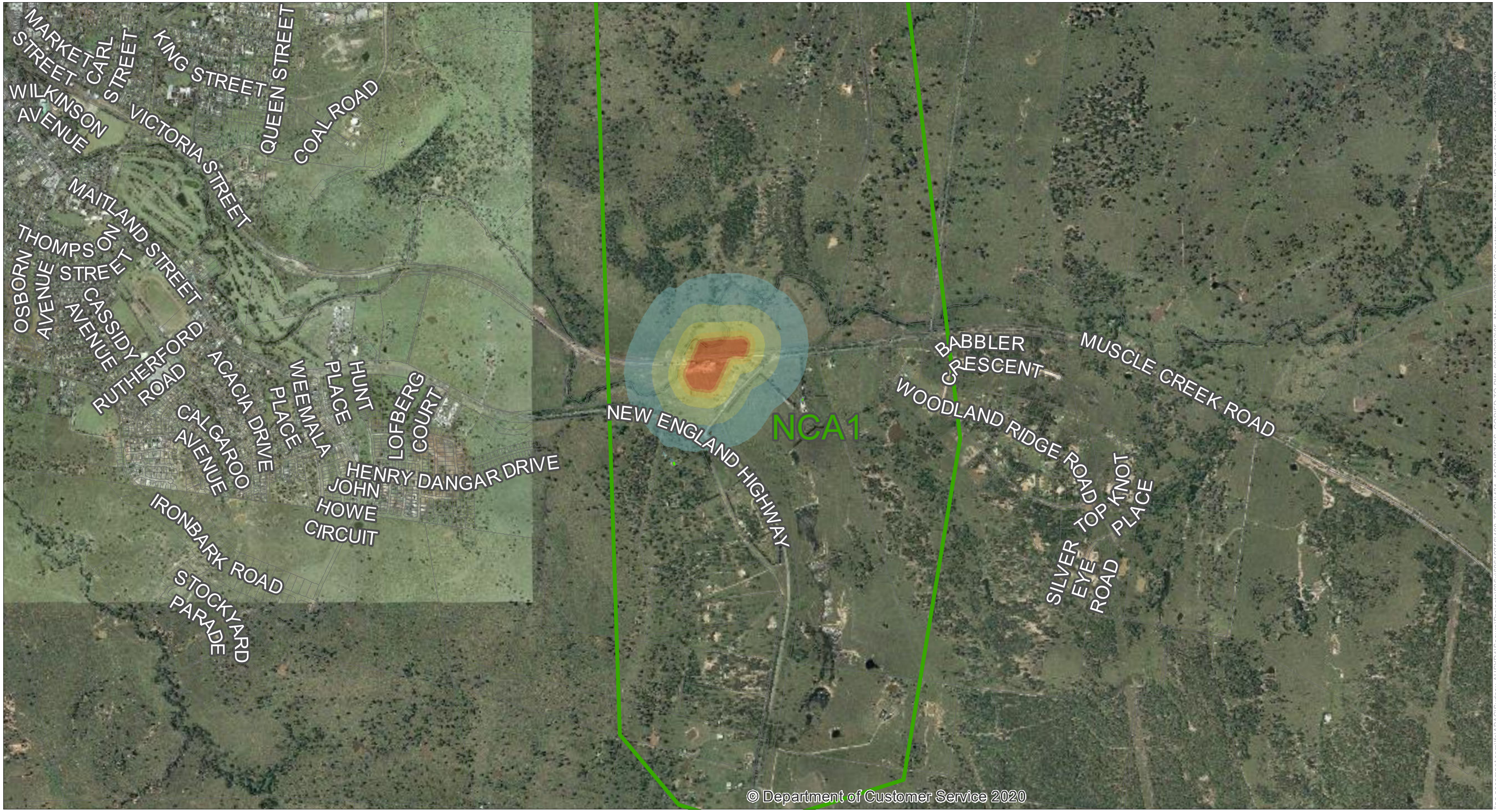
0
1 - 10

N

0 450 900 Meters

AECOM





Muswellbrook Bypass - Ancillary Modification Area 10 - Vegetation clearing - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74

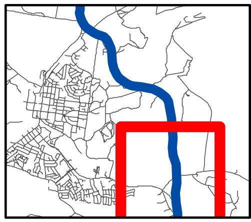
Exceedance of NML, dB

0
1 - 10

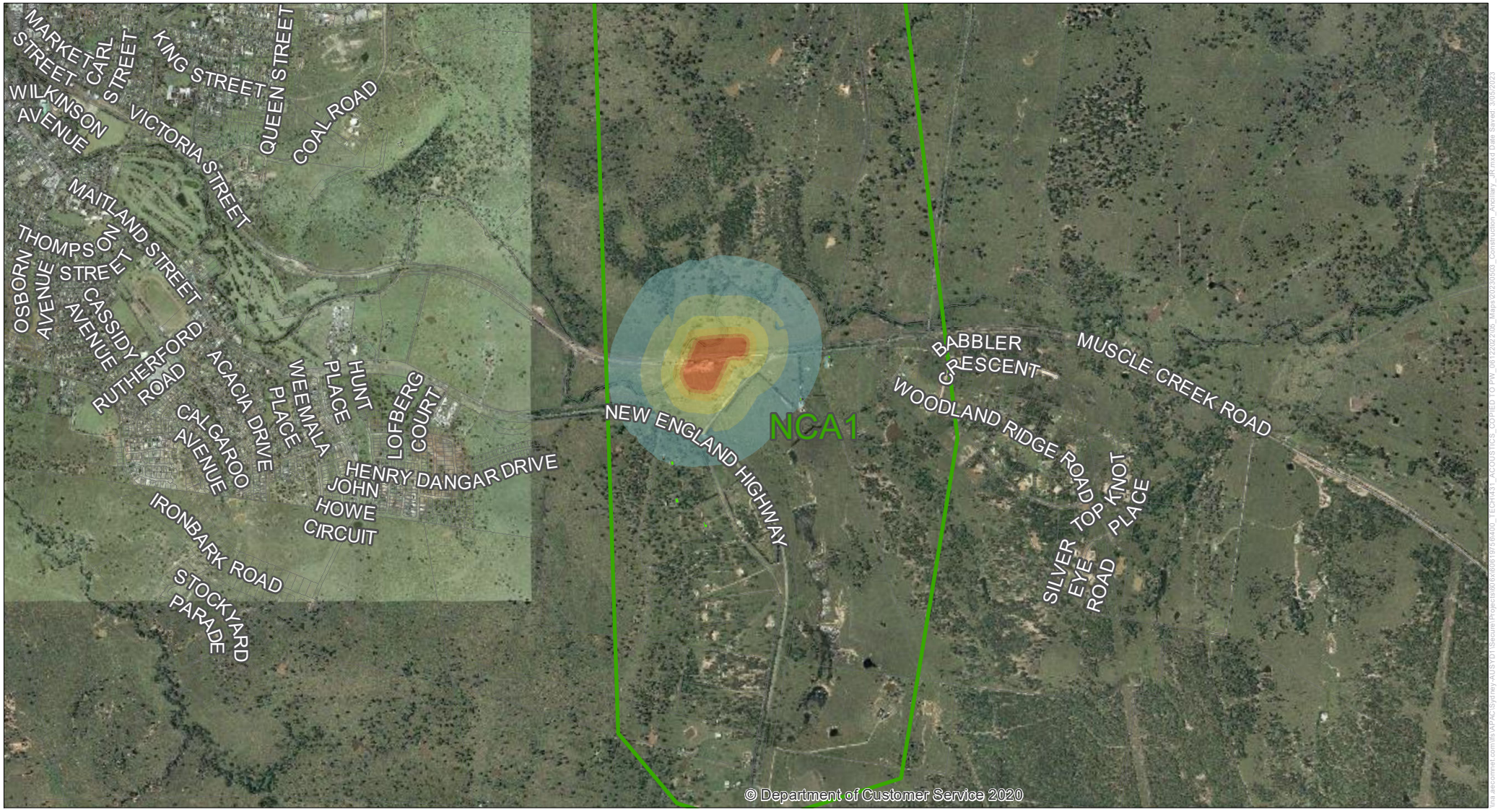
NCAs

N
0 450 900 Meters

AECOM



Source:



Muswellbrook Bypass - Ancillary Modification Area 10 - Site Establishment - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74

NCAs

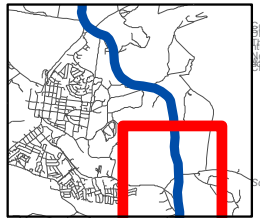
Exceedance of NML, dB

0

1 - 10

N

0 450 900 Meters



AECOM

Muswellbrook Bypass - Ancillary Modification Area 10 - Laydown, storage and delivery - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64

Exceedance of NML, dB

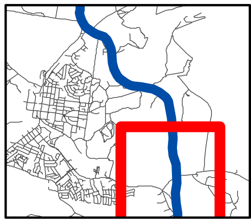
0

NCAs

N

0 450 900 Meters

AECOM



Source:

Muswellbrook Bypass - Ancillary Modification Area 10 - Stockpiling - Standard Hours

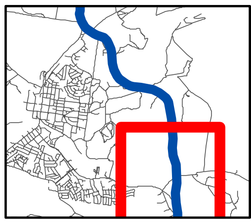
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64

Exceedance of NML, dB

0

NCAs



N

0 450 900 Meters

AECOM

Source:

Muswellbrook Bypass - Ancillary Modification Area 10 - Demobilisation - Standard Hours

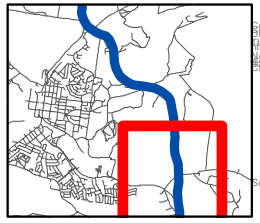
Sound Pressure Level, L_{Aeq} dB(A)

Exceedance of NML, dB

0

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69

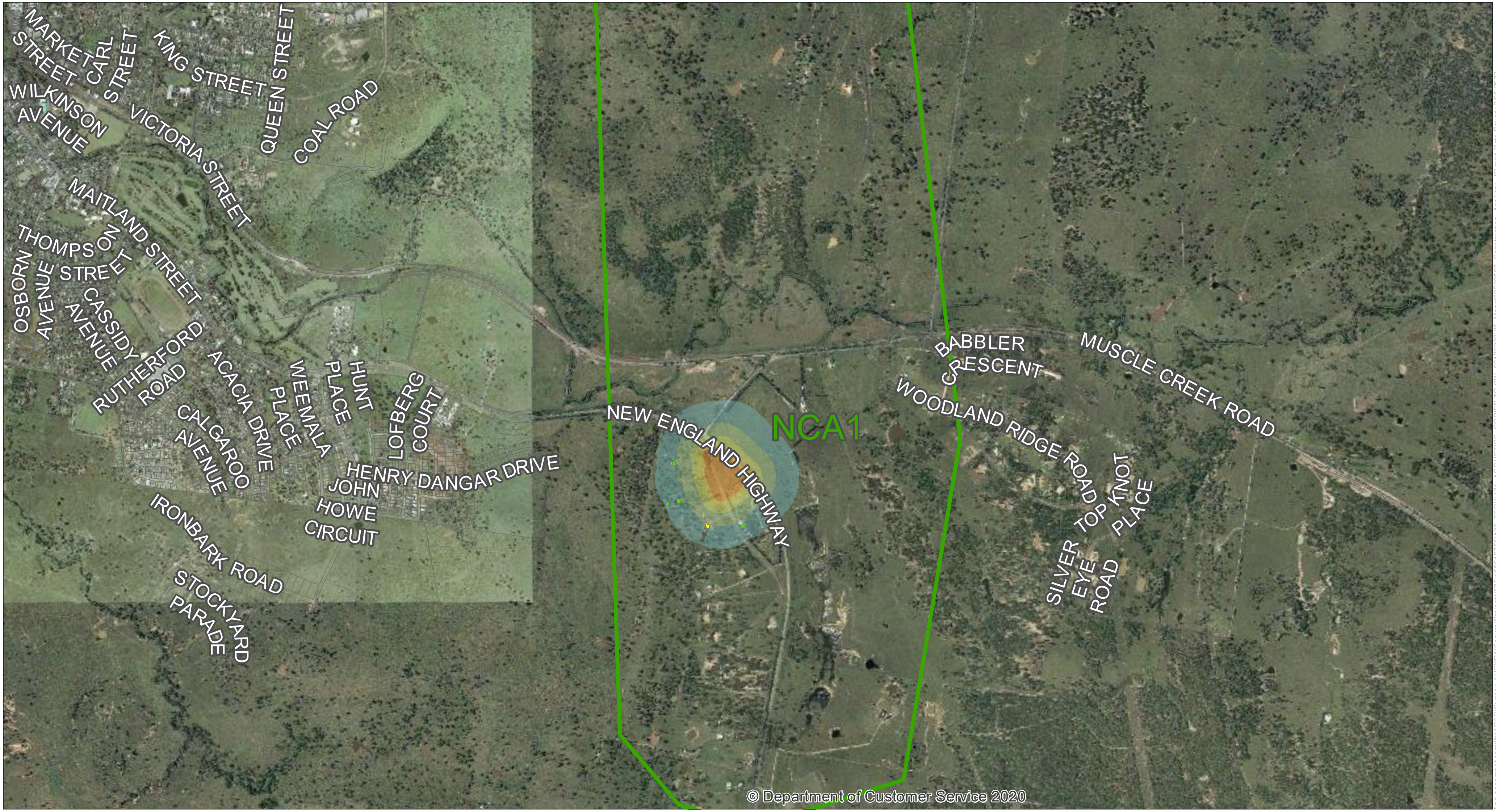
NCAs



N

0 450 900 Meters

AECOM



Muswellbrook Bypass - Ancillary Modification Area 13 - Utility relocations - Standard Hours

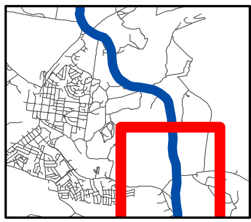
Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69

NCAs

Exceedance of NML, dB

0
1 - 10
11 - 20

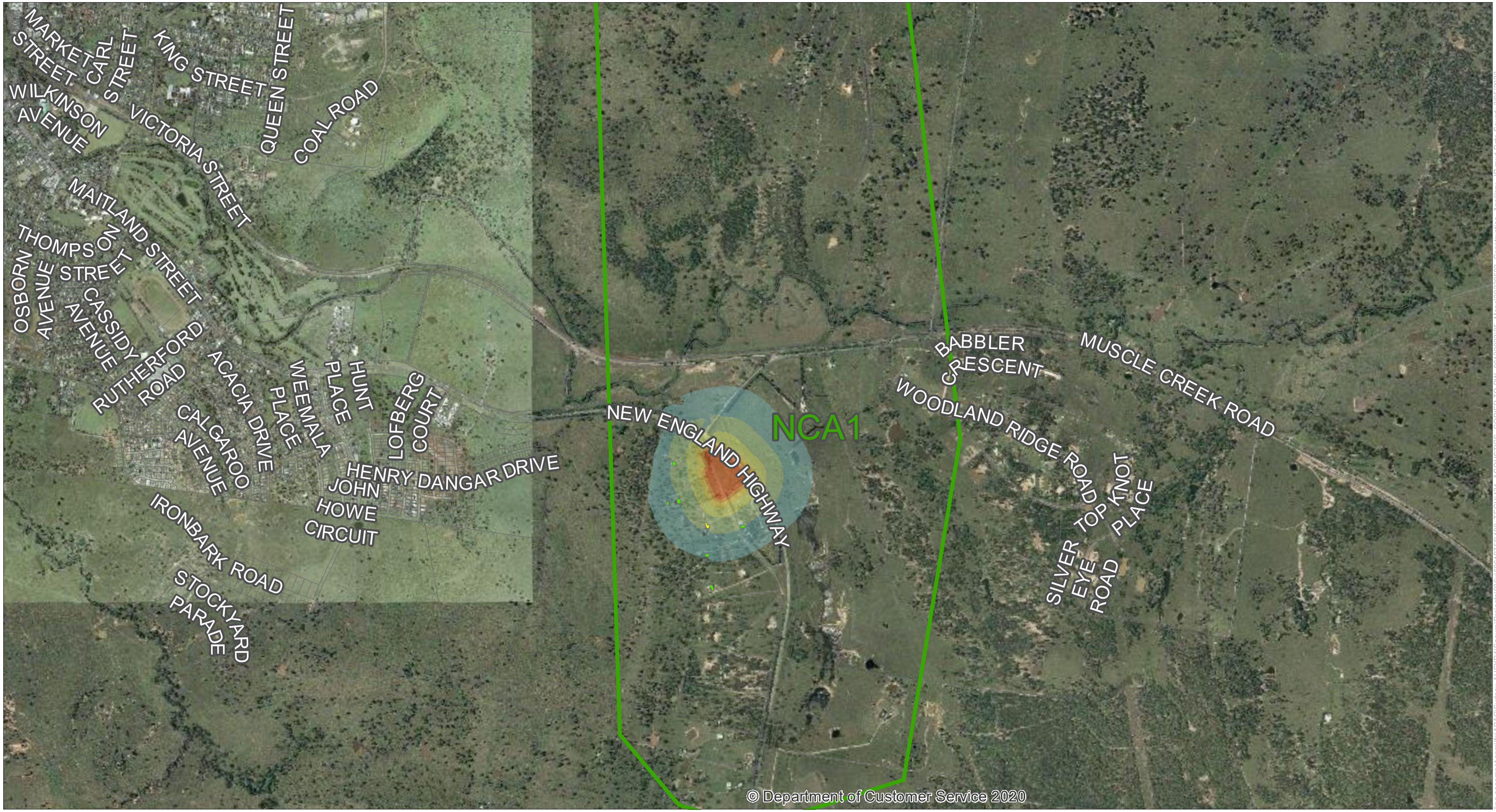


N

0 450 900 Meters

AECOM

Source:



Muswellbrook Bypass - Ancillary Modification Area 13 - Vegetation clearing - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74

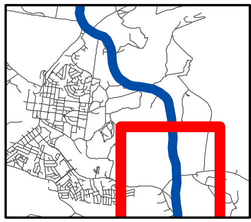
NCAs

Exceedance of NML, dB

0

1 - 10

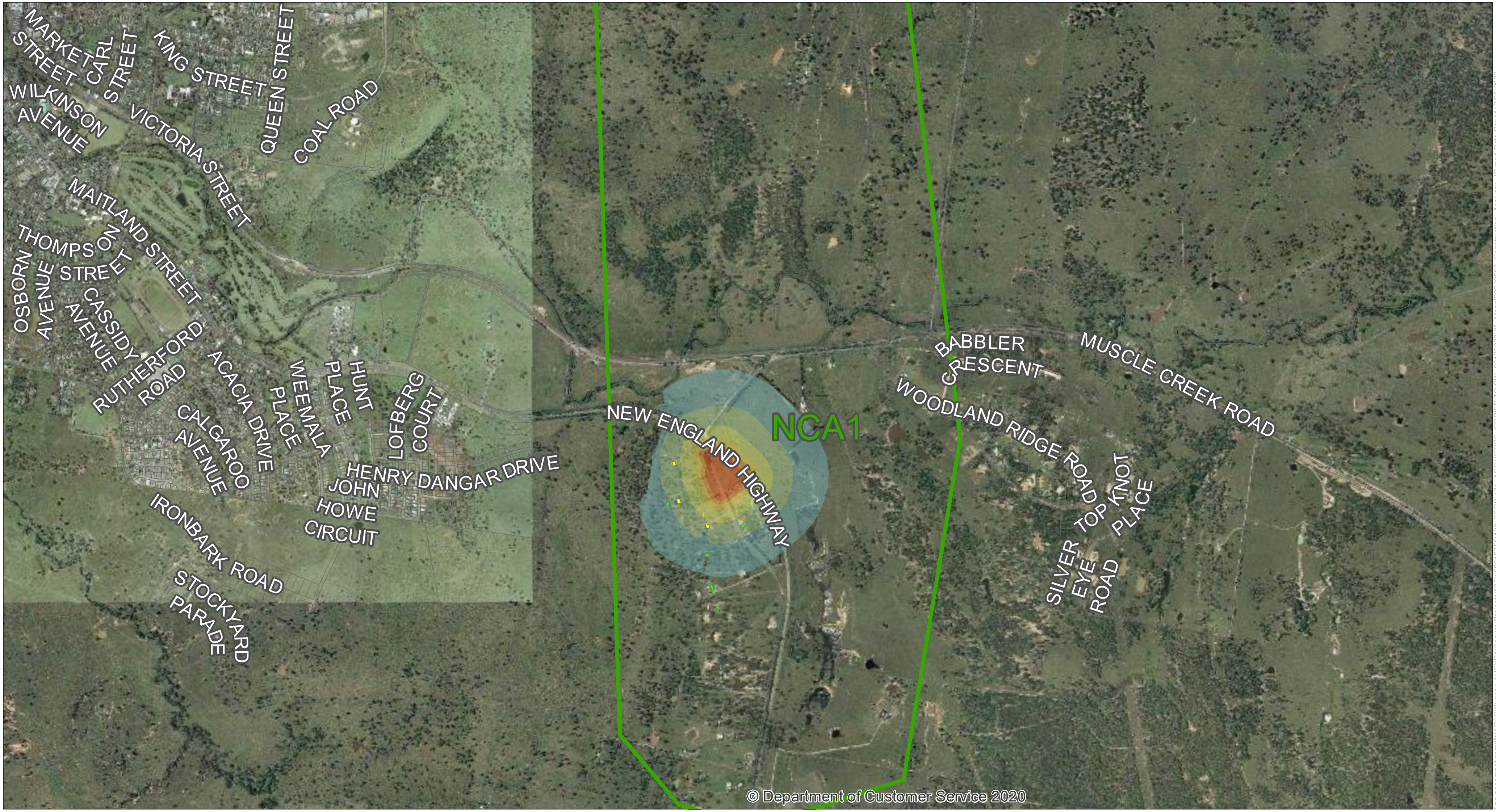
11 - 20



0 450 900 Meters

AECOM

Source:



Muswellbrook Bypass - Ancillary Modification Area 13 - Site Establishment - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74

NCAs

Exceedance of NML, dB

0

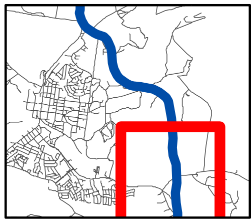
1 - 10

11 - 20

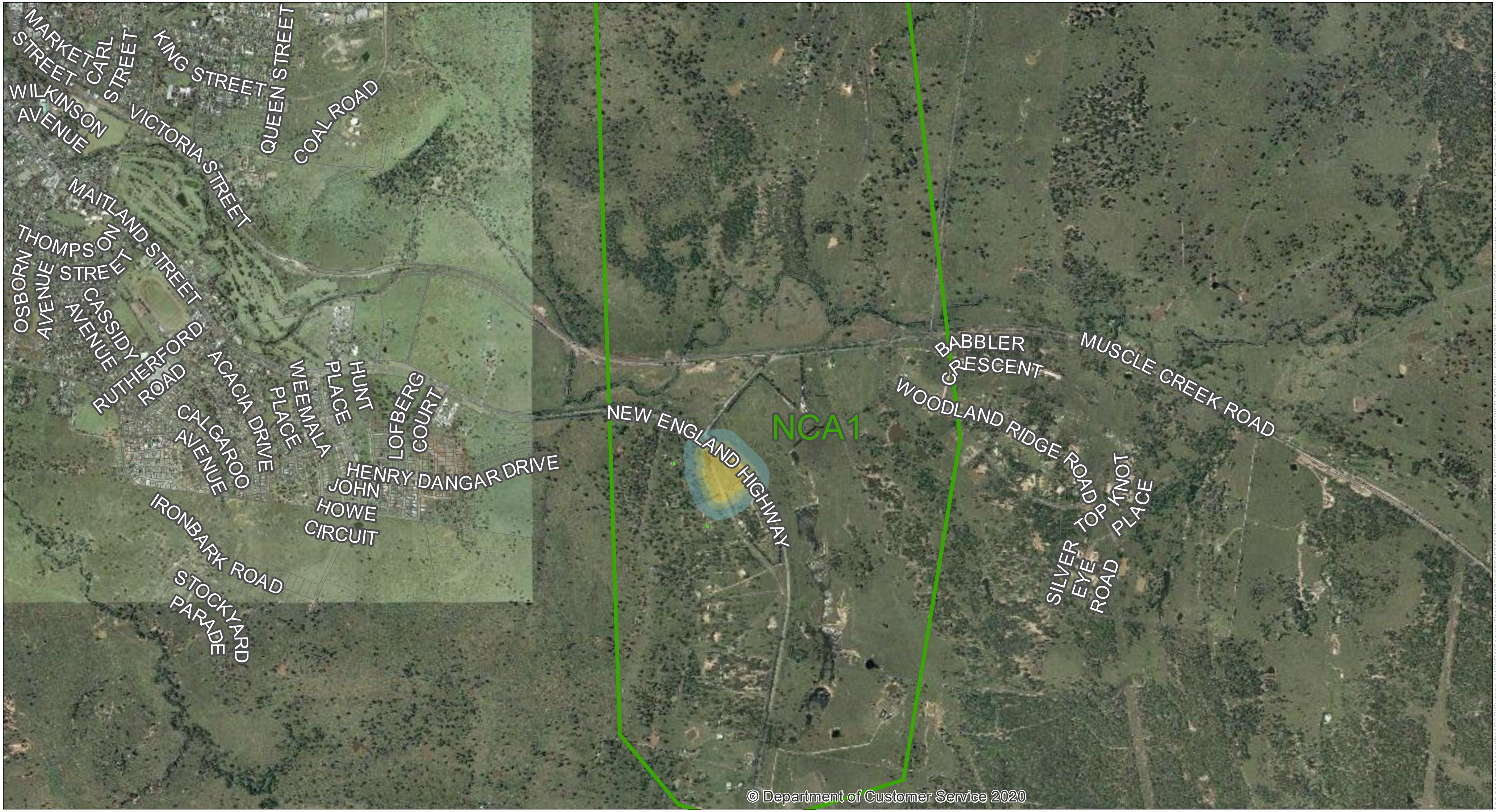
N

0 450 900 Meters

AECOM



Source:



Muswellbrook Bypass - Ancillary Modification Area 13 - Laydown, storage and delivery - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64

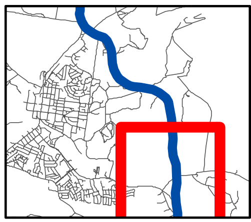
Exceedance of NML, dB

0
1 - 10

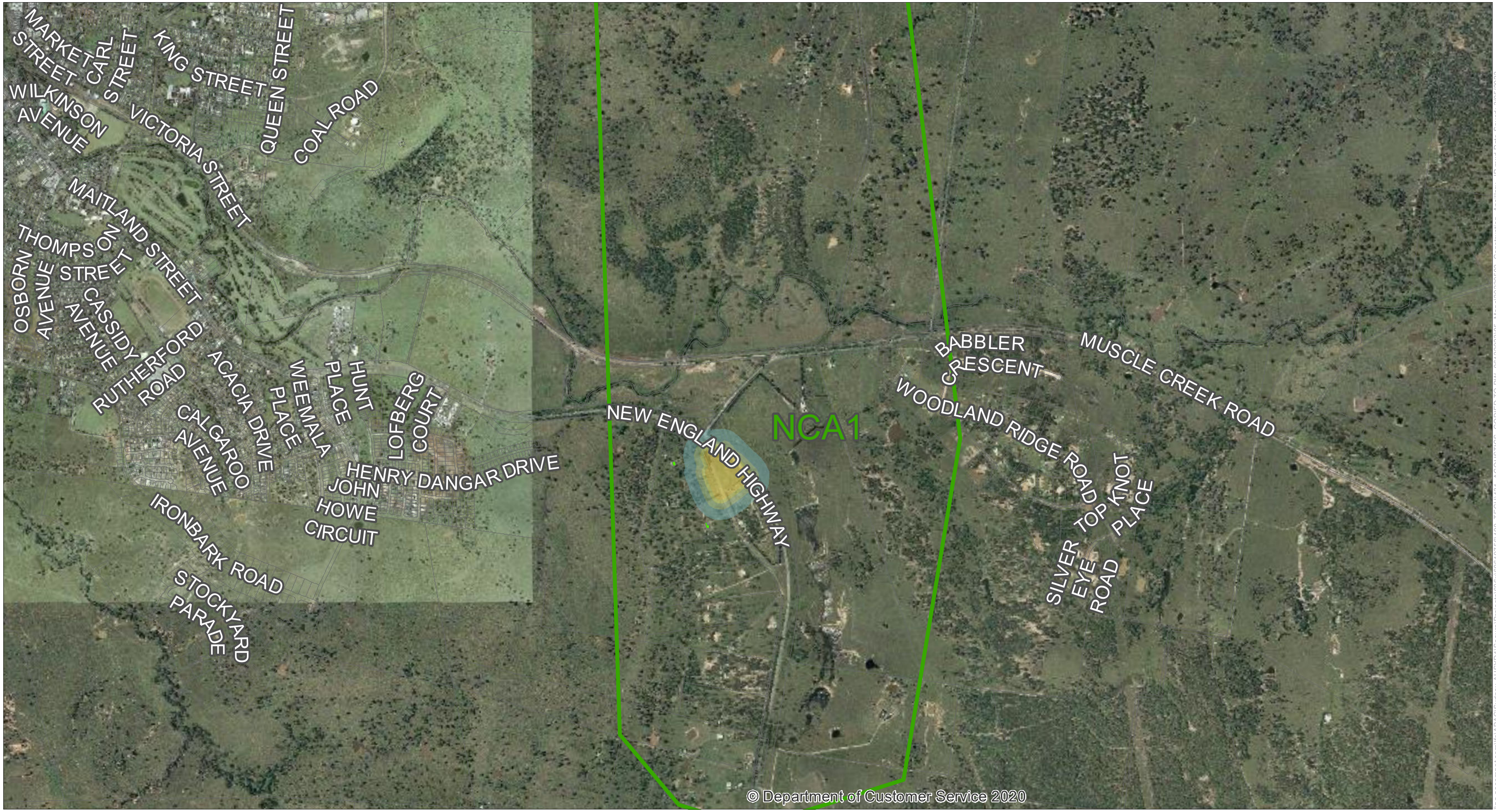
NCAs

N
0 450 900 Meters

AECOM



Source:



Muswellbrook Bypass - Ancillary Modification Area 13 - Stockpiling - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64

Exceedance of NML, dB

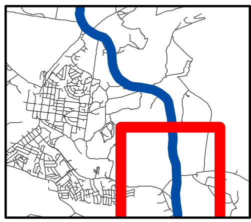
0
1 - 10

NCAs

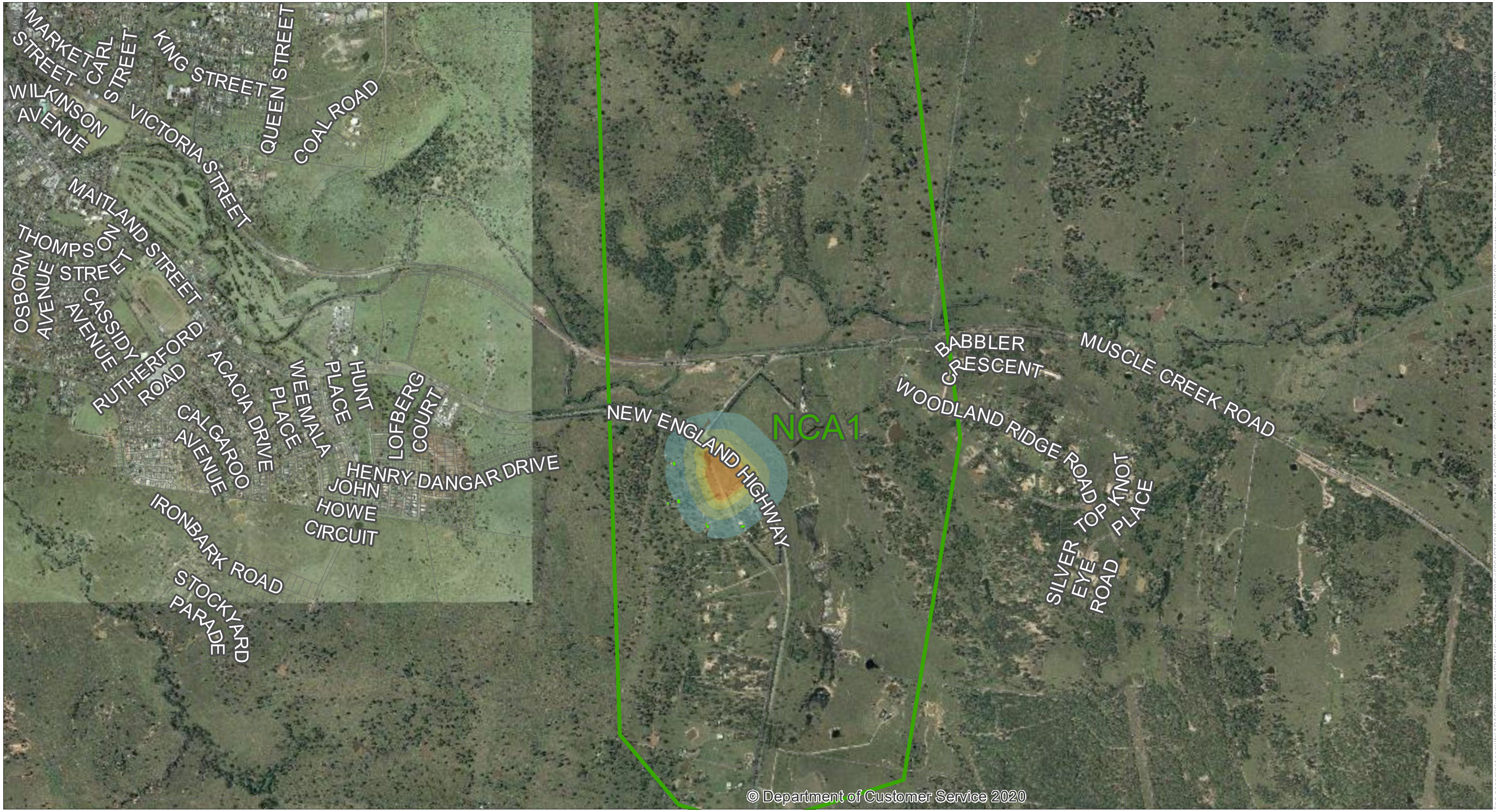
N

0 450 900 Meters

AECOM



Source:



Muswellbrook Bypass - Ancillary Modification Area 13 - Demobilisation - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69

NCAs

Exceedance of NML, dB

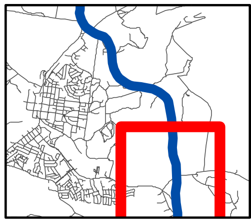
0

1 - 10

N

0 450 900 Meters

AECOM



Source:

Muswellbrook Bypass - Ancillary Modification Area 14 - Utility relocations - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69

NCAs

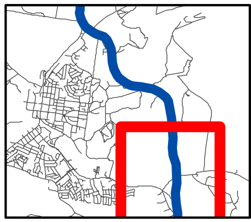
Exceedance of NML, dB

0

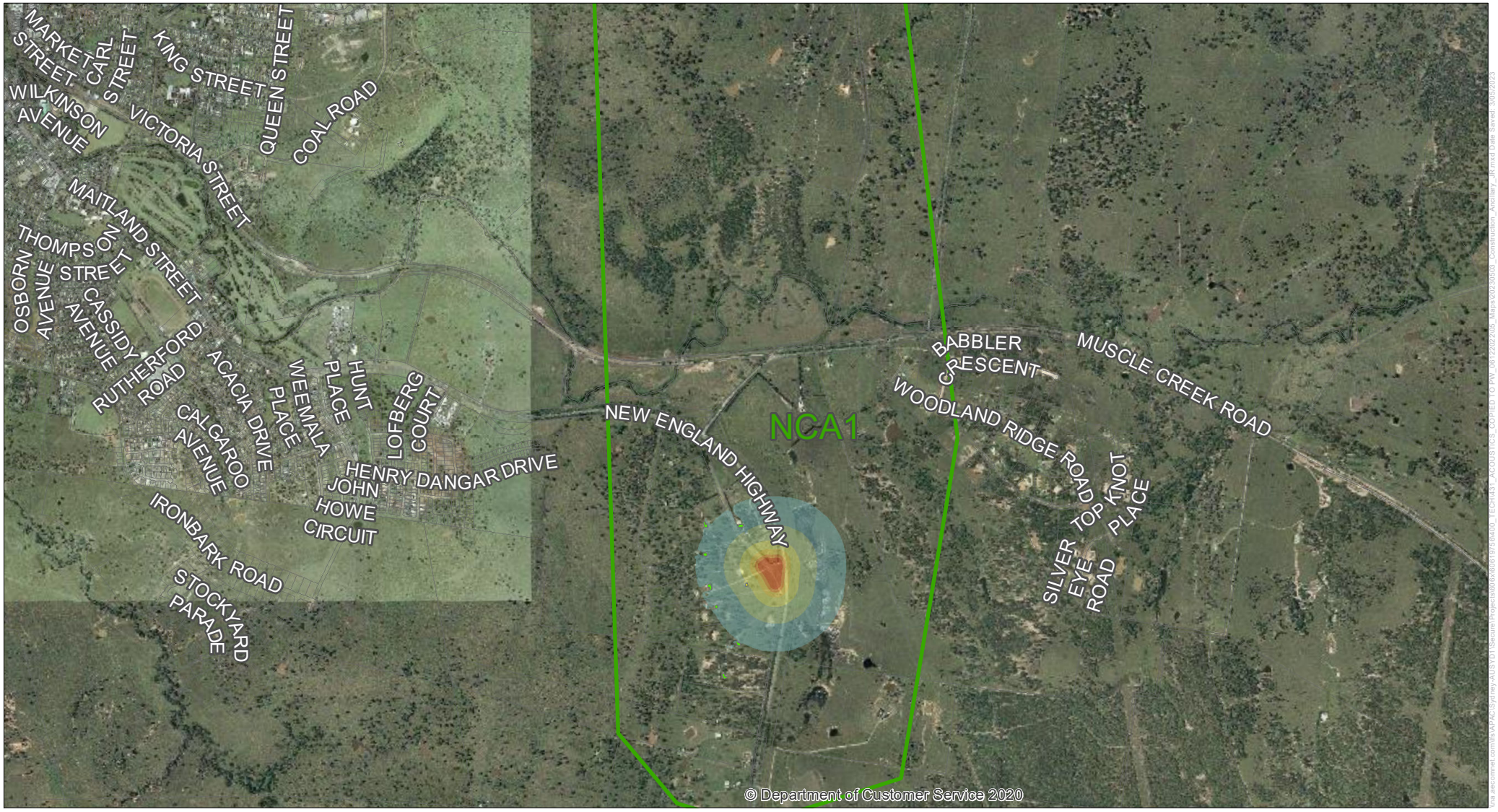
1 - 10

0 450 900 Meters

AECOM



Source:



Muswellbrook Bypass - Ancillary Modification Area 14 - Vegetation clearing - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74

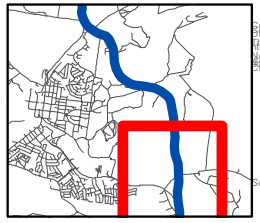
NCAs

Exceedance of NML, dB

0

1 - 10

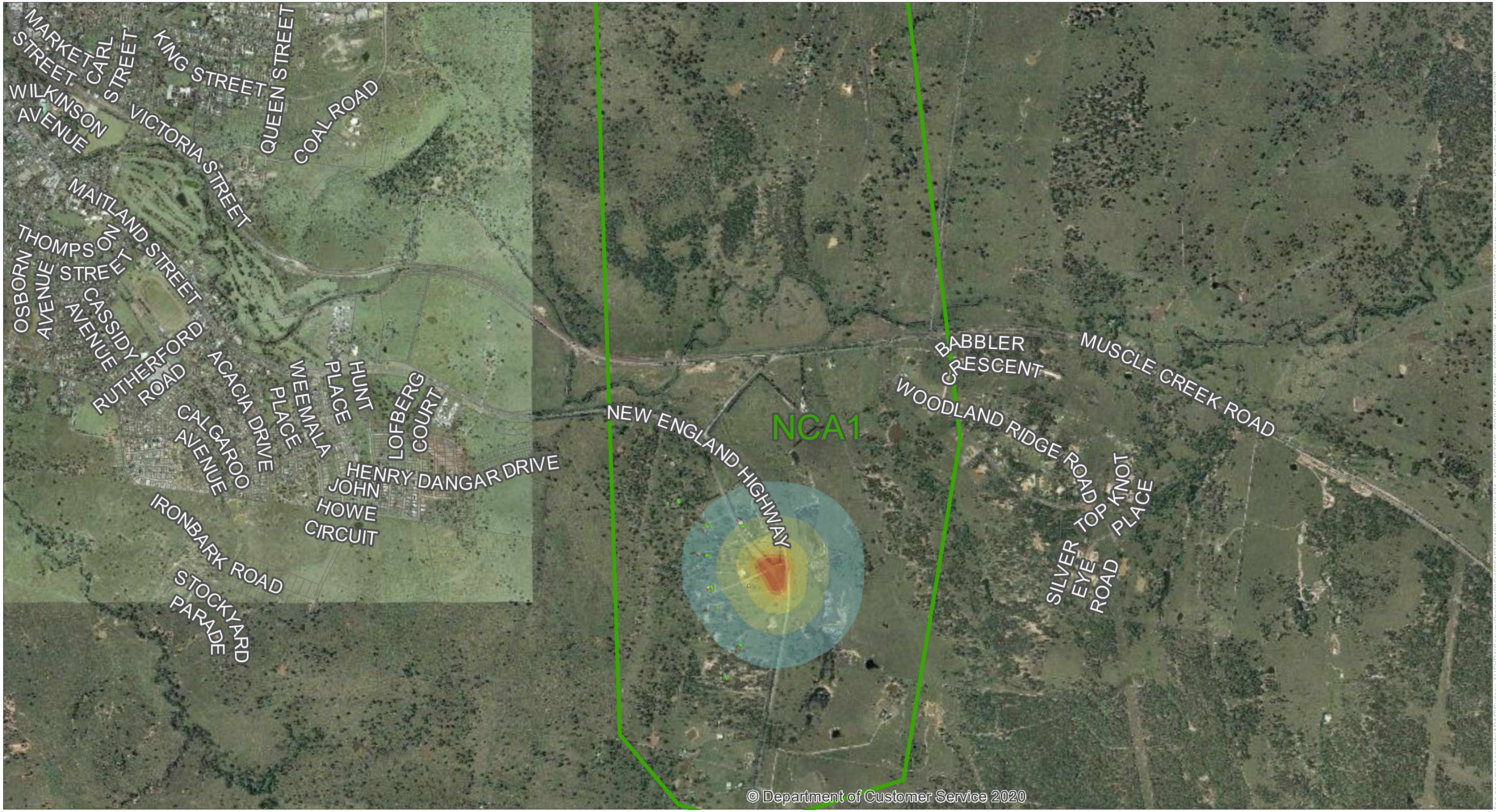
11 - 20



N

0 450 900 Meters

AECOM



Muswellbrook Bypass - Ancillary Modification Area 14 - Site Establishment - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74

Exceedance of NML, dB

0

1 - 10

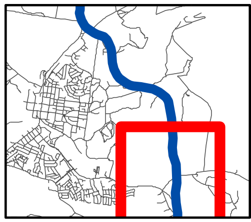
11 - 20

NCAs

N

0 450 900 Meters

AECOM



Source:

Muswellbrook Bypass - Ancillary Modification Area 14 - Laydown, storage and delivery - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64

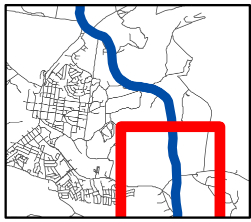
NCAs

Exceedance of NML, dB

0
1 - 10

0 450 900 Meters

AECOM



Source:

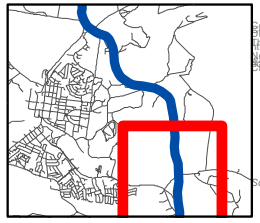
Muswellbrook Bypass - Ancillary Modification Area 14 - Stockpiling - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
NCAs

Exceedance of NML, dB

0
1 - 10



N

0 450 900 Meters

AECOM

Muswellbrook Bypass - Ancillary Modification Area 14 - Demobilisation - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69

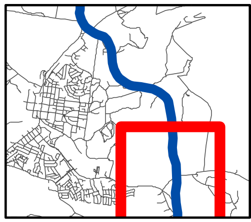
Exceedance of NML, dB

0
1 - 10

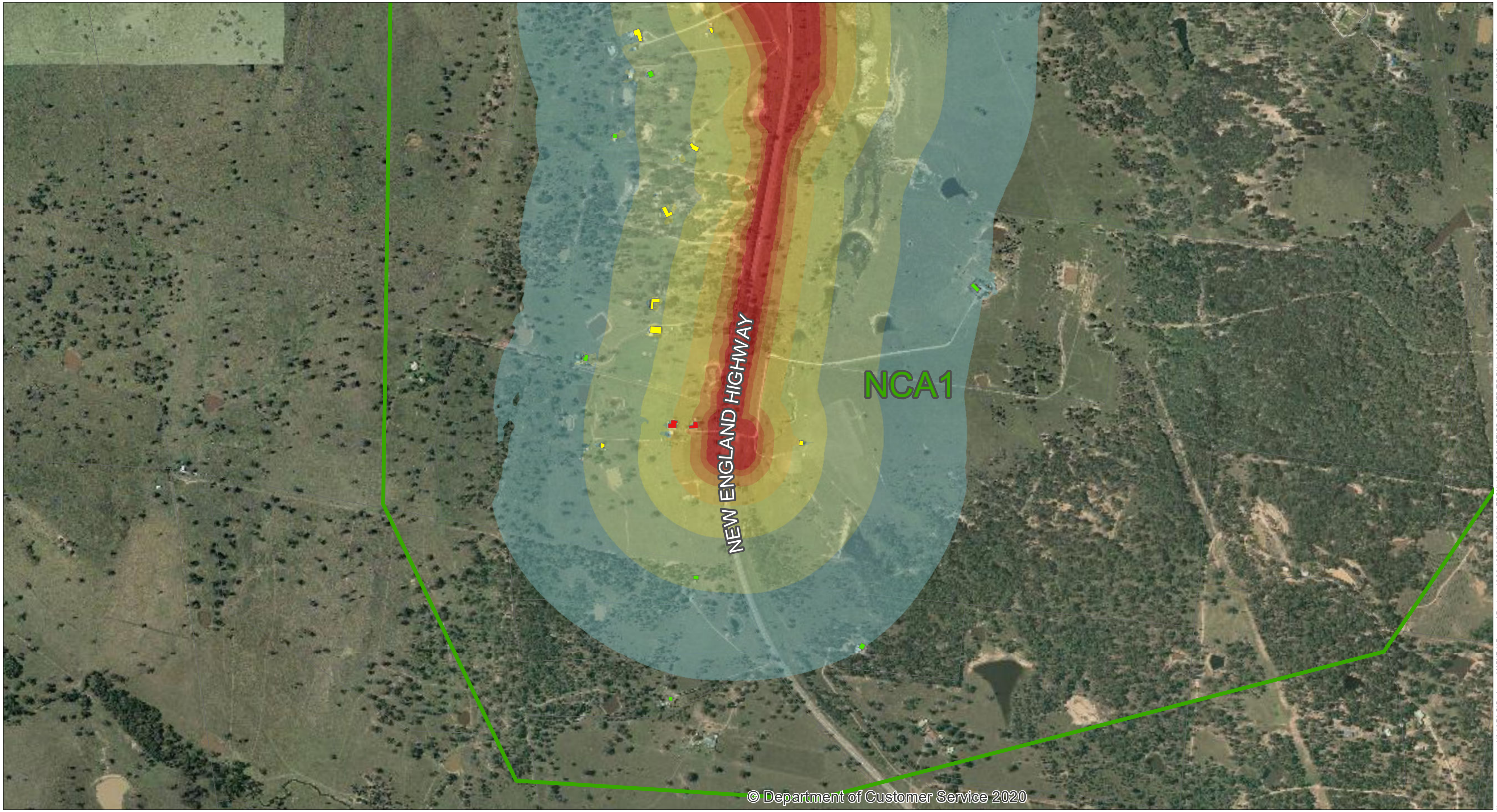
NCAs

Meters 0 450 900

AECOM



Source:



Muswellbrook Bypass - Earthworks - Standard Hours

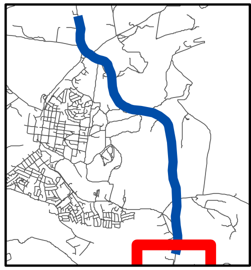
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

Exceedance of NML, dB

0
1 - 10
11 - 20
> 20

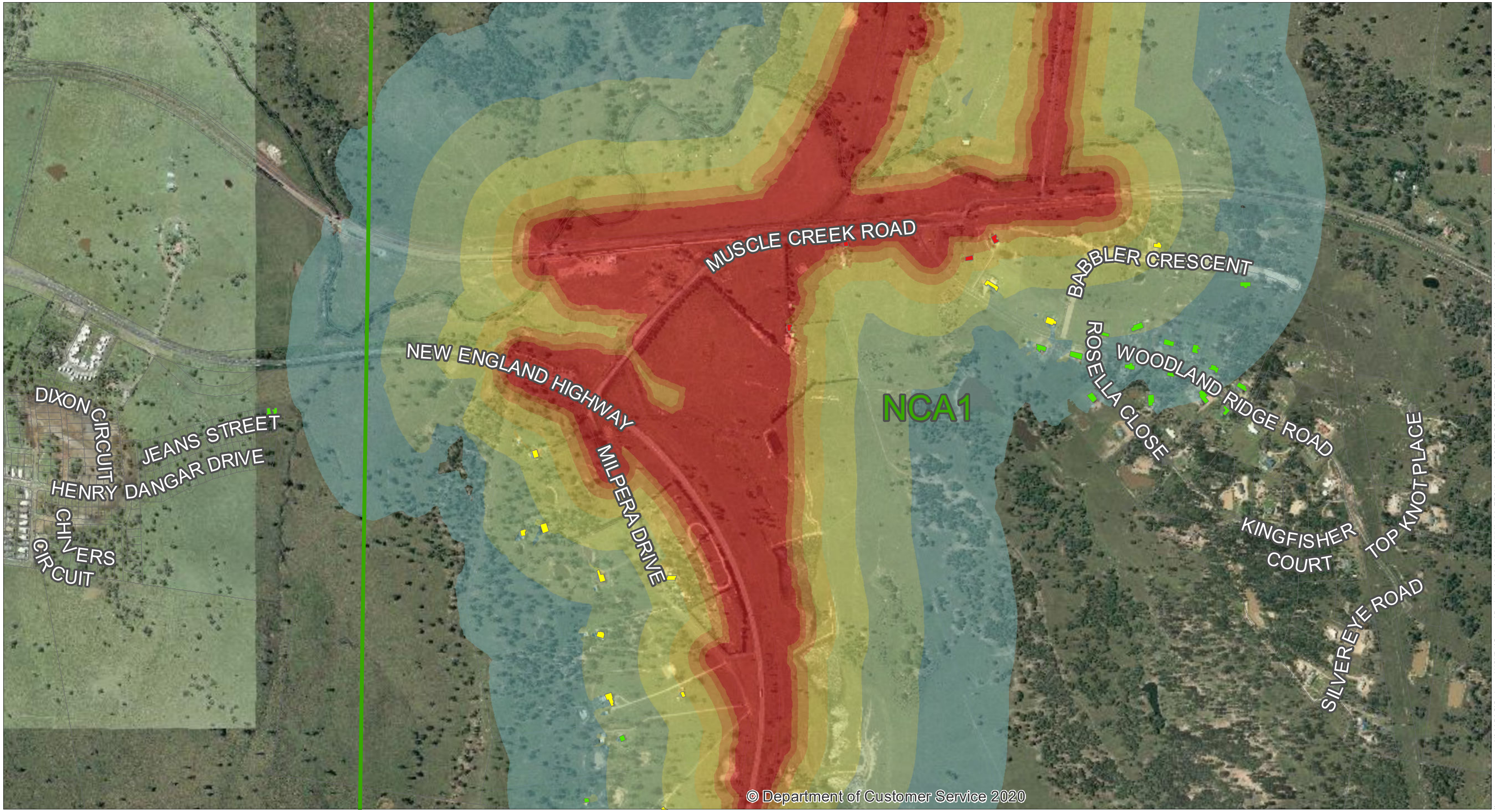


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Earthworks - Standard Hours

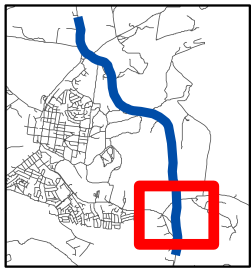
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

Exceedance of NML, dB

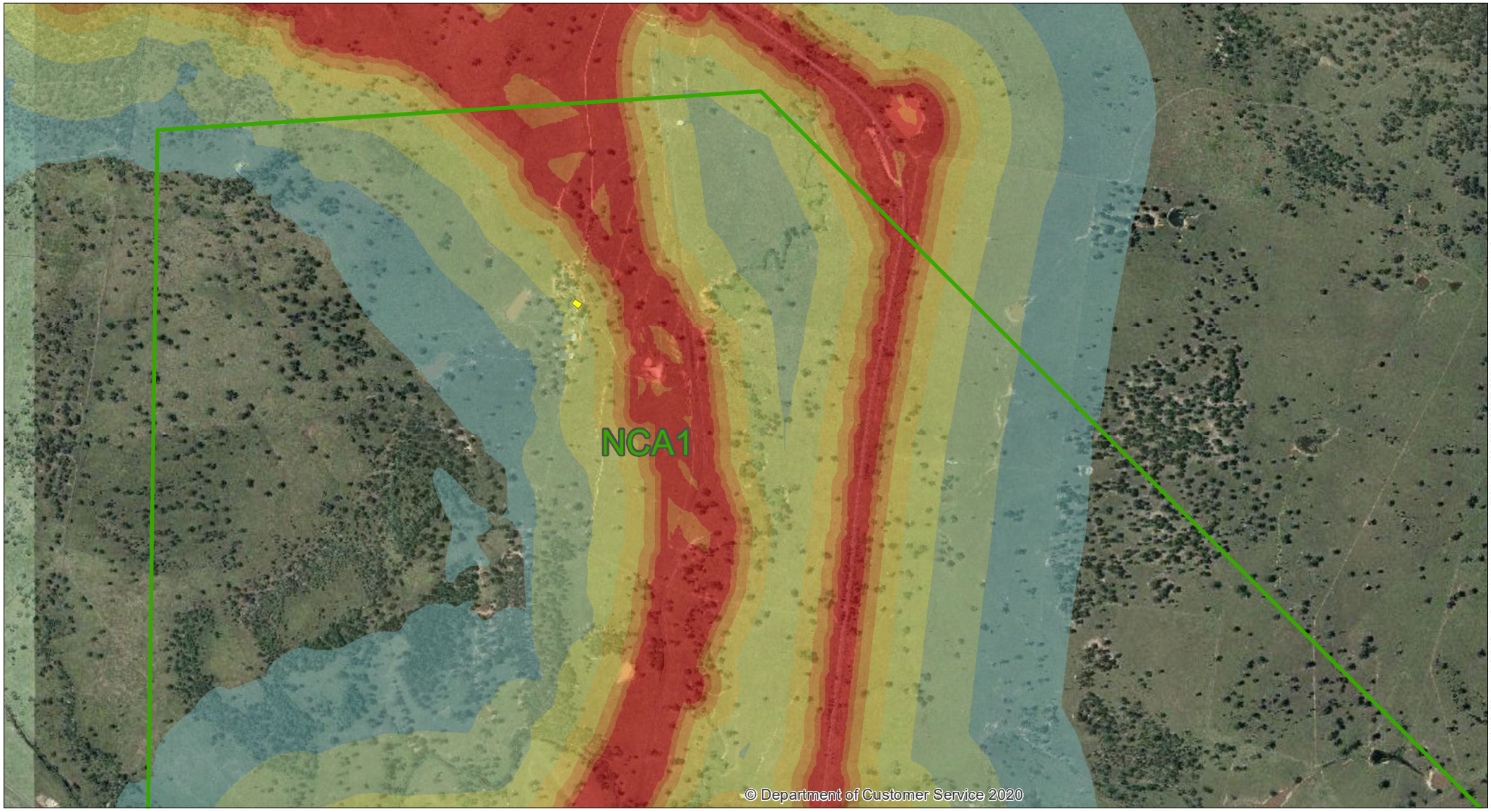
0
1 - 10
11 - 20
> 20



0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Earthworks - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

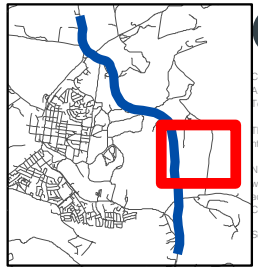
< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | >= 75

NCAs

Exceedance of NML, dB

0

11 - 20

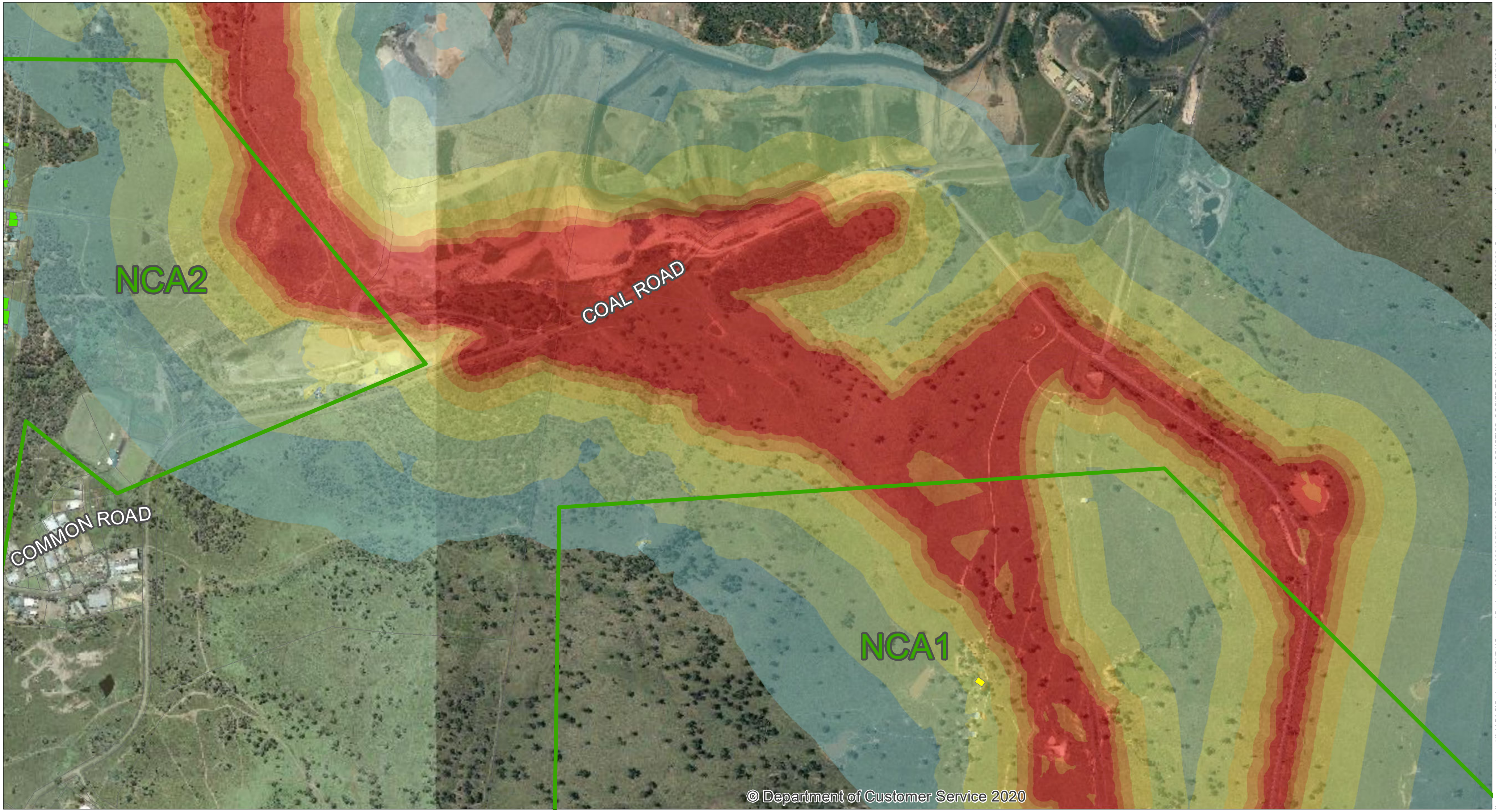


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Earthworks - Standard Hours

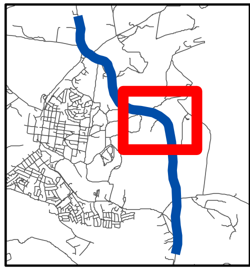
Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
>= 75

Exceedance of NML, dB

0
11 - 20

NCAs

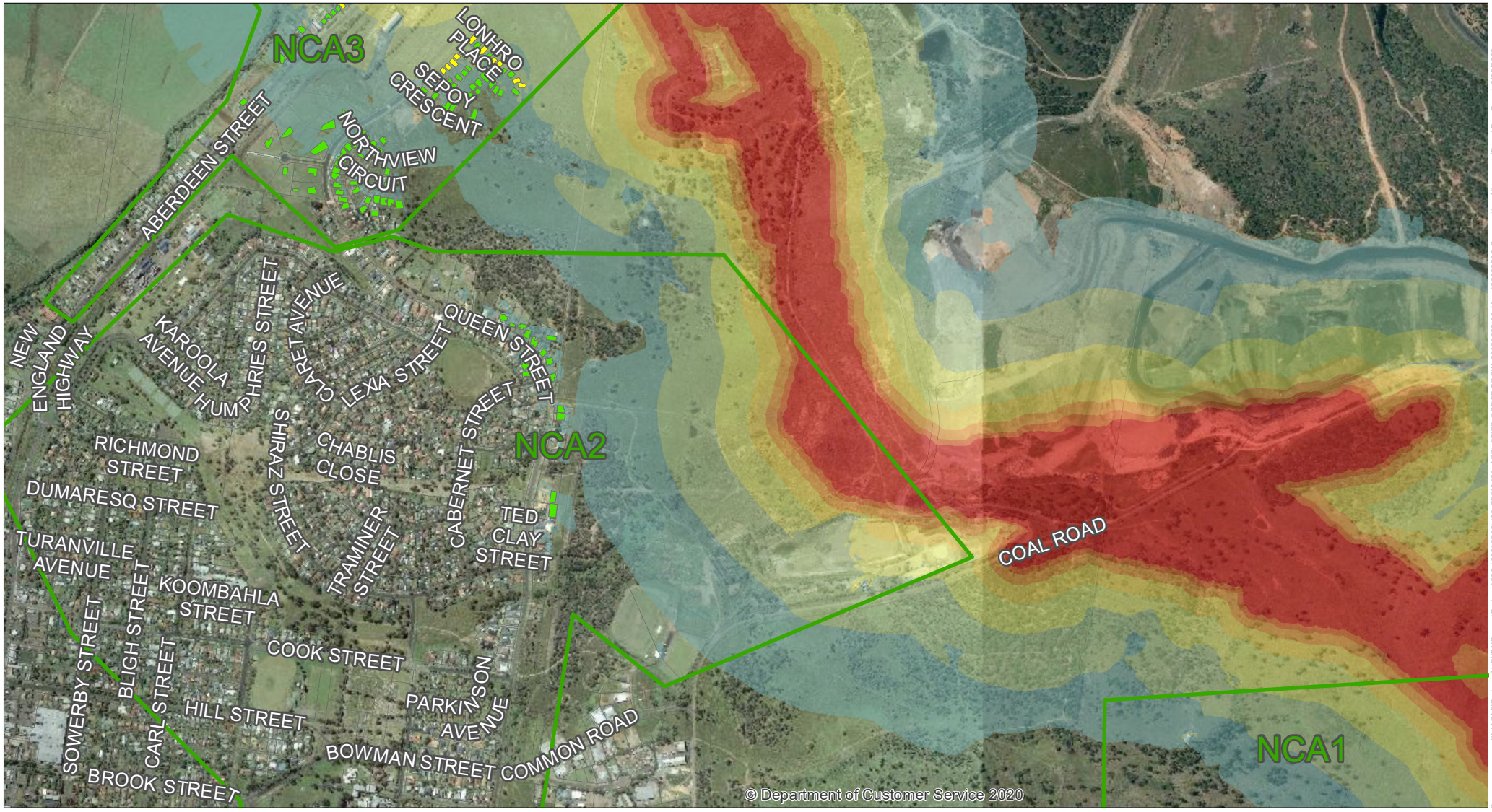


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Earthworks - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | >= 75

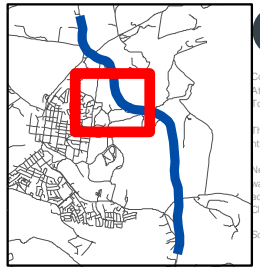
NCAs

Exceedance of NML, dB

0

1 - 10

11 - 20

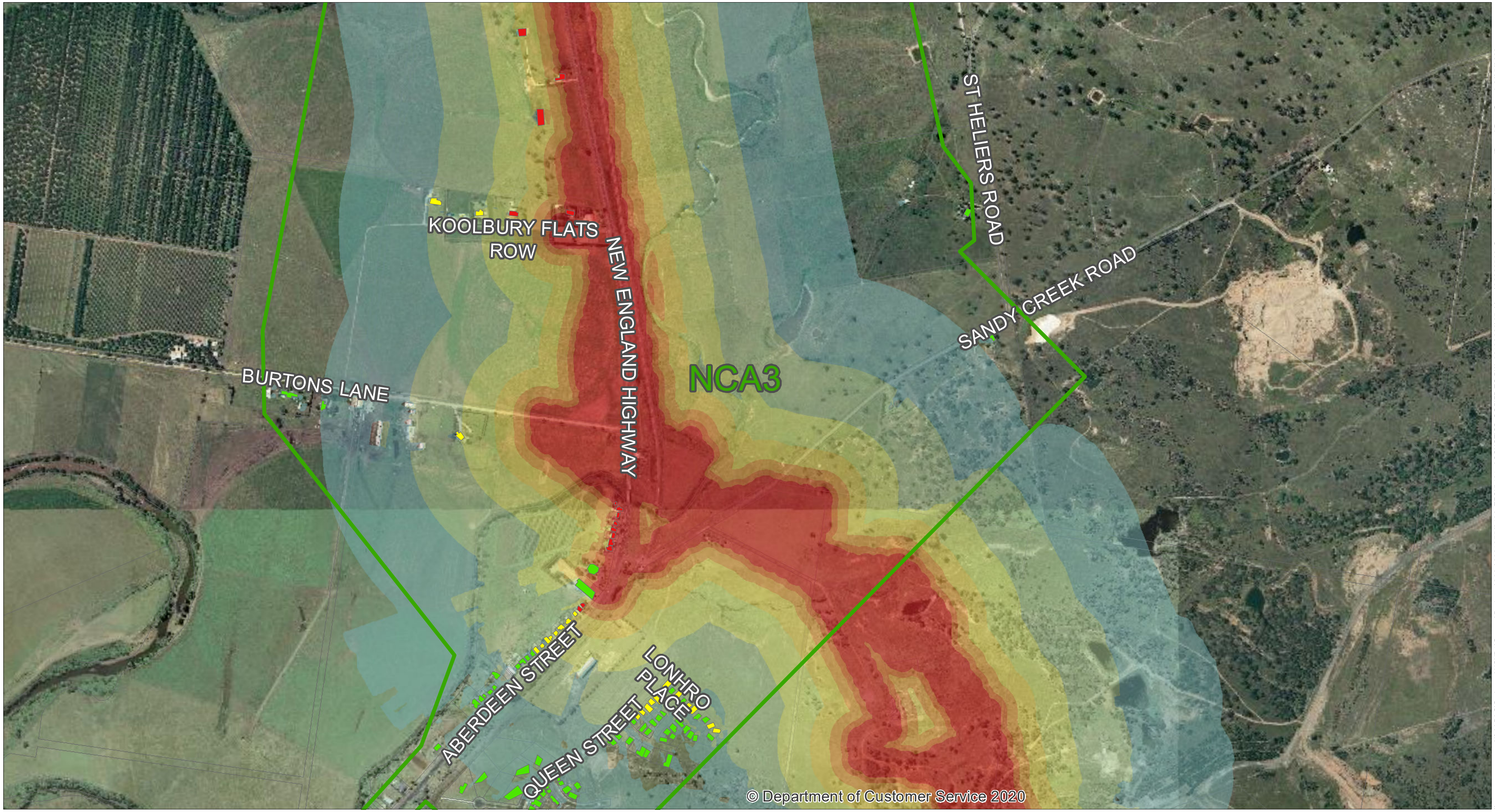


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Earthworks - Standard Hours

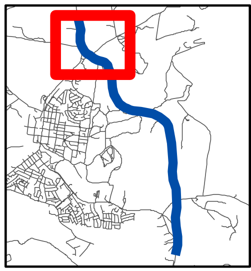
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

Exceedance of NML, dB

0
1 - 10
11 - 20
> 20

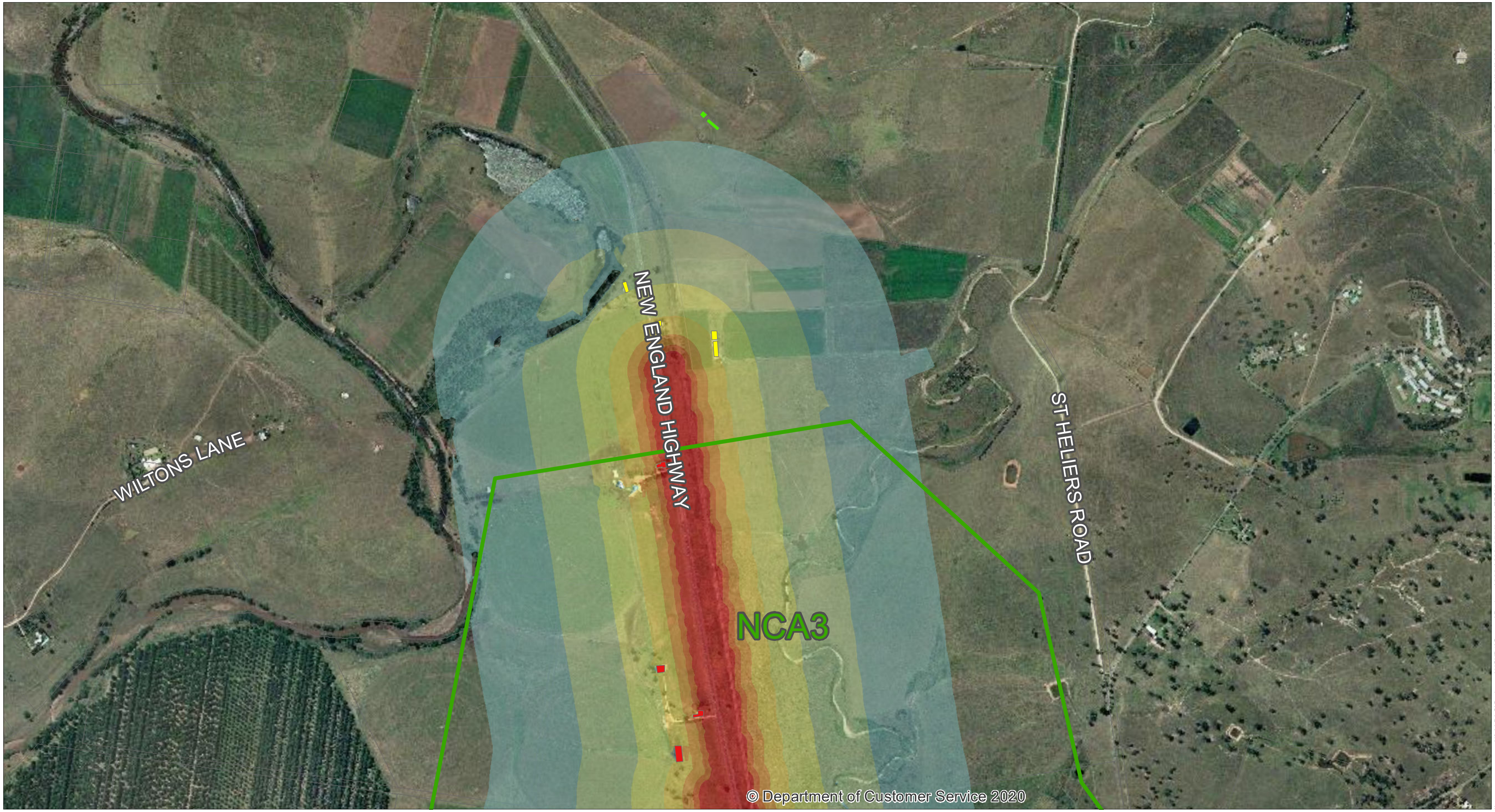


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Earthworks - Standard Hours

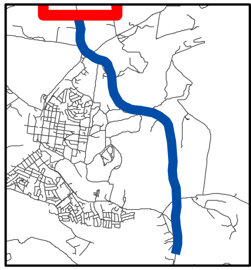
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

Exceedance of NML, dB

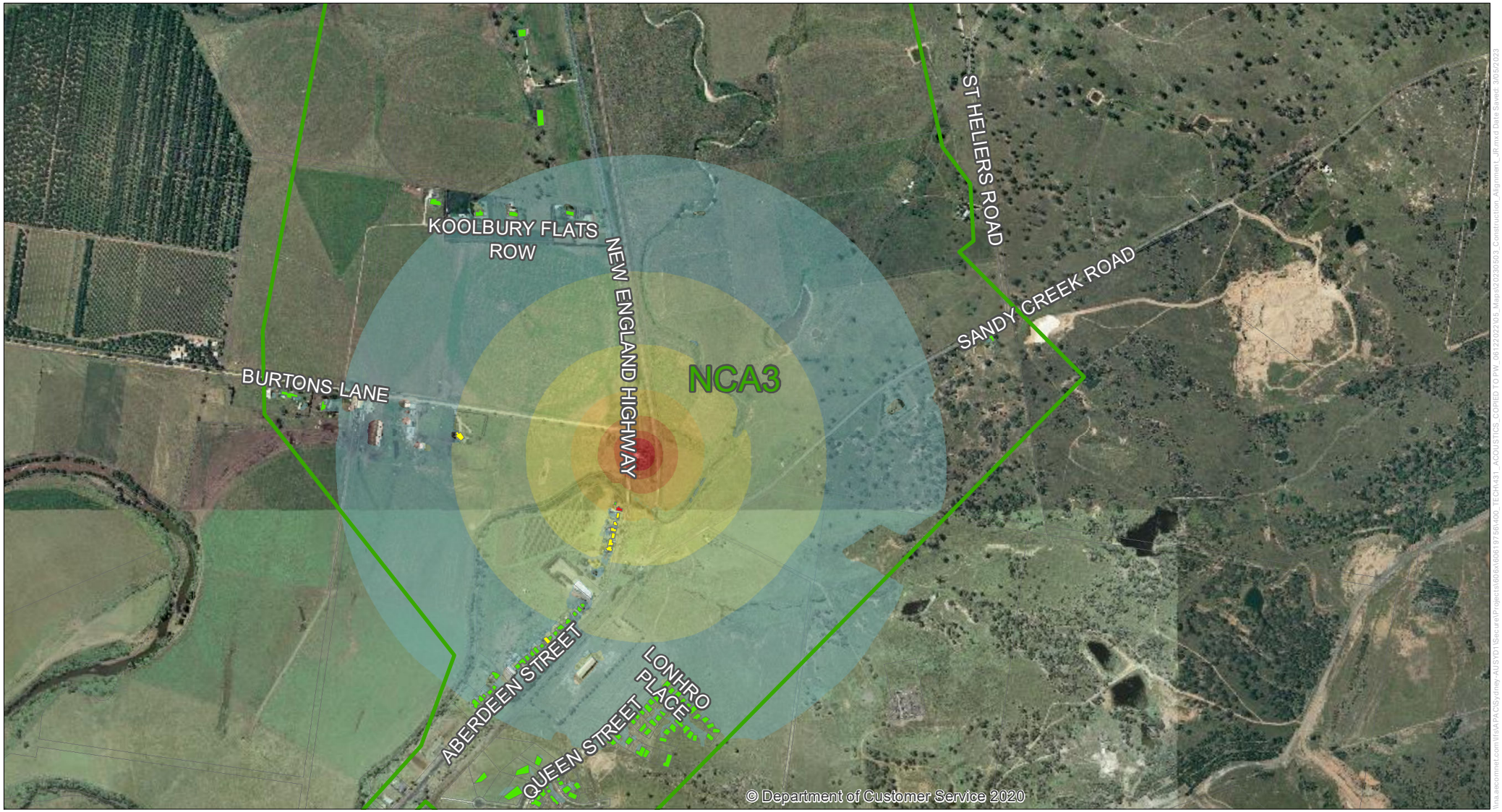
- 0
- 1 - 10
- 11 - 20
- > 20



0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Building removal - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | >= 75

NCAs

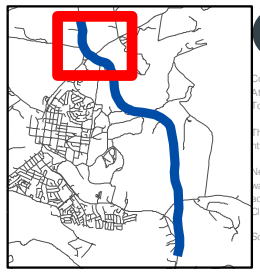
Exceedance of NML, dB

0

1 - 10

11 - 20

> 20

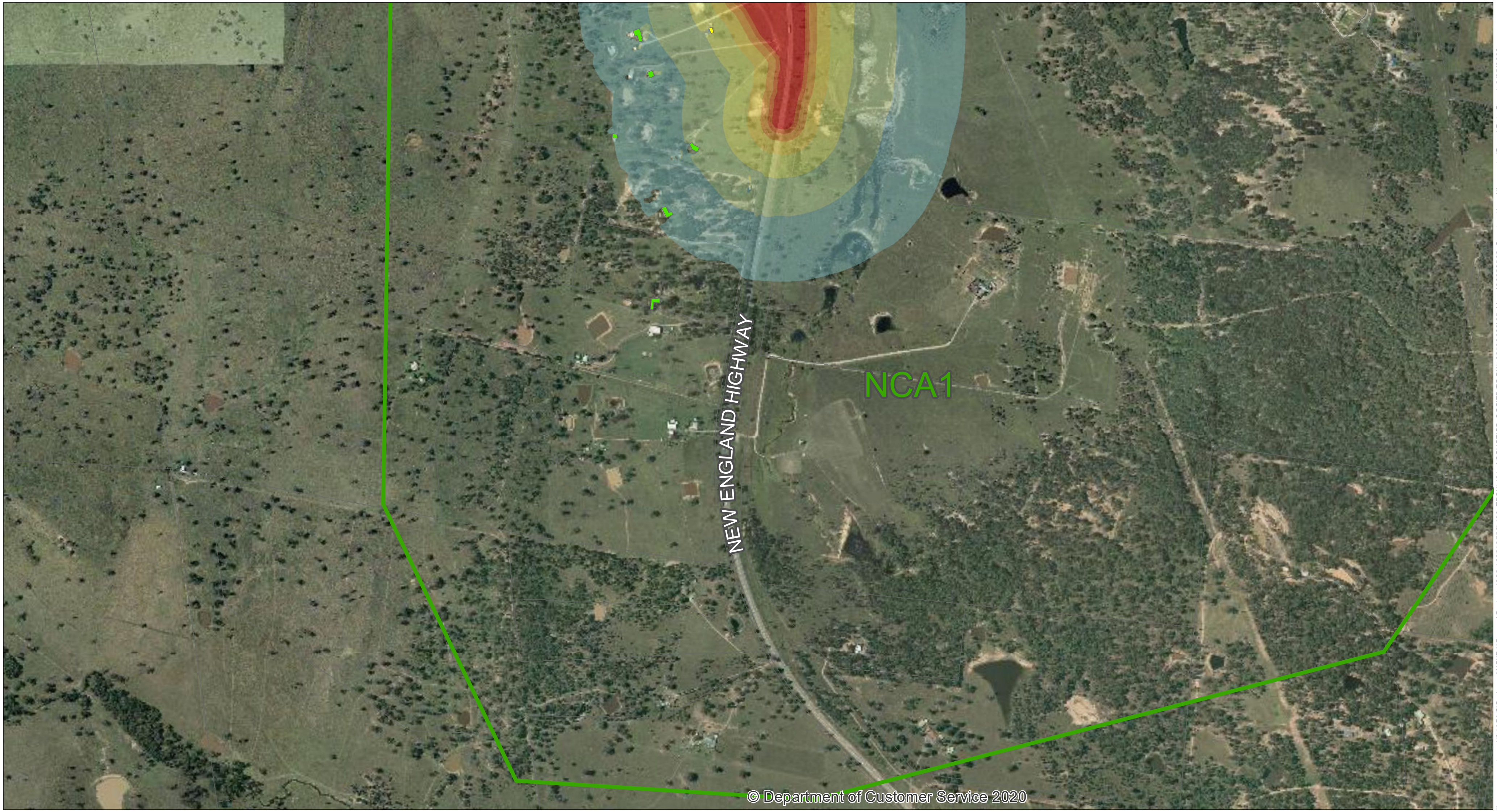


N

0 225 450 Meters

AECOM

Source:



\\na.aecomnet.com\lfs\APAC\Sydney-AUSYD1\Secure\Projects\606x\60619756\400_TECH\431_ACOUSTICS_COPIED TO PW_06122022\05_Maps\20230503_Construction_Alignment_JR.mxd Date Saved: 3/05/2023

Muswellbrook Bypass - Drainage - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

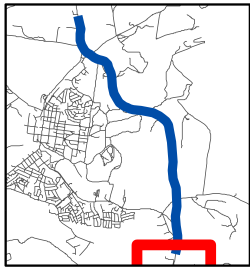
< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

Exceedance of NML, dB

0

1 - 10

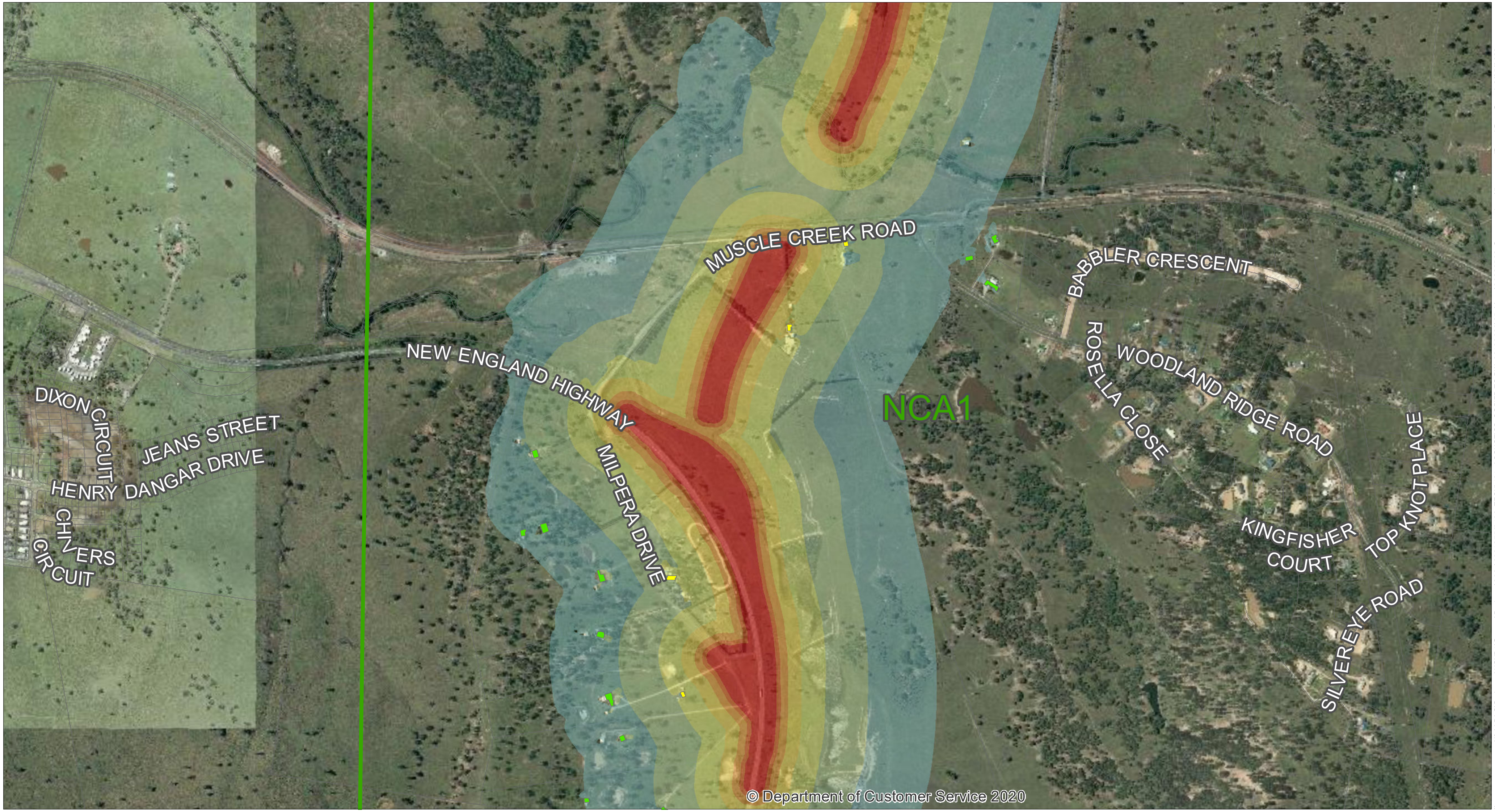
NCAs



0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Drainage - Standard Hours

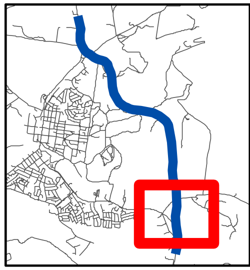
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

Exceedance of NML, dB

0
1 - 10
11 - 20

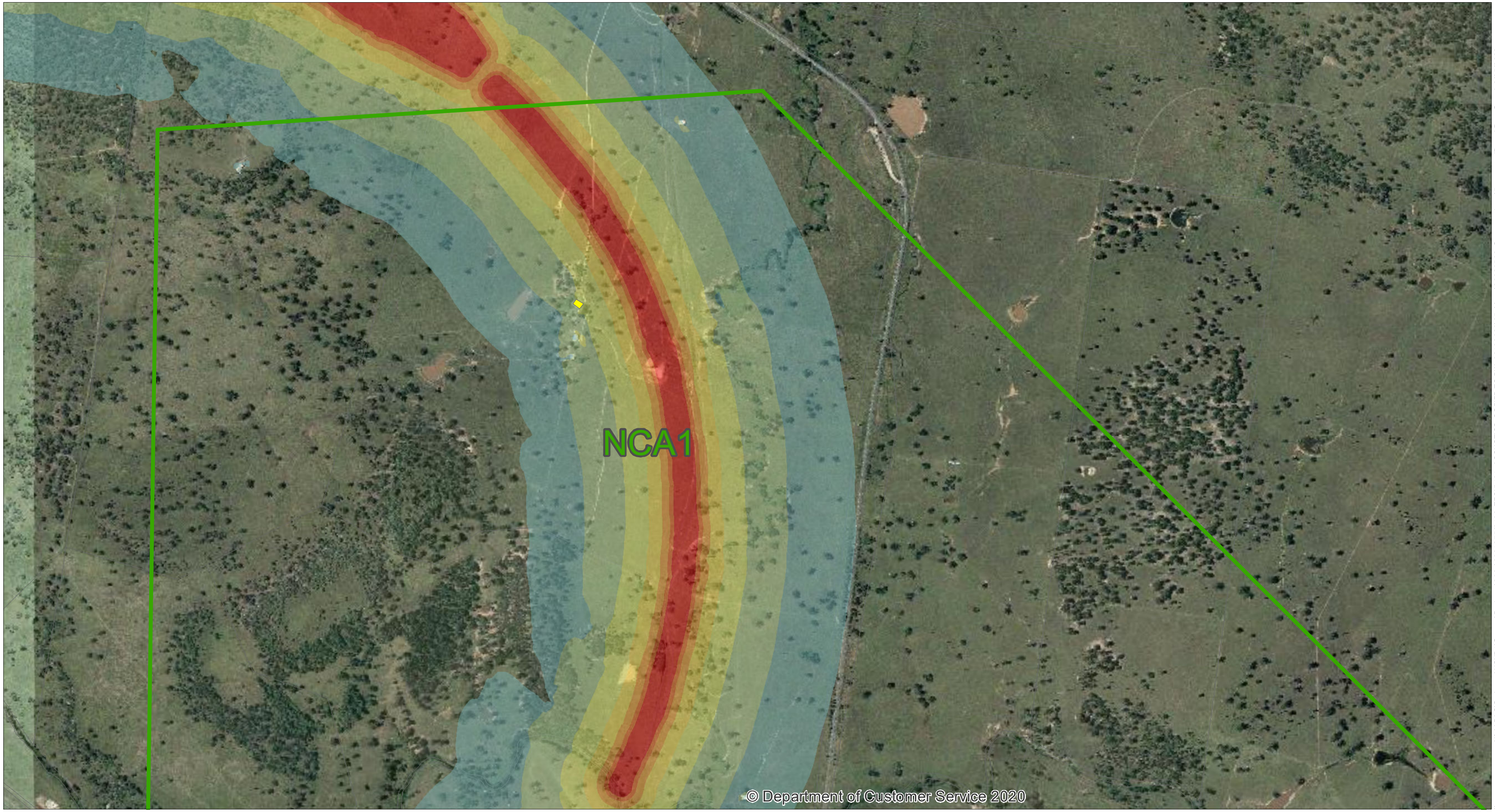


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Drainage - Standard Hours

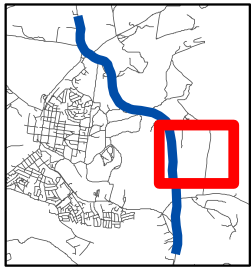
Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
>= 75

NCAs

Exceedance of NML, dB

0
11 - 20

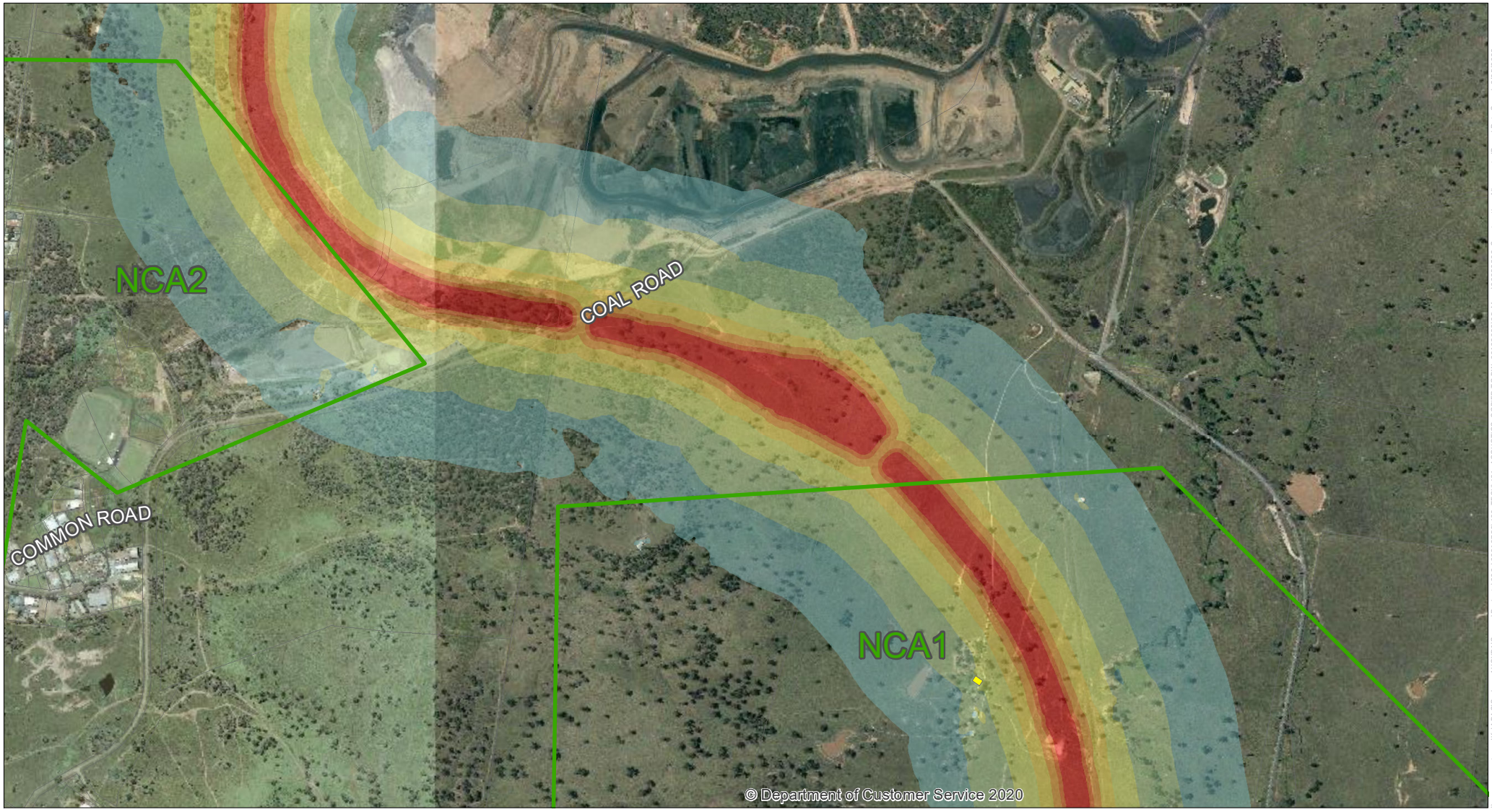


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Drainage - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

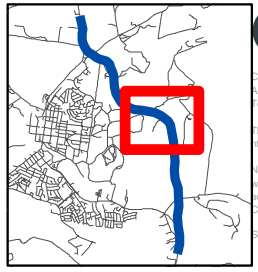
< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | >= 75

NCAs

Exceedance of NML, dB

0

11 - 20

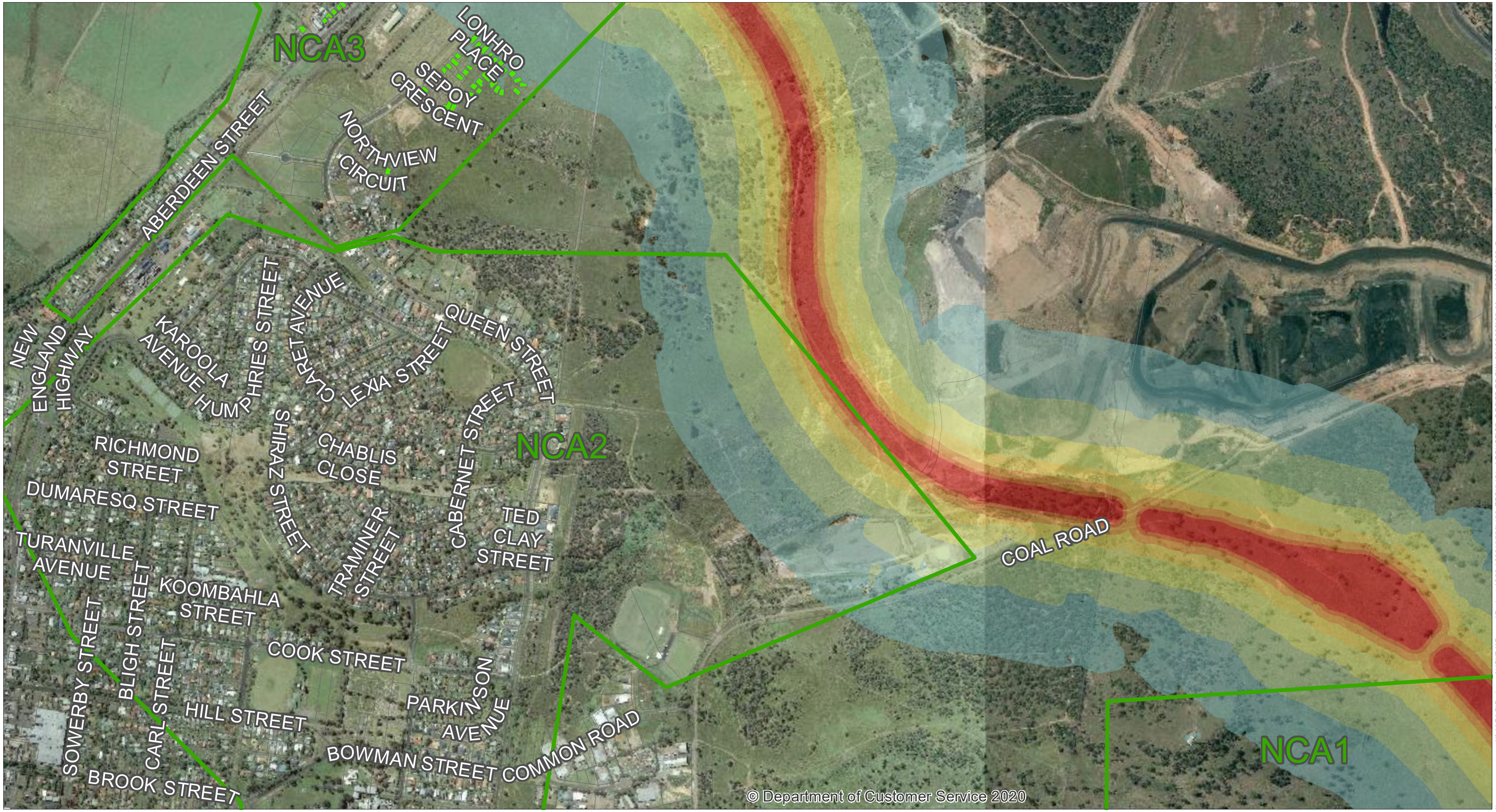


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Drainage - Standard Hours

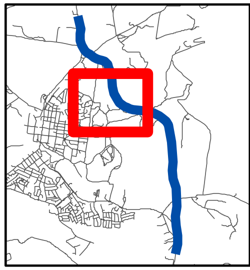
Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
>= 75

Exceedance of NML, dB

0
1 - 10

NCAs



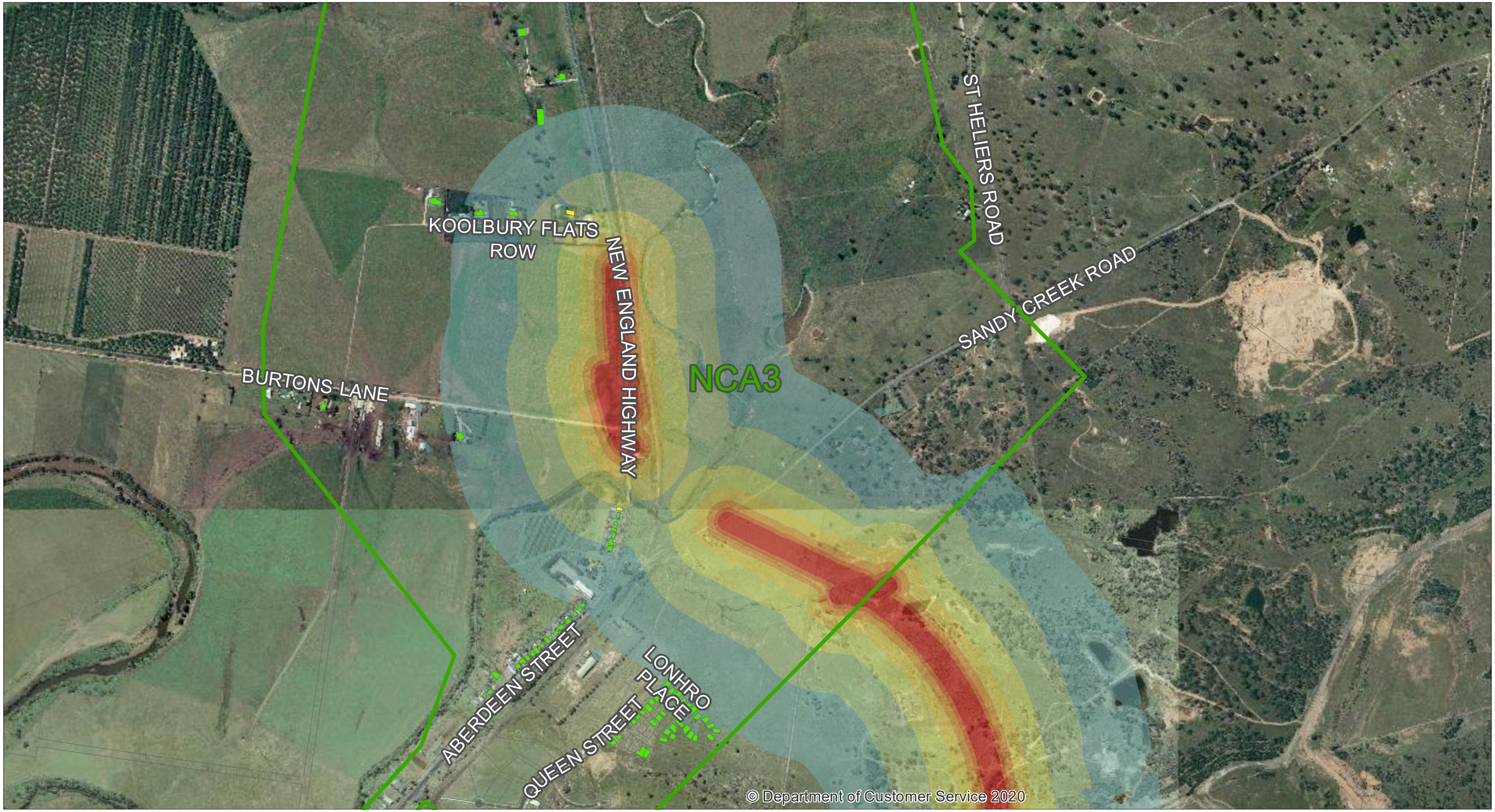
N

0 225 450 Meters

AECOM

Source:

\\na.aecomnet.com\lfs\APAC\Sydney-AUSYD1\Secure\Projects\606x\60619756\400_TECH\431_ACOUSTICS_COPIED TO PW_06122022\05_Maps\20230503_Construction_Alignment_JR.mxd Date Saved: 3/05/2023



Muswellbrook Bypass - Drainage - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

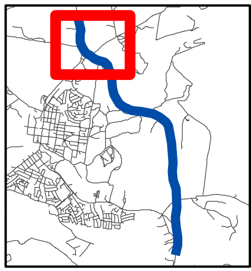
NCAs

Exceedance of NML, dB

0

1 - 10

11 - 20



N

0 225 450 Meters

AECOM

Source:

Muswellbrook Bypass - Drainage - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 45

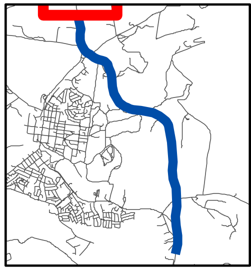
45 - 49

Exceedance of NML, dB

0

1 - 10

NCAs

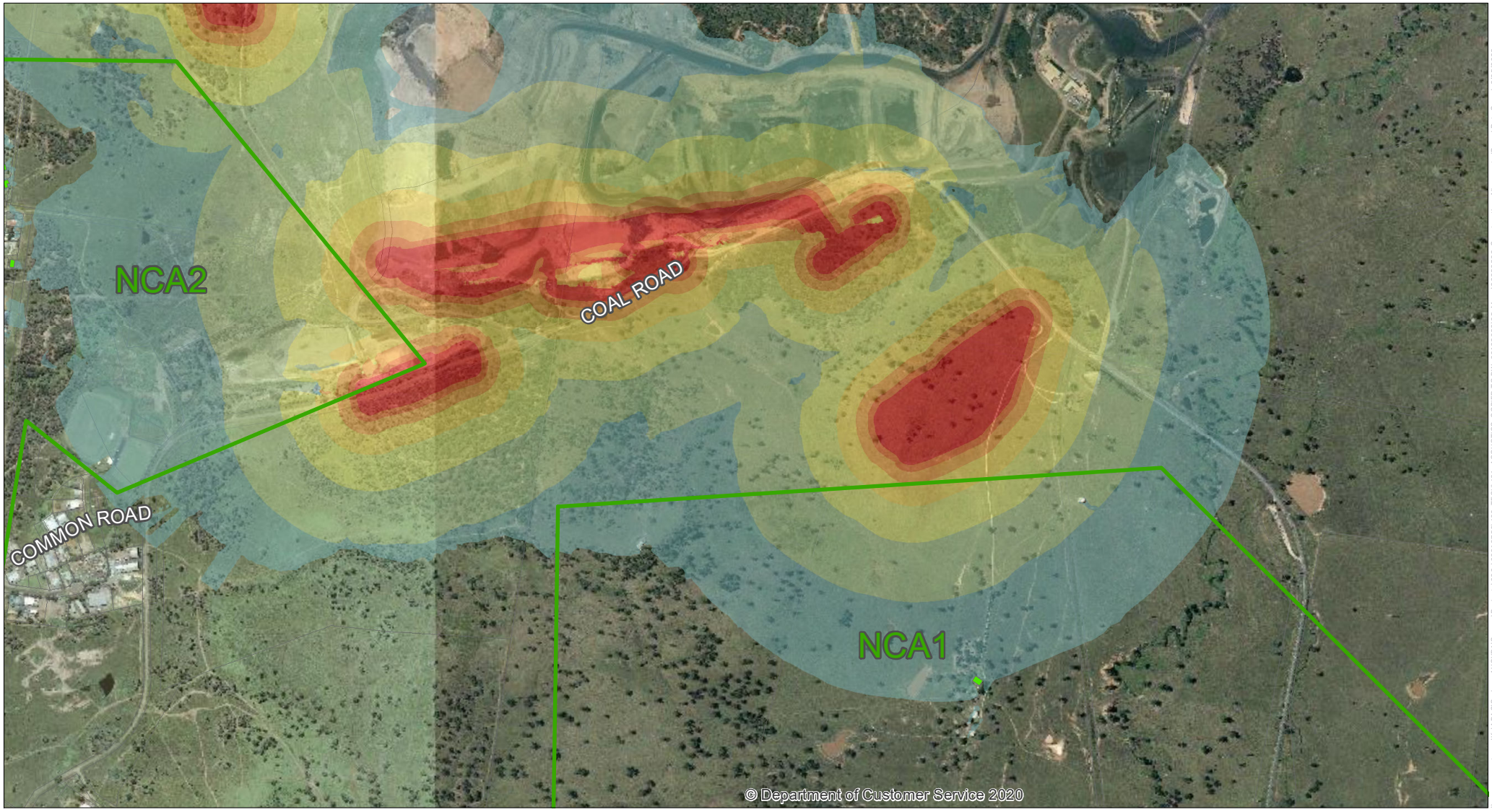


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Utility works - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

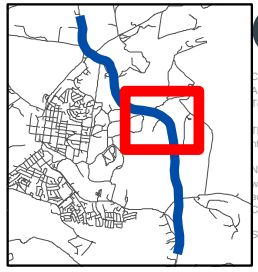
< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | >= 75

NCAs

Exceedance of NML, dB

0

1 - 10

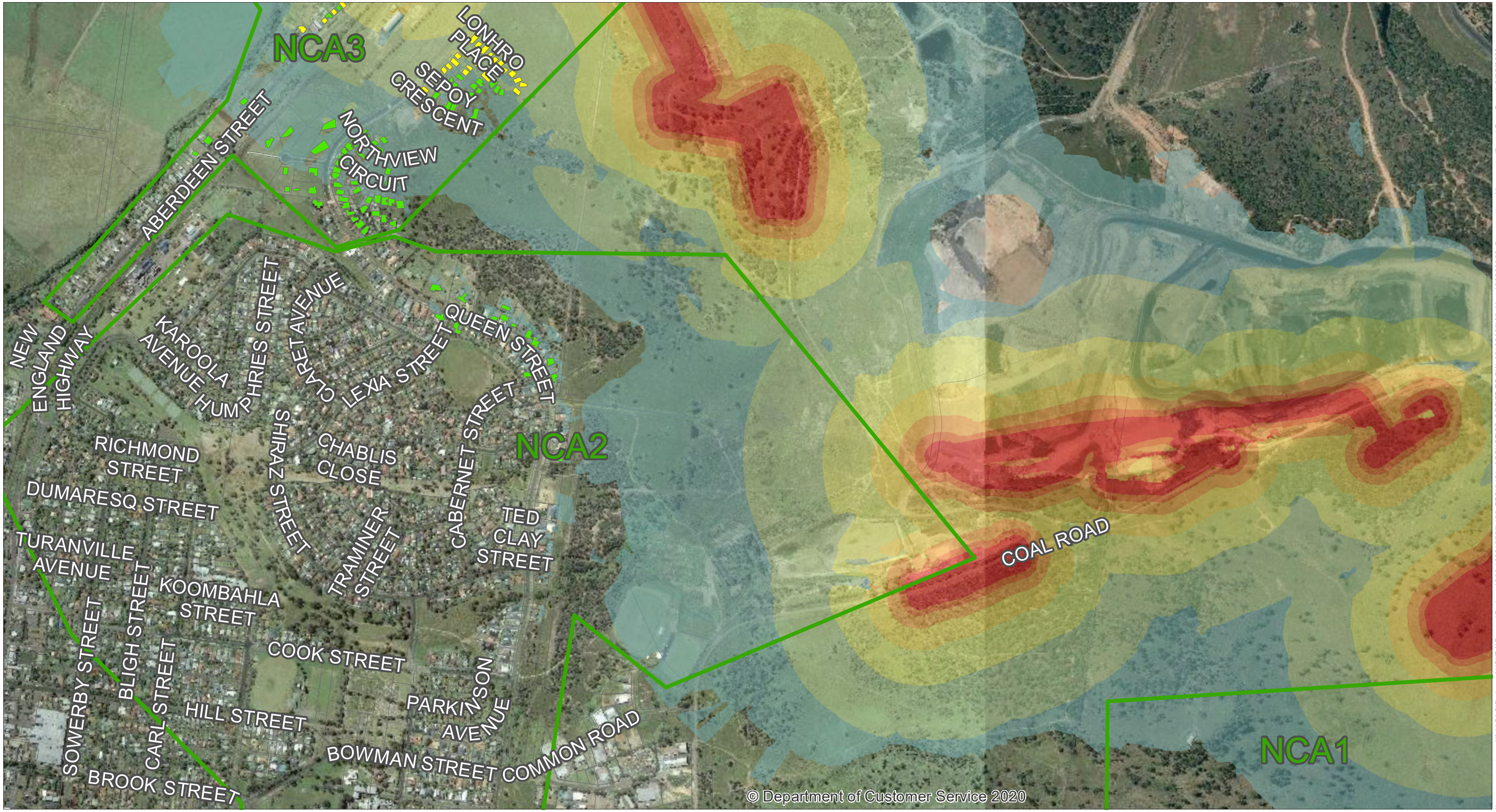


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Utility works - Standard Hours

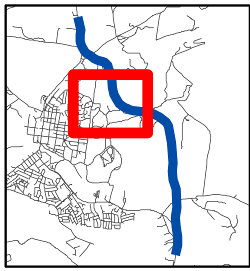
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

Exceedance of NML, dB

0
1 - 10
11 - 20

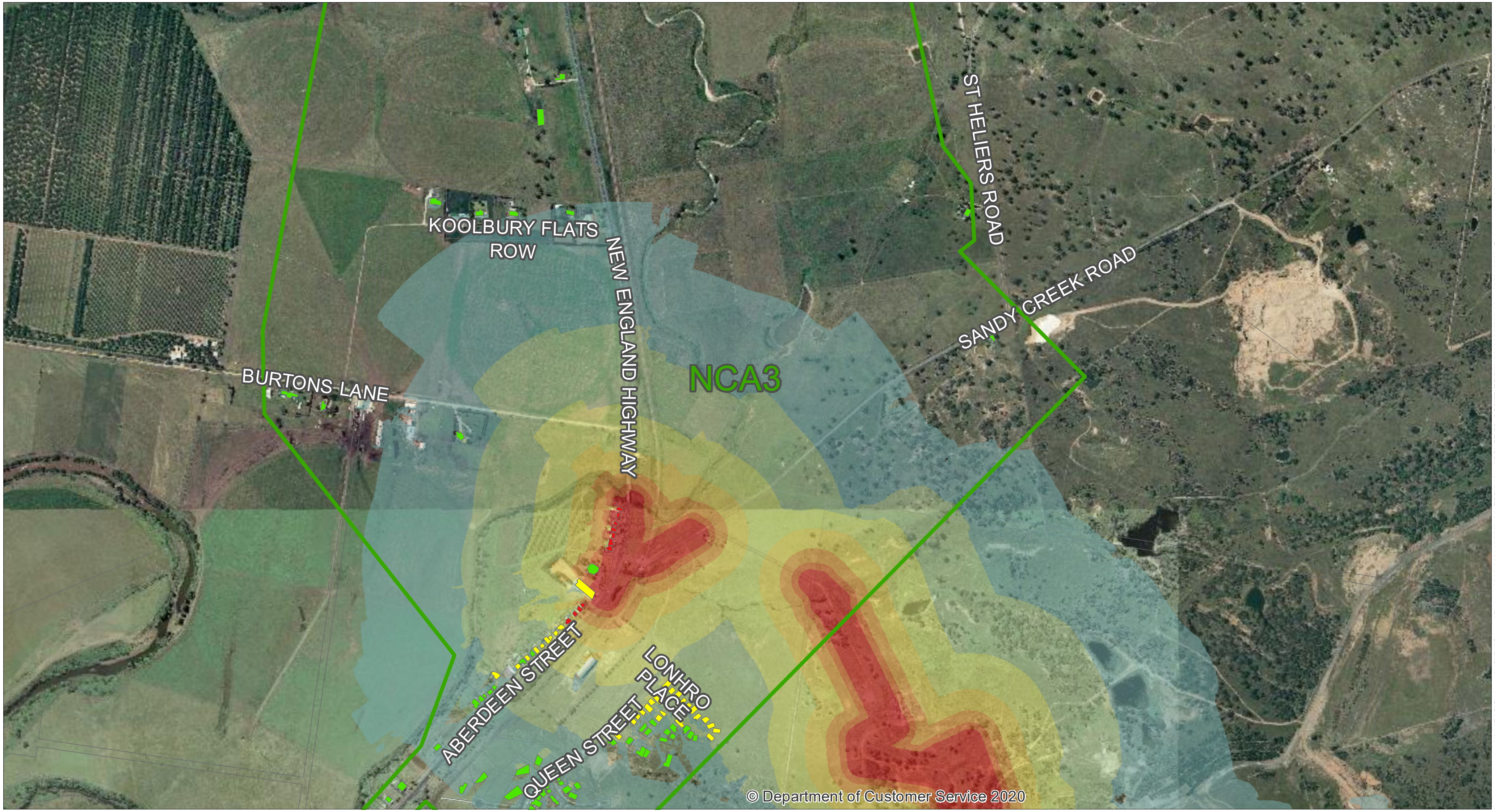
NCAs



0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Utility works - Standard Hours

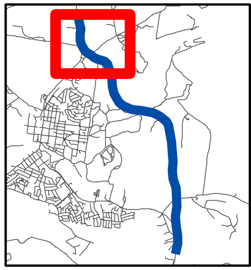
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

Exceedance of NML, dB

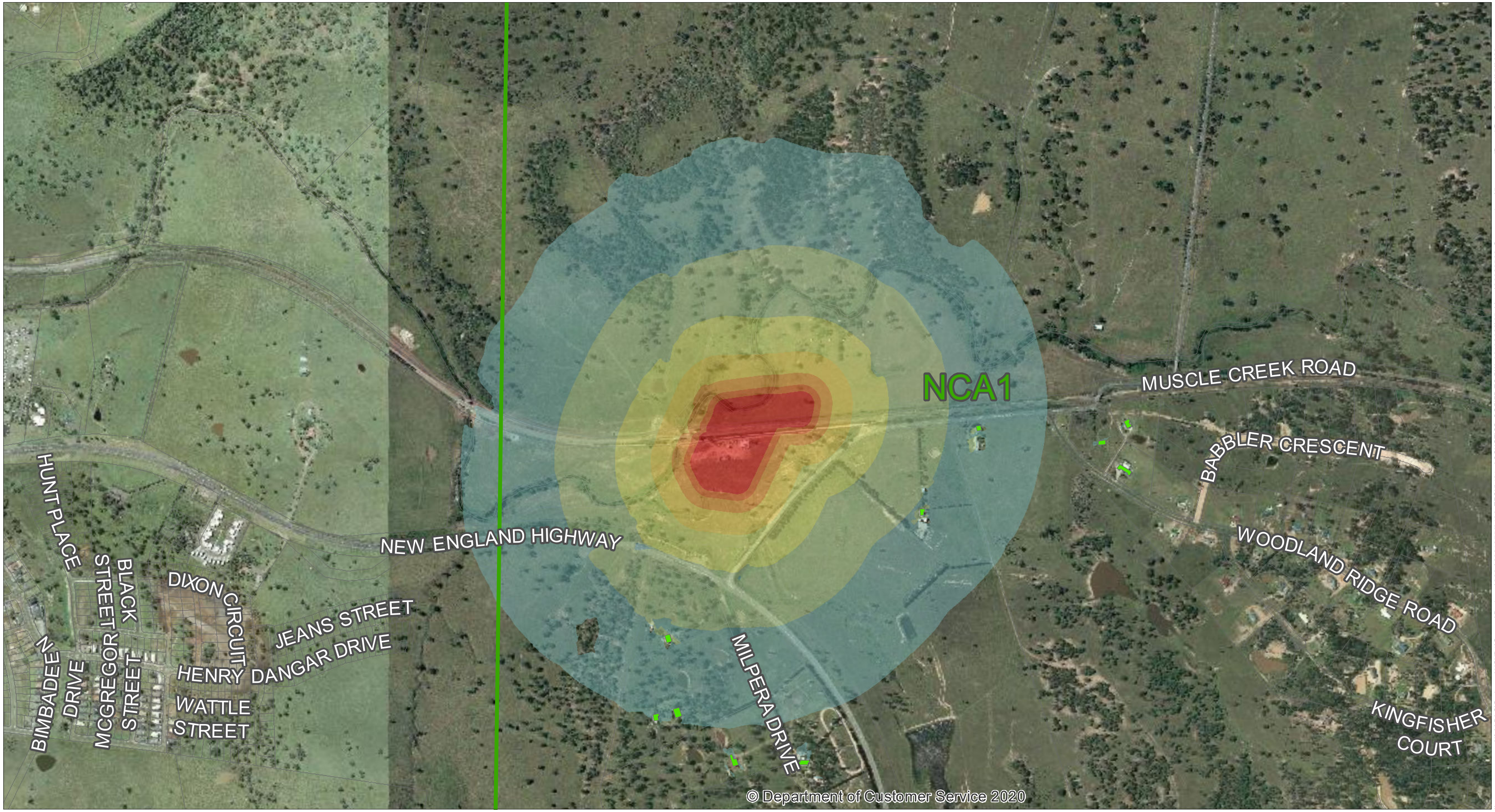
0
1 - 10
11 - 20
> 20



N

0 225 450 Meters

Source:



Muswellbrook Bypass - Utility works - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

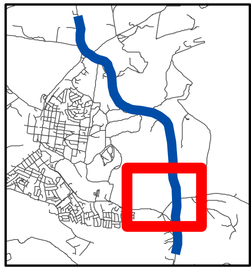
< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

Exceedance of NML, dB

0

1 - 10

NCAs

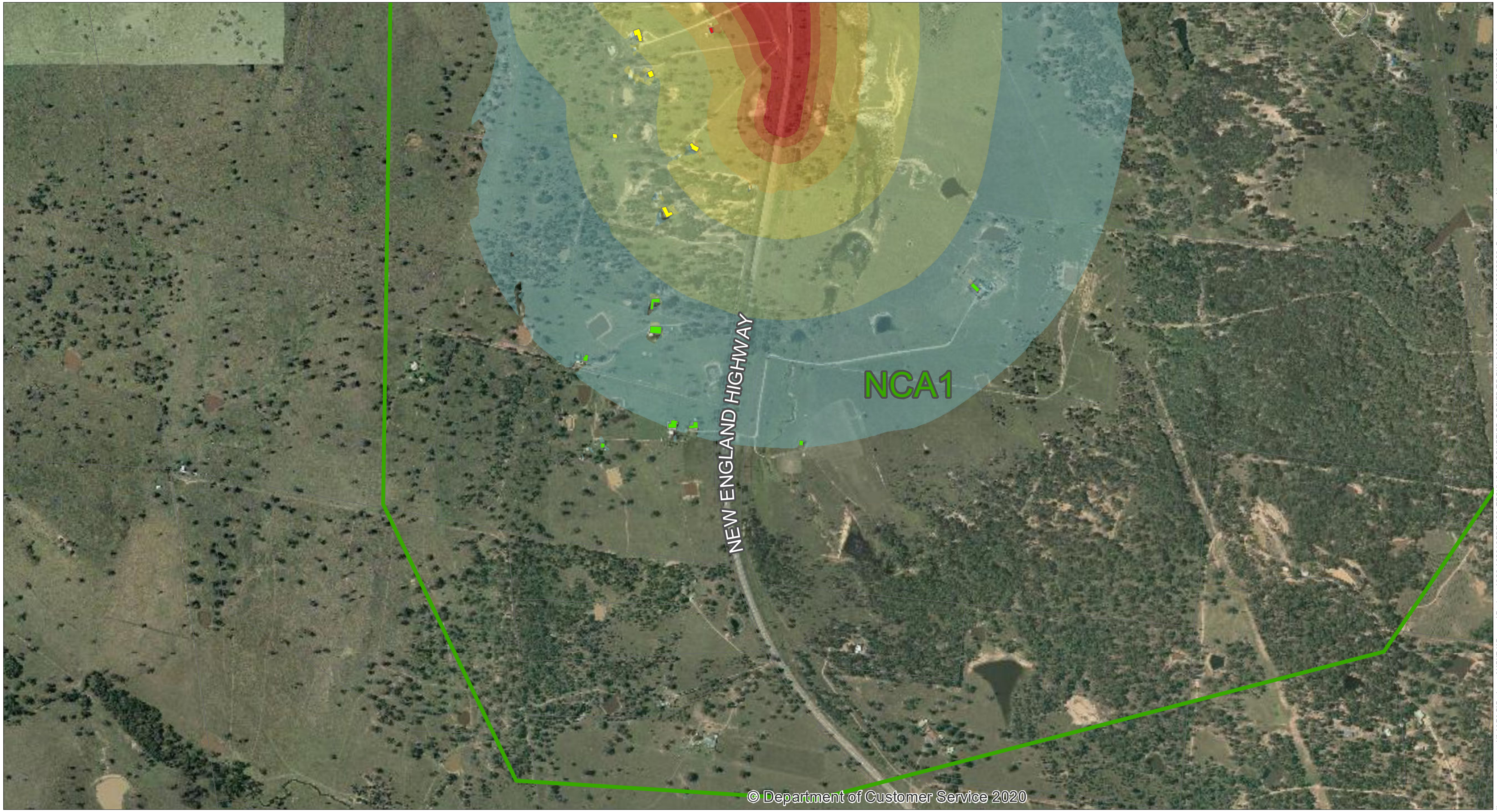


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Standard Hours

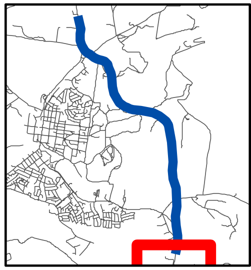
Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
>= 75

NCAs

Exceedance of NML, dB

0
1 - 10
11 - 20

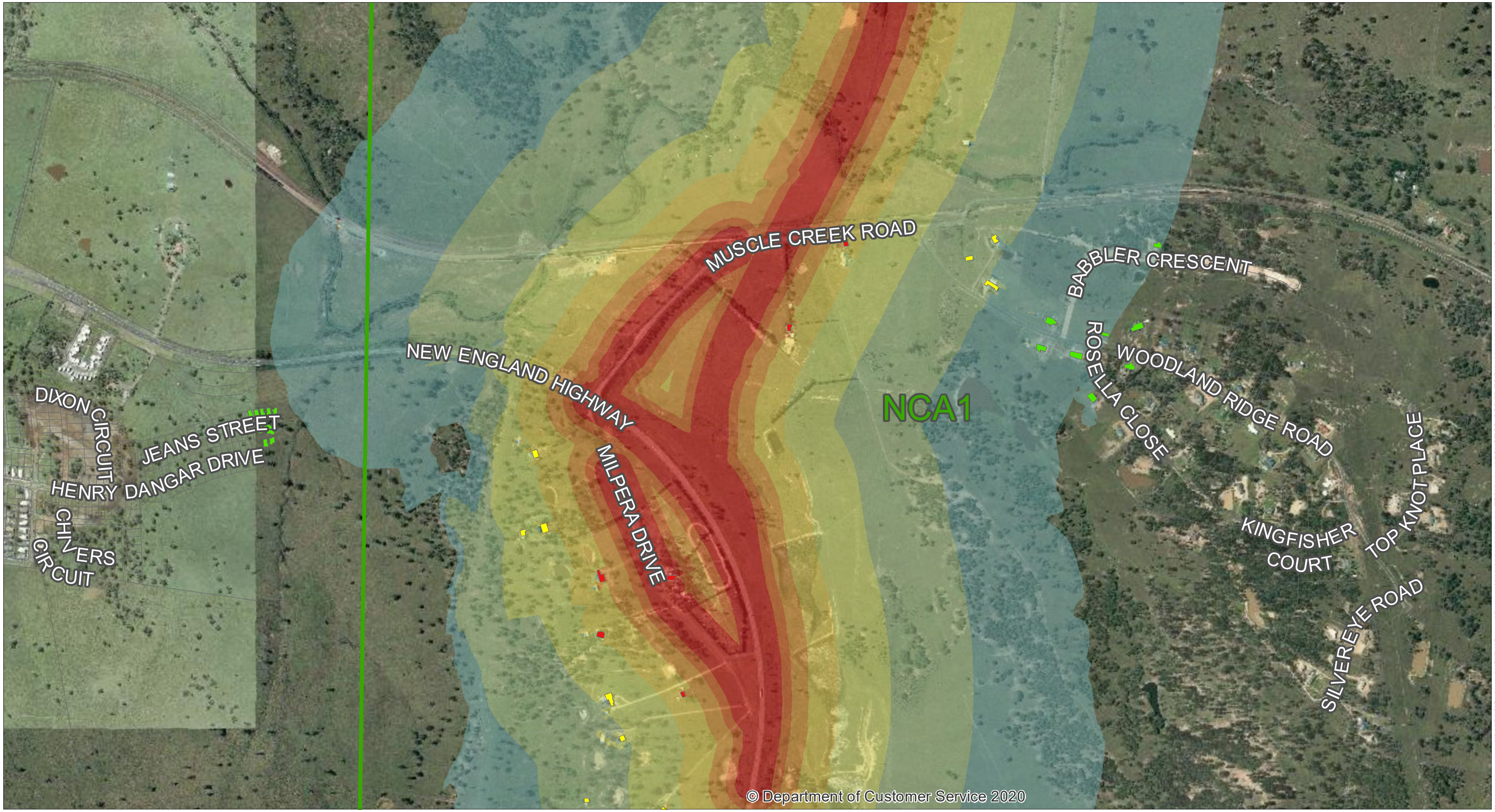


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Standard Hours

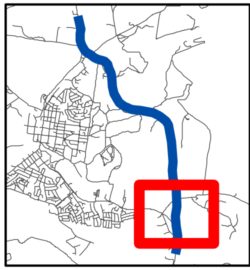
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

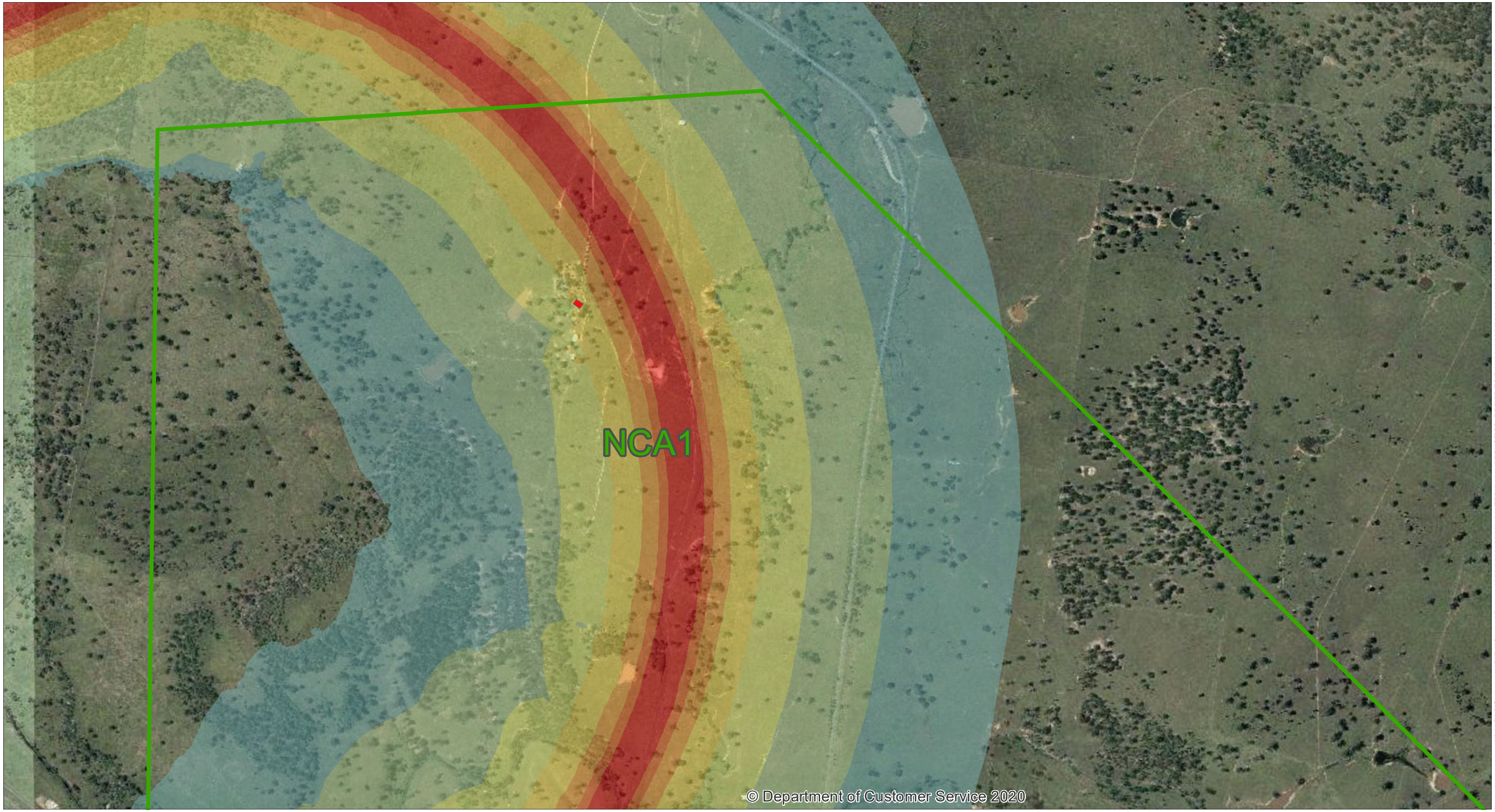
Exceedance of NML, dB

0
1 - 10
11 - 20
> 20



0 225 450 Meters

Source:



Muswellbrook Bypass - Pavement works - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

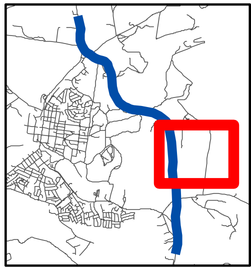
< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

Exceedance of NML, dB

0

> 20

NCAs

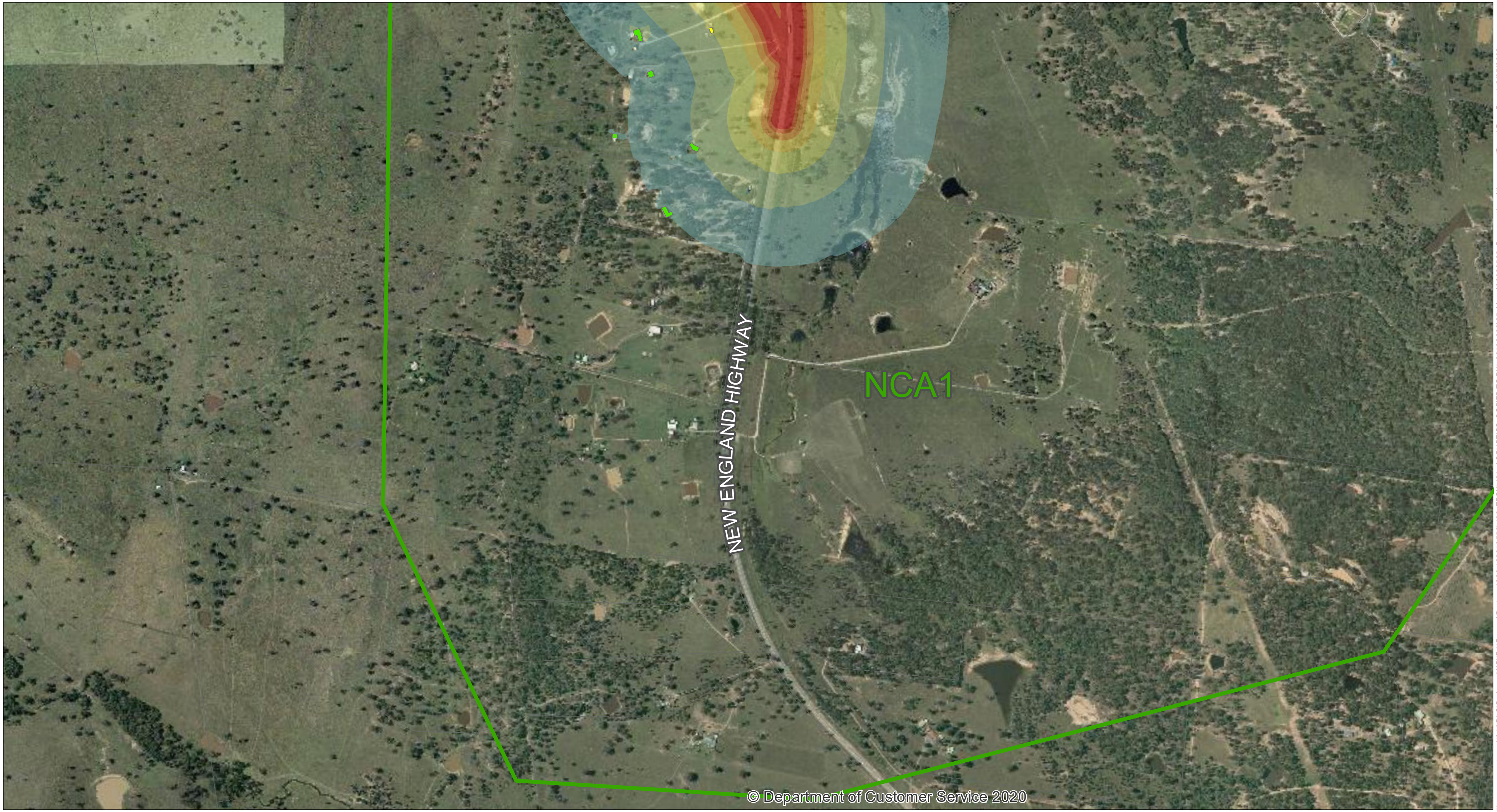


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

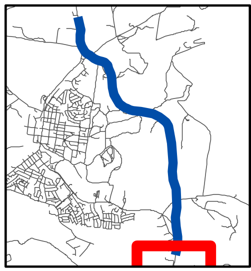
< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

Exceedance of NML, dB

0

1 - 10

NCAs



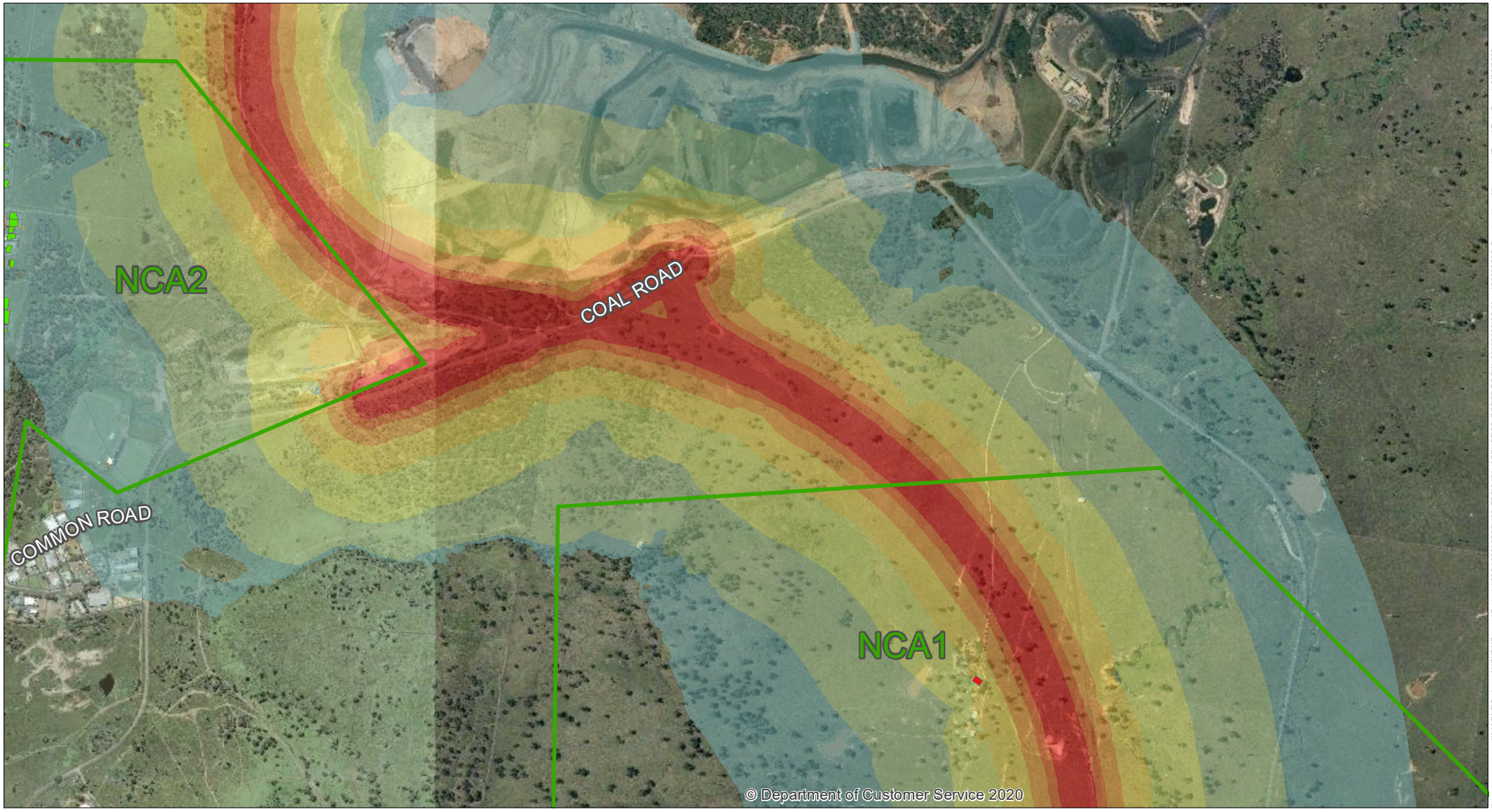
N

0 225 450 Meters

AECOM

Source:

\\na.aecomnet.com\lfs\APAC\Sydney-AUSYD1\Secure\Projects\606x\60619756\400_TECH\431_ACOUSTICS_COPIED TO PW_06122022\05_Maps\20230503_Construction_Alignment_JR.mxd Date Saved: 3/05/2023



Muswellbrook Bypass - Pavement works - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

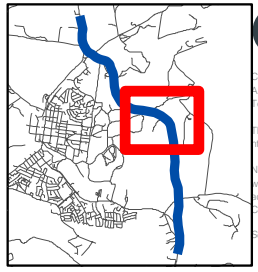
< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | >= 75

NCAs

Exceedance of NML, dB

0

> 20

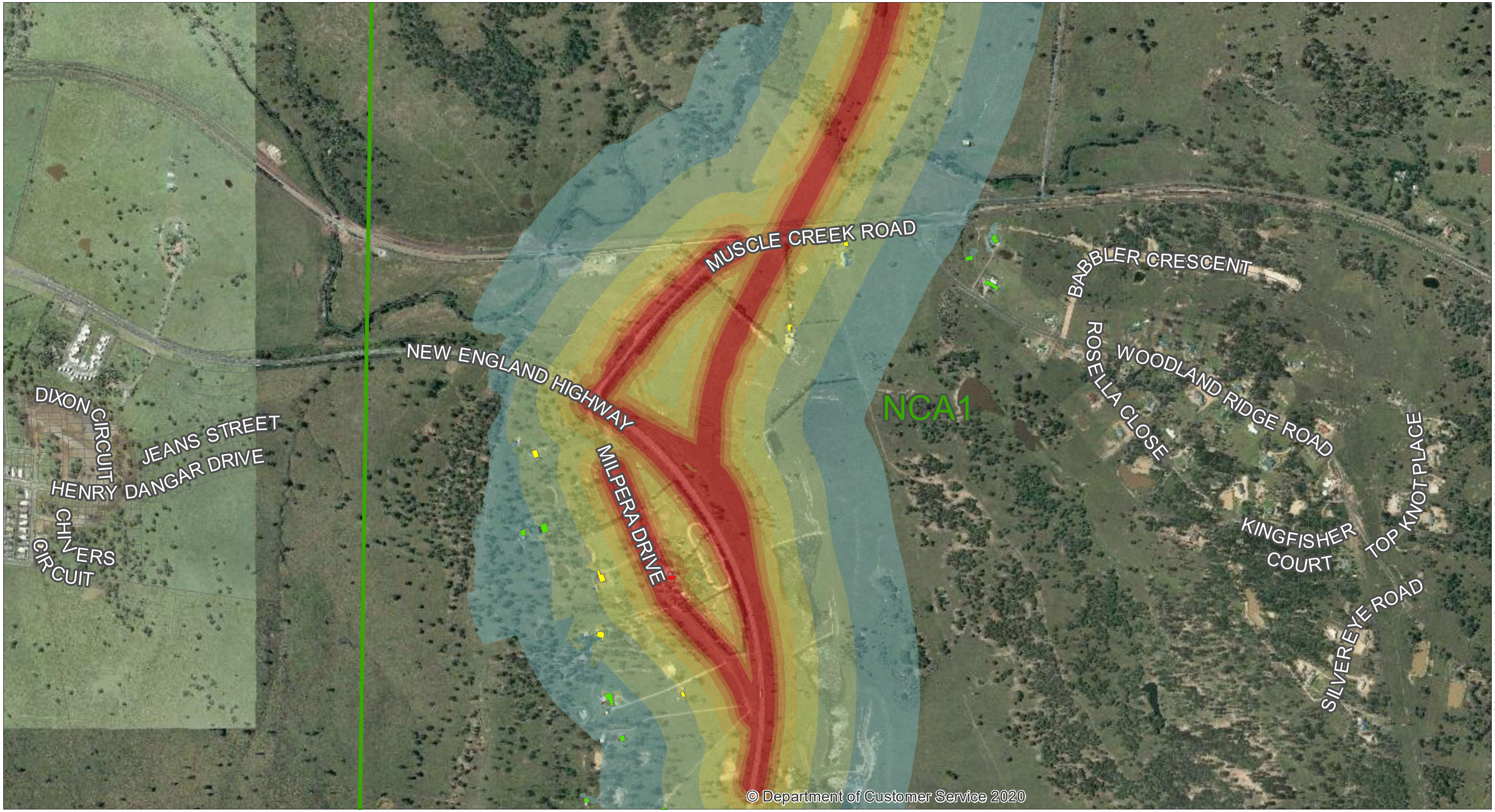


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Standard Hours

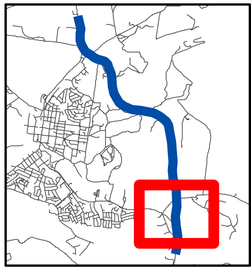
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

Exceedance of NML, dB

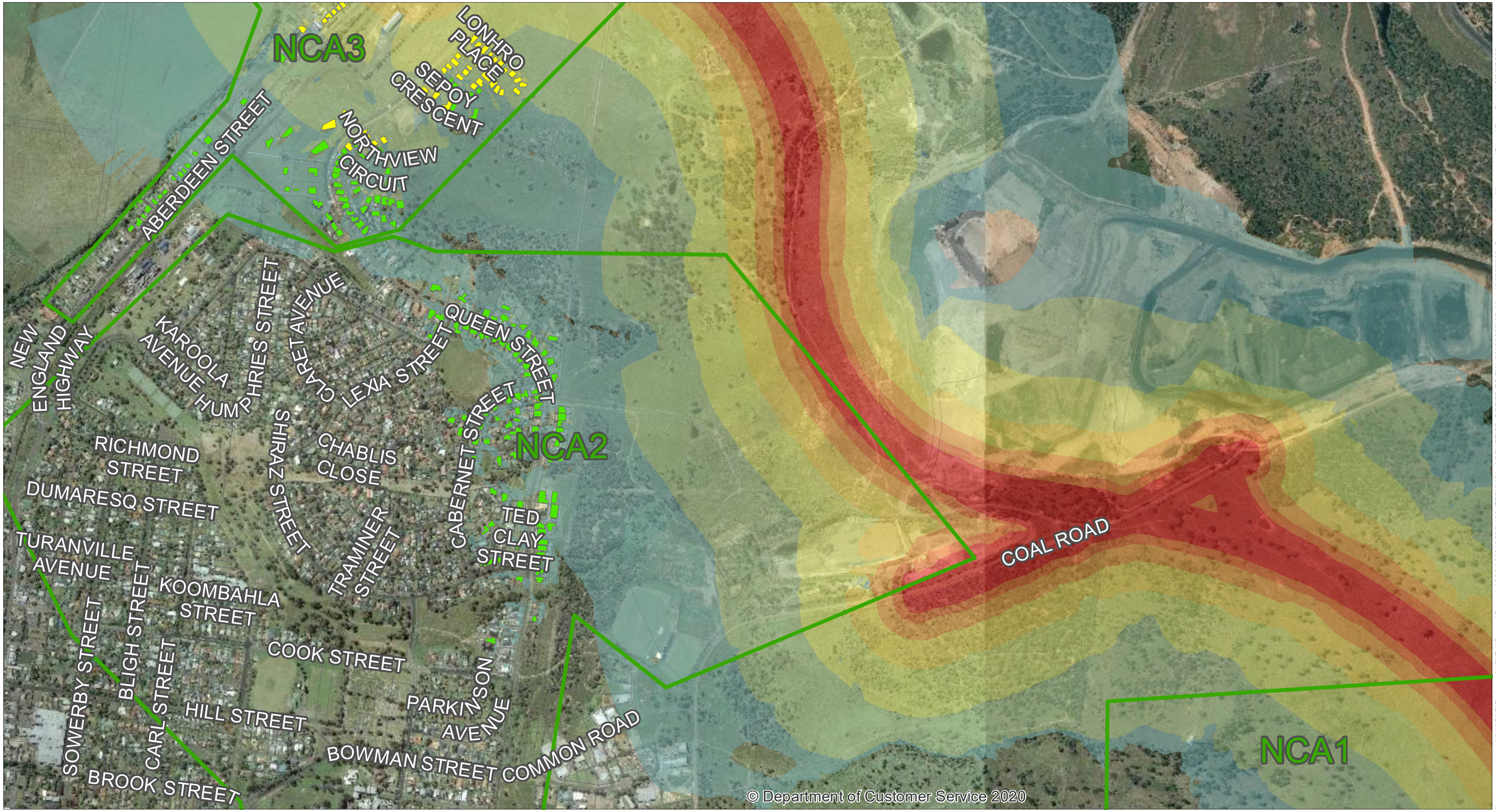
- 0
- 1 - 10
- 11 - 20
- > 20



Meters 0 225 450

AECOM

Source:



Muswellbrook Bypass - Pavement works - Standard Hours

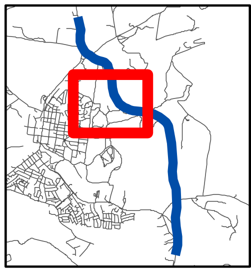
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

Exceedance of NML, dB

0
1 - 10
11 - 20

NCAs

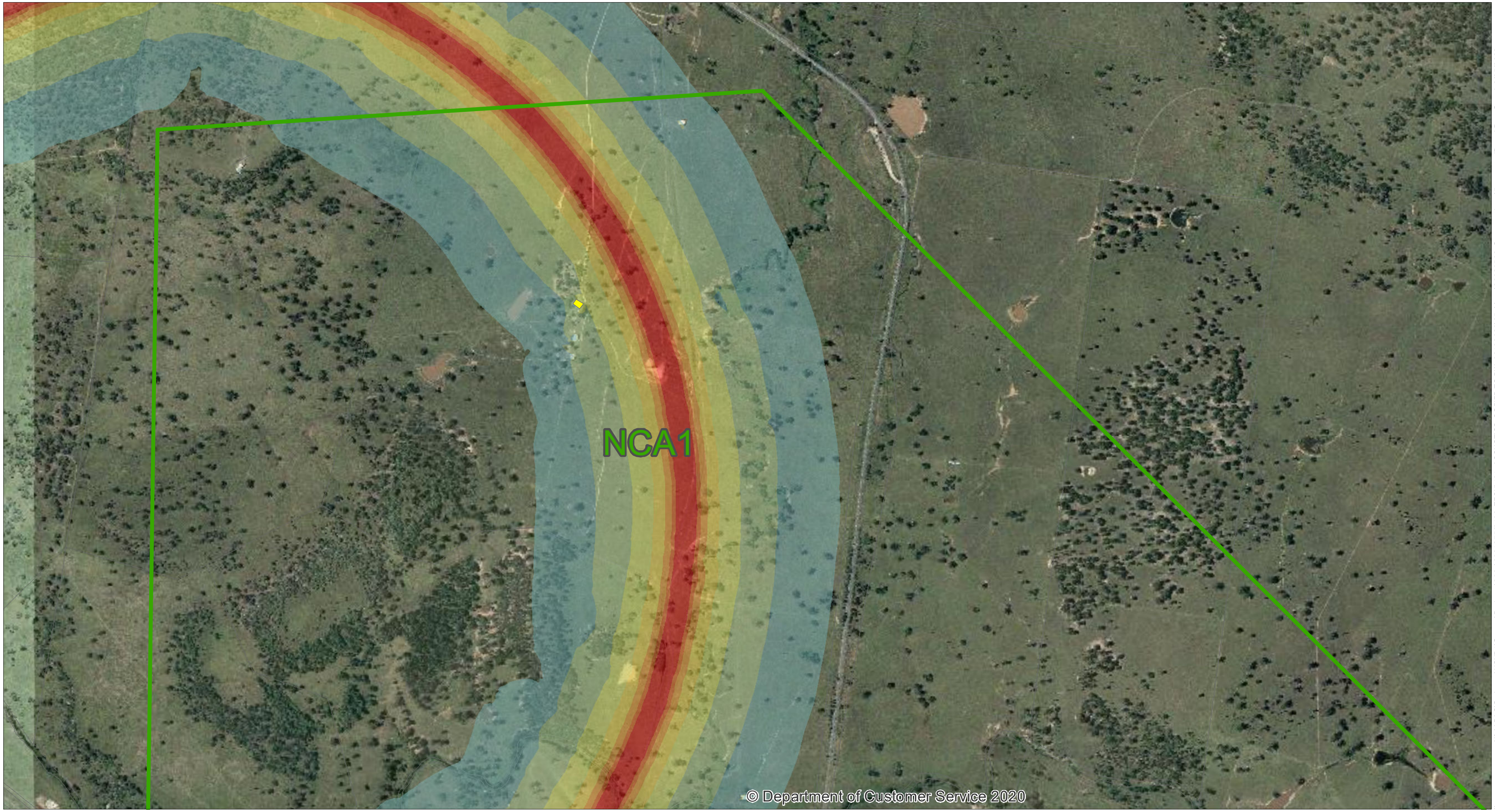


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Standard Hours

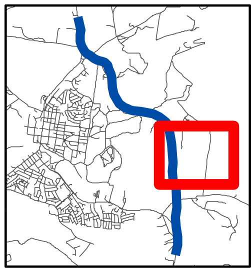
Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
>= 75

Exceedance of NML, dB

0
11 - 20

NCAs

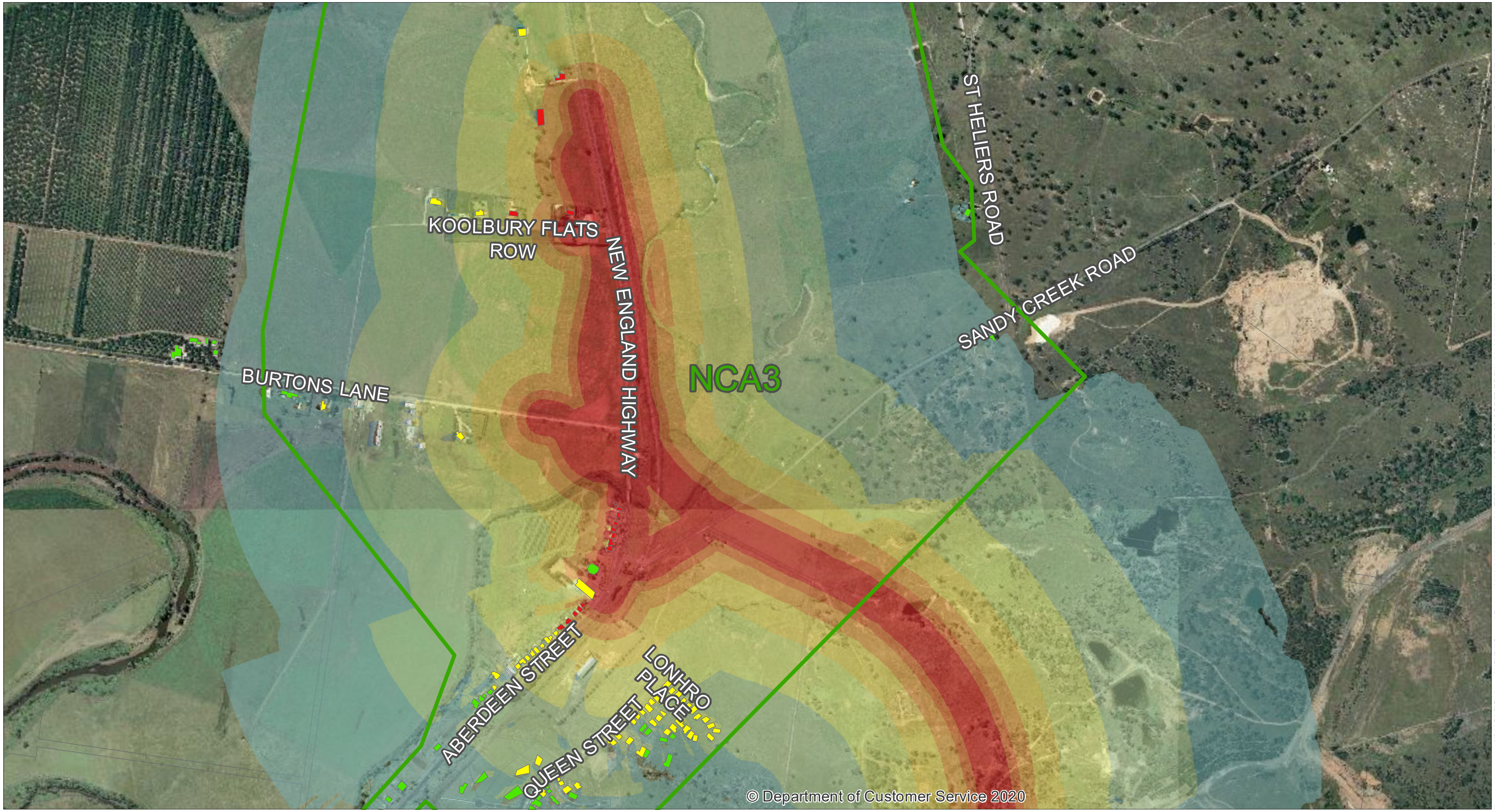


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Standard Hours

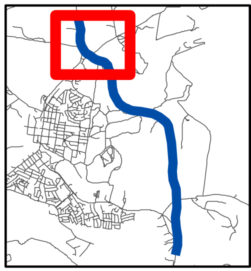
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

Exceedance of NML, dB

0
1 - 10
11 - 20
> 20

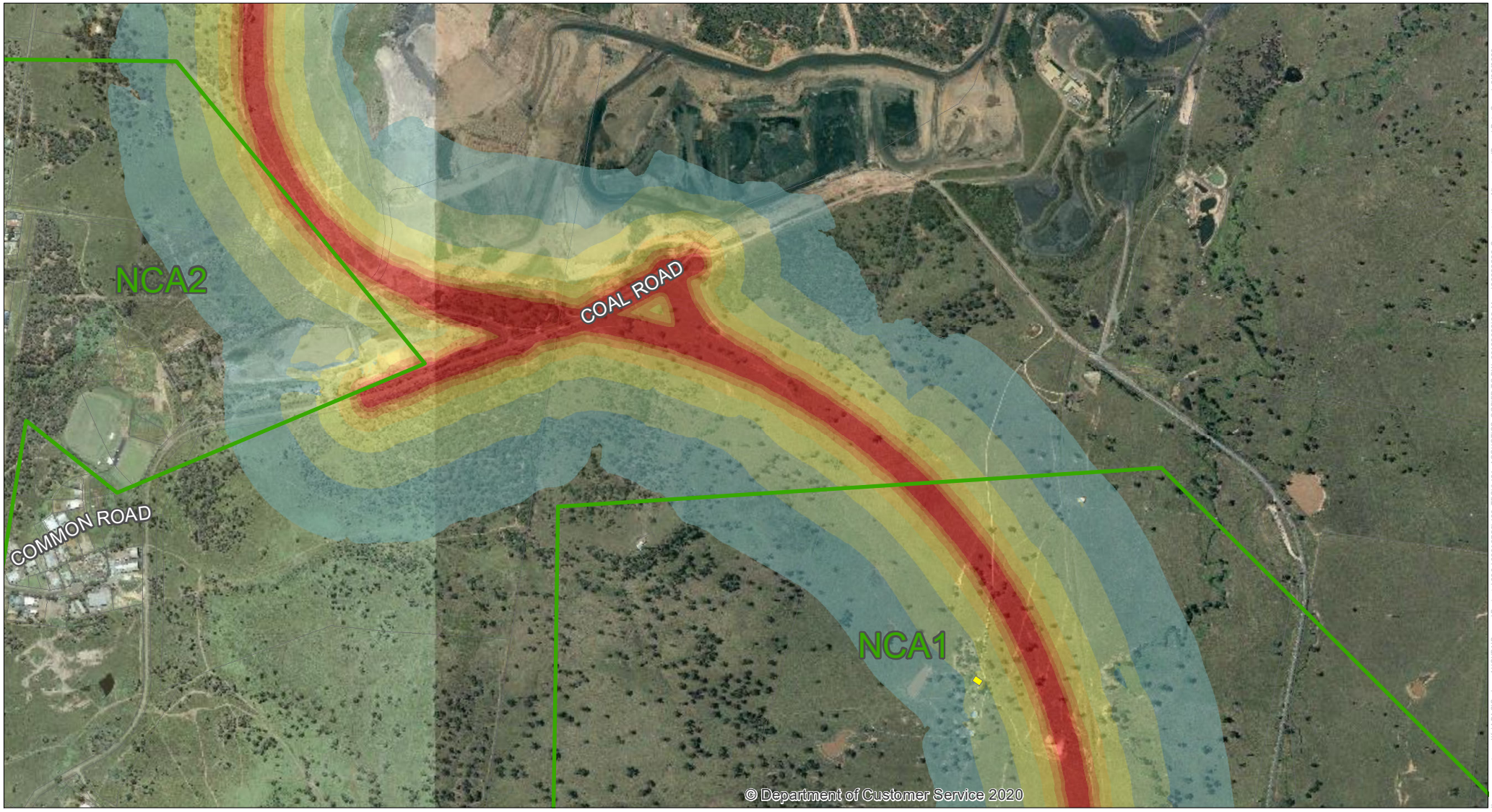


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

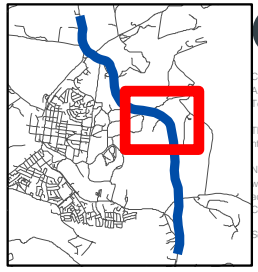
< 45 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | >= 75

NCAs

Exceedance of NML, dB

0

11 - 20

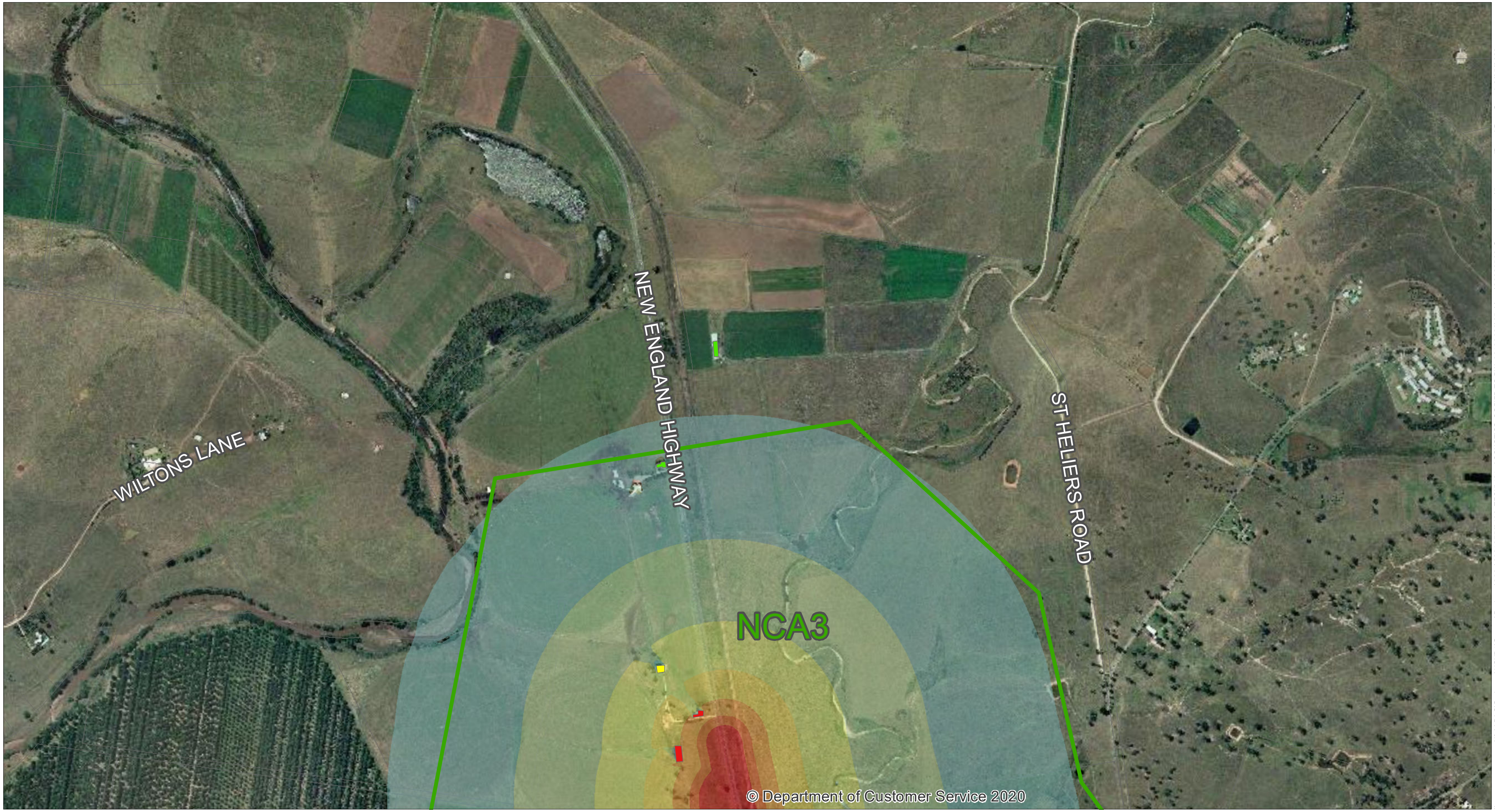


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Standard Hours

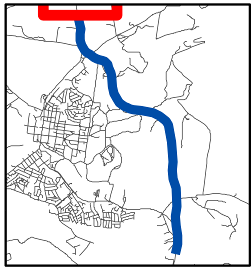
Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
>= 75

NCAs

Exceedance of NML, dB

0
1 - 10
11 - 20
> 20

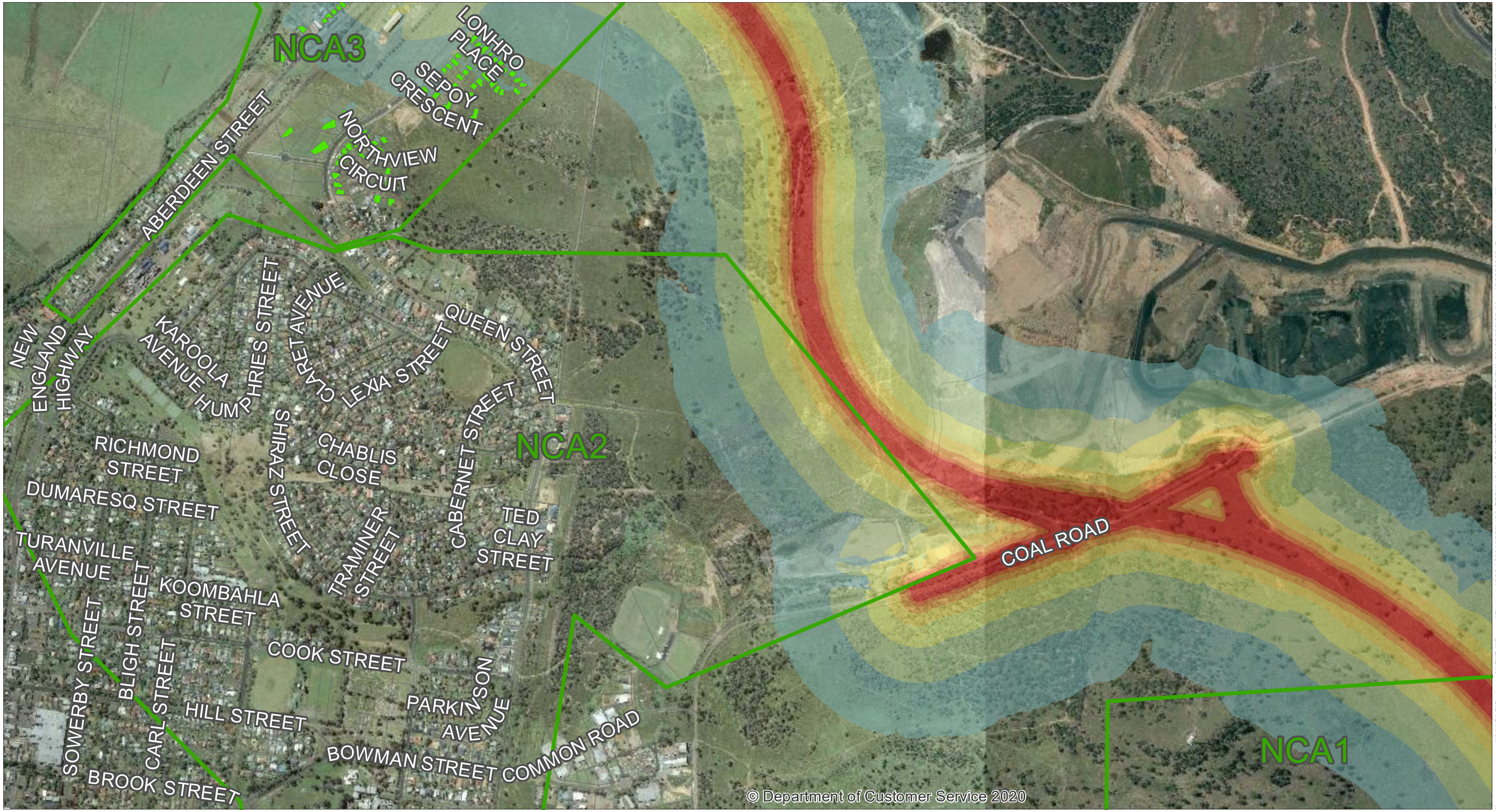


Meters
0 225 450

AECOM

Source:

\\na.aecomnet.com\lfs\APAC\Sydney-AUSYD1\Secure\Projects\606x\60619756\400_TECH\431_ACOUSTICS_COPIED TO PW_06122022\05_Maps\20230503_Construction_Alignment_JR.mxd Date Saved: 3/05/2023



Muswellbrook Bypass - Finishing works - Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

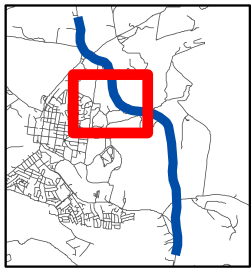
< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

Exceedance of NML, dB

0

1 - 10

NCAs

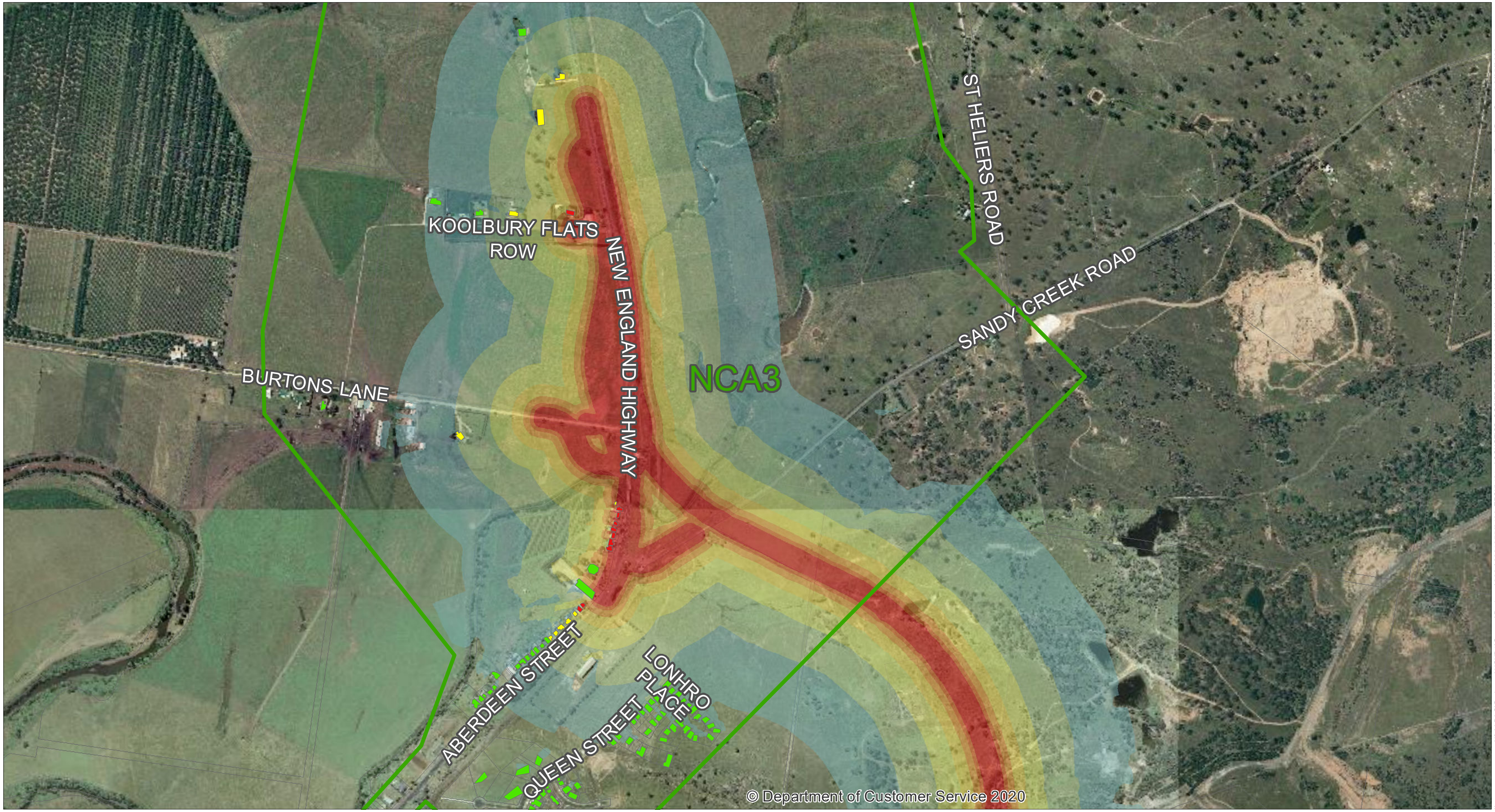


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Standard Hours

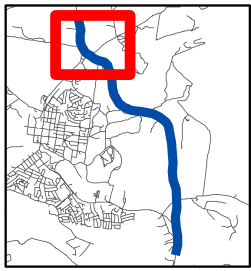
Sound Pressure Level, L_{Aeq} dB(A)

< 45, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, >= 75

NCAs

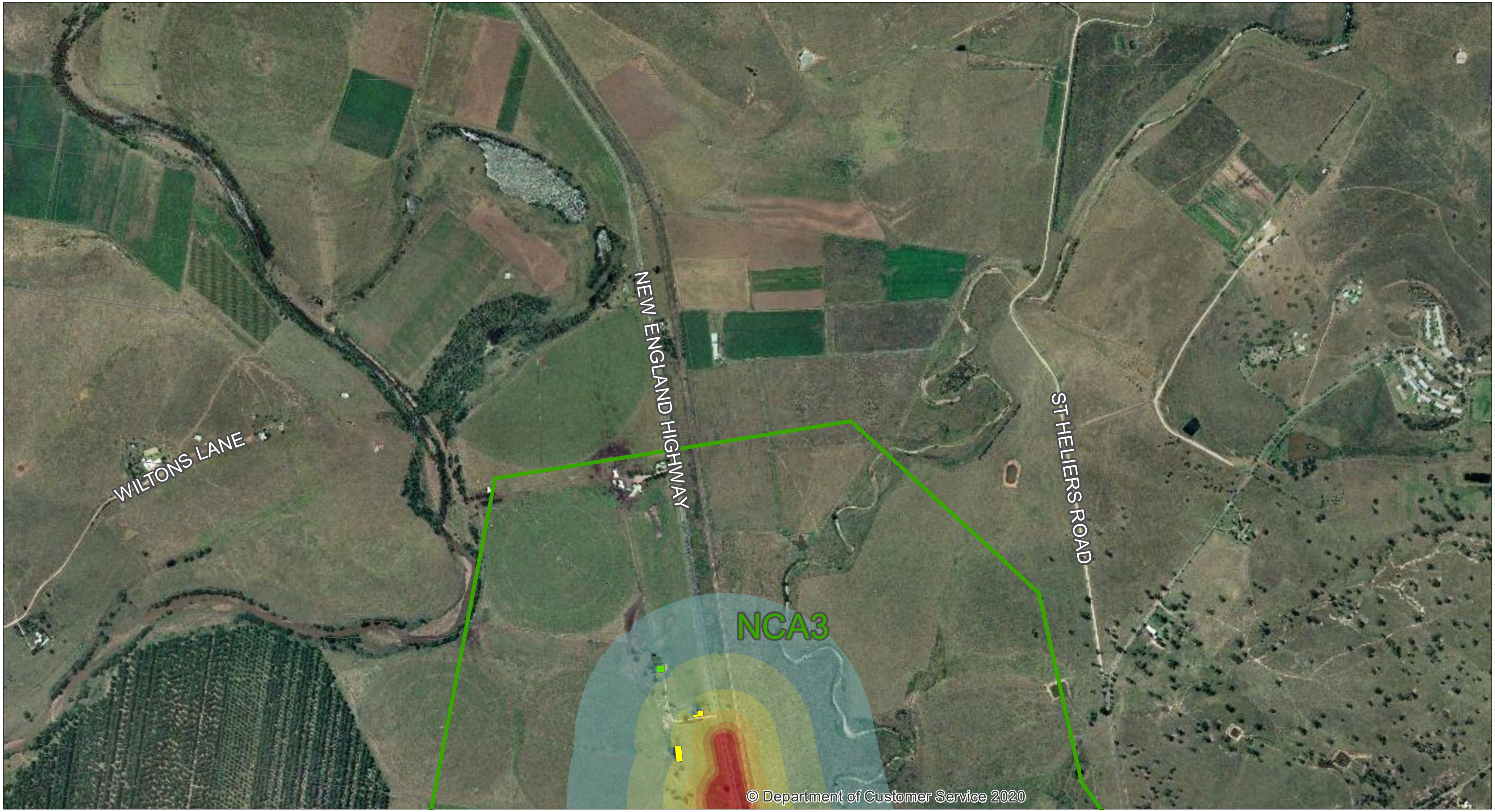
Exceedance of NML, dB

- 0
- 1 - 10
- 11 - 20
- > 20



Meters: 0, 225, 450

Source:



Muswellbrook Bypass - Finishing works - Standard Hours

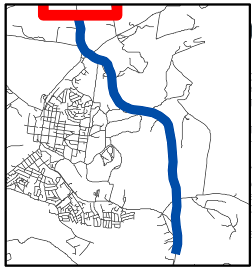
Sound Pressure Level, L_{Aeq} dB(A)

< 45
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74

Exceedance of NML, dB

0
1 - 10
11 - 20

NCAs



0 225 450 Meters

AECOM

Muswellbrook Bypass - Ancillary Modification Area 10 - Laydown, storage and delivery - Outside Standard Hours

WP4

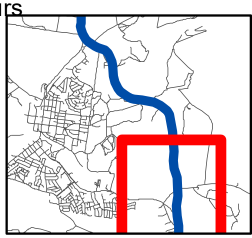
< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64

NCAs

Exceedance of NML, dB

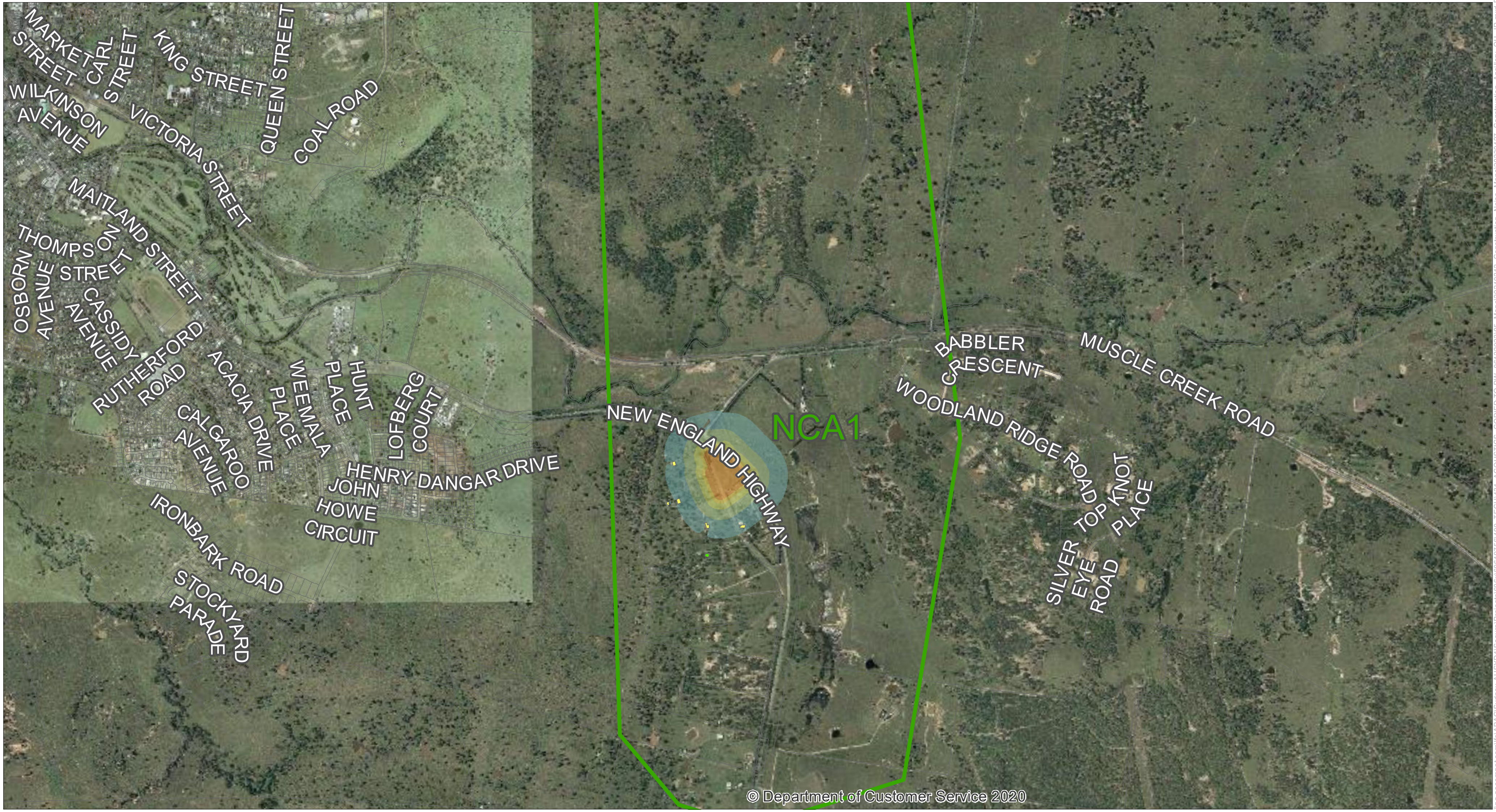
0

1 - 5



0 450 900 Meters

Source:



Muswellbrook Bypass - Ancillary Modification Area 13 - Laydown, storage and delivery - Outside Standard Hours

WP4

< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64

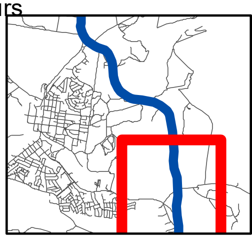
NCAs

Exceedance of NML, dB

0

1 - 5

6 - 15



0 450 900 Meters

Source:

Muswellbrook Bypass - Ancillary Modification Area 14 - Laydown, storage and delivery - Outside Standard Hours

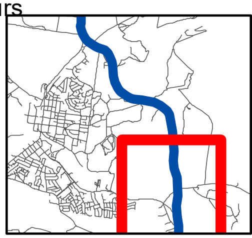
WP4

< 40
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64

NCAs

Exceedance of NML, dB

0
1 - 5
6 - 15



0 450 900 Meters

AECOM

Source:

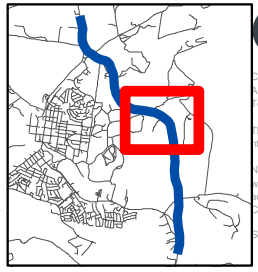
Muswellbrook Bypass - Utility works - Outside Standard Hours

Sound Pressure Level, L_{Aeq} dB(A) Exceedance of NML, dB(A)

0

<40

NCAs



N

0 225 450 Meters

AECOM

Source:

Muswellbrook Bypass - Utility works - Outside Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 40, 40 - 44, 45 - 49, 50 - 54

NCAs

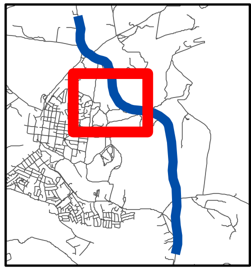
Exceedance of NML, dB(A)

0

1 - 5

6 - 15

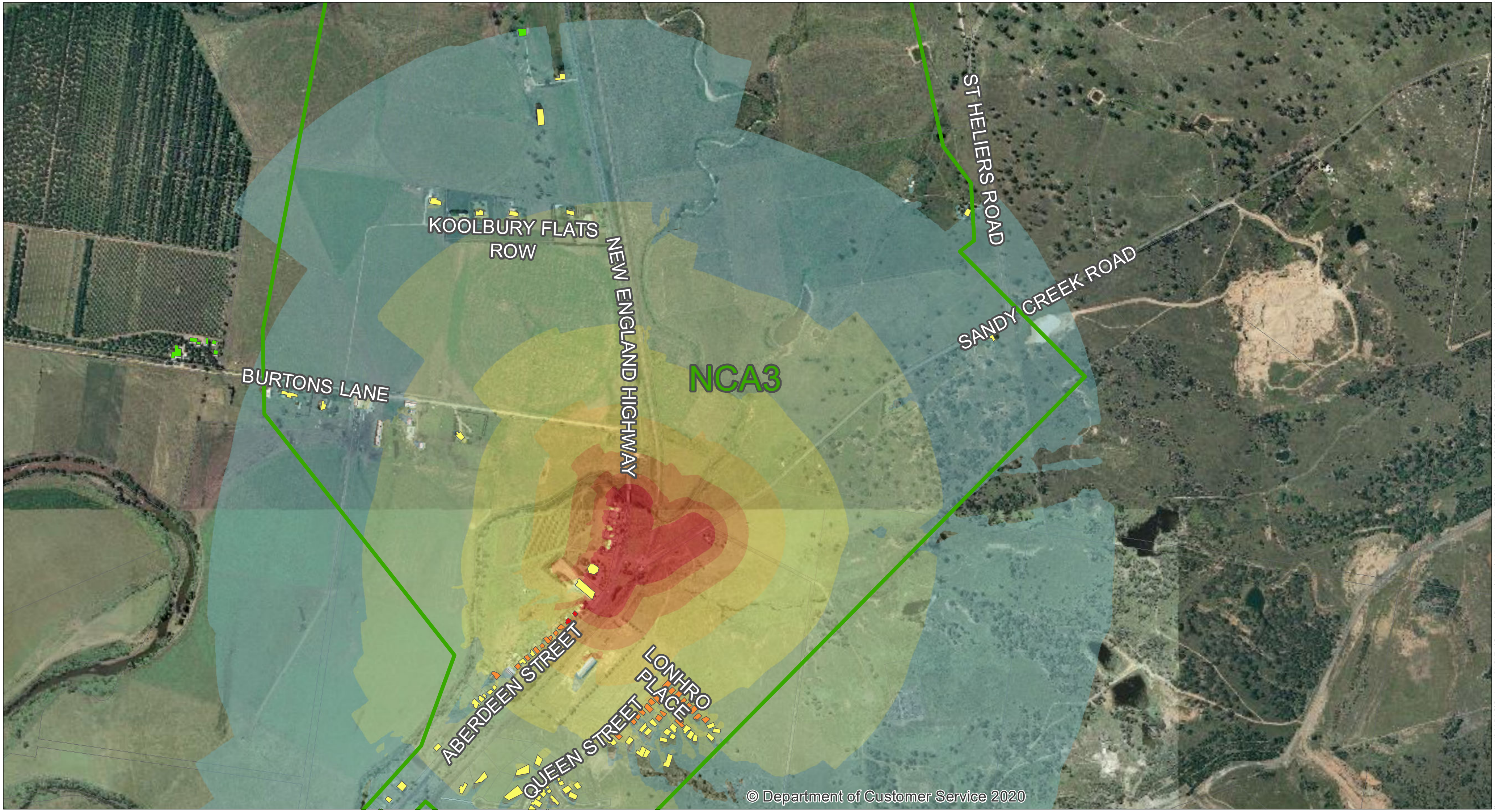
16 - 25



Meters
0 225 450

AECOM

Source:



Muswellbrook Bypass - Utility works - Outside Standard Hours

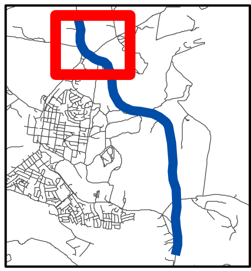
Sound Pressure Level, L_{Aeq} dB(A)

< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, >= 70

NCAs

Exceedance of NML, dB(A)

0
6 - 15
16 - 25
> 25

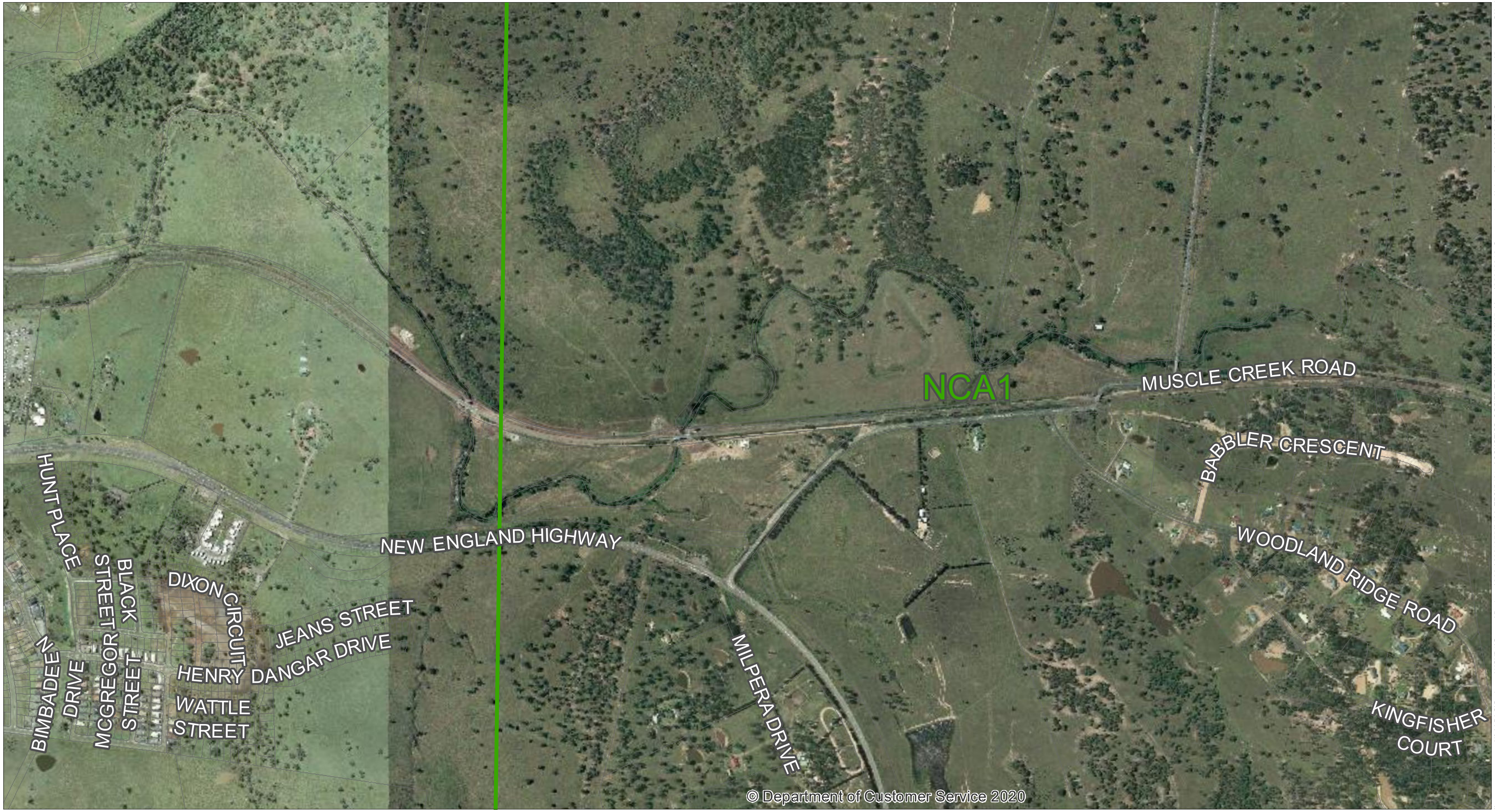


N

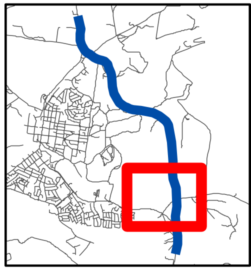
0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Utility works - Outside Standard Hours



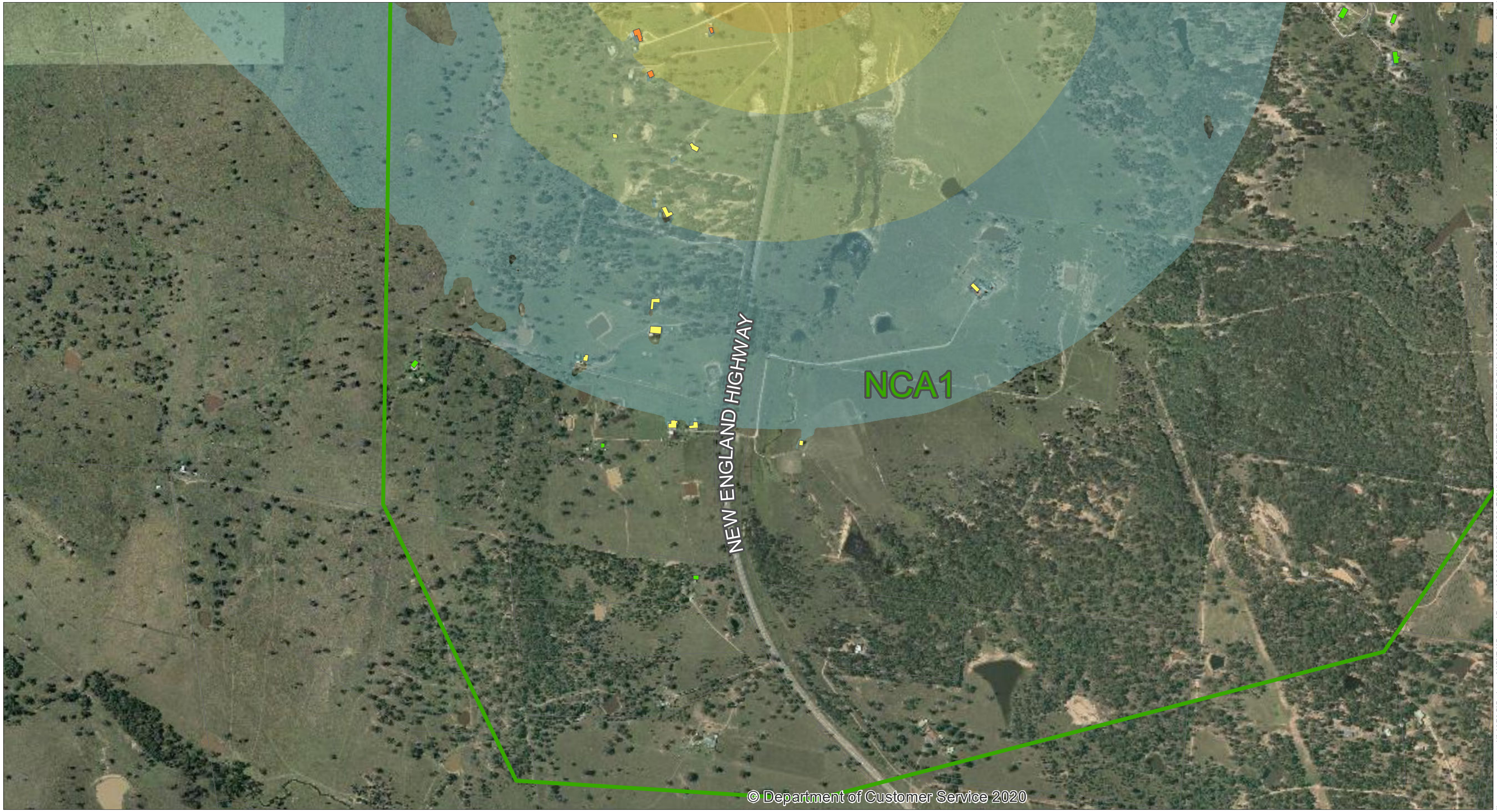
N
0 225 450 Meters

AECOM

Source:

NCAs **Exceedance of NML, dB(A)**

0



Muswellbrook Bypass - Pavement works - Outside Standard Hours

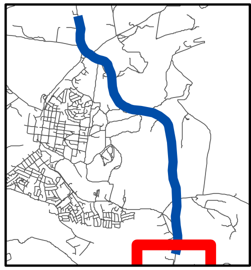
Sound Pressure Level, L_{Aeq} dB(A)

< 40
40 - 44
45 - 49
50 - 54

Exceedance of NML, dB(A)

0
1 - 5
6 - 15

NCAs

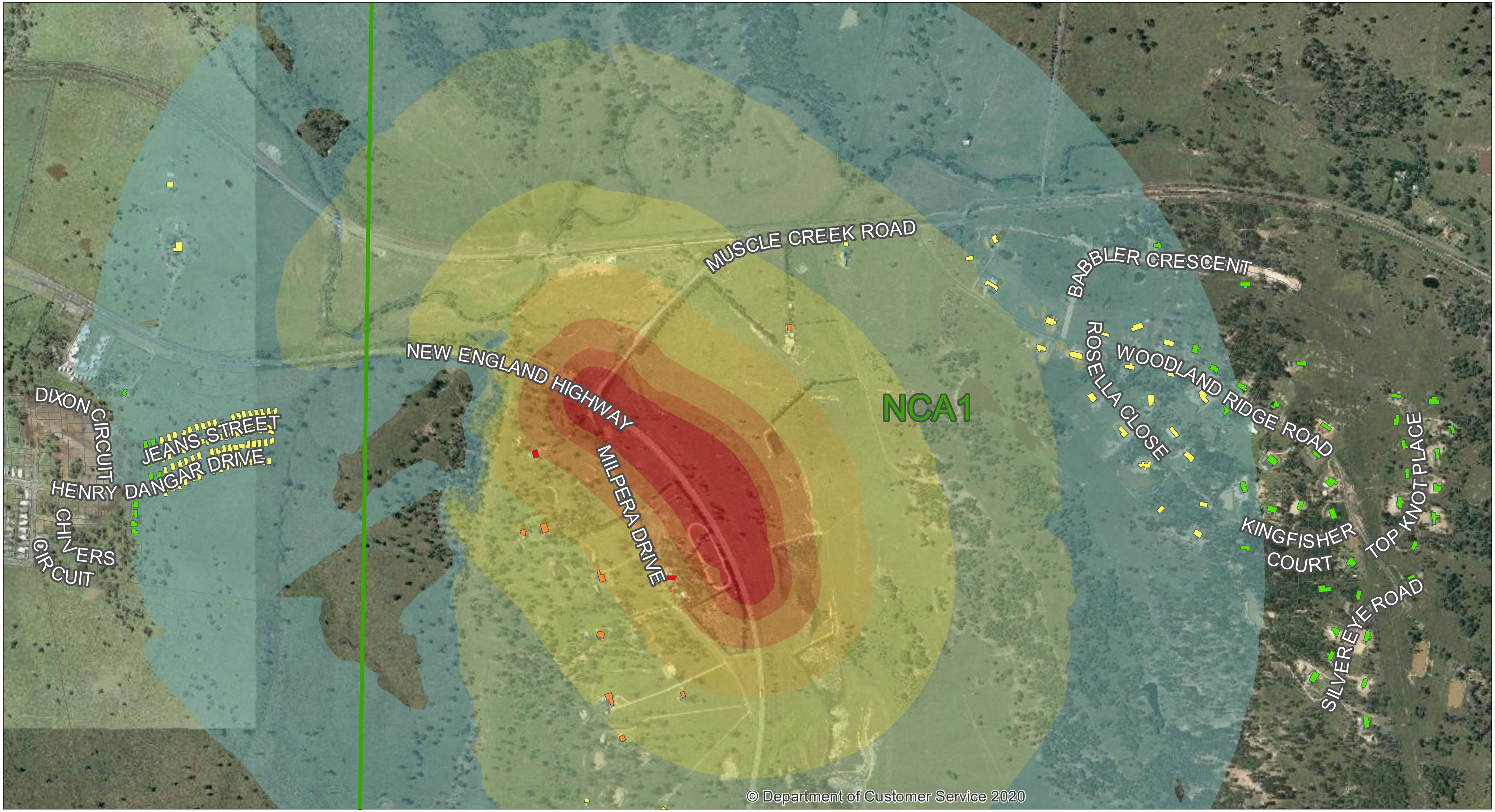


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Outside Standard Hours

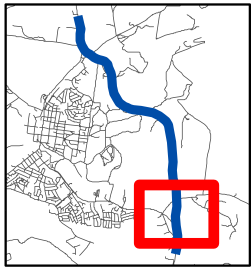
Sound Pressure Level, L_{Aeq} dB(A)

< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, >= 70

NCAs

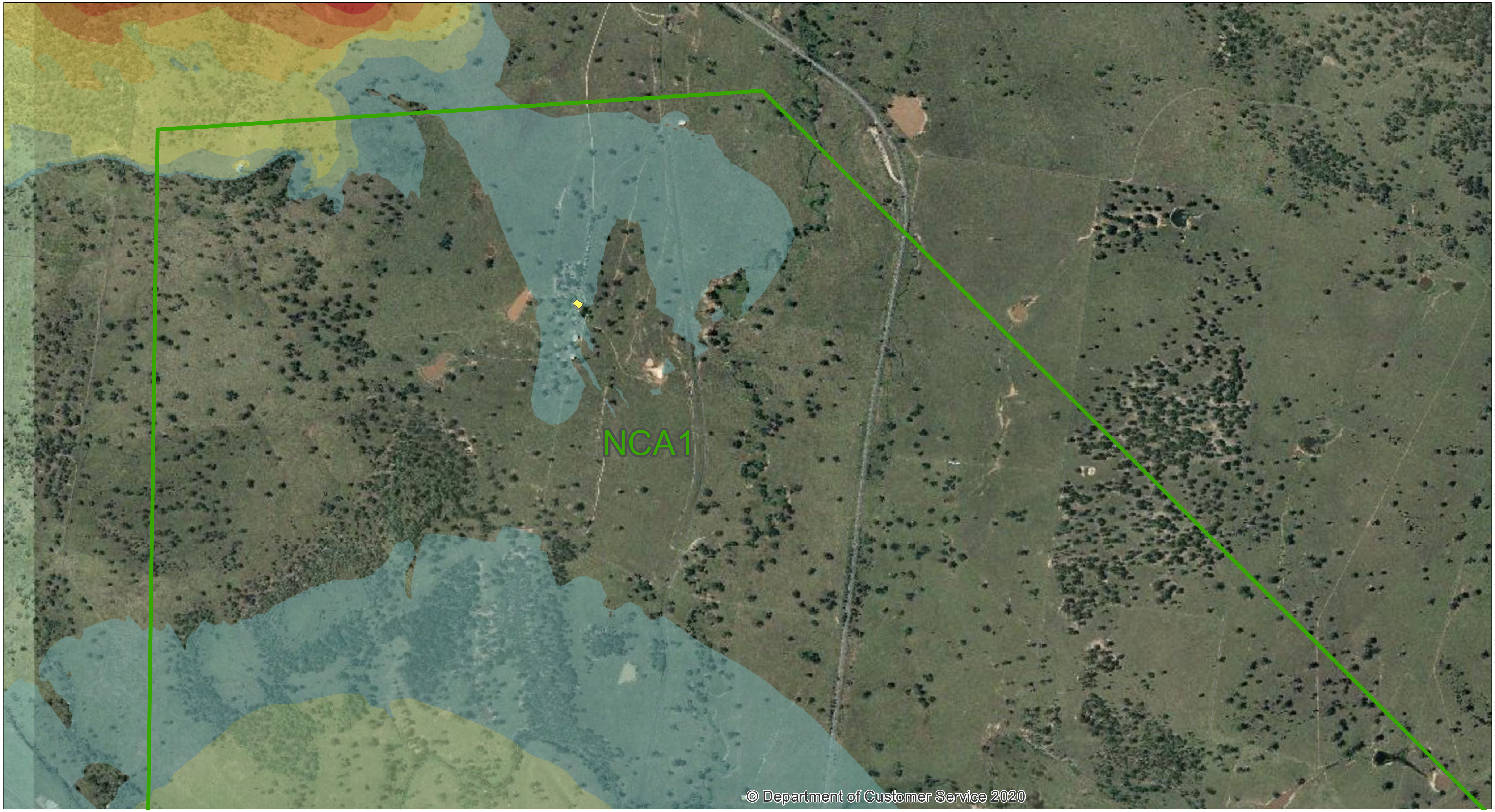
Exceedance of NML, dB(A)

- 0
- 1 - 5
- 6 - 15
- 16 - 25
- > 25



0 225 450 Meters

Source:



Muswellbrook Bypass - Pavement works - Outside Standard Hours

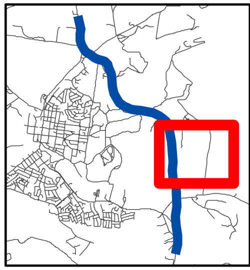
Sound Pressure Level, L_{Aeq} dB(A)

< 40
40 - 44
45 - 49
50 - 54

Exceedance of NML, dB(A)

0
6 - 15

NCAs

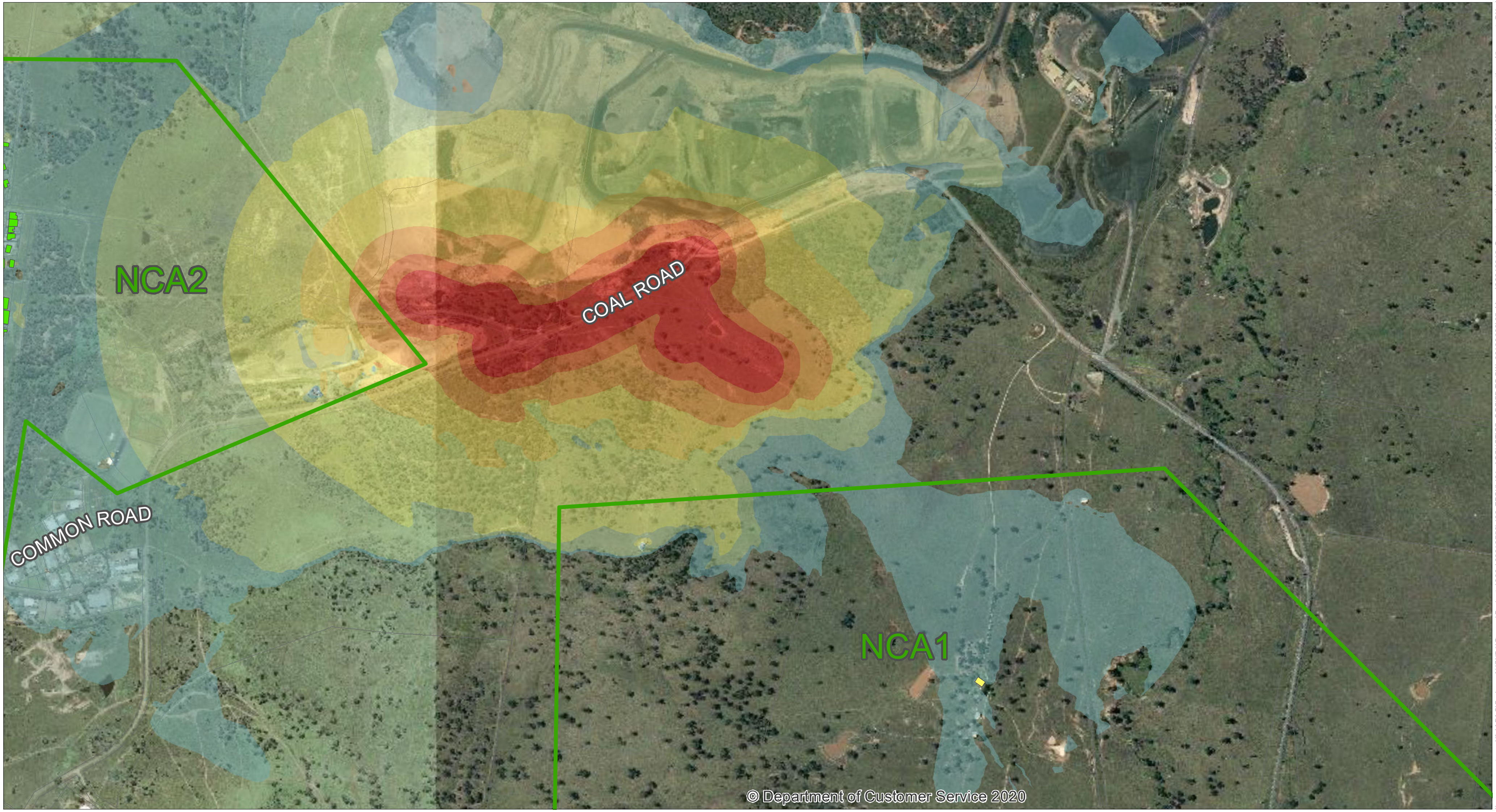


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Outside Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

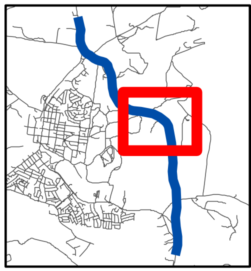
< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, >= 70

Exceedance of NML, dB(A)

0

6 - 15

NCAs

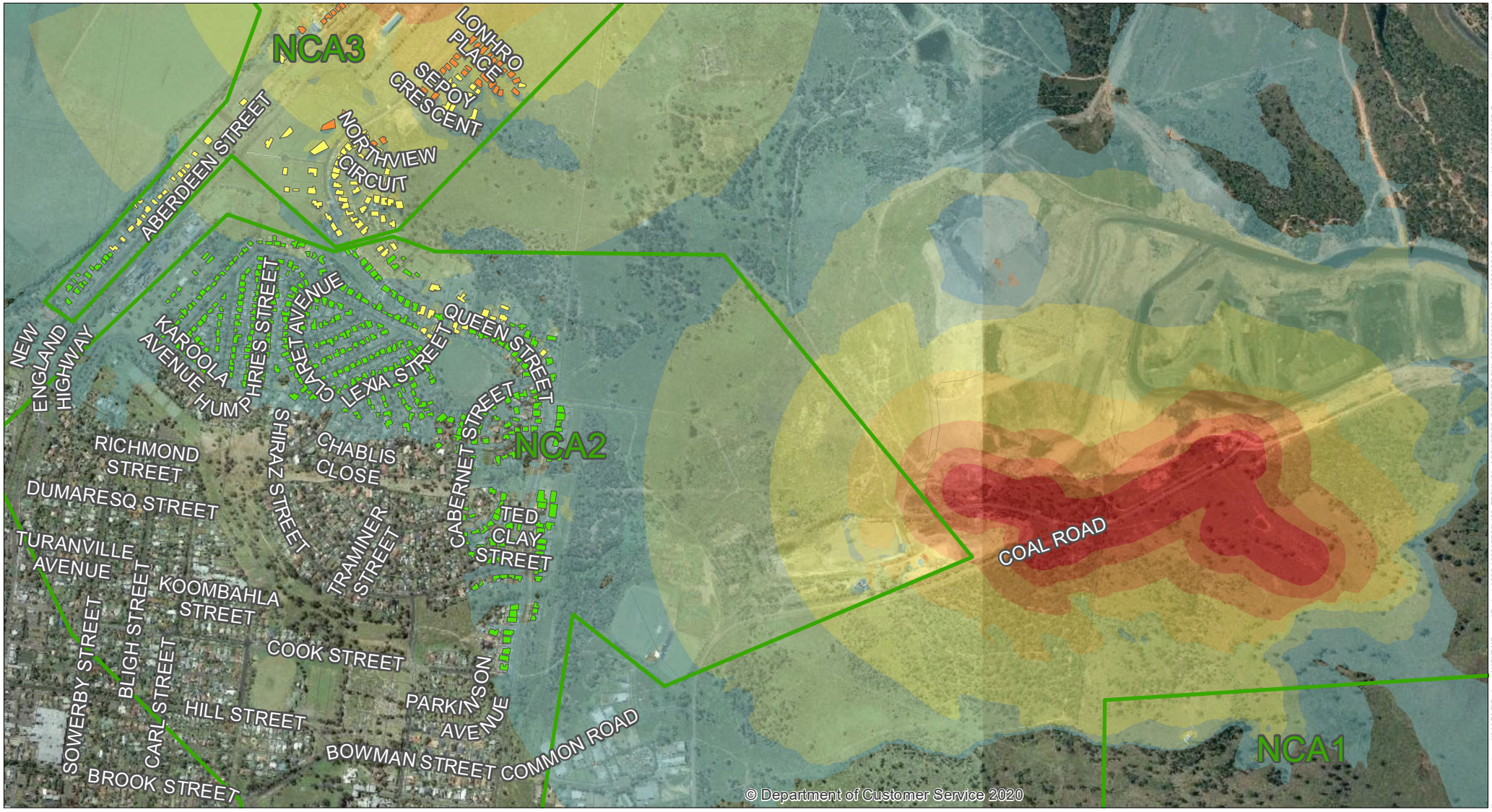


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Outside Standard Hours

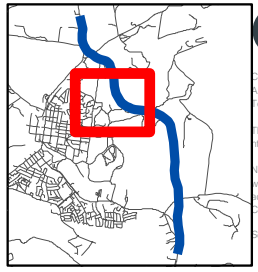
Sound Pressure Level, L_{Aeq} dB(A)

< 40 | 40 - 44 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | >= 70

NCAs

Exceedance of NML, dB(A)

0
1 - 5
6 - 15
16 - 25

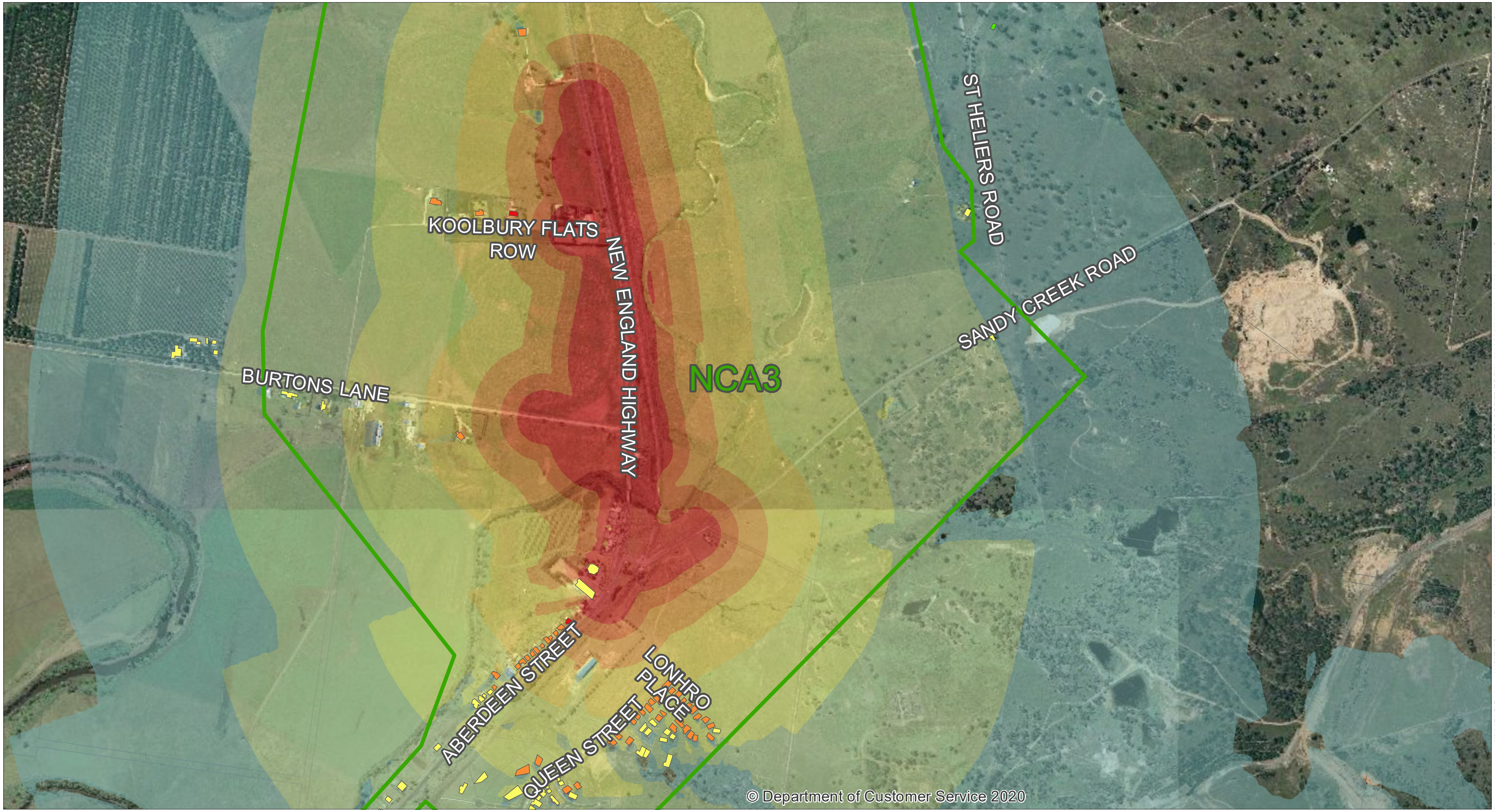


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Outside Standard Hours

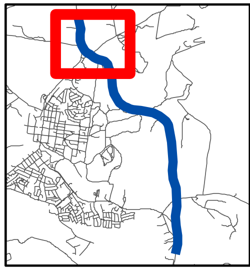
Sound Pressure Level, L_{Aeq} dB(A)

< 40
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
>= 70

NCAs

Exceedance of NML, dB(A)

0
6 - 15
16 - 25
> 25

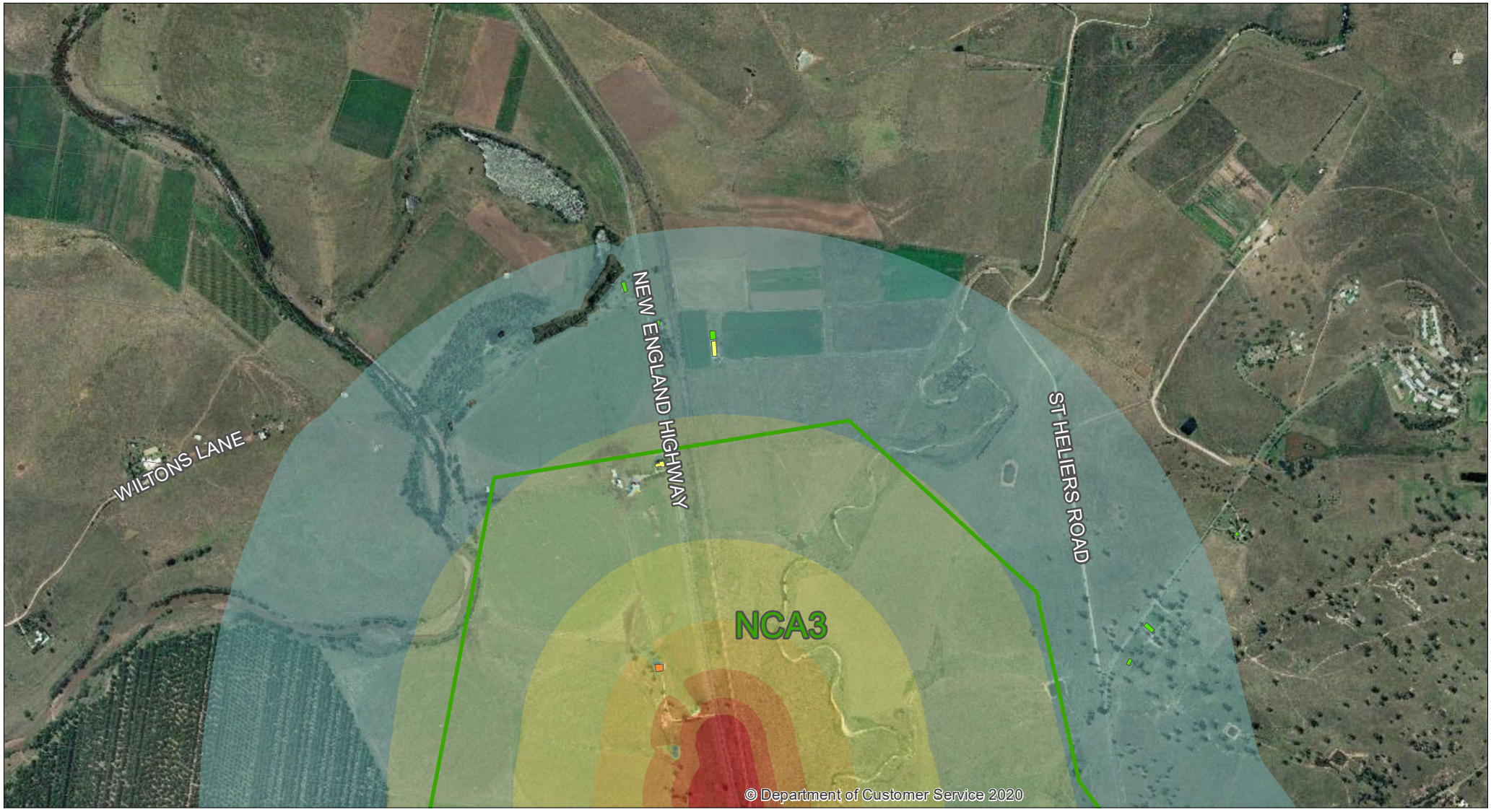


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Pavement works - Outside Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 40 | 40 - 44 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | >= 70

NCAs

Exceedance of NML, dB(A)

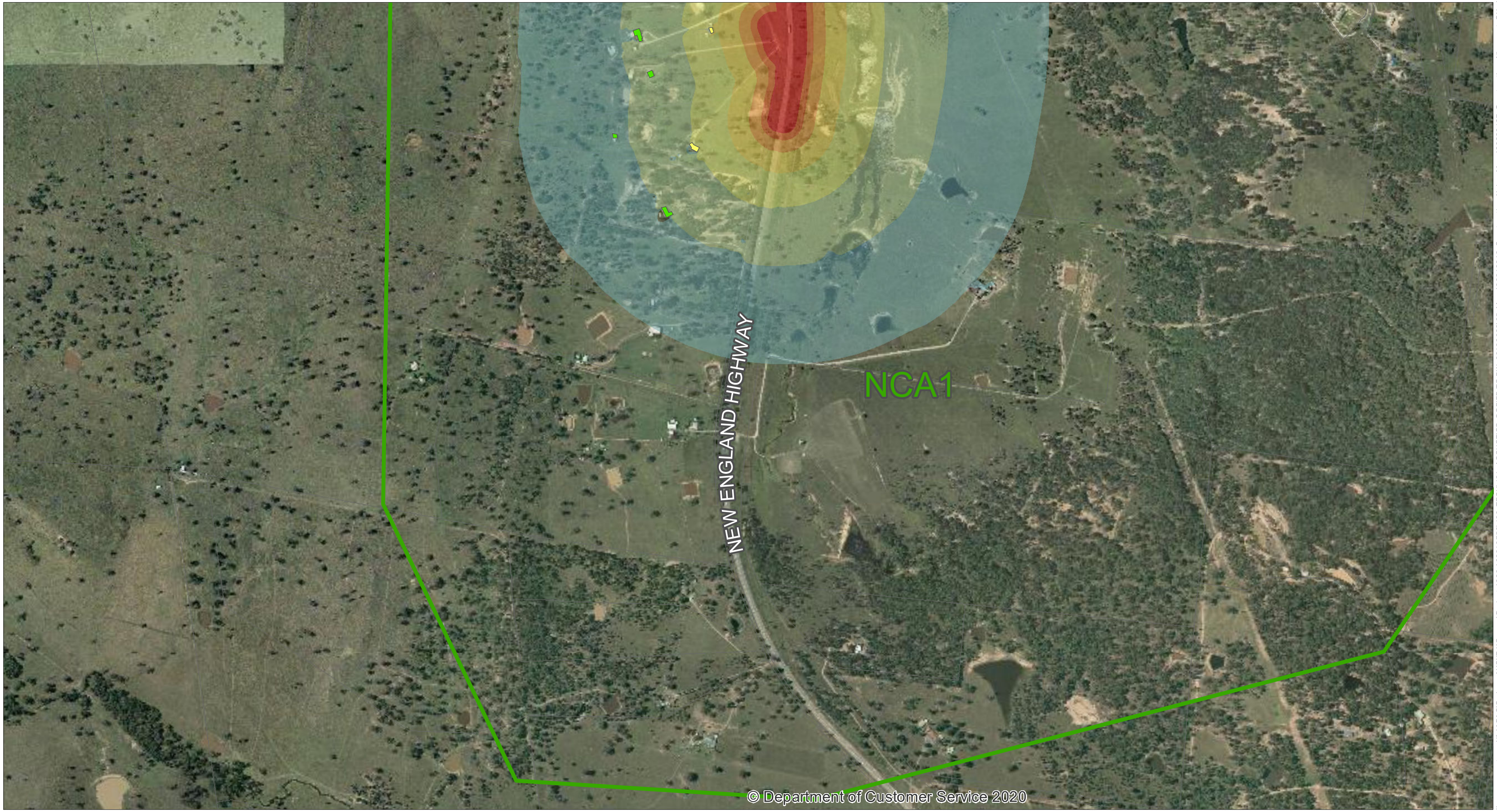
0
1 - 5
6 - 15
16 - 25

N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Outside Standard Hours

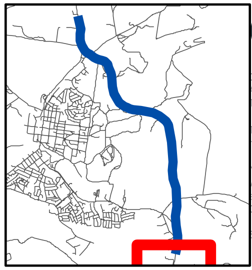
Sound Pressure Level, L_{Aeq} dB(A)

< 40
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
>= 70

NCAs

Exceedance of NML, dB(A)

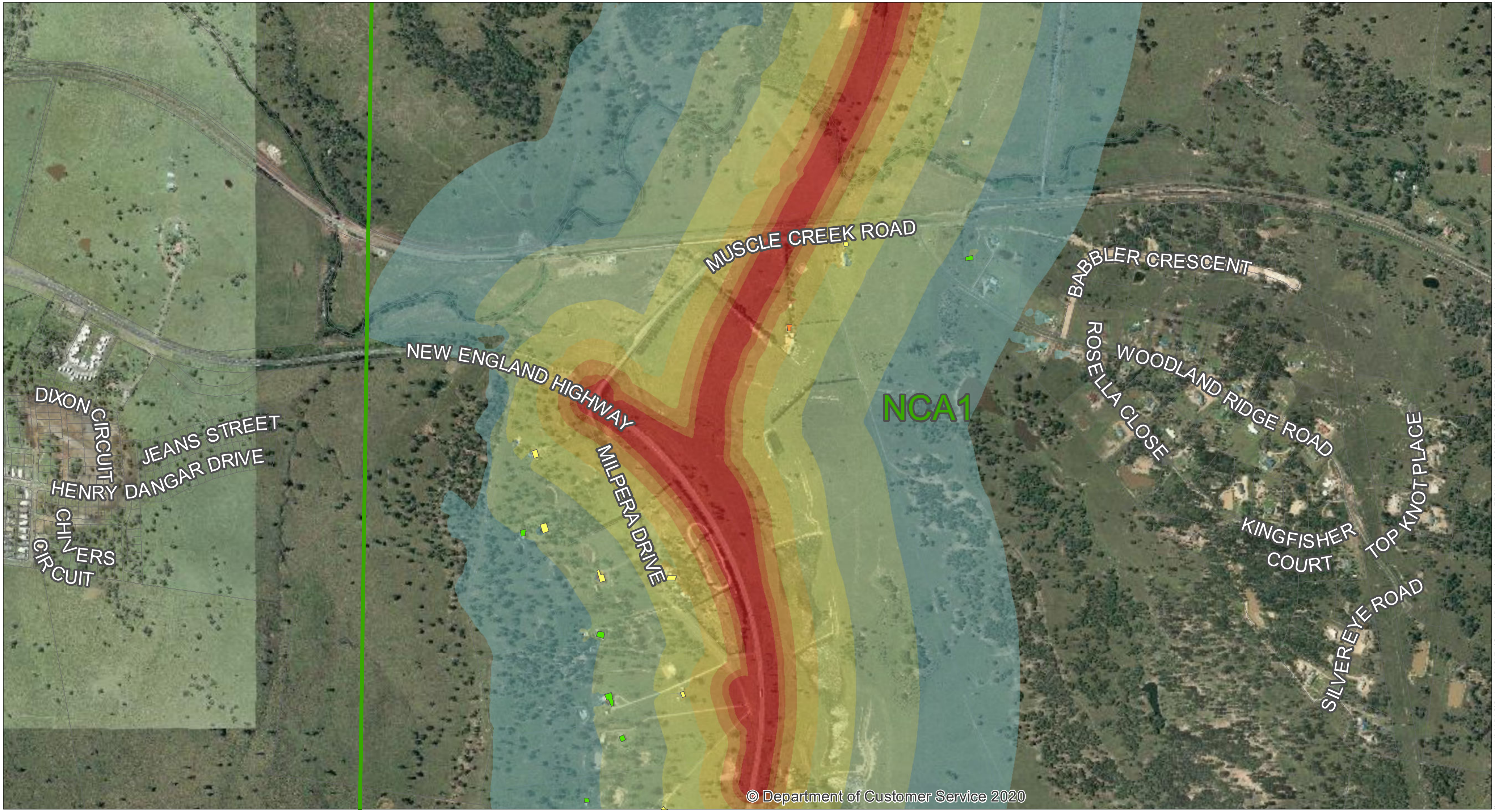
0
1 - 5
6 - 15



N
0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, >= 70

NCAs

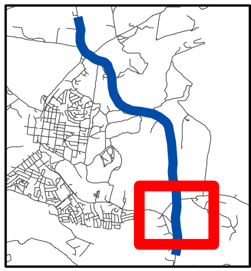
Exceedance of NML, dB(A)

0

1 - 5

6 - 15

16 - 25

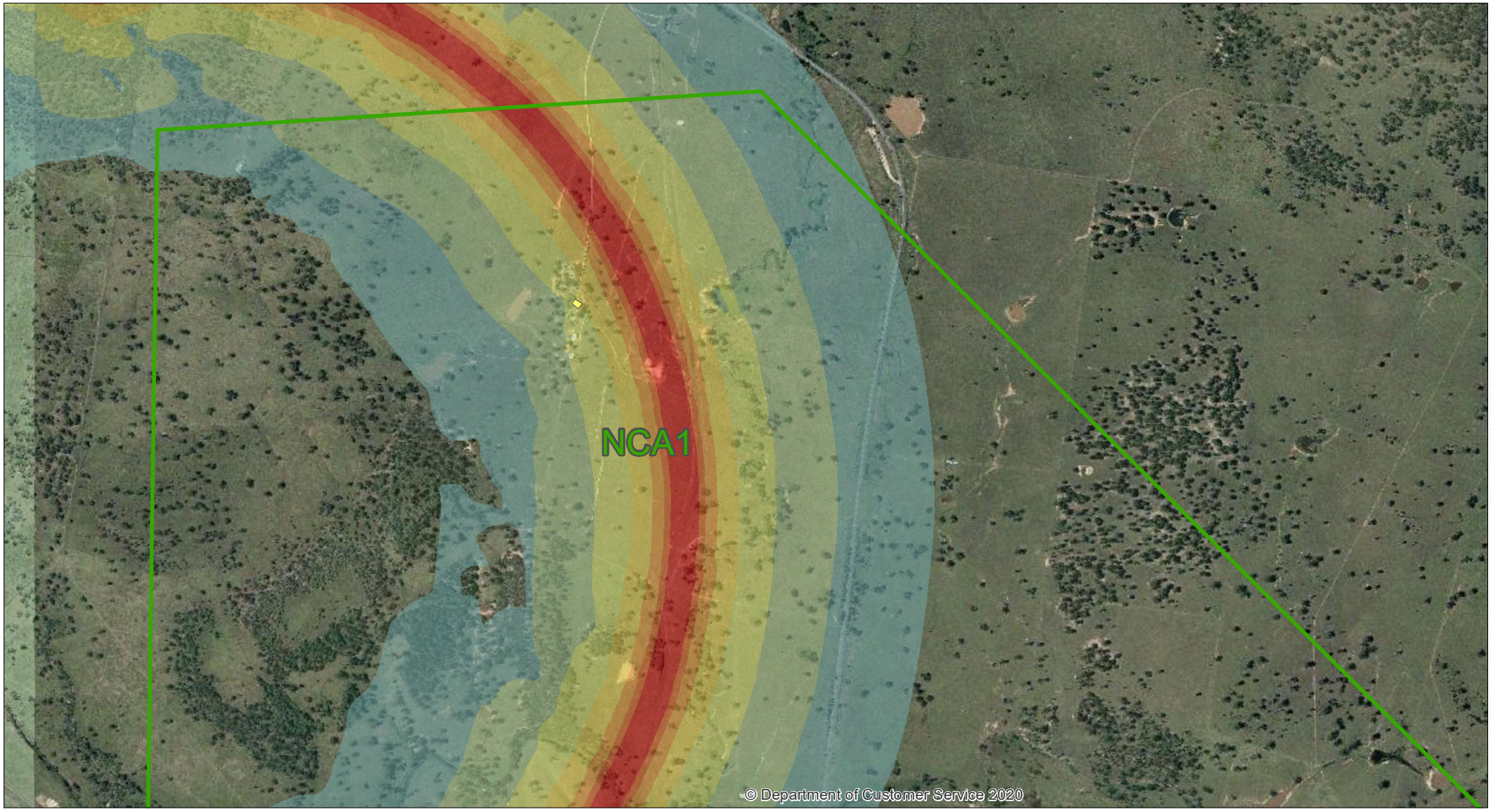


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

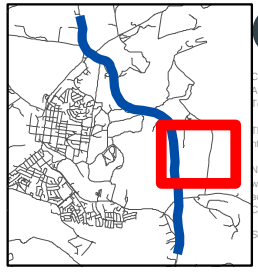
< 40 | 40 - 44 | 45 - 49 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | >= 70

NCAs

Exceedance of NML, dB(A)

0

6 - 15

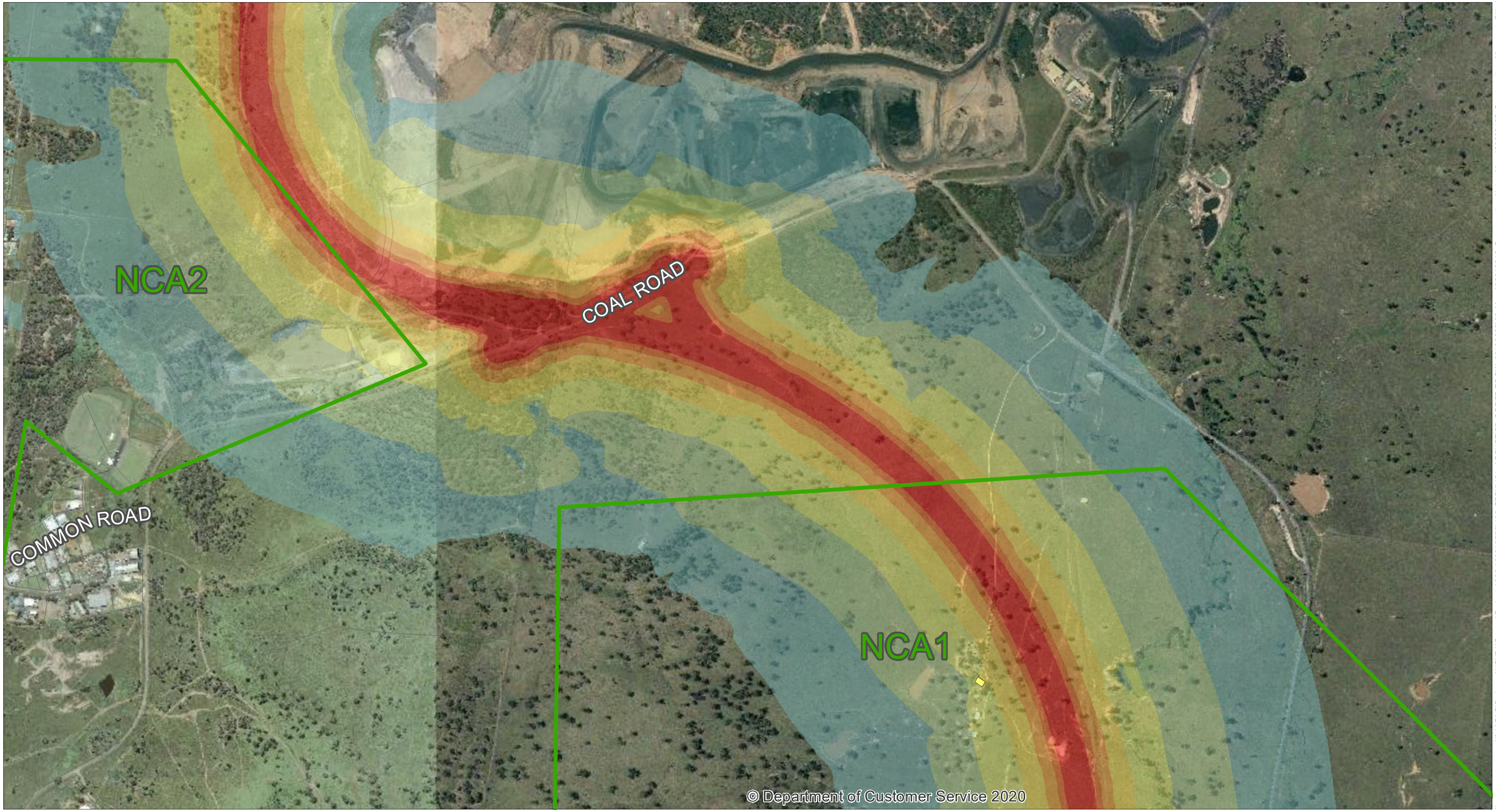


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

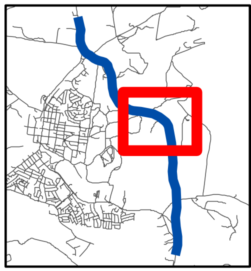
< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, >= 70

Exceedance of NML, dB(A)

0

6 - 15

NCAs

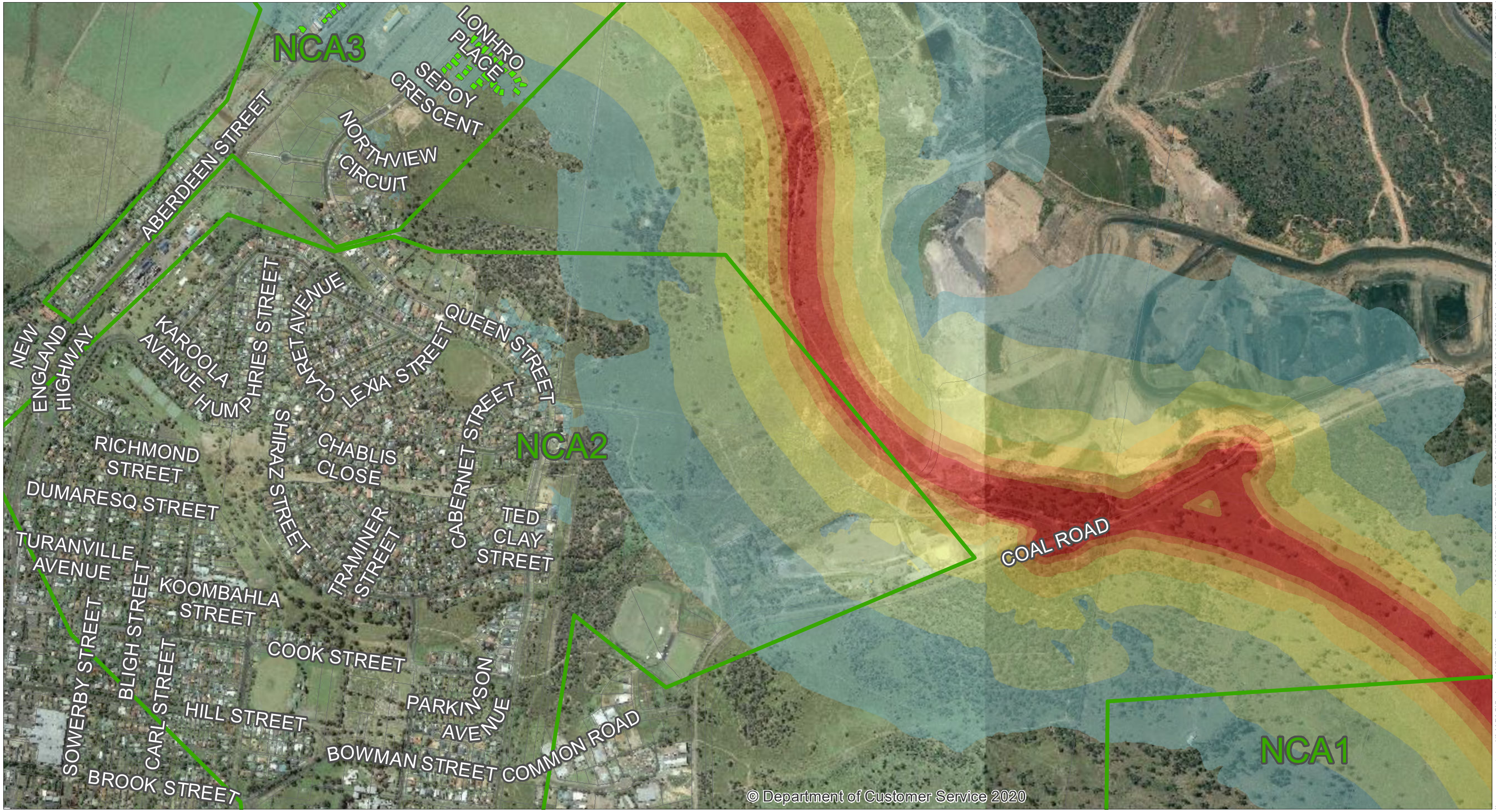


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Aeq} dB(A)

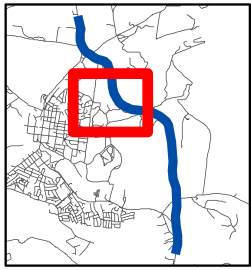
< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, >= 70

Exceedance of NML, dB(A)

0

1 - 5

NCAs

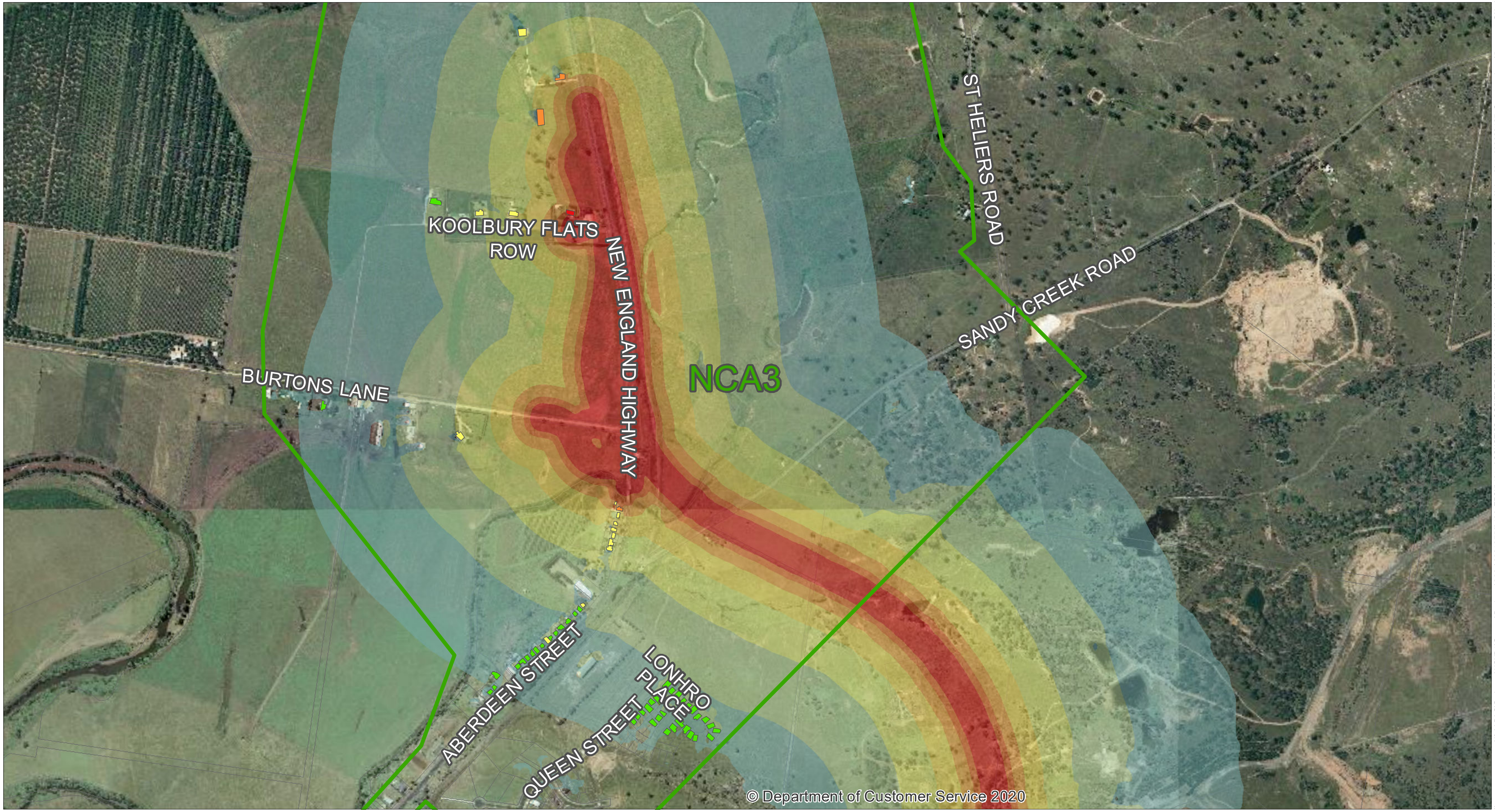


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Outside Standard Hours

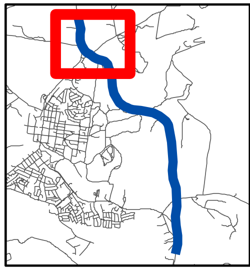
Sound Pressure Level, L_{Aeq} dB(A)

< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69, >= 70

NCAs

Exceedance of NML, dB(A)

- 0
- 1 - 5
- 6 - 15
- 16 - 25
- > 25

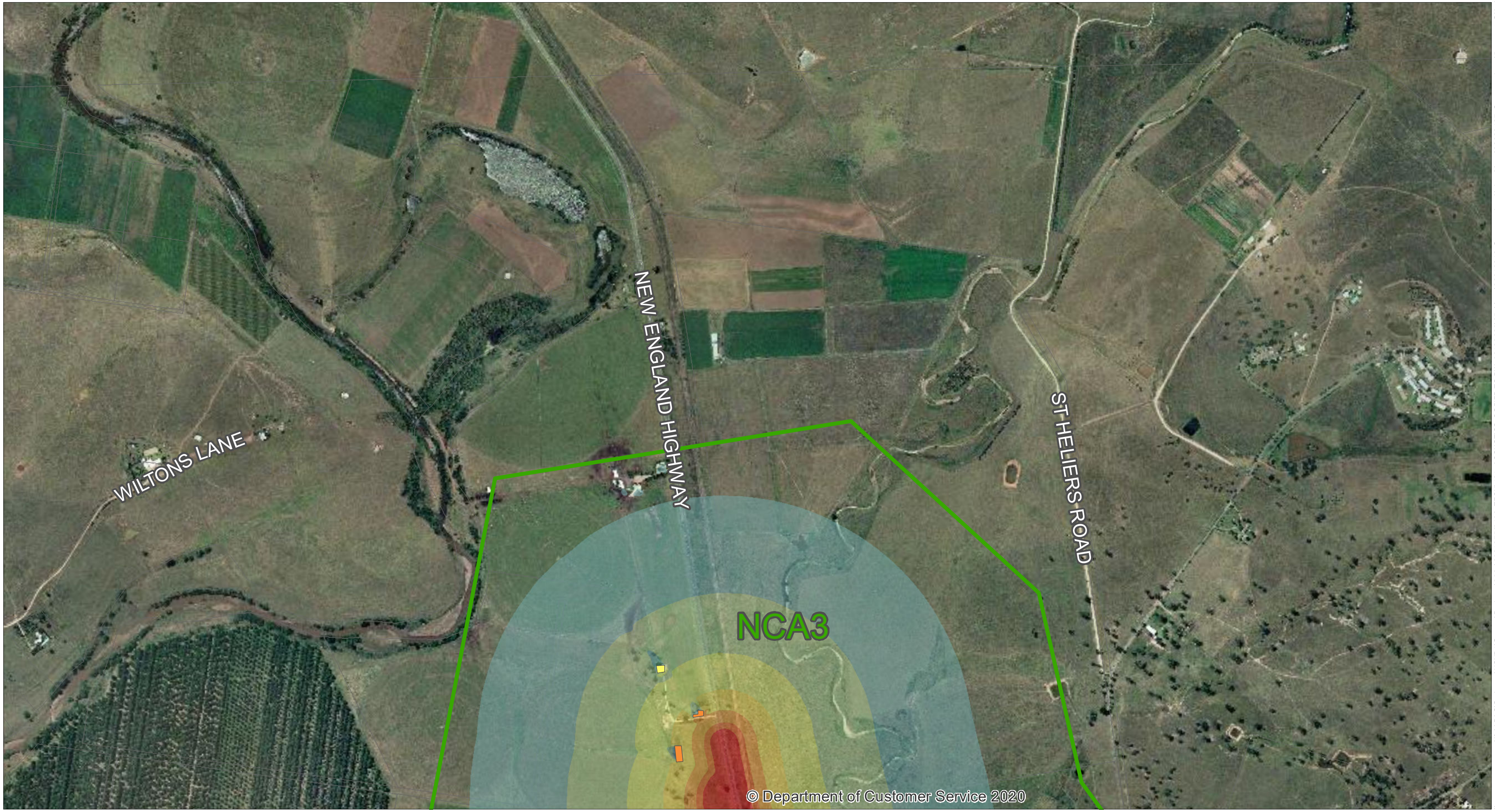


N

0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Finishing works - Outside Standard Hours

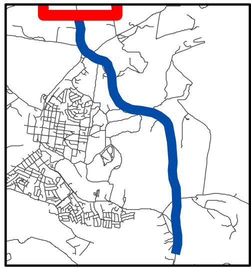
Sound Pressure Level, L_{Aeq} dB(A)

< 40
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69

Exceedance of NML, dB(A)

0
6 - 15
16 - 25

NCAs



0 225 450 Meters

AECOM

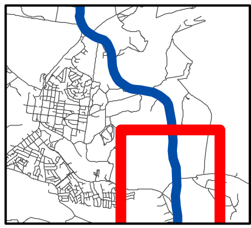
Source:

Muswellbrook Bypass - Ancillary Modification Area 10 - Laydown, storage and delivery - Outside Standard Hours

WP4_Max

< 40
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69

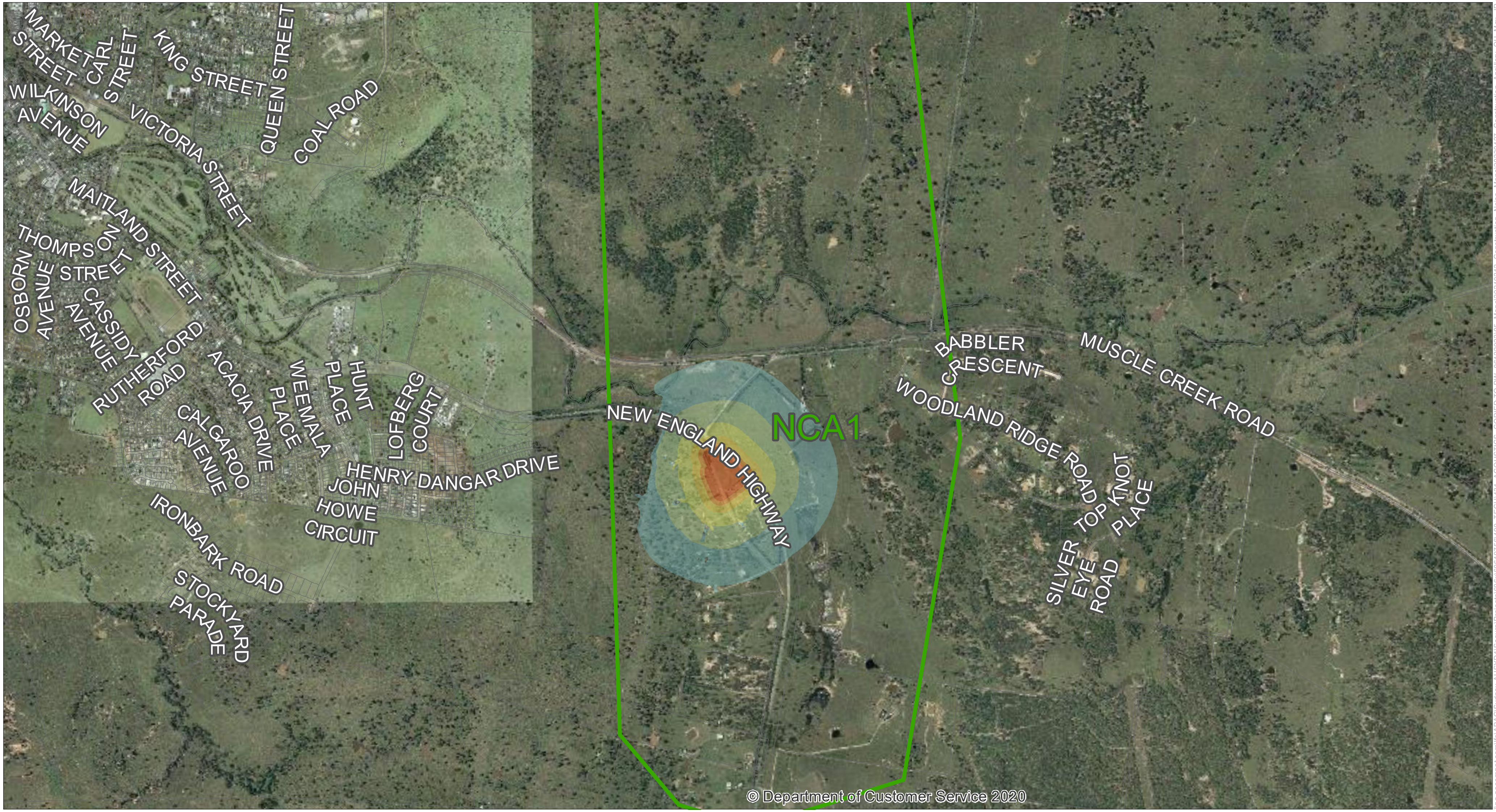
NCAs



0 450 900 Meters

AECOM

Source:

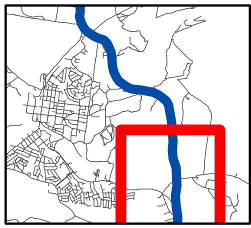


Muswellbrook Bypass - Ancillary Modification Area 13 - Laydown, storage and delivery - Outside Standard Hours

WP4_Max

< 40, 40 - 44, 45 - 49, 50 - 54, 55 - 59, 60 - 64, 65 - 69

NCAs

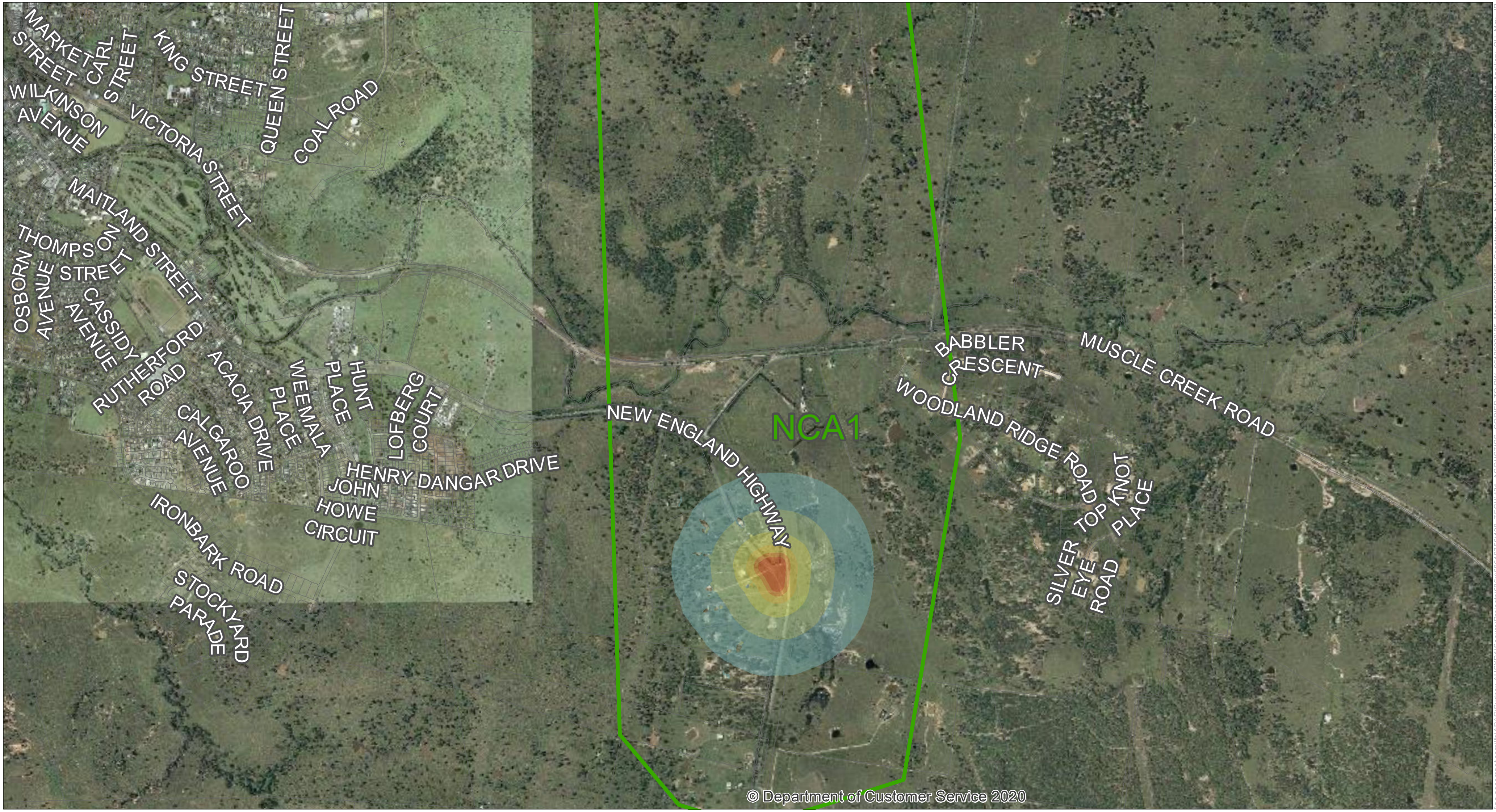


N

0 450 900 Meters

AECOM

Source:

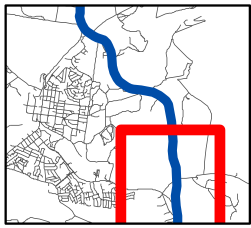


Muswellbrook Bypass - Ancillary Modification Area 14 - Laydown, storage and delivery - Outside Standard Hours

WP4_Max

< 40
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69

NCAs



0 450 900 Meters

AECOM

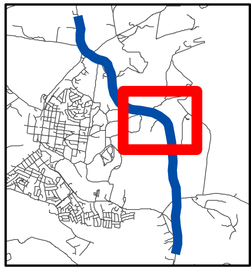
Source:

Muswellbrook Bypass - Utility works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50

NCAs



N

0 225 450 Meters

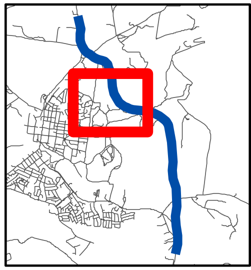
Source:

Muswellbrook Bypass - Utility works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50
50 - 54
55 - 59
60 - 64

NCAs

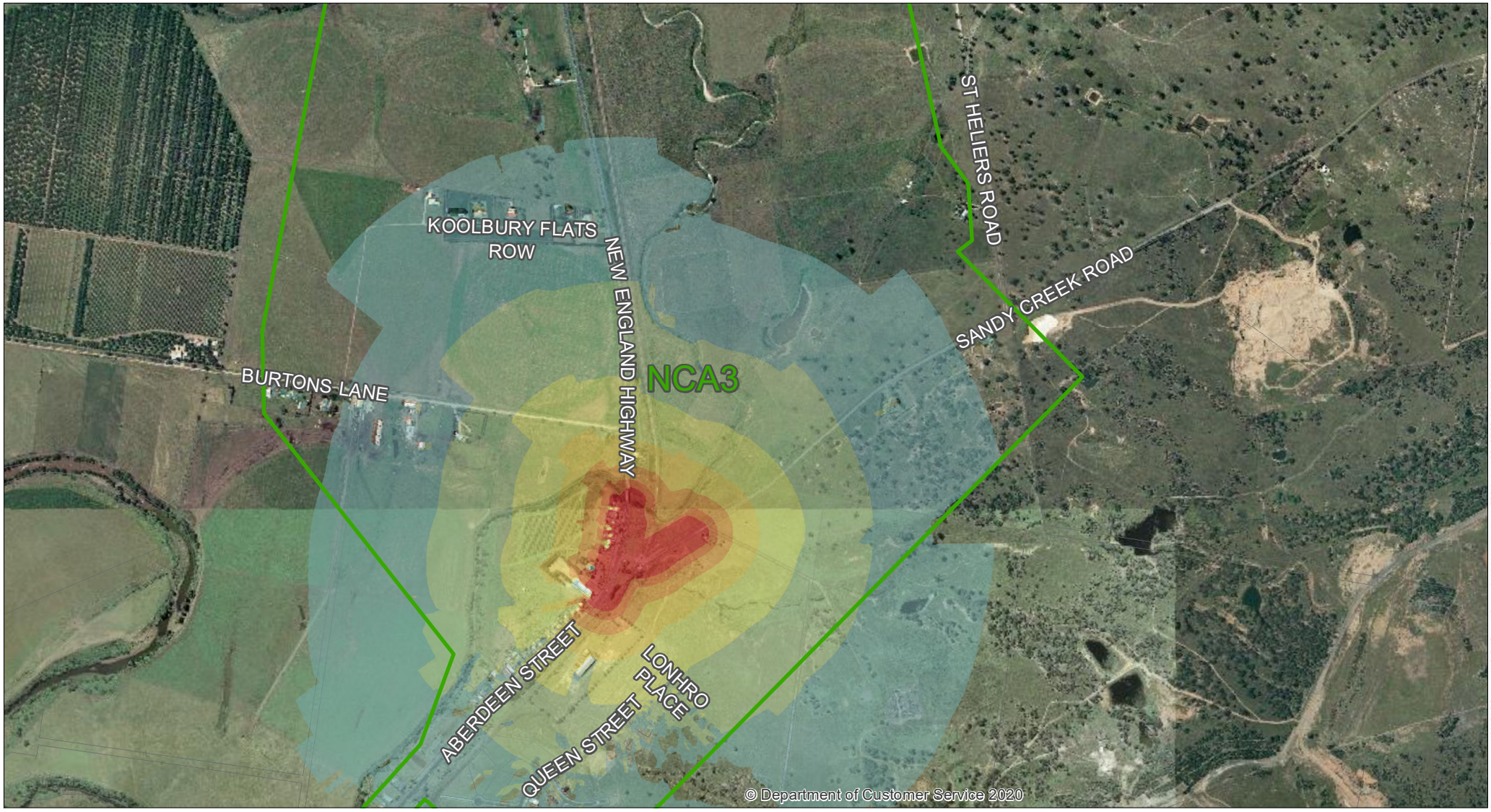


N

0 225 450 Meters

AECOM

Source:

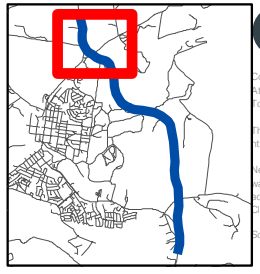


Muswellbrook Bypass - Utility works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | 75 - 79 | > 79

NCAs

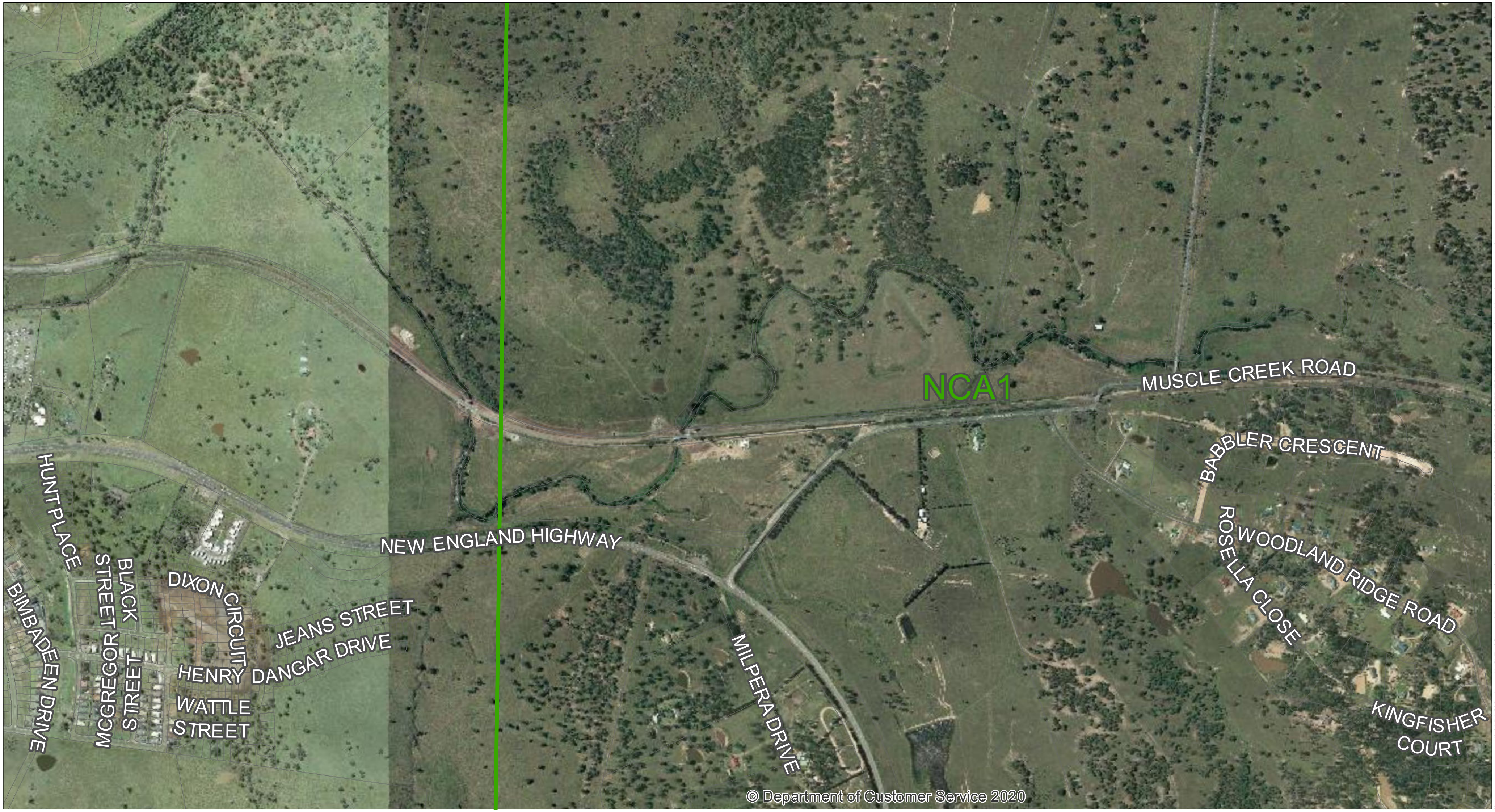


N

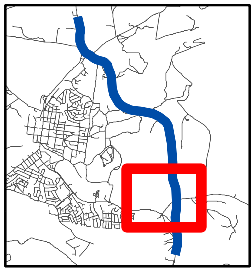
0 225 450 Meters

AECOM

Source:



Muswellbrook Bypass - Utility works - Outside Standard Hours



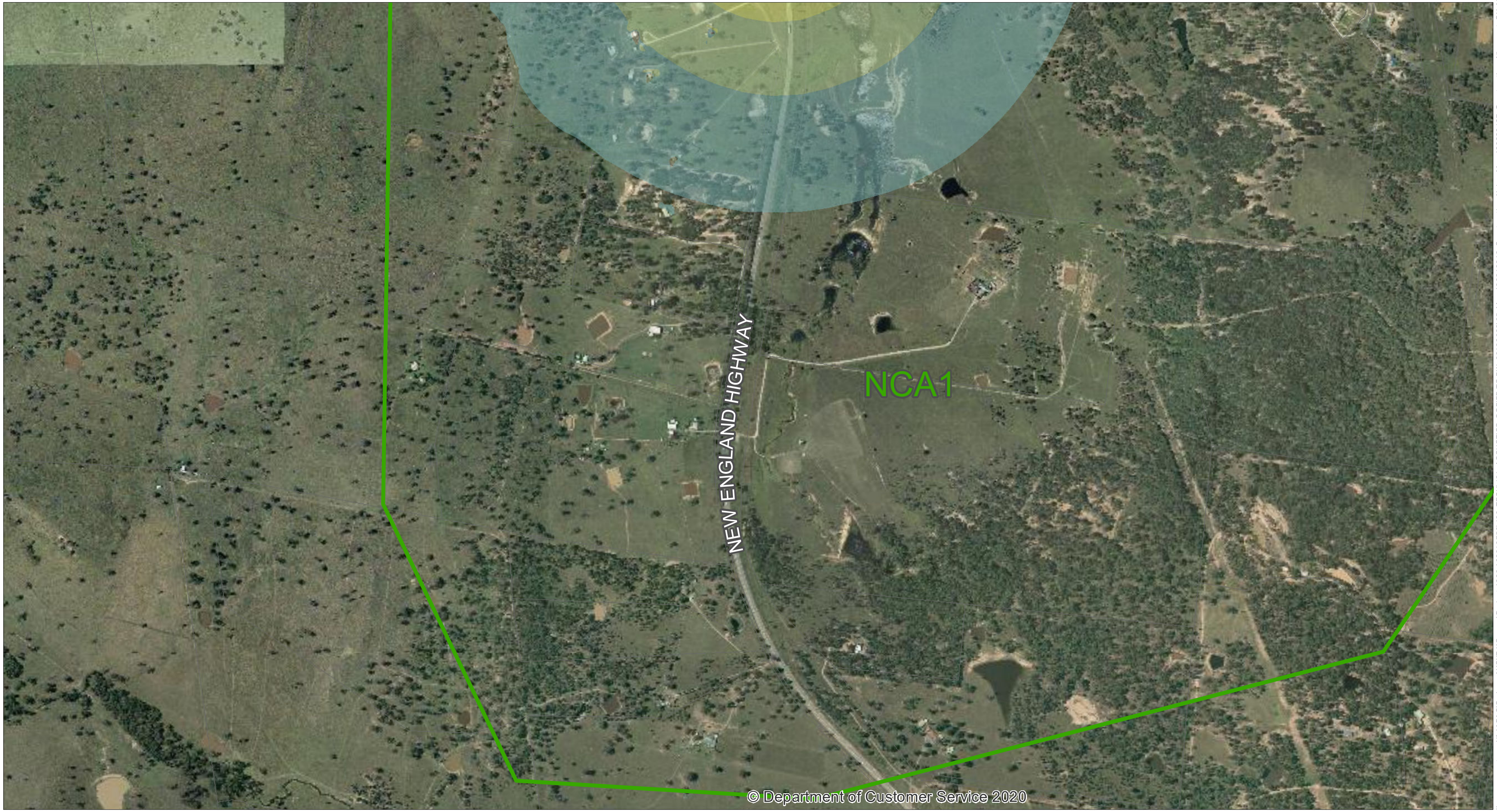
N

0 225 450 Meters

AECOM

Source:

NCAs

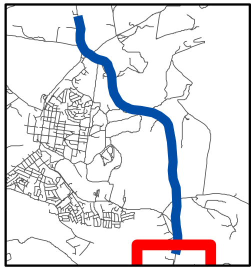


Muswellbrook Bypass - Pavement works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50
50 - 54
55 - 59

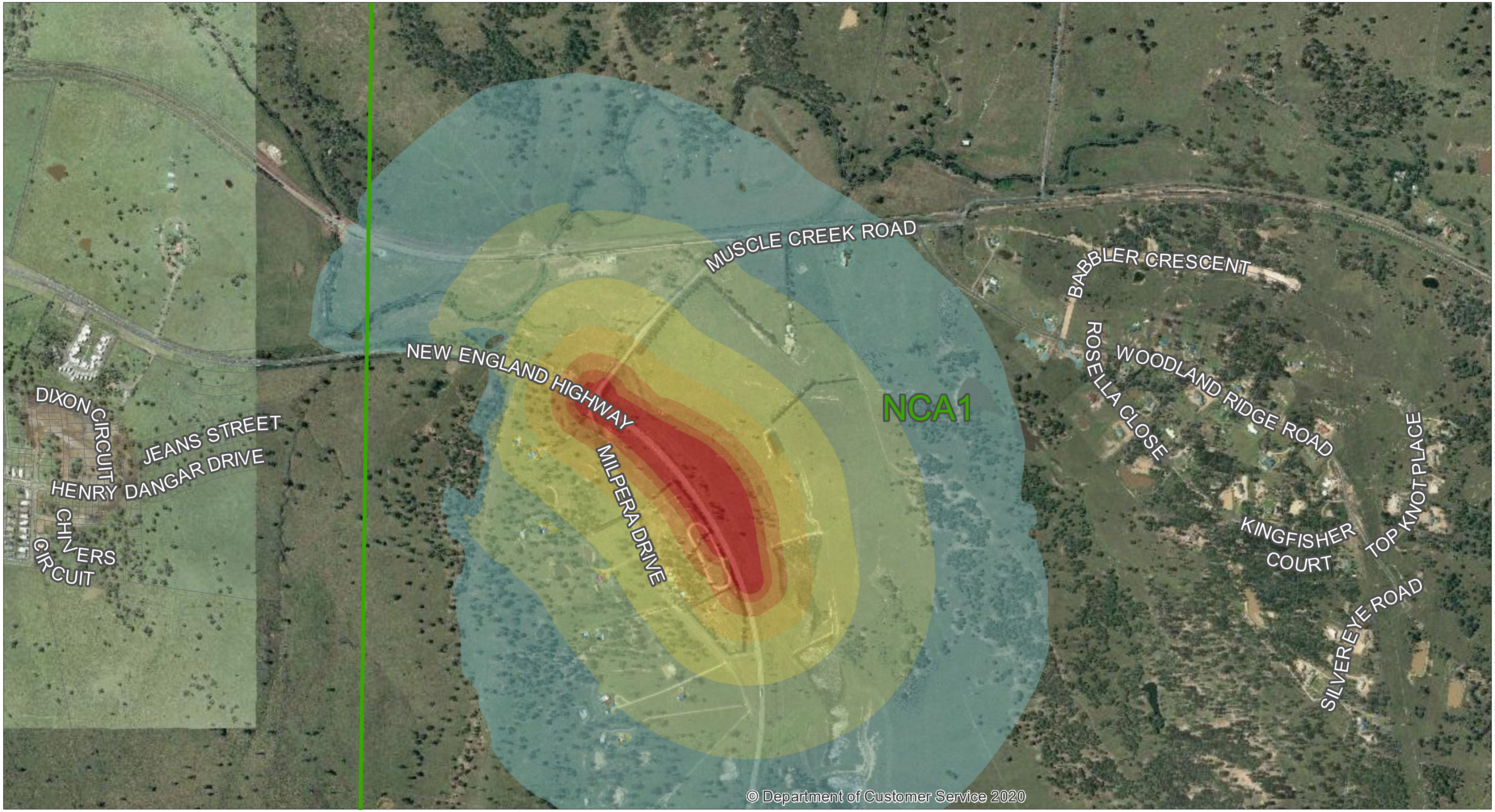
NCAs



N
0 225 450 Meters

AECOM

Source:

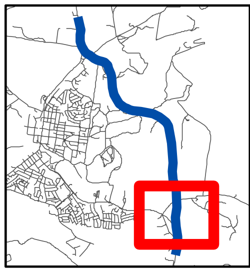


Muswellbrook Bypass - Pavement works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, 75 - 79, > 79

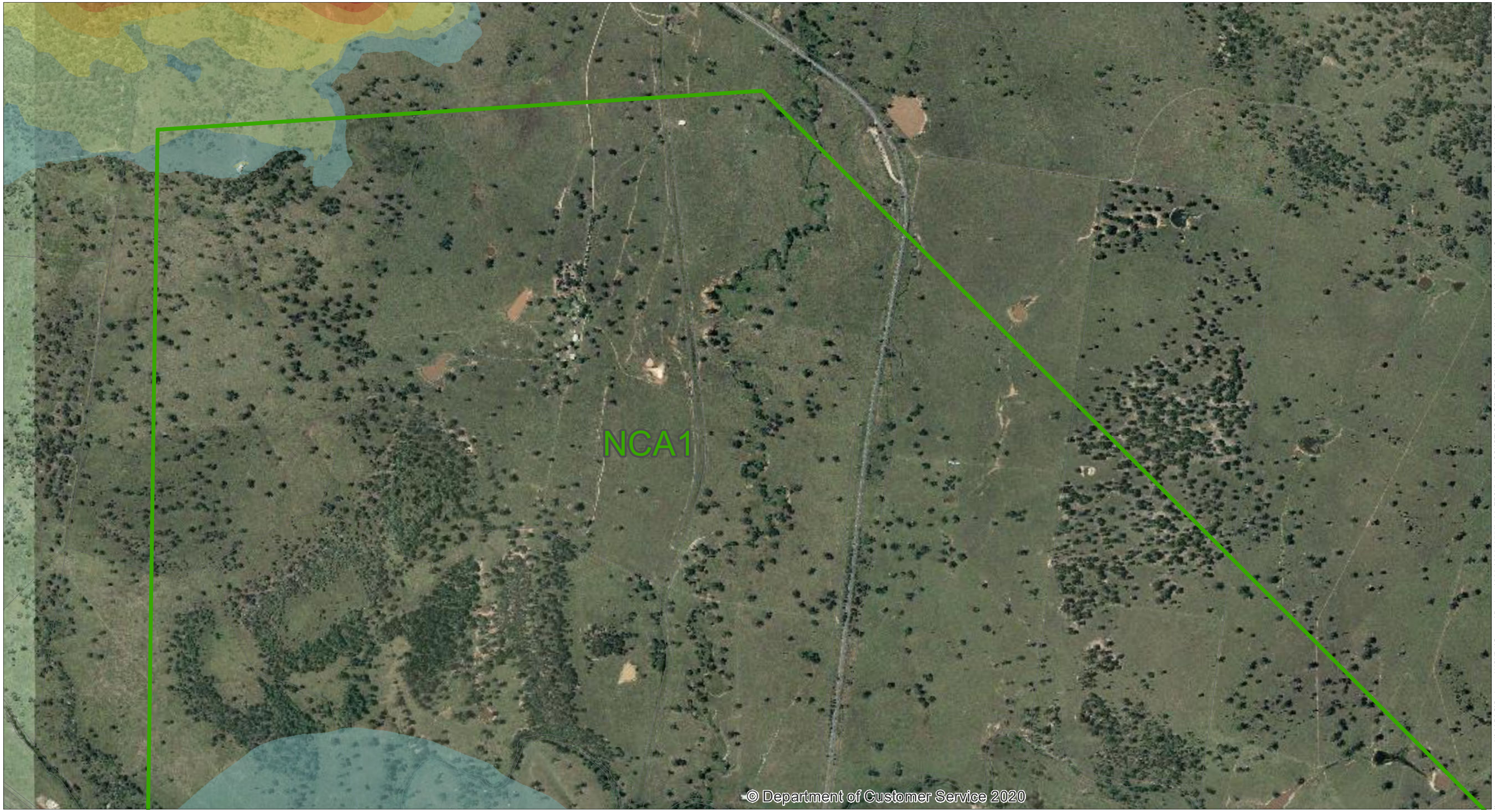
NCAs



N

0 225 450 Meters

AECOM

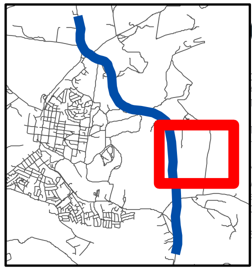


Muswellbrook Bypass - Pavement works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50
50 - 54

NCAs

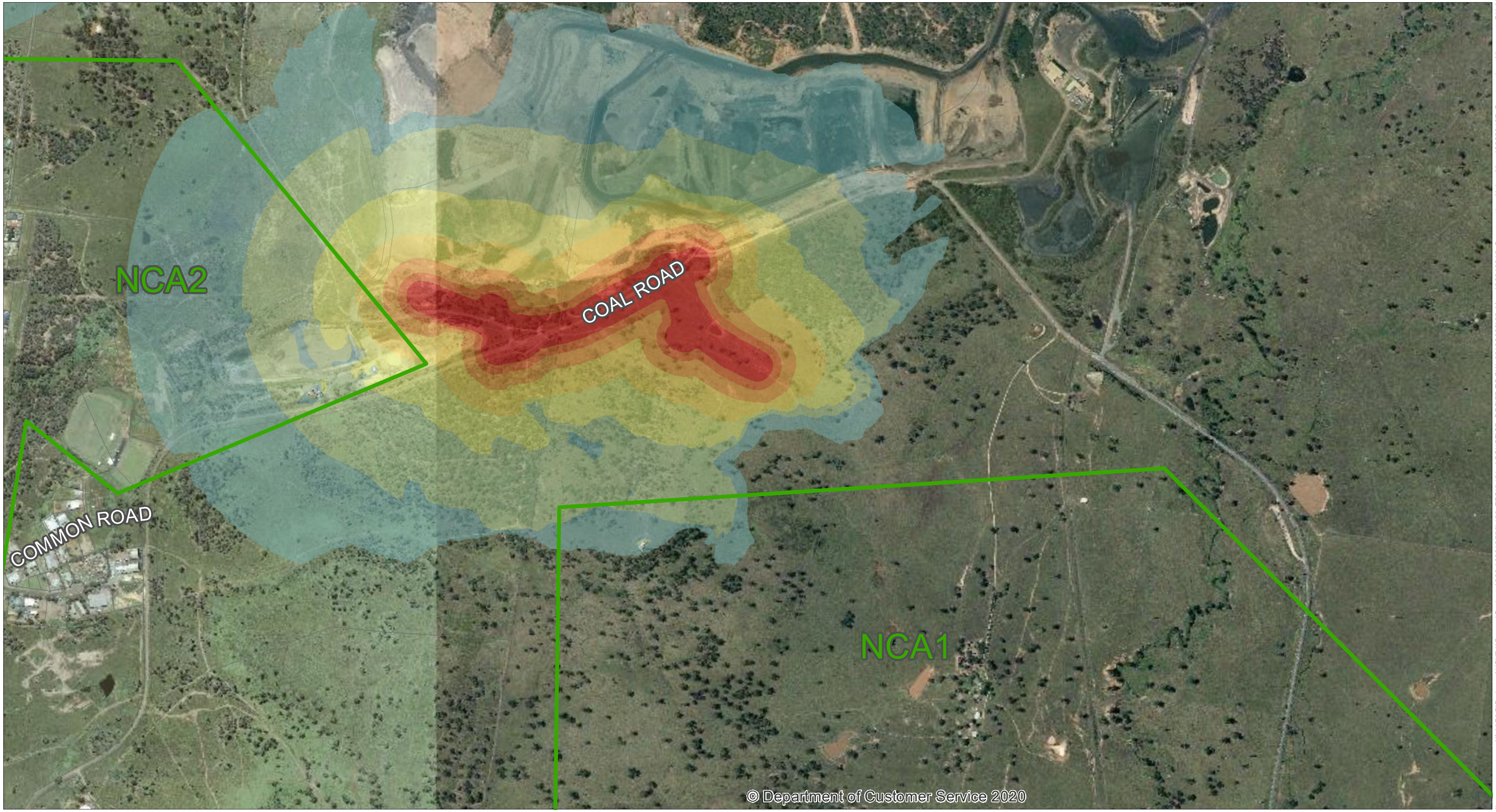


N

0 225 450 Meters

AECOM

Source:

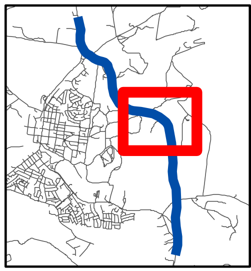


Muswellbrook Bypass - Pavement works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
75 - 79
> 79

NCAs

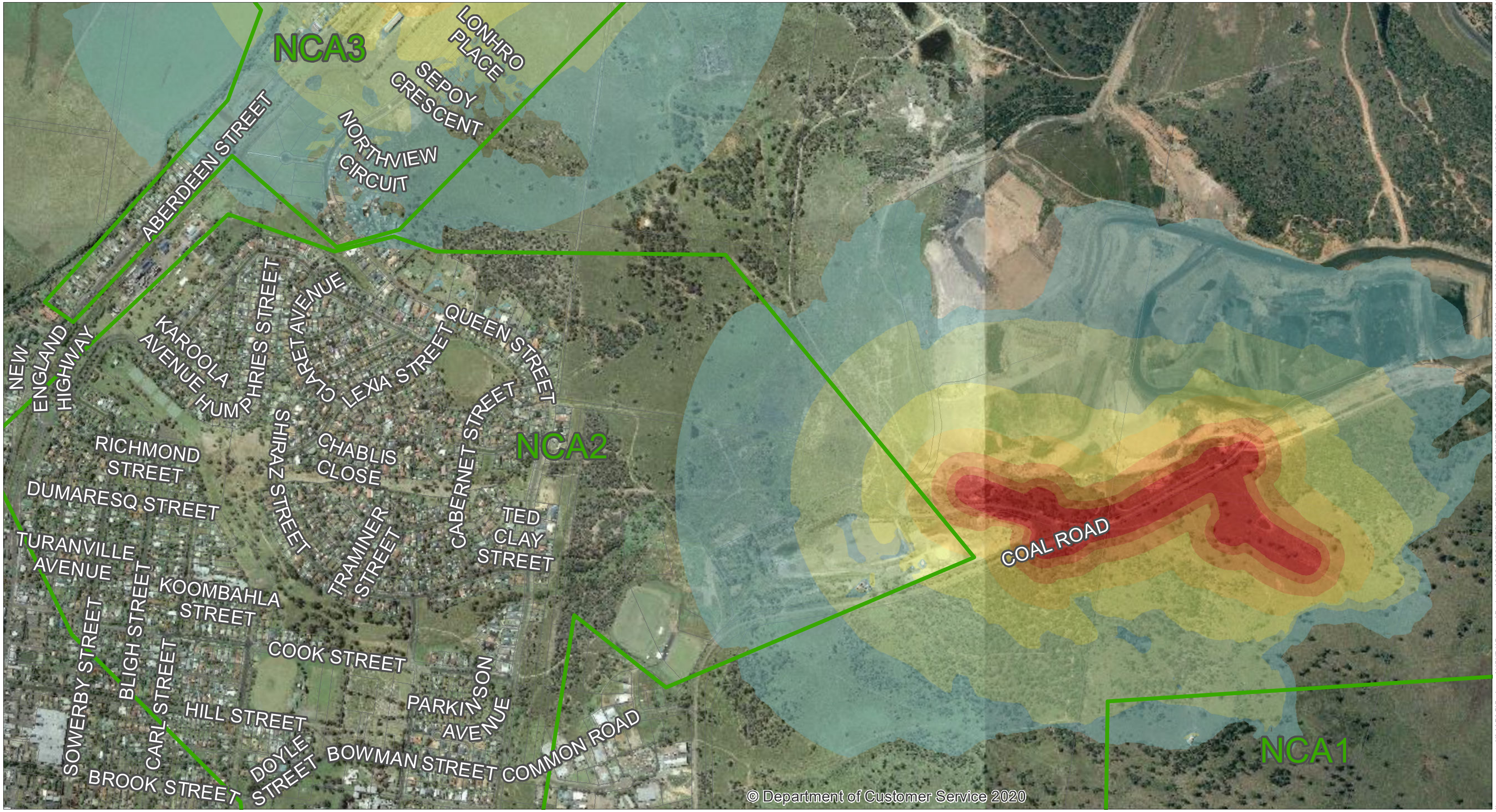


N

0 225 450 Meters

AECOM

Source:

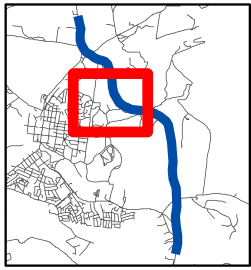


Muswellbrook Bypass - Pavement works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, 75 - 79, > 79

NCAs

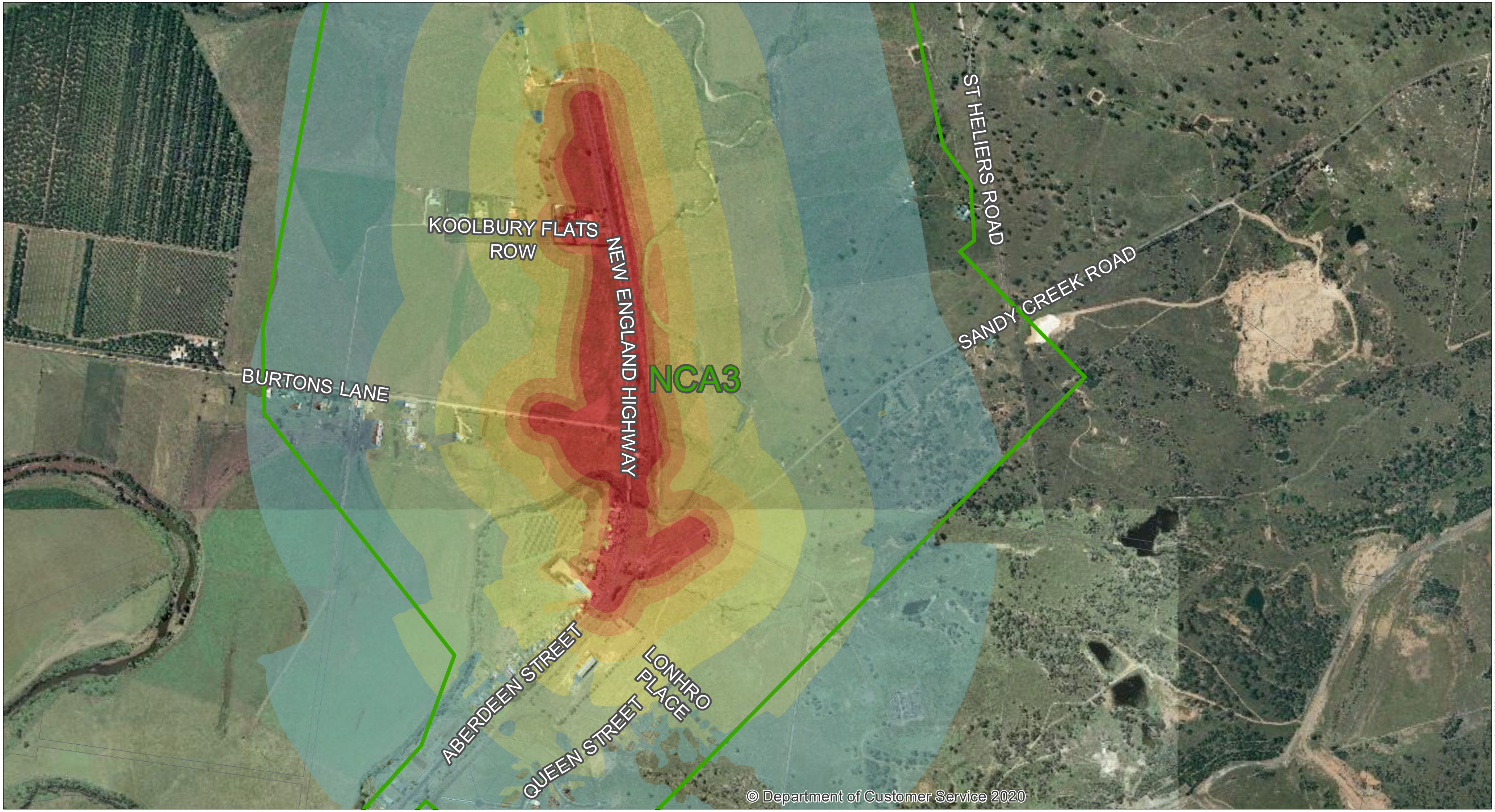


N

0 225 450 Meters

AECOM

Source:

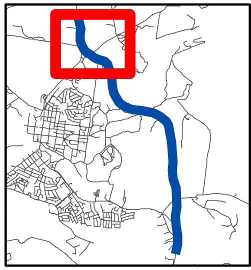


Muswellbrook Bypass - Pavement works - Outside Standard Hours

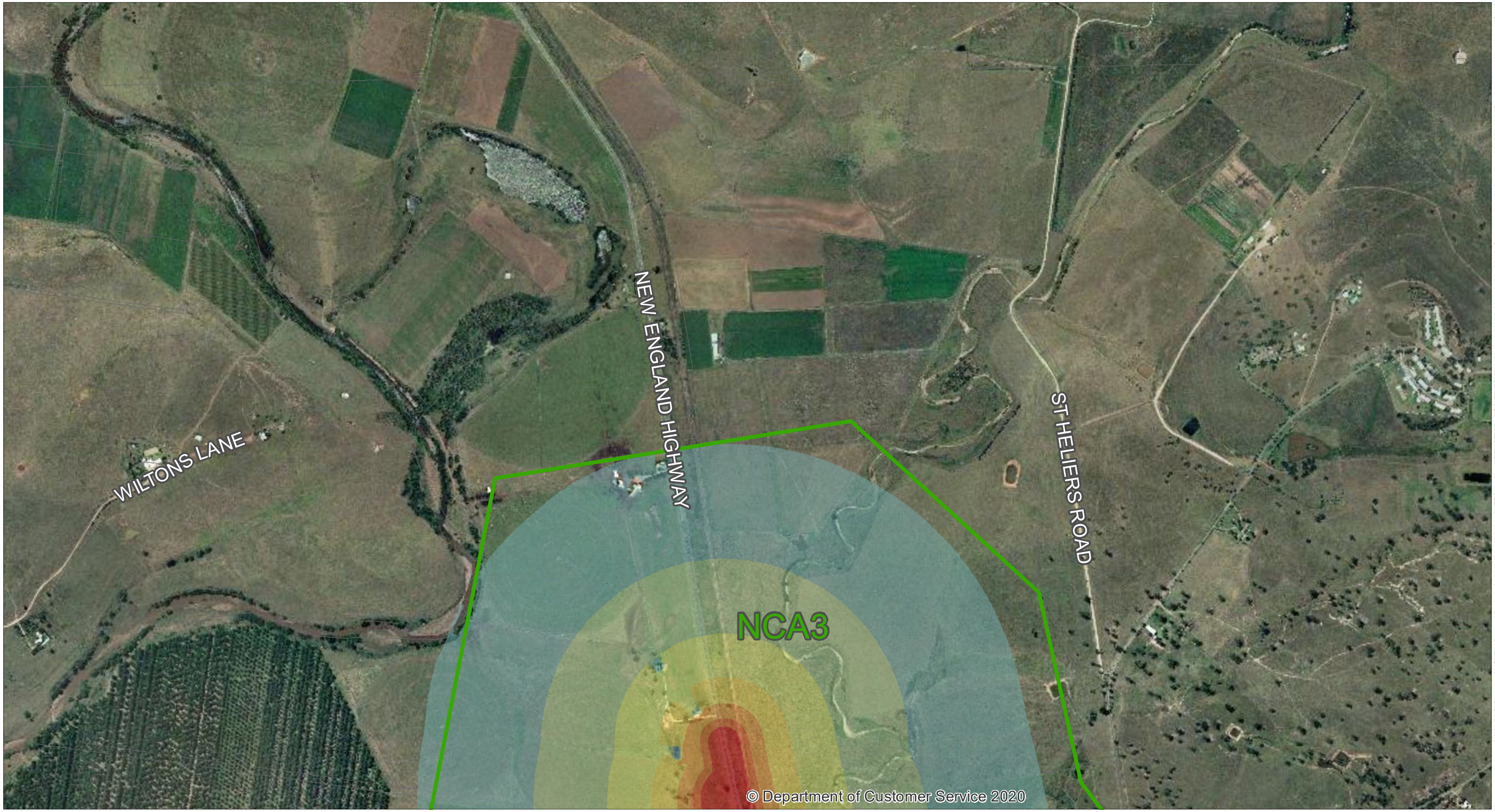
Sound Pressure Level, L_{Amax} dB(A)

< 50
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
75 - 79
> 79

NCAs



Source:

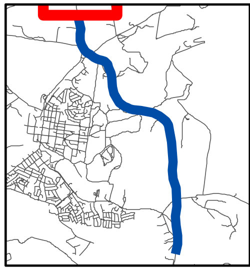


Muswellbrook Bypass - Pavement works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, 75 - 79, > 79

NCAs

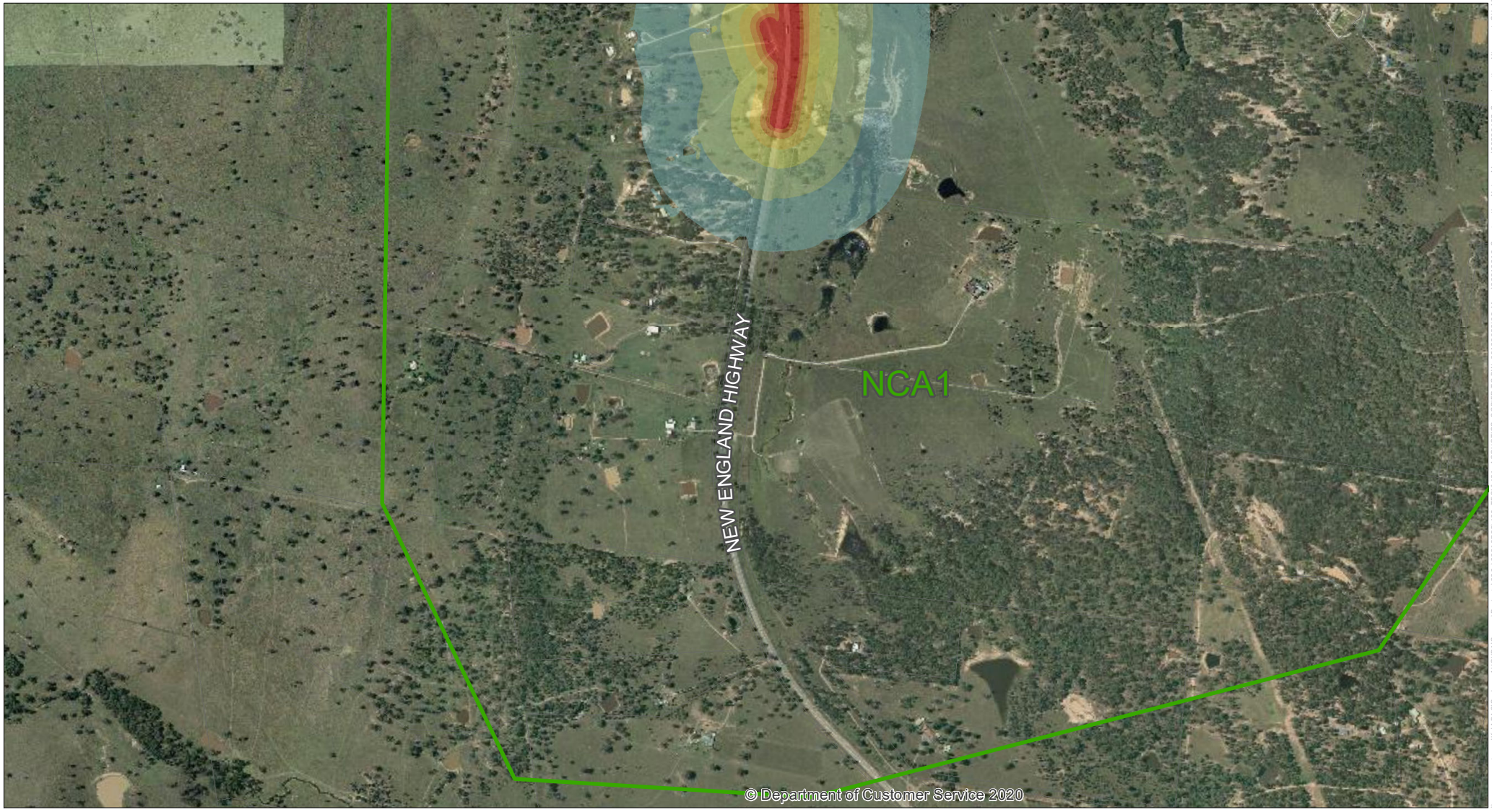


N

0 225 450 Meters

AECOM

Source:

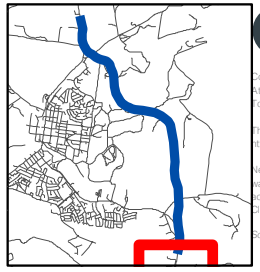


Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | 75 - 79 | > 79

NCAs

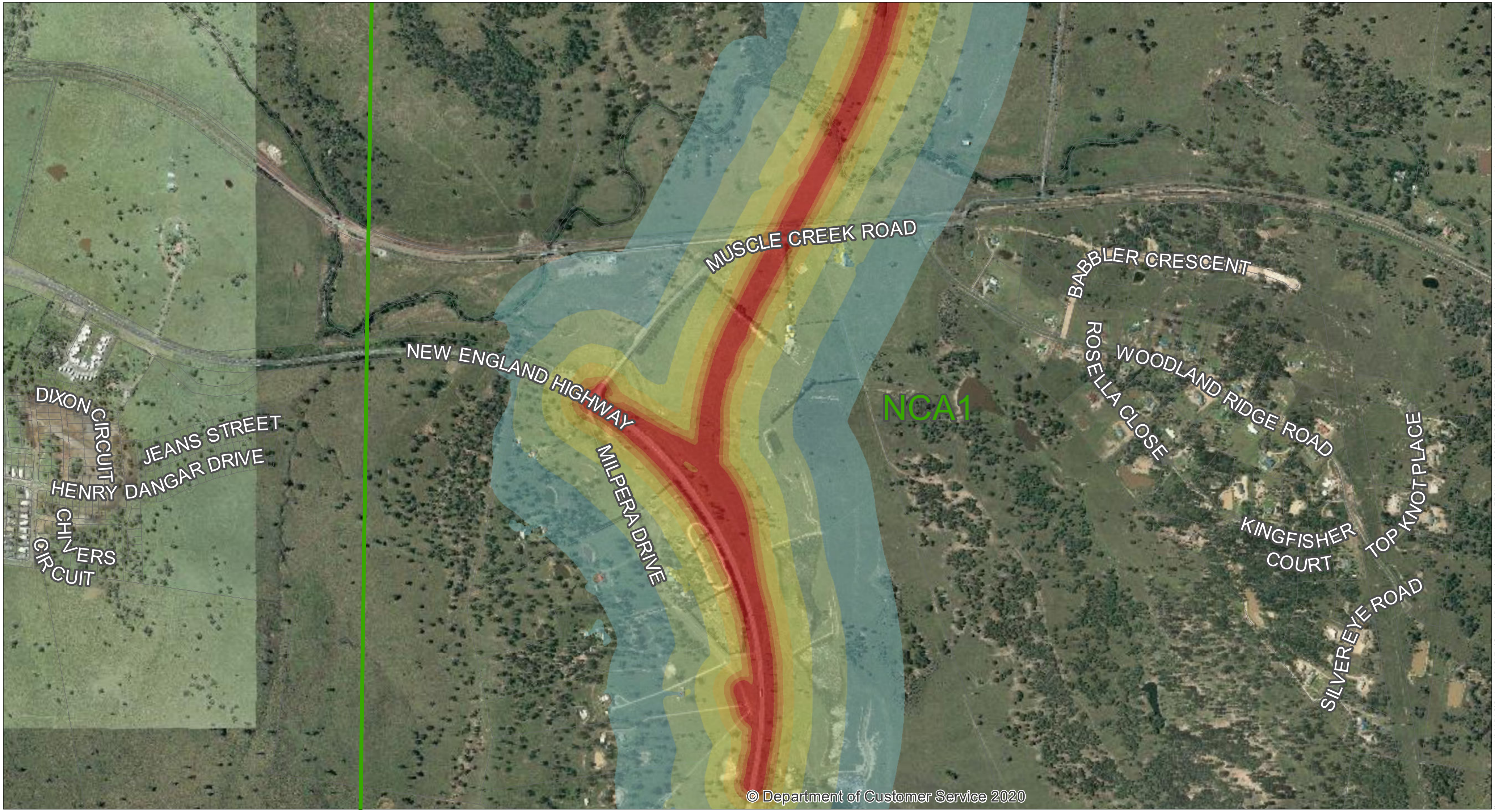


N

0 225 450 Meters

AECOM

Source:

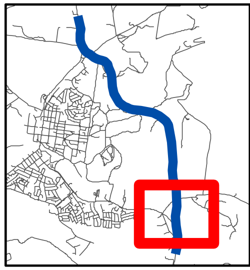


Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | 75 - 79 | > 79

NCAs

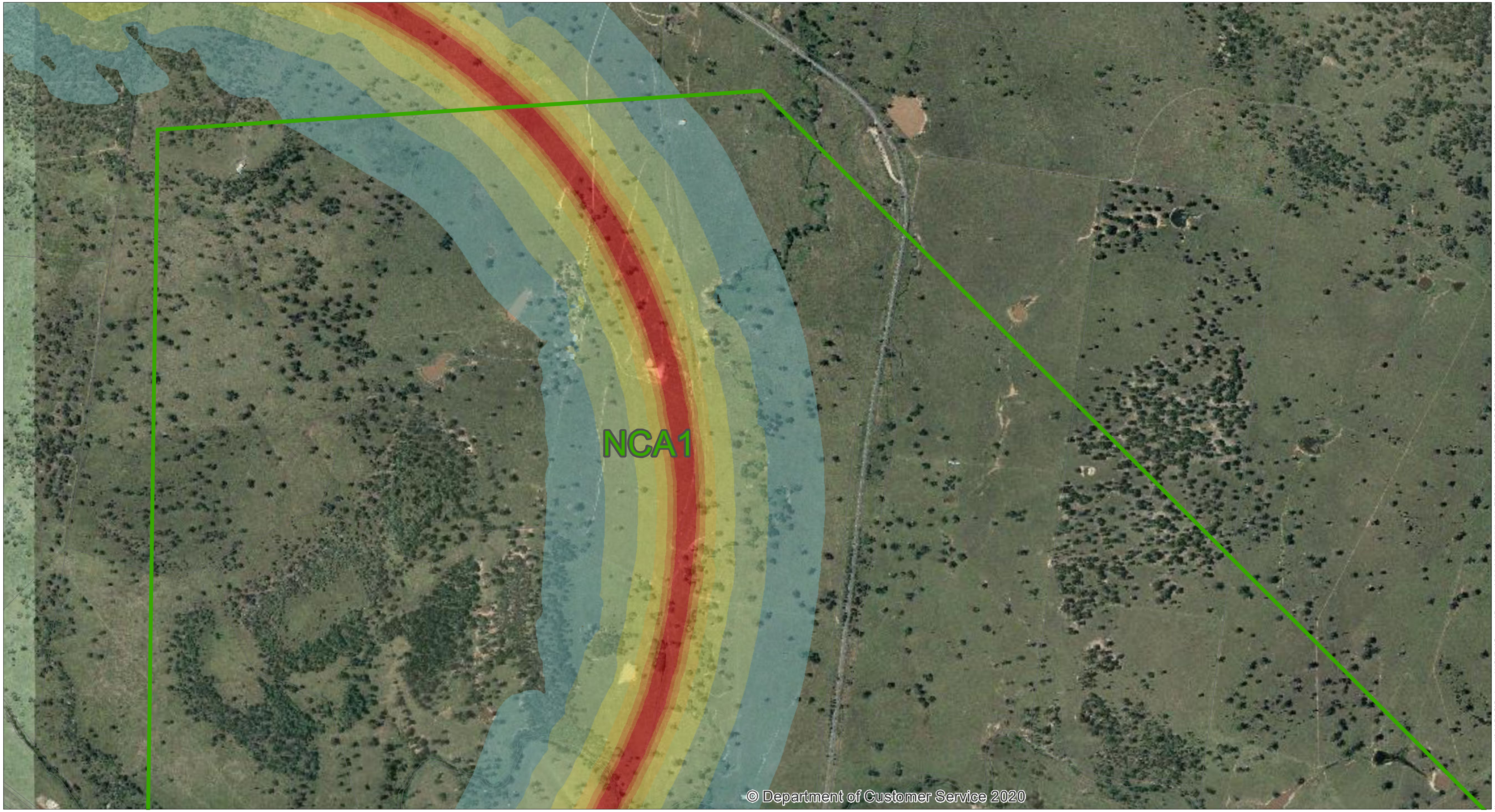


N

0 225 450 Meters

AECOM

Source:

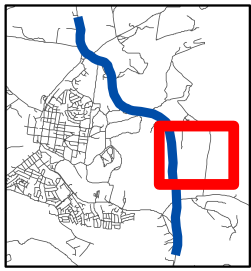


Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
75 - 79
> 79

NCAs

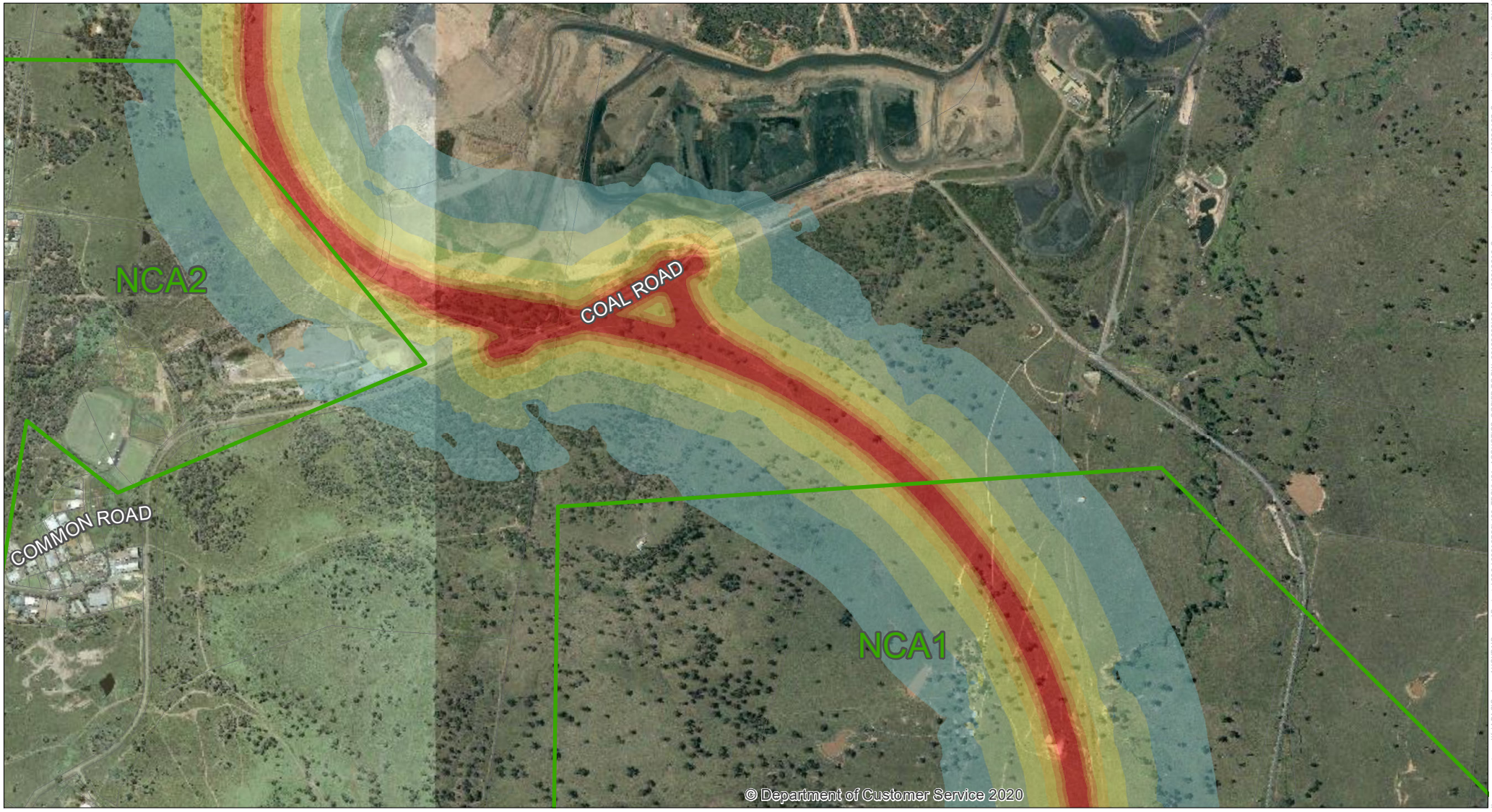


N

0 225 450 Meters

AECOM

Source:

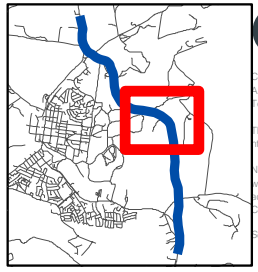


Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | 75 - 79 | > 79

NCAs

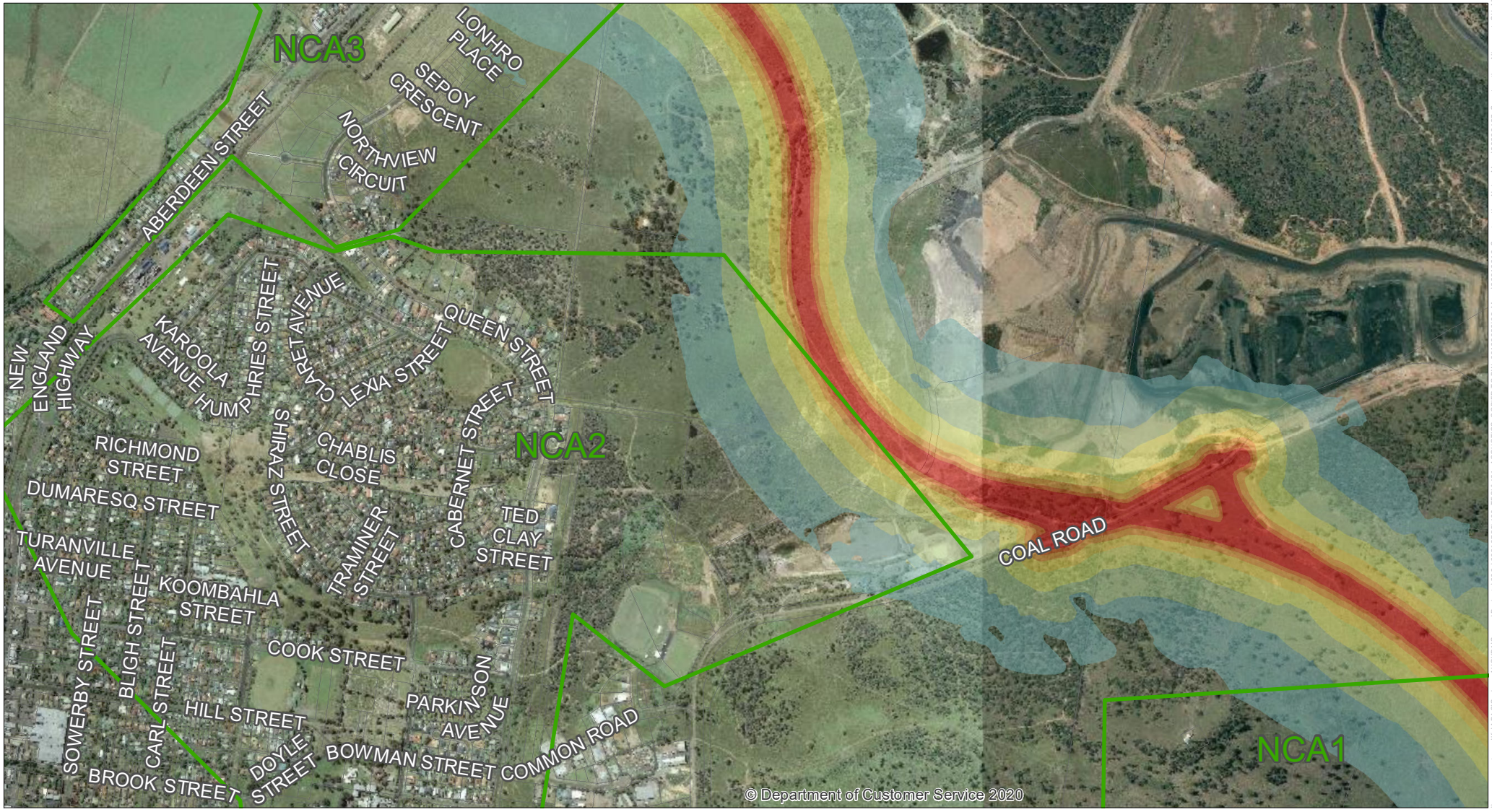


N

0 225 450 Meters

AECOM

Source:

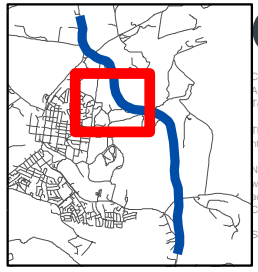


Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50 | 50 - 54 | 55 - 59 | 60 - 64 | 65 - 69 | 70 - 74 | 75 - 79 | > 79

NCAs

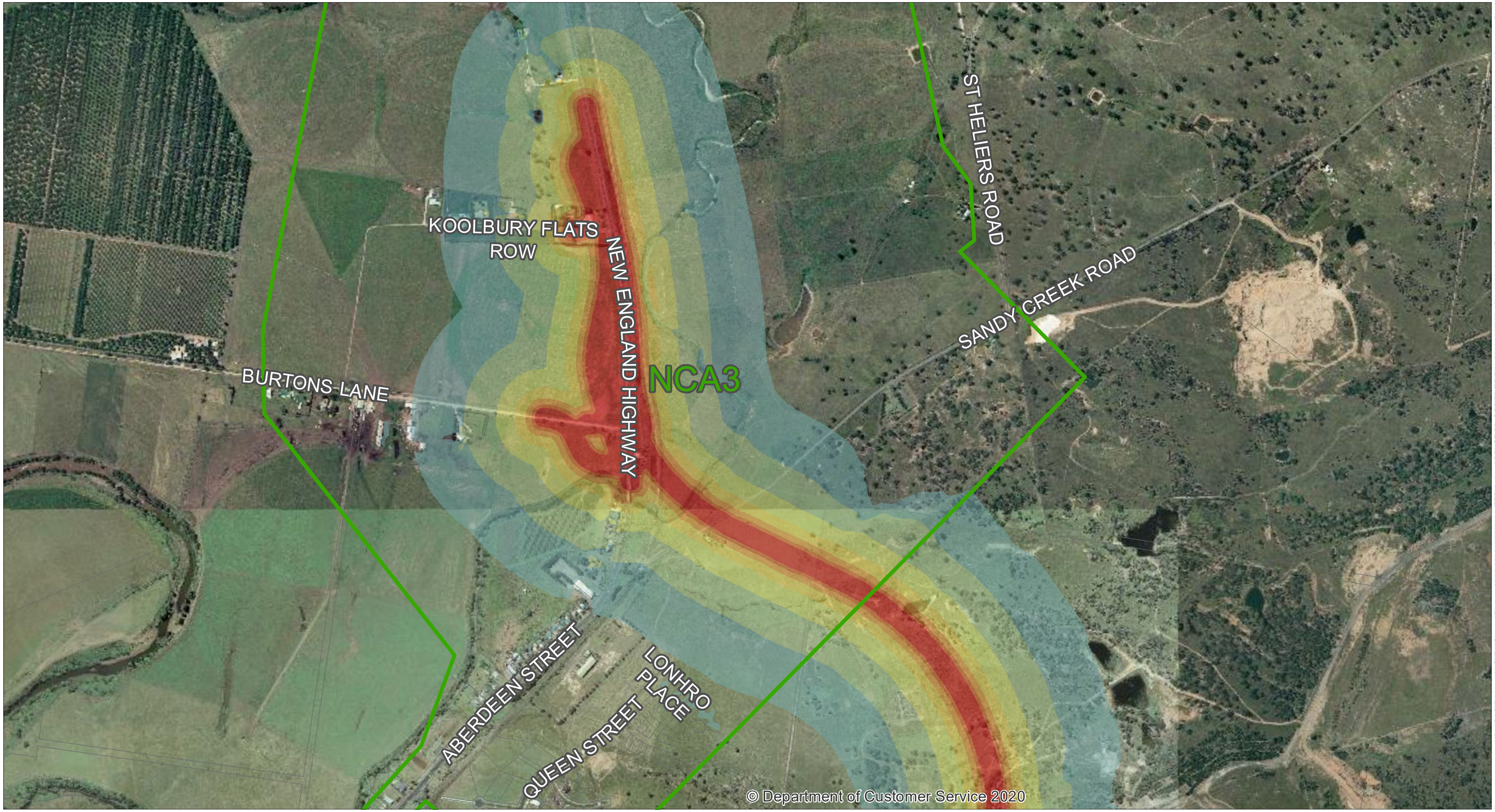


N

0 225 450 Meters

AECOM

Source:

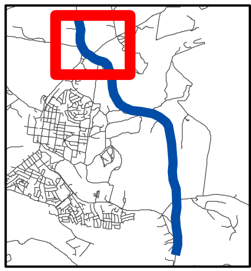


Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

< 50, 50 - 54, 55 - 59, 60 - 64, 65 - 69, 70 - 74, 75 - 79, > 79

NCAs

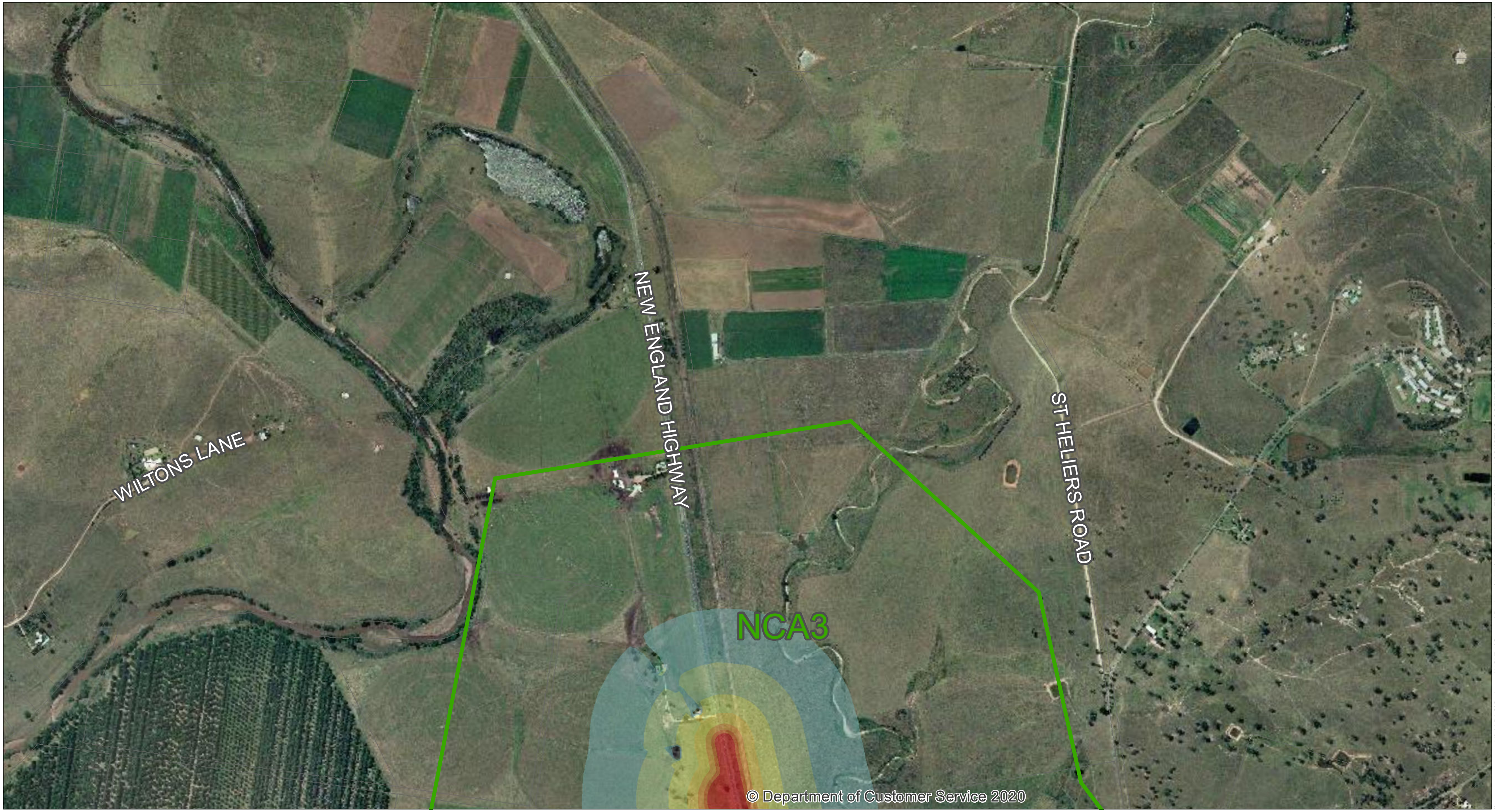


N

0 225 450 Meters

AECOM

Source:

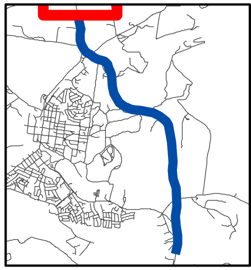


Muswellbrook Bypass - Finishing works - Outside Standard Hours

Sound Pressure Level, L_{Amax} dB(A)

- < 50
- 50 - 54
- 55 - 59
- 60 - 64
- 65 - 69
- 70 - 74

NCAs



N

0 225 450 Meters

AECOM

Source: