B-line

April 2017

Spit Bridge to Neutral Bay
B-Line Road Infrastructure
Submissions Report

NSW GOVERNMENT Transport Roads & Maritime Services

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Roads and Maritime Services

Spit Bridge to Neutral Bay B-Line Road Infrastructure

Submissions report

April 2017

Prepared by AECOM and Roads and Maritime Services

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Executive summary

Roads and Maritime Services (Roads and Maritime) is the proponent for the Spit Bridge to Neutral Bay B-Line Road Infrastructure (the Proposal). The Proposal is part of the Northern Beaches B-Line Program – a NSW Government initiative to provide a more frequent and reliable bus service between the Northern Beaches and Sydney's Central Business District (CBD). The program includes on-road and off-road infrastructure improvements and enhancements to the broader Northern Beaches and Lower North Shore bus network. The on-road and off-road elements would be delivered as a number of individual projects by the Northern Beaches B-Line Program (NBBP). The new B-Line service is expected to be operational in late 2017.

The assessment of the Proposal is documented in the Spit Bridge to Neutral Bay B-Line Road Infrastructure Review of Environmental Factors (REF) (Roads and Maritime Services, December 2016). The REF was placed on public display for eight weeks between 5 December 2016 and 1 February 2017. During this time the community and stakeholders were invited to review the Proposal and provide feedback. A physical copy of the REF was displayed at four locations and was also made available on the Northern Beaches B-Line website.

Three hundred and forty two submissions were received including 340 from the community, one from Mosman Council and one from North Sydney Council.

Issues raised by the community and stakeholders

Submissions received raised a variety of issues. These included (but were not limited to) the following key issues:

- Design of the Proposal
- Loss of parking
- Traffic congestion
- Access to public transport facilities
- Pedestrian and vehicle safety
- Air quality
- Noise impacts
- The scope and adequacy of consultation activities
- Vegetation removal along the corridor
- Justification for the Proposal
- Alternative options considered
- A number of suggestions/issues that were outside the scope of this assessment.

Submissions received from North Sydney Council and Mosman Council have also been addressed in this report.

Changes to the Proposal

Since the display of the Review of Environmental Factors, NBBP have re-assessed design options and requirements and made further refinements to the Proposal. As a result certain items have been removed from the scope of the Proposal presented in the REF. Despite this, changes to these and other elements in the future are still being considered as part of wider area-based solutions which are being developed in consultation with North Sydney and Mosman Councils.

The following items have been removed from the scope of the Proposal:

- The construction of a new left hand turn lane from Spit Road (city bound) into Awaba Street The relocation of the M30 bus layover from Spit Road to Military Road east
- The construction of an indented bus bay on Military Road (citybound) between Murdoch Street and Hampden Avenue. Subsequently the relocation of the bus shelter and ancillary infrastructure at this location has been also been removed from the scope of the Proposal
- All proposed turn restrictions at the intersection of Military Road/Ben Boyd Road. All traffic restrictions at this intersection would remain as per the existing scenario

- The proposed section of tidal flow between Watson Street and Ben Boyd Road at Neutral Bay. Further changes at this intersection in the future are still being considered as part of a wider area-based solution which is being developed in consultation with North Sydney Council, but are no longer part of this Proposal.

The following scope items have been amended from the Proposal presented in the REF:

- The previously proposed relocation of outbound and citybound local bus stops at Cremorne has been reassessed. The updated Proposal is for the outbound bus stop to be moved 105 metres west (towards Neutral Bay) from its current location. A bus shelter would be provided in this new location to provide protection from inclement weather. The citybound bus stop at Cremorne would now be moved 95 metres west (towards Neutral Bay) from its current location. No bus shelter would be provided in this new location as this bus stop would be adjacent to an existing shop awning
- Additional parking impacts in Zones A2, A5, B1, and C5 as a result of ongoing design development
- Changes to the setup and operation of the construction compound on the corner of Clifford Street and Spit Road. The compound would now operate from ground level rather than underground, as the former cinema is currently being demolished. The compound will also operate 24 hours a day during construction of the Proposal.

All changes to the scope included within this report have been made in accordance with the original objectives of the Proposal (as defined in Section 2.1.4 of the REF), and in response to submissions received from the community.

Additional assessment

The changes outlined above have been made to the Proposal in response to submissions received from the community, and as a result of further progression of the concept design of the Proposal.

The environmental impacts associated with the Proposal, including scope changes outlined above, have been considered and accordingly some assessments undertaken in the Review of Environmental Factors have been re-visited. This includes assessments for traffic and transport impacts, noise and vibration, urban design, landscape and visual amenity, socio-economic impacts, and biodiversity. These additional assessments are described in Section 3 of this report. Two additions have been made to the environmental management measures provided in the REF. These include the specification of hoarding to be placed around the construction compound during setup and operation of the compound and the preparation of a comprehensive road safety audit with specific focus on pedestrian safety as part of detailed design. A full list of management measures is provided Section 4 of this report.

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1 Introduction and background

1.1 The Proposal

Roads and Maritime Services (Roads and Maritime) is the proponent and determining authority for the on-road works associated with the Northern Beaches B-Line Program (NBBP). This program proposes to upgrade roads, intersections and bus stops from Mona Vale to Neutral Bay to support the new B-Line bus service. The NBBP is a NSW Government initiative to provide a more frequent and reliable bus service between the Northern Beaches and Sydney's Central Business District (CBD).

The Proposal includes improvements along Spit Road and Military Road in support of improved journey times for the B-Line bus service. The assessment of the Proposal is documented in the Spit Bridge to Neutral Bay B-Line Road Infrastructure Review of Environmental Factors (REF) prepared by Roads and Maritime (December, 2016) for the NBBP. The REF outlined the key features of the Proposal at the time, which were:

- Lengthening of existing bus bays along Spit Road at Parriwi Road, Mosman, Stanton Road, Mosman and extension of the existing in-lane bus zone on the outbound side of Military Road opposite Hampden Avenue, Cremorne
- Installation of new traffic signals at the intersection of Spit Road and Stanton Road
- Removal of the signalised pedestrian crossing between Stanton Road and Warringah Road, Mosman
- Widening of the road in the north east corner of the intersection of Spit Road and Stanton Road
- Construction of a left turn bay on the citybound side of Spit Road providing access into Awaba Street at Mosman.
- Widening of the western side of Spit Road, north of Punch Street, including lane marking reconfiguration to provide a widened citybound kerb lane (on the eastern side of Spit Road)
- Extension of the existing citybound lane management (tidal flow) system along Spit Road, from north of Ourimbah Road, Mosman, to Killarney Street, Mosman
- Closure of Clifford Street, Mosman at Spit Road to form a cul-de-sac
- Construction of a new indented bus bay and citybound bus stop for B-Line and local bus services on Spit Road at Clifford Street, Mosman
- Construction of a new outbound bus stop for B-Line and local bus services on Spit Road opposite Clifford Street
- Relocation of the M30 bus layover, currently located on Spit Road, to Military Road east
- Construction of new citybound indented bus bays on Military Road at Prince Street, Mosman and near Hampden Avenue, Cremorne
- Half closure of Cabramatta Road, Cremorne to allow left-in only movements from Military Road
- Replace the existing citybound lane management (tidal flow) system, and construct additional tidal flow sections along Military Road between Spofforth Street, Cremorne and Watson Street, Neutral Bay
- Impose turning restrictions at the intersections of Ben Boyd Road/Military Road and Murdoch Street/Military Road
- Minor widening of the kerbside lane of Military Road citybound to the north and south of Holt Avenue
- Changes to existing parking arrangements to accommodate new bus bays and tidal flow system throughout the corridor
- Minimum property acquisition necessary for changes to road infrastructure to support the efficient operation of the B-Line, including associated property boundary adjustments
- The use of a construction compound within the underground car park of the former Greater Union Cinema on the corner of Clifford Street and Spit Road
- Ancillary works including road resurfacing, relocation of utilities, minor drainage and pavement works, adjustments to street lighting, changes to signage, upgrades to pedestrian fencing and landscaping, new line marking and improved/new traffic signal infrastructure.

An overview of the B-Line bus service route is provided in Figure 1-1. The Proposal is located within the Mosman and North Sydney Local Government Areas (LGA), approximately four kilometres from the Sydney CBD (as the crow flies). The works included in the Proposal are located at various locations along Spit and Military roads between The Spit Bridge and Neutral Bay. The Proposal area has been separated into the following Zones and subzones, which are shown in Figure 1-2:

- Zone A: Spit Road between Spit Bridge and Ourimbah Road in the suburb of Mosman
- Zone B: Spit Road between Ourimbah Road and Spofforth Street in the suburbs of Mosman and Cremorne
- Zone C: Military Road between Spofforth Street and Watson Street in the suburbs of Cremorne and Neutral Bay.

Several changes have been made to the Proposal in response to the submissions received as part of the REF display and as part of continued development of the design by NBBP. These changes are set out in Section 3 of this report and have been assessed in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Subject to a final determination to proceed, construction of the Proposal is expected to commence in the first half of 2017 and would take about nine months to complete. A more detailed description of the Proposal can be found in the Spit Bridge to Neutral Bay B-Line Road Infrastructure REF.

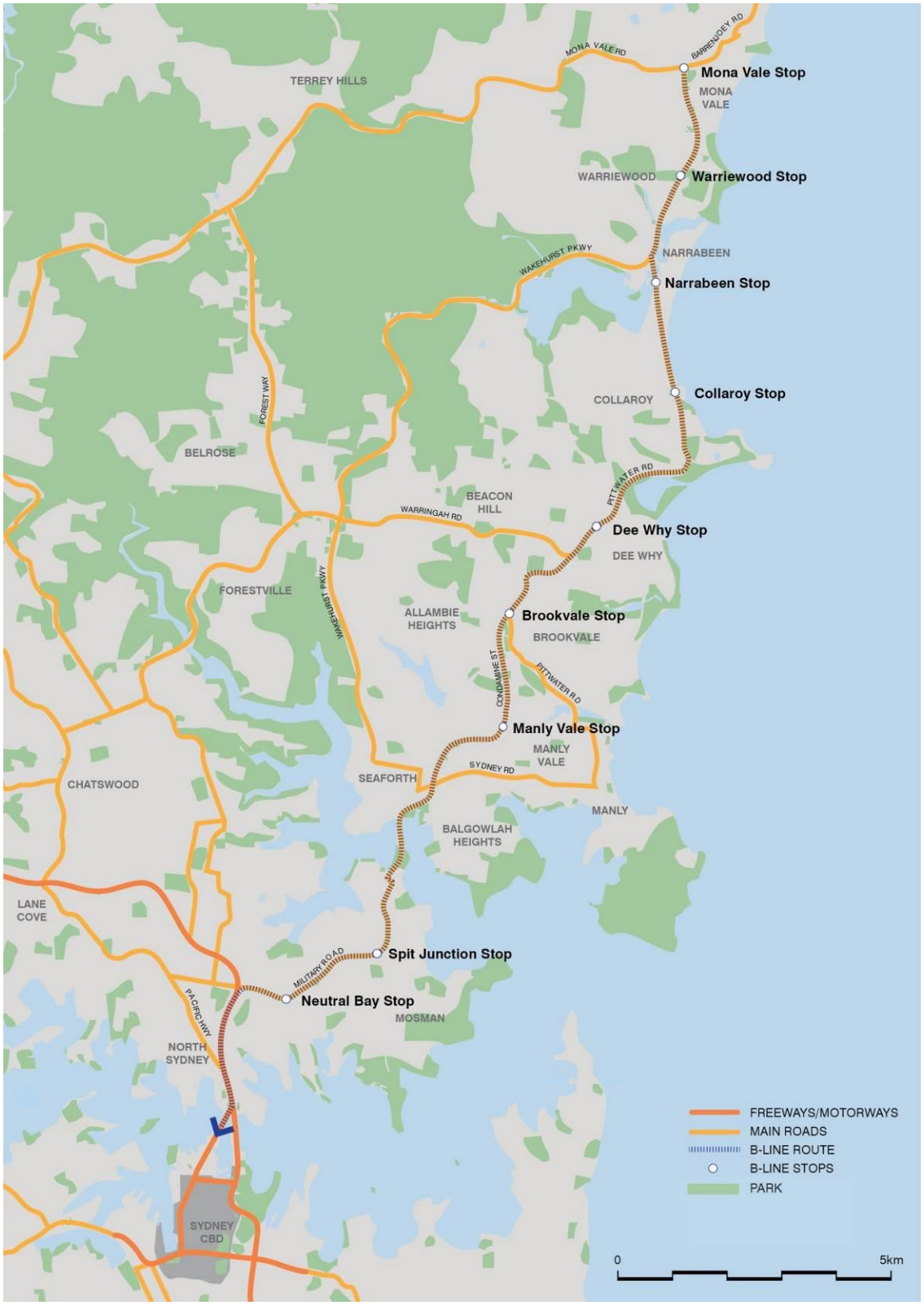

Figure 1-1: Overview of the new B-Line service

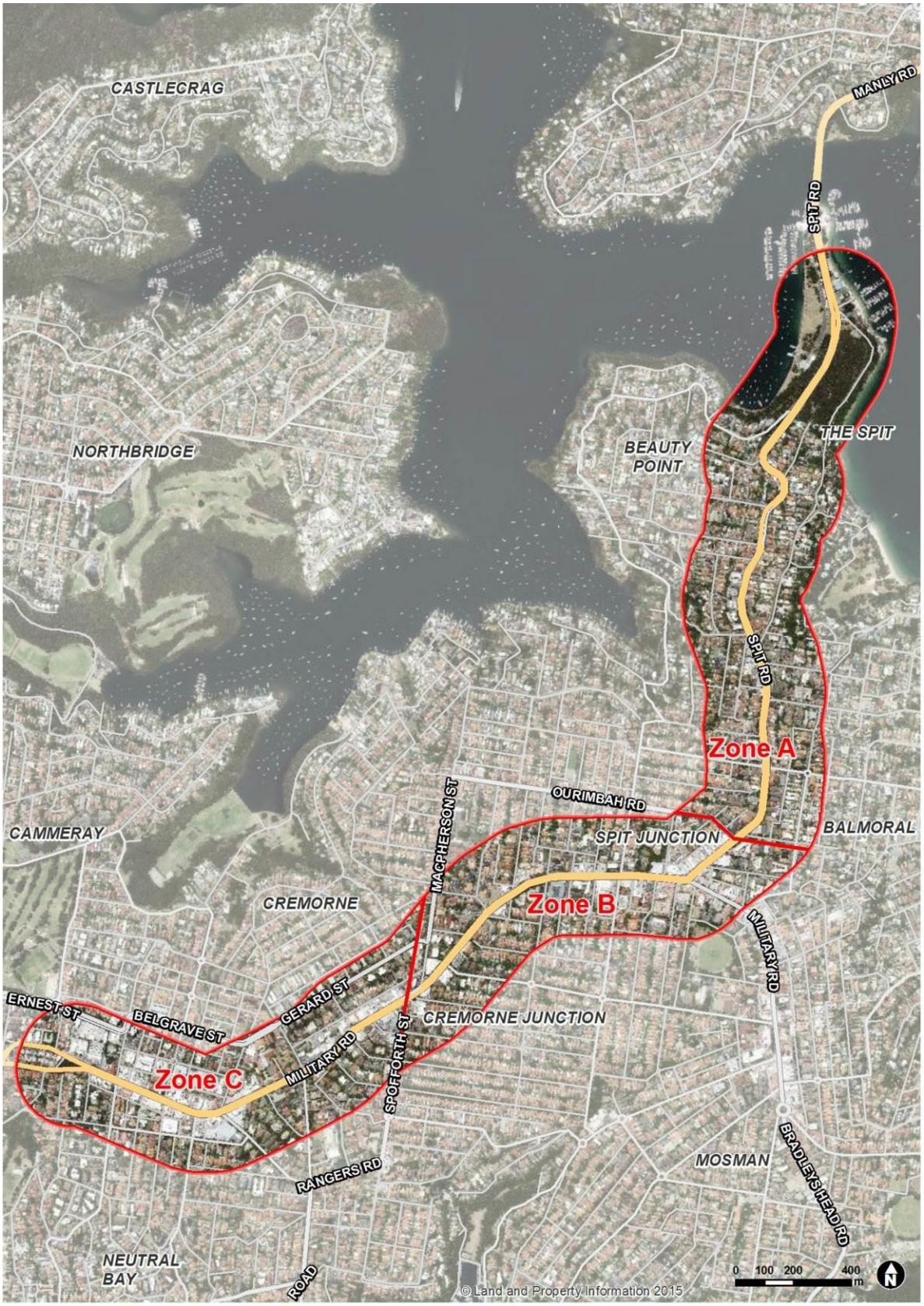

Figure 1-2: Overview of the Proposal area

1.2 REF display

In late 2016 Roads and Maritime prepared an REF to assess the environmental impacts of the proposed on-road infrastructure works between The Spit Bridge and Neutral Bay. The REF was publically displayed for eight weeks between 5 December 2016 and 1 February 2017 at four locations, as detailed in Table 1-1. The REF was also placed on the B-Line Program website and made available for download. The display locations and website address were advertised in the Mosman Daily newspaper.

Table 1-1: Public display locations for the Spit Bridge to Neutral Bay B-Line Road Infrastructure REF

Location	Address
North Sydney Council Customer Service Centre	200 Miller Street, North Sydney
Mosman Council Civic Centre	Mosman Square, Spit Junction
Barry O'Keefe Library	605 Military Road, Mosman
Transport for NSW	Level 5, Tower A, Zenith Centre, 821 Pacific Highway, Chatswood

In addition to the public display and website the following consultation activities were also undertaken:

- Newsletters were distributed to residents of Mosman, Neutral Bay and Cremorne along the B-Line corridor and into surrounding streets on 8 and 9 December and again on 18 January. On each occasion 9,100 newsletters were distributed (distribution staff were GPS tracked to allow verification)
- Four community information sessions were held (two in Neutral Bay, two in Mosman)
- A manned shopping centre kiosk at the Big Bear shopping centre was run for one week, (static kiosk, manned at lunch time) with NBBP staff members speaking to about 70 members of the community
- Direct community engagement – more than 80 impacted businesses were contacted directly
- Mosman Council, North Sydney Council and local MP Jillian Skinner were briefed on the Proposal prior to the display period. Ongoing engagement continues with both councils
- Mosman Council and North Sydney Council advertised B-Line info sessions via their communication channels
- A meeting/briefing was held with Neutral Bay Chamber of Commerce
- A meeting with representatives of the Cremorne Chamber of Commerce was held to address concerns regarding the proposed relocation of the bus stop at Cremorne.
- Five advertisements were placed in the Manly and Mosman Daily regarding the B-Line information sessions (from 8 December to 19 January)
- During the display period, the B-Line project was mentioned more than 50 times in both national and local press
- Additional information was provided on the website, including a fly through video of the proposed changes in Mosman/Neutral Bay/Cremorne, which has been viewed more than 3000 times
- Emergency services were contacted regarding the Proposal
- Meetings were held with potentially affected schools
- Updates were dropped off at Hayden Orpheum, IGA Cremorne, Big Bear Shopping Centre and Woolworths Neutral Bay
- Following the display period, meetings have continued with potentially impacted property owners and businesses.

1.3 Purpose of the report

This report relates submissions received in response to the public display of the REF prepared for the Spit Bridge to Neutral Bay B-Line Road Infrastructure. This report should be read in conjunction with that document. This submissions report summarises the issues raised and provides responses to each issue (Section 2).

This report also details investigations that have been carried out since the finalisation of the REF. Section 3, describes and assesses the environmental impact of changes to the Proposal, and Section 4 summarises all previously existing management measures for the Proposal and identifies new or revised environmental management measures required as a result of changes to the Proposal.

Changes to the Proposal have been made since the preparation of the REF. These are outlined and assessed in Section 3 of this report and are mostly centred on the removal of certain elements of the previous scope. No project changes are proposed that would require the preparation of a preferred infrastructure report.

All environmental management measures, including one additional measure arising from the assessment within this report, are presented in Section 4.

2 Response to issues

Roads and Maritime Services received 342 submissions, accepted up until 1 February 2017. Table 2-1 lists the respondents and each respondent's allocated submission number. The table also indicates where the issues from each submission have been addressed in Section 2 of this report.

Table 2-1: Respondents

Respondent	Submission No.	Section number where issues are addressed
Individual	1	Section 2.21
Individual	2	Section 2.21, Section 2.11
Individual	3	Section 2.21
Individual	4	Section 2.13
Individual	5	Section 2.2.3
Individual	6	Section 2.4.4
Individual	7	Section 2.13, Section 2.18, Section 2.10.1, Section 2.10.2, Section 2.2.1, Section 2.2.2, Section 2.2.3, Section 2.2.4, Section 2.21, Section 2.4.4
Individual	8	Section 2.18, Section 2.10.1, Section 2.11, Section 2.21, Section 2.7
Individual	9	Section 2.18, Section 2.7, Section 2.10.1, Section 2.10.2, Section 2.11, Section 2.12, Section 2.14, Section 2.19, Section 2.21, Section 2.8
Individual	10	Section 2.7, Section 2.10.2, Section 2.21
Individual	11	Section 2.7, Section 2.10.2, Section 2.21
Individual	12	Section 2.4.1
Individual	13	Section 2.11, Section 2.18, Section 2.10.4
Individual	14	Section 2.3, Section 2.10.2
Individual	15	Section 2.4.1
Individual	16	Section 2.11, Section 2.18, Section 2.21, Section 2.10.2, Section 2.9.1
Individual	17	Section 2.16, Section 2.10.2, Section 2.15.1, Section 2.17.1, Section 2.6.1, Section 2.9.1, Section 2.9.2
Individual	18	Section 2.6.1
Individual	19	Section 2.6.1, Section 2.7
Individual	20	Section 2.21

Respondent	Submission No.	Section number where issues are addressed
Individual	21	Section 2.18, Section 2.6.2, Section 2.8, Section 2.9.1
Individual	22	Section 2.13, Section 2.21, Section 2.10.1, Section 2.10.3, Section 2.17.1
Individual	23	Section 2.5
Individual	24	Section 2.4.2
Individual	25	Section 2.21
Individual	26	Section 2.5, Section 2.4.1, Section 2.4.2, Section 2.4.4
Individual	27	Section 2.19
Individual	28	Section 2.10.4
Individual	29	Section 2.6.1
Individual	30	Section 2.8
Individual	31	Section 2.10.4
Individual	32	Section 2.2.1
Individual	33	Section 2.8
Individual	34	Section 2.8
Individual	35	Section 2.3
Individual	36	Section 2.10.1, Section 2.17.2, Section 2.21
Individual	37	Section 2.18, Section 2.21, Section 2.8
Individual	38	Section 2.10.2, Section 2.8
Individual	39	Section 2.2.1, Section 2.3
Individual	40	Section 2.5
Individual	41	Section 2.4.3
Individual	42	Section 2.9.1
Individual	43	Section 2.21, Section 2.17.1
Individual	44	Section 2.18, Section 2.19
Individual	45	Section 2.2.1, Section 2.2.2, Section 2.2.3
North Sydney Council	46	Section 2.18, Section 2.7, Section 2.10.2, Section 2.10.4, Section 2.11, Section 2.14, Section 2.15.2, Section 2.21, Section 2.22, Section 2.6.1, Section 2.8

Respondent	Submission No.	Section number where issues are addressed
Individual	47	Section 2.16, Section 2.2.1, Section 2.2.4
Individual	48	Section 2.6.1
Individual	49	Section 2.21
Individual	50	Section 2.2.1, Section 2.2.4
Individual	51	Section 2.3, Section 2.10.4, Section 2.11, Section 2.17.2, Section 2.2.2, Section 2.8
Individual	52	Section 2.18, Section 2.10.3, Section 2.11, Section 2.21, Section 2.7, Section 2.9.2
Individual	53	Section 2.15.1, Section 2.2.1, Section 2.2.4
Individual	54	Section 2.2.1
Individual	55	Section 2.15.1, Section 2.2.1, Section 2.2.4
Individual	56	Section 2.2.1
Individual	57	Section 2.9.1
Individual	58	Section 2.21
Individual	59	Section 2.10.4
Individual	60	Section 2.21, Section 2.10.2, Section 2.11, Section 2.17.2, Section 2.2.4
Individual	61	Section 2.21, Section 2.2.1, Section 2.2.3, Section 2.2.4
Individual	62	Section 2.10.1, Section 2.6.1, Section 2.8, Section 2.9.1
Individual	63	Section 2.21, Section 2.10.2, Section 2.17.2, Section 2.9.1
Individual	64	Section 2.21, Section 2.10.2, Section 2.18, Section 2.2.1, Section 2.2.2
Individual	65	Section 2.9.1
Individual	66	Section 2.10.1, Section 2.10.4, Section 2.11, Section 2.2.1, Section 2.8
Individual	67	Section 2.8
Individual	68	Section 2.21, Section 2.10.2
Individual	69	Section 2.9.1
Individual	70	Section 2.9.1
Individual	71	Section 2.9.1

Respondent	Submission No.	Section number where issues are addressed
Individual	72	Section 2.9.1
Individual	73	Section 2.15.1, Section 2.2.1, Section 2.2.3
Individual	74	Section 2.2.1
Individual	75	Section 2.15.1, Section 2.2.1, Section 2.2.2, Section 2.2.4, Section 2.2.5
Individual	76	Section 2.6.1, Section 2.9.1
Individual	77	Section 2.10.2, Section 2.9.1
Individual	78	Section 2.15.1, Section 2.2.1, Section 2.2.3
Individual	79	Section 2.10.2, Section 2.18, Section 2.7
Individual	80	Section 2.9.1
Individual	81	Section 2.15.1, Section 2.16, Section 2.2.1, Section 2.2.3, Section 2.2.4
Individual	82	Section 2.21, Section 2.7
Individual	83	Section 2.21
Individual	84	Section 2.15.1, Section 2.16, Section 2.2.1, Section 2.2.3
Individual	85	Section 2.5
Individual	86	Section 2.15.1, Section 2.16, Section 2.2.1, Section 2.2.3, Section 2.2.4
Individual	87	Section 2.9.1
Individual	88	Section 2.18, Section 2.10.2, Section 2.2.1, Section 2.2.2, Section 2.2.3
Individual	89	Section 2.18, Section 2.5, Section 2.11, Section 2.14, Section 2.3
Individual	90	Section 2.10.1, Section 2.10.3, Section 2.21, Section 2.6.1, Section 2.7, Section 2.9.1, Section 2.9.3
Individual	91	Section 2.21, Section 2.10.1, Section 2.10.2
Individual	92	Section 2.2.1, Section 2.2.3, Section 2.2.4
Individual	93	Section 2.15.1, Section 2.2.1, Section 2.2.4
Individual	94	Section 2.7
Individual	95	Section 2.9.1
Individual	96	Section 2.18, Section 2.15.1, Section 2.16, Section 2.2.1, Section 2.2.2, Section 2.2.3, Section 2.21

Respondent	Submission No.	Section number where issues are addressed
Individual	97	Section 2.2.1
Individual	98	Section 2.2.1
Individual	99	Section 2.2.1
Individual	100	Section 2.6.1, Section 2.9.1
Individual	101	Section 2.10.4, Section 2.9.1, Section 2.9.3
Individual	102	Section 2.2.1, Section 2.2.2, Section 2.2.3
Individual	103	Section 2.9.1
Individual	104	Section 2.9.1, Section 2.9.5, Section 2.9.6
Individual	105	Section 2.21
Individual	106	Section 2.18, Section 2.2.1, Section 2.2.2
Individual	107	Section 2.9.1
Individual	108	Section 2.18, Section 2.15.1, Section 2.16, Section 2.2.1, Section 2.2.3
Individual	109	Section 2.9.1
Individual	110	Section 2.5
Individual	111	Section 2.6.1, Section 2.9.1, Section 2.9.4
Individual	112	Section 2.5
Individual	113	Section 2.18, Section 2.2.1
Individual	114	Section 2.5
Individual	115	Section 2.18, Section 2.2.1
Individual	116	Section 2.10.5, Section 2.2.1, Section 2.2.3
Individual	117	Section 2.5
Individual	118	Section 2.18, Section 2.10.3, Section 2.21, Section 2.6.1, Section 2.7, Section 2.9.1, Section 2.9.3
Individual	119	Section 2.6.1
Individual	120	Section 2.10.3, Section 2.21, Section 2.7, Section 2.9.1
Individual	121	Section 2.10.3, Section 2.21, Section 2.6.1, Section 2.7, Section 2.9.1
Individual	122	Section 2.17.2, Section 2.21

Respondent	Submission No.	Section number where issues are addressed
Individual	123	Section 2.10.2, Section 2.18, Section 2.2.1, Section 2.2.3
Individual	124	Section 2.5, Section 2.10.2, Section 2.19, Section 2.2.4, Section 2.21, Section 2.4.1
Individual	125	Section 2.5
Individual	126	Section 2.18, Section 2.2.1 , Section 2.2.1, Section 2.2.3
Individual	127	Section 2.2.1, Section 2.2.3
Individual	128	Section 2.2.1, Section 2.2.3
Individual	129	Section 2.10.2
Individual	130	Section 2.5
Individual	131	Section 2.6.1
Individual	132	Section 2.2.3
Individual	133	Section 2.10.3
Individual	134	Section 2.13, Section 2.8
Individual	135	Section 2.7, Section 2.9.1
Individual	136	Section 2.18, Section 2.2.1, Section 2.2.2, Section 2.2.3
Individual	137	Section 2.16, Section 2.2.1, Section 2.2.4
Individual	138	Section 2.2.1, Section 2.2.2, Section 2.2.3
Individual	139	Section 2.2.1
Individual	140	Section 2.10.4, Section 2.15.2
Individual	141	Section 2.5
Individual	142	Section 2.21, Section 2.10.2, Section 2.10.4
Individual	143	Section 2.17.1, Section 2.21, Section 2.4.3, Section 2.6.1, Section 2.7, Section 2.9.1, Section 2.9.4
Individual	144	Section 2.10.4, Section 2.9.1
Individual	145	Section 2.10.2, Section 2.10.3, Section 2.11, Section 2.13, Section 2.21, Section 2.6.1, Section 2.9.1, Section 2.9.5
Individual	146	Section 2.9.1
Individual	147	Section 2.5
Individual	148	Section 2.18, Section 2.3, Section 2.10.1, Section 2.10.2, Section 2.2.1, Section 2.21, Section 2.6.1, Section 2.8, Section 2.9.1

Respondent	Submission No.	Section number where issues are addressed
Individual	149	Section 2.18, Section 2.2.1, Section 2.2.2, Section 2.2.3
Individual	150	Section 2.18, Section 2.21, Section 2.7, Section 2.10.2, Section 2.11, Section 2.14
Individual	151	Section 2.6.1, Section 2.9.1, Section 2.9.3, Section 2.9.5
Individual	152	Section 2.18, Section 2.10.2, Section 2.11, Section 2.6.1, Section 2.9.1, Section 2.9.6
Individual	153	Section 2.10.2, Section 2.10.4, Section 2.11, Section 2.21, Section 2.8
Individual	154	Section 2.18, Section 2.21, Section 2.10.2, Section 2.10.3, Section 2.11, Section 2.7, Section 2.9.1
Individual	155	Section 2.18, Section 2.10.3, Section 2.9.1
Individual	156	Section 2.10.2, Section 2.2.1, Section 2.2.2, Section 2.2.3
Individual	157	Section 2.5
Individual	158	Section 2.21, Section 2.9.1
Individual	159	Section 2.9.1
Individual	160	Section 2.18, Section 2.21, Section 2.11, Section 2.12, Section 2.14, Section 2.7, Section 2.9.1
Individual	161	Section 2.3, Section 2.10.2
Individual	162	Section 2.2.2, Section 2.21
Individual	163	Section 2.9.1
Individual	164	Section 2.10.1, Section 2.21, Section 2.9.1
Individual	165	Section 2.9.1
Individual	166	Section 2.18, Section 2.10.4, Section 2.9.1
Individual	167	Section 2.21, Section 2.8
Individual	168	Section 2.6.1
Individual	169	Section 2.8
Individual	170	Section 2.15.1, Section 2.2.1, Section 2.2.3, Section 2.21
Individual	171	Section 2.18, Section 2.10.2, Section 2.21, Section 2.9.1
Individual	172	Section 2.6.1, Section 2.6.2, Section 2.9.1
Individual	173	Section 2.18, Section 2.9.1

Respondent	Submission No.	Section number where issues are addressed
Individual	174	Section 2.9.1
Individual	175	Section 2.2.1, Section 2.2.3
Individual	176	Section 2.9.1
Individual	177	Section 2.2.2
Individual	178	Section 2.2.1, Section 2.2.3
Individual	179	Section 2.5
Individual	180	Section 2.21, Section 2.6.1, Section 2.9.3
Individual	181	Section 2.9.1
Individual	182	Section 2.5
Individual	183	Section 2.9.1
Individual	184	Section 2.9.1
Individual	185	Section 2.9.1
Individual	186	Section 2.21, Section 2.9.1
Individual	187	Section 2.9.1
Individual	188	Section 2.10.2
Individual	189	Section 2.9.1
Individual	190	Section 2.10.2
Mosman Council	191	Section 2.18, Section 2.21, Section 2.10.3, Section 2.10.4, Section 2.22
Individual	192	Section 2.9.1
Individual	193	Section 2.10.2, Section 2.9.1, Section 2.9.5
Individual	194	Section 2.9.1
Individual	195	Section 2.10.4
Individual	196	Section 2.9.1
Individual	197	Section 2.9.1
Individual	198	Section 2.5
Individual	199	Section 2.5
Individual	200	Section 2.10.4, Section 2.6.1, Section 2.9.1
Individual	201	Section 2.18

Respondent	Submission No.	Section number where issues are addressed
Individual	202	Section 2.9.1
Individual	203	Section 2.6.1, Section 2.9.1
Individual	204	Section 2.9.1
Individual	205	Section 2.9.1
Individual	206	Section 2.10.4
Individual	207	Section 2.9.1
Individual	208	Section 2.9.1
Individual	209	Section 2.6.1, Section 2.9.1, Section 2.9.3
Individual	210	Section 2.10.1, Section 2.10.4, Section 2.19, Section 2.2.1, Section 2.9.1
Individual	211	Section 2.2.1, Section 2.2.3
Individual	212	Section 2.9.1, Section 2.9.5
Individual	213	Section 2.9.1
Individual	214	Section 2.9.6
Individual	215	Section 2.5
Individual	216	Section 2.21, Section 2.8
Individual	217	Section 2.21, Section 2.10.2, Section 2.11
Individual	218	Section 2.10.2
Individual	219	Section 2.9.1
Individual	220	Section 2.3
Individual	221	Section 2.9.1
Individual	222	Section 2.21
Individual	223	Section 2.9.1
Individual	224	Section 2.9.1
Individual	225	Section 2.18, Section 2.9.1
Individual	226	Section 2.9.1
Individual	227	Section 2.5
Individual	228	Section 2.10.1, Section 2.9.1
Individual	229	Section 2.18, Section 2.9.1

Respondent	Submission No.	Section number where issues are addressed
Individual	230	Section 2.9.1
Individual	231	Section 2.10.3, Section 2.6.1, Section 2.9.1
Individual	232	Section 2.9.1
Individual	233	Section 2.18, Section 2.10.2, Section 2.8, Section 2.9.1
Individual	234	Section 2.10.2, Section 2.15.1, Section 2.6.1, Section 2.9.1
Individual	235	Section 2.9.1
Individual	236	Section 2.5
Individual	237	Section 2.9.1
Individual	238	Section 2.18, Section 2.10.2, Section 2.2.1, Section 2.2.2, Section 2.2.3
Individual	239	Section 2.18, Section 2.9.1, Section 2.9.5
Individual	240	Section 2.9.4
Individual	241	Section 2.10.4, Section 2.6.1, Section 2.9.1, Section 2.9.6
Individual	242	Section 2.9.1
Individual	243	Section 2.18, Section 2.21
Individual	244	Section 2.5
Individual	245	Section 2.10.4, Section 2.2.1, Section 2.2.3
Individual	246	Section 2.10.2, Section 2.5
Individual	247	Section 2.9.1
Individual	248	Section 2.9.1
Individual	249	Section 2.6.1, Section 2.9.1
Individual	250	Section 2.17.2, Section 2.9.4
Individual	251	Section 2.9.1
Individual	252	Section 2.9.1
Individual	253	Section 2.9.1
Individual	254	Section 2.10.4, Section 2.9.1
Individual	255	Section 2.9.1
Individual	256	Section 2.9.1
Individual	257	Section 2.9.1

Respondent	Submission No.	Section number where issues are addressed
Individual	258	Section 2.9.1
Individual	259	Section 2.18, Section 2.9.1
Individual	260	Section 2.9.1
Individual	261	Section 2.9.1
Individual	262	Section 2.21, Section 2.6.1
Individual	263	Section 2.9.1
Individual	264	Section 2.17.2, Section 2.6.1, Section 2.9.1
Individual	265	Section 2.9.1
Individual	266	Section 2.4.2
Individual	267	Section 2.9.1
Individual	268	Section 2.9.1
Individual	269	Section 2.8
Individual	270	Section 2.9.1
Individual	271	Section 2.10.4, Section 2.6.1, Section 2.6.2, Section 2.9.1
Individual	272	Section 2.17.2, Section 2.6.1, Section 2.9.1
Individual	273	Section 2.9.1
Individual	274	Section 2.7, Section 2.9.1
Individual	275	Section 2.19, Section 2.21
Individual	276	Section 2.9.1
Individual	277	Section 2.9.1
Individual	278	Section 2.9.1
Individual	279	Section 2.3
Individual	280	Section 2.20
Individual	281	Section 2.9.1
Individual	282	Section 2.9.1
Individual	283	Section 2.9.1
Individual	284	Section 2.18, Section 2.10.2, Section 2.21
Individual	285	Section 2.18, Section 2.10.2, Section 2.21

Respondent	Submission No.	Section number where issues are addressed
Individual	286	Section 2.10.1, Section 2.6.1, Section 2.6.2, Section 2.9.1
Individual	287	Section 2.8
Individual	288	Section 2.6.1
Individual	289	Section 2.4.4
Individual	290	Section 2.4.4
Individual	291	Section 2.10.4
Individual	292	Section 2.7
Individual	293	Section 2.21, Section 2.7
Individual	294	Section 2.10.1, Section 2.17.2, Section 2.21
Individual	295	Section 2.21, Section 2.4.4
Individual	296	Section 2.11, Section 2.8
Individual	297	Section 2.10.2, Section 2.7
Individual	298	Section 2.9.1
Individual	299	Section 2.2.1, Section 2.2.5, Section 2.2.6
Individual	300	Section 2.8
Individual	301	Section 2.21
Individual	302	Section 2.18, Section 2.15.1, Section 2.16, Section 2.2.1, Section 2.2.3
Individual	303	Section 2.15.1, Section 2.16, Section 2.2.1, Section 2.2.3, Section 2.2.4
Individual	304	Section 2.7
Individual	305	Section 2.9.1
Individual	306	Section 2.5
Individual	307	Section 2.5
Individual	308	Section 2.9.1
Individual	309	Section 2.2.1, Section 2.2.3
Individual	310	Section 2.2.4
Individual	311	Section 2.18, Section 2.10.2, Section 2.10.3, Section 2.6.1, Section 2.7, Section 2.9.1

Respondent	Submission No.	Section number where issues are addressed
Individual	312	Section 2.2.2, Section 2.2.3
Individual	313	Section 2.9.1, Section 2.9.3
Individual	314	Section 2.9.1
Individual	315	Section 2.3, Section 2.6.1, Section 2.9.1
Individual	316	Section 2.21, Section 2.9.1
Individual	317	Section 2.6.1, Section 2.9.1
Individual	318	Section 2.13
Individual	319	Section 2.9.1
Individual	320	Section 2.21, Section 2.9.1
Individual	321	Section 2.21, Section 2.9.1
Individual	322	Section 2.9.2
Individual	323	Section 2.9.1
Individual	324	Section 2.9.1
Individual	325	Section 2.9.1
Individual	326	Section 2.9.1
Individual	327	Section 2.9.1
Individual	328	Section 2.9.1
Individual	329	Section 2.6.1
Individual	330	Section 2.6.1, Section 2.9.1, Section 2.9.3
Individual	331	Section 2.9.1
Individual	332	Section 2.9.1
Individual	333	Section 2.9.1
Individual	334	Section 2.9.1
Individual	335	Section 2.21, Section 2.9.1
Individual	336	Section 2.21, Section 2.9.1
Individual	337	Section 2.9.1
Individual	338	Section 2.6.1, Section 2.9.1
Individual	339	Section 2.9.1

Respondent	Submission No.	Section number where issues are addressed
Individual	340	Section 2.6.1
Individual	341	Section 2.6.1
Individual	342	Section 2.17.2, Section 2.8, Section 2.9.1

2.1 Overview of Issues Raised

A total of 342 submissions were received in response to the display of the REF. This included submissions from Mosman Council and North Sydney Council and 340 from the community. The majority of submissions were received via email or through the B-Line website.

Each submission has been examined individually to understand the issues being raised. The issues raised in each submission have been extracted and collated, and responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided. The issues raised and NBBP's response to these issues forms the basis of this section.

The majority of submissions objected to specific aspects of the Proposal (for example relocation of bus stops at the Cremorne town centre), however did not explicitly object to or support the overall Proposal as described in the REF or the B-Line program generally.

The main issues and concerns raised by Mosman Council included impacts to parking, businesses, road user and pedestrian safety and the amenity of nearby residents, particularly as a result of the proposed relocation of the M30 layover and the left turn bay at Awaba Street.

The main issues and concerns raised by North Sydney Council included the lack of a publically released business case that details the likely achievements and value for money of the B-Line service, impacts to parking, the lack of a North Sydney B-Line bus stop and concern that the Proposal would not meet its objectives.

The main questions, concerns and issues raised by members of the public were focused on the following four key areas:

- The proposed extension of the indented bus bay at Spit Road, near Stanton Road, and the installation of traffic control signals at the Stanton Road/Spit Road intersection (Subzone A2) – 85 submissions were received on this issue
- The proposed half closure of Cabramatta Road at the intersection with Military Road (Subzone C1) – 45 submissions were received on this issue
- The proposed restriction of allowable traffic movements at the intersection of Ben Boyd Road and Military Road (Subzone C4) – 24 submissions were received on this issue
- The proposed relocation of bus stops at Cremorne town centre and installation of tidal flow traffic management system (Subzone C5) – 157 submissions were received on this issue.

To a lesser extent, submissions also specifically addressed or raised questions concerning the following parts of the proposal:

- The proposed construction of a left turn lane at the Spit Road/Awaba Street intersection (Subzone A3) – 10 submissions were received on this issue
- The proposed closure of Clifford Street at its junction with Spit Road (Subzone B1) – 12 submissions were received on this issue

- The proposed relocation of the M30 bus layover to Military Road east (Subzone B1) – 26 submissions were received on this issue
- The proposed construction of a new indented bus bay on Military Road, between Hampden Avenue and Murdoch Street (Subzone C3) – 24 submissions were received on this issue.

A number of submissions did not specify a key area but expressed a general opposition to the Proposal and/or general concerns regarding the REF process, in particular the level of assessment and community consultation undertaken. Six submissions expressed opposition to the Proposal due to the proposed removal of vegetation.

In addition, there were a number of alternative solutions or design options put forward, though some of these were outside the scope of the Proposal.

Seven submissions were received in support of the Proposal

2.2 Spit Road and Stanton Road intersection

Eighty-five of the submissions related to the intersection of Stanton Road and Spit Road, located within Zone A2 (as shown in Figure 1-2).

The majority of responses which mentioned Stanton Road were opposed to the proposed new traffic signals. The main concerns within these submissions related to increased traffic on Stanton Road and its associated impacts including, but not limited to, driveway access, property value, road safety and environmental/ health impacts. These are outlined in more detail below.

One submission expressed support for the proposed traffic signals at this intersection.

2.2.1 Traffic and Access

Access to Stanton Road and associated traffic impacts

Submission numbers

7, 32, 39, 45, 47, 53, 54, 55, 56, 61, 64, 66, 73, 75, 78, 81, 84, 86, 88, 92, 96, 98, 102, 106, 108, 113, 115, 116, 123, 126, 127, 128, 136, 137, 138, 139, 148, 149, 170, 175, 178, 210, 211, 238, 245, 302, 303, 309.

Issue description

- Respondents raised concern that the new traffic signals and changed access arrangements into Stanton Road would generate traffic, cause local road congestion, convert a residential street into a major thoroughfare, and encourage ‘rat-runs’ along Stanton Road
- Request confirmation that the current ‘no left turn’ into Stanton Road during the morning peak is kept and the ‘no right turn’ during the afternoon peak is kept to avoid Stanton Road becoming a ‘rat run’
- Submissions raised concern that the traffic light will introduce rat-runs on local roads putting pedestrians at risk
- Has a traffic assessment been done to assess the traffic impact to Stanton Road?

Response

Section 6.1.2 in the REF summarises the operational impacts of the proposed traffic signals at Stanton Road. These impacts are further detailed in the Local Area Assessment in Section 5.5 of the Traffic and Transport Assessment (Appendix D to the REF) which includes a qualitative assessment of the impacts on Stanton Road and the local side streets.

Figure 2-1 and Figure 2-2 illustrate the allowable traffic movements proposed at the Stanton Road/Spit Road intersection at different times of the day.

The proposal for the traffic control signals at Stanton Road is to provide an additional access point to Spit Road for traffic wishing to turn right (ie head north) from the east side of Spit Road. This is intended to relieve the existing right turn at Awaba Street that is heavily congested at numerous times across the day and at weekends. To achieve this, the existing right turn restriction out of Stanton Road onto Spit Road (outbound) during the PM peak would be removed and a signal-controlled right turn would be introduced. This is likely to result in additional traffic using Stanton Road to access Spit Road outbound. The proposed signals are not expected to introduce additional traffic turning from Spit Road into Stanton Road as the existing left turn restriction in place during the AM Peak would remain, thus maintaining the current restrictions on rat-run vehicles and minimising risk to pedestrians on local roads during this period. The number of vehicles entering Stanton Road from Spit Road outside of the AM peak would not be affected by the proposed traffic signals as this movement is already unrestricted.

The proposed traffic signals would include provision for pedestrian crossings of both Stanton Road and Spit Road. Thus the safety of pedestrians at this intersection would be improved.

Whilst a minor increase in the volume of traffic on Stanton Road and other local roads is expected there would be no changes to speed limits or other conditions on these roads that would increase the risk to the safety of pedestrians.

Figure 2-1: Allowable traffic movements at the intersection of Spit Road and Stanton Road outside of the AM peak.

Figure 2-2: Allowable traffic movements at the intersection of Spit Road and Stanton Road during the AM peak.

Property access impacts

Submission numbers

45, 50, 74, 92, 93, 96, 97, 108, 126, 128, 156, 170, 178, 211, 299.

Issue description

- Concern that the traffic queuing at intersection will block driveway access and egress along Stanton Road
- Concern that the proposal will worsen an existing safety hazard for residents exiting the driveways and increase risk of crashes with vehicles and cyclists.

Response

When the new traffic signals are implemented it is expected that vehicles would queue along the western end of Stanton Road whilst waiting for the right turn signal phase. As such there would be scenarios during the day where access to driveways along Stanton Road would be impeded by the queue from the traffic lights extending beyond some driveways. The length of this queue would depend upon the time of day.

For motorists wishing to access driveways on the northern side of Stanton Road:

- Motorists travelling from the west would not be impeded by the queues
- If travelling from the east, motorists would need to wait in the queue until the right turn phase of the traffic signals and then turn in when they get to the driveway. Whilst this right turn phase out of Stanton Road is active, all southbound traffic on Spit Road would be stopped, including traffic wishing to turn left into Stanton Road. This would also include cyclists, who would be required to cross at the shared pedestrian crossing. As such there would be no traffic entering Stanton Road and hence any motorists wishing to turn into a driveway would not have to contend with vehicles travelling in the opposite direction (ie coming from Spit Road). This is a safer situation than the existing situation where traffic turning right into a driveway has to give way to cars, buses, or bicycles turning off Spit Road into Stanton Road.

For motorists wishing to access driveways on the southern side of Stanton Road:

- If travelling from the west, motorists would need to wait for the traffic lights to change, allowing queued vehicles to move forward and create a gap
- If travelling from the east, motorists would need to wait in the queue until the right turn phase of the traffic signals and then turn in when they get to the driveway.

The scenario for the driveways on the southern side of the road is somewhat mitigated by the presence of the Council car park on this side of the road. The closest residence to Spit Road on this side of Stanton Road is 44 Stanton Road. The driveway for this residence is more than 50 metres from the Spit Road intersection, meaning that only heavy queues during peak periods are expected to affect most properties on this side of Stanton Road.

2.2.2 Need and Alternatives

Justification of new traffic lights at Stanton Road

Submission numbers

7, 45, 51, 64, 75, 88, 96, 102, 106, 136, 138, 149, 156, 162, 177, 238, 312.

Issue description

Much of the feedback regarding the Stanton Road intersection challenged the justification and need for the proposed traffic signals. Reasons cited included:

- The traffic signals and associated widening and lengthening of the indented bus bay do not seem justified as it is not allocated as a B-Line drop off/pick up bus stop
- Additional traffic lights would create more congestion
- Introducing a signalised right turn from Stanton Road onto Spit Road (stated as the 'proposal need' within the REF) would not improve traffic, or bus movements on Spit Road undermining the need for the traffic signals. The number of vehicles using this right turn movement is low and is already adequately catered for by the Awaba Street intersection
- There is only one infrequent citybound bus service (Route 229) that currently uses Stanton Road and therefore the widening for the intersection is not warranted
- The REF does not indicate the traffic travel time benefit for Spit Road (between the proposed new traffic signals at Stanton Road and adjacent Awaba Street intersections) to demonstrate whether the new intersection is justified.

Response

Impacts upon traffic congestion are discussed in Section 6.1 of the REF, with a detailed specialist report provided in Appendix D to the REF. The traffic modelling undertaken as part of this REF included the provision of new traffic lights on the intersection of Spit Road and Stanton Road. The modelling of the full corridor, which included this intersection treatment, showed overall benefits to buses as well as other road users, and confirmed that there would be a general easing of congestion along the corridor.

Under the current arrangement at Stanton Road, the bus bay only allows space for a single bus to stop. When a second bus arrives, it could potentially queue in the kerbside lane, blocking traffic whilst it waits for the bay to clear. This lane is a T3 transit lane and clearway between 6am and 10am Monday to Friday. If the intersection is signalised, buses cannot queue across the intersection without affecting the right turn phase. Therefore, the existing indented bus bay needs to be extended to accommodate two buses without affecting the intersection. On the rare occasion when a third bus arrives, it would wait in the kerbside lane north of the intersection until there is space in the bus bay. This scenario is expected to be rare and hence the impact upon T3 traffic in this lane would be minimal and would be reduced from the current situation.

Bus route 229 currently turns left into Stanton Road from Spit Road. It is an hourly service and as such is relatively infrequent when compared to other services in the area. The widening of the northeast corner of the intersection is required so that these turning buses do not encroach over the centreline on Stanton Road where a vehicle may be waiting to turn right onto Spit Road. Although the frequency is only once an hour, the likelihood of a vehicle waiting at the intersection when the bus turns into Stanton Road is high. If a bus was not able to turn safely into Stanton Road then the bus would block the kerbside lane whilst waiting for the turning vehicles to clear. This would result in delays the T3 traffic using the kerbside lane, including other buses, the elimination of which is one of the primary objectives of the Proposal. Investigations undertaken since publishing the REF indicate that there would not be any property fence adjustments required in this location as there is already sufficient setback to the existing property fence.

Proposed alternatives for Stanton Road

Submission numbers

45, 51, 75, 96, 177, 312.

Issue description

- Instead of new traffic signals, ban all right turns out of Stanton Road onto Spit Road. It is already banned 4pm to 7pm and is not a high traffic movement. It is also already adequately catered for by the Awaba Street intersection. NBBP could alter the green phase time at the Awaba Street intersection to achieve further congestion improvements
- Three suggestions to install 'Keep Clear' road signage at the Spit Road/Stanton Road intersection to allow space for the few northbound right turning vehicles, instead of the traffic signals
- Instead of traffic signals, allow only buses to turn left into Stanton Road off Spit Road at all times. To cater for their turning movement, install a traffic island which directs the lanes to the far left of the intersection for the left turn movement onto Spit Road
- Propose the full closure of Stanton Road as an alternative solution.

Response

The only signalised intersection (north of Mosman Junction) that allows vehicles to turn right and head north from the east side of Spit Road is at Awaba Street. As a result this intersection is heavily used and results in long queues that require an extended 'green' signal phase to clear the queued traffic. This reduces the available 'green' time for through traffic on Spit Road resulting in delays to buses and general traffic.

The traffic control signals at Stanton Road are needed to provide an alternative option to turn right from the east side of Spit Road. This would relieve the right turn at Awaba Street and provide the opportunity to increase 'green' time for the through traffic on Spit Road, increasing the intersection throughput for this dominant flow of traffic.

'Keep Clear' road markings are typically provided to assist vehicles to turn right from side roads to travel in the direction opposite to the congested direction. In the situation at Stanton Road, if there is outbound congestion and traffic is queued back to Stanton Road, any vehicle that enters the 'Keep Clear' area to wait for the queue to move would be committing an offense. Therefore, 'Keep Clear' road markings would not be provided. The provision of the traffic signals would ensure that vehicles would be able to turn right from Stanton Road at all times rather than try to turn right between gaps in both directions of six lanes of traffic as currently occurs. It is not currently Roads and Maritime approach to implement 'Keep Clear' markings at such an intersections because of the number of lanes and subsequent safety concerns, as outlined above.

Neither the closure of Stanton Road, restriction of all right turns from Stanton Road or making Stanton Road only accessible by buses from Spit Road would contribute positively to the objectives of the Proposal or to the local road network as a whole. These alternatives would increase the volume of traffic turning right from Awaba Street to head north on Spit Road. This intersection is already congestion at various times of the day and would not adequately cope with the extra traffic these alternative proposals would generate.

2.2.3 Design and Safety

Cyclist safety

Submission numbers

5, 7, 61, 78, 81, 86, 88, 92, 123, 126, 128, 136, 138, 149, 170, 175, 178, 211, 238, 245, 303, 309, 312.

Issue description

- Submissions noted that the location is part of a key regional cyclist route between the Northern Beaches and the city and were concerned that the proposed traffic lights and extension of the indented bus bay would impact upon cyclist safety. The submission requested that more cyclist safety elements be incorporated into the design to minimise this impact
- There was a request that the design be reviewed by a designer with expertise in the provision of cycling infrastructure
- One submission requested clarification for the route cyclists would take once they have crossed Spit Road at Stanton Road.

Response

The declared cycle route through the area is along the eastern footpath of Spit Road, across Stanton Road, and then down the southern side of Stanton Road to Moruben Road. This requires cyclists to cross Stanton Road in an uncontrolled manor with potential for conflict with vehicles and buses turning into Stanton Road from Spit Road. The proposed traffic signals at the Stanton Road intersection would include construction of a shared path along the southern footpath of Stanton Road between the traffic signals and the council carpark driveway. Cyclists travelling west on Stanton Road would be directed onto the shared path and would then be able to cross Stanton Road using the signalised pedestrian crossing. The reverse would apply for cyclists coming from the north on Spit Road. This would result in a safer method for crossing Stanton Road and improved cyclist access at this intersection.

The design for the traffic control signals and the shared path would undergo a road safety audit, which would include cyclist safety.

Pedestrian safety

Submission numbers

7, 45, 73, 84, 86, 92, 96, 102, 108, 116, 126, 127, 132, 156, 170, 302, 309.

Issue description

Several submissions raised concerns about pedestrian safety on the narrowed north-west corner of the intersection of Stanton Road/Spit Road. One of the submissions also requested to know where replacement pedestrian crossing would be located after the mid-block crossing is removed.

Response

Signalised pedestrian crossings would be provided on all three sides of the intersection as shown in Figure 2-1 and Figure 2-2 above. The phasing of the traffic signals would provide ‘red arrow’ protection for all pedestrian movements when pedestrian buttons have been pushed. The provision of traffic signals would improve the safety of pedestrians who currently have to cross Stanton Road to access the bus stop without signalised protection. The signals would also provide a direct protected crossing point for bus passengers wishing to cross Spit Road to access the bus stop on the eastern side without having to walk to the mid-block pedestrian crossing 70 metres north of Stanton Road.

It is noted that the road verge on the north-west corner of the intersection is not being narrowed and would remain as the standard 3.6 metre width. The road verge at the north-east corner of the intersection is however proposed to be narrowed to allow additional turning room for buses turning into Stanton Road from Spit Road. It is proposed to partially acquire property from 129-133 Spit Road to still provide a standard 3.6 metre wide road verge at the north-east corner.

2.2.4 Property Acquisition

Submission numbers

7, 47, 50, 53, 55, 60, 61, 75, 81, 86, 92, 93, 124, 137, 303, 310.

Issue description

Submissions indicated concerns that the new traffic signals and associated increased traffic would result in a loss of amenity and negatively impact upon property values on Stanton Road. One submission requested more information on the location of property acquisitions required for the Proposal in this area.

Response

Details of proposed property acquisition have been provided in Section 3.3 of the REF. As outlined in Section 2.2.2 above there would be no property adjustment required in this location to facilitate the proposed improvements to the intersection on the basis that the existing setback is sufficient.

An assessment of socio-economic impacts is provided in Section 6.6.2 of the REF. The Proposal is expected to provide a positive socio-economic benefit to Mosman as a result of the improvements to the public transport network and associated reduction in travel times for commuters. Roads and Maritime does not speculate on the movement of real estate and property prices.

2.2.5 Parking

Submission numbers

75, 299.

Issue description

- Concern that the design of the new intersection and approaches will reduce parking availability, many noting extra demand during summer months
- Specific concerns regarding access to existing off-street parking at 130/132 Spit Road.
- The demand for access to the existing Council commuter carpark on the corner of Stanton Road will contribute to traffic congestion.
- The REF states that parking surveys are to be completed in late 2016. How and when will the outcomes of the additional assessment be provided to the community? Did traffic and parking assessments account for seasonal variation (with peak usage over summer to access local beaches)?

Response

Parking impacts resulting from Stanton Road traffic signals were assessed in Section 6.1 of the REF and have been further reviewed in Section 3 of this report.

Access to the existing council carpark would not be affected by the proposed traffic signals.

The installation of traffic signals at this intersection would result in northbound traffic on Spit Road being periodically stopped at a red signal. This contrasts with the existing free flow through the intersection (when the road is not otherwise congested). Under the Proposal access to off-street parking for residents on the western side of Spit Road may be restricted by the presence of queues at the new traffic signals. The length and duration of these queues is expected to be short as the traffic signals will be phased so as to minimise impacts to this main flow of traffic whilst still

allowing time for vehicles to turn out of Stanton Road. As such restrictions to driveways in this area would be short-lived and infrequent.

As part of a review of parking availability throughout Spit Road and Military Road, a series parking occupancy surveys were completed in December 2016. The study is currently being reviewed and would be made available on the Northern Beaches B-Line website in due course. The timing of this study (December 2016) was considered to be the highest demand period thus providing a 'worst case' assessment of potential parking impacts.

2.2.6 Environment

Submission numbers

47, 81, 84, 86, 96, 108, 137, 299, 302, 303.

Issue description

- Concerns that the new traffic signals would contribute to increased operational noise and air pollution impacts upon local residents
- Congestion and associated impacts will impact quality of life for residents in Stanton Road
- Did the noise assessment consider the increased noise from increased traffic on Stanton Road, including noise from buses?

Response

Section 6.9 of the REF considers the potential impacts of the Proposal on local air quality. It identified that the likely impacts to air quality as a result of the Proposal during operation would be low. The Proposal aims to improve traffic flow, particularly relating to bus movements and therefore local air emissions from operational traffic are expected to remain broadly similar to the existing conditions.

Section 6.3 of the REF considers the potential operational noise impacts of the Proposal. It identifies that no substantial change to noise or vibration impacts are anticipated along the Spit Road and Military Road corridor. This is due to the existing high traffic noise levels in the Proposal area.

Further operational noise assessment has been undertaken to assess the potential impacts of the Proposal as a result of increasing traffic on local roads. The results of this assessment are provided in Section 3.8 of this report. The findings of this assessment generally indicate that, based on the existing relatively high levels of road traffic noise in the area, controlled primarily by Spit and Military Roads, it is unlikely that the increase in noise levels due to additional diverted traffic at any noise sensitive receivers would be greater than 2.0 dB(A). Any change in noise levels that is less than 2.0 dB(A) is generally not perceptible to the human ear and therefore the noise impact of additional traffic on local roads is expected to be minor.

The introduction of traffic signals at the intersection of Stanton Road and Spit Road would alter the nature of operational traffic through this intersection. This change however is not expected to result in operational noise increases exceeding 2.0 dB(A) for sensitive receivers in the immediate vicinity due to the existing high background noise levels associated with traffic on Spit Road.

No B-Line bus services would be directed onto Stanton Road as part of the scope of this Proposal. The Proposal also does not propose to increase the existing number of bus services accessing Stanton Road or the indented bus stop on Spit Road at this intersection.

2.3 Spit Road and Awaba Street Intersection

Submission numbers

14, 35, 39, 51, 89, 148, 161, 220, 279, 315.

Issue description

The majority of responses which referred to Awaba Street were opposed to the proposed changes to the intersection. In particular submissions were opposed to the installation of the dedicated left turn lane for southbound vehicles on Spit Road. Reasons for opposition included increased congestion at the intersection and along Awaba Street and design and safety issues.

Submissions received in response to this proposal included the following key issues:

- Concerns regarding the traffic assessment and modelling conducted and subsequent justification of the proposed construction of the new left hand turn from the Spit Road into Awaba Street
- Concern that proposal and associated local road traffic impacts would impede driveway access
- Impacts upon privacy and amenity for adjacent residents
- Concern regarding the encroachment of the road into residential properties (property acquisition)
- Concern that the proposed changes at this intersection would decrease property value and returns on rental property investment
- The Proposal would result in an increased risk to pedestrian safety
- Awaba Street would not be able to cope with additional traffic from the new left turn lanes
- The proposed new left turn would increase congestion on Moruben Road
- Left turn at Stanton should be allowed during the AM peak to reduce pressure at Awaba Street
- Concerns that the removal of vegetation would result in increased noise, decreased air quality and reduced visual amenity.
- Left turn should be permissible at Warringah Road to reduce pressure at Awaba Street and reduce the need for left turn lane at Awaba Street.

Response

The REF outlined the justification for the provision of a dedicated left turn lane at this intersection (Section 3.1.1 of the REF) and assessed the potential impacts of this scope on the local environment and community (Section 6 of the REF).

Following a review of submissions received, the design of Awaba Street/Spit Road intersection has been reconsidered. The scope has been amended to remove the southbound left turn bay from the Proposal.

It is expected that that the overall travel time benefits achieved by the Proposal as outlined in the REF would not be substantially affected by the deletion of this scope item because of benefits provided by other aspects of the Proposal.

An assessment of this change in scope (ie the removal of the dedicated left turn lane at the Spit Road and Awaba Street intersection) has been considered and is outlined in Section 3 below.

2.4 Spit Road and Clifford Street intersection

A number of submissions were received opposing the proposed closure of Clifford Road where it intersects with Spit Road. The main reasons for objection included the removal of access for local residents to Spit Road, the potential for an increase in rat-running through local streets and the noise impacts of additional traffic and buses in this location. Other submissions asked for

clarifications around the works proposed for the old cinema building and changes around existing bus services at this location.

2.4.1 Traffic and Access

Opposed to the closure of Clifford Street

Submission numbers

15.

Issue description

- Opposed to closure of Clifford Street and installation of associated bus station
- Opposed to the closure of Clifford Street, as it provides access to Spit Road and Military Road for residents to the east during morning peak hour traffic, particularly as significant congestion at Mandalong Road prohibits it as an alternative route
- Clarification of property impacts - what part of Clifford Street (where it joins Military Road) will be taken up for the B-Line bus stop and indented bus bay? What impacts would there be on other local roads/intersections?

Response

As shown in Figure 20 in Section 3.1.1 of the REF, Clifford Street is proposed to be closed at the intersection with Spit Road to allow an indented bus bay to be constructed along Spit Road across the existing junction with Clifford Street. Whilst the final design of the closure is still being developed, it is confirmed that access to Civic Lane would continue, which would maintain existing access to all properties by residents and service vehicles. No other parts of Clifford Street or adjacent properties not previously identified in Section 3.3 of the REF would be occupied by B-Line bus stop infrastructure. The Proposal does not include the provision of a bus station at this location.

The local area assessment presented in the Traffic and Transport Assessment (Appendix D to the REF) describes the expected impacts of the closure of Clifford Street at Spit Road. The assessment concluded that the closure of Clifford Street would not have a substantial impact on the surrounding road network as there are viable alternative access routes to the main road corridor. The low volumes of traffic that would usually turn left from Spit Road into Clifford Street (28 vehicles per hour during the AM peak) would be able to access Clifford Street via Awaba Street and Punch Street. This could result in up to 28 additional vehicles per hour using these streets. This is on average less than one car every two minutes, which is considered a minor increase.

The greatest number of vehicles turning left from Clifford Street onto Spit Road was recorded as 111 vehicles per hour. This occurred during the AM peak. The logical diversion route is to access Military Road via Moruben Road and Mandalong Road. At times when this route is congested, traffic may use Awaba Street or Punch Street for access to Spit Road.

Potential for rat-running and impacts on local roads

Submission numbers

12, 26, 124.

Issue description

- Concerned about increased traffic and that it would contribute to rat-run along local roads

- Punch Lane should be one-way to prevent rat-run and queuing as a result of the closure of Clifford Street
- The closure of Clifford Street would force traffic to utilise alternative routes such as small laneways in the area (rat-running)
- What would be the number of additional cars per day traveling west on Punch Street to Spit Road?
- What would be the number of additional cars per day traveling east on Punch Road to Moruben Road?
- What are the likely traffic impacts on Punch Street, Mosman as a result of the proposed road closure?

Response

The local area assessment presented in the Traffic and Transport Assessment (Appendix D to the REF) describes the expected impacts of the closure of Clifford Street at Spit Road. The assessment concluded that the closure of Clifford Street would not have a substantial impact on the surrounding road network as there are viable alternative access routes to the main road corridor. The low volumes of traffic that would usually turn left into Clifford Street from Spit Road (28 vehicles per hour during the AM peak) would be able to access Clifford Street via Awaba Street and Punch Street. This could result in up to 28 additional vehicles per hour using these streets at this time. This is less than one car every two minutes, which is considered a minor increase.

For traffic turning out of Clifford Street onto Spit Road (recorded as a maximum of 111 vehicles per hour during the AM peak), the logical diversion route is to access Military Road via Moruben Road and Mandalong Road. At times when this route is congested, traffic may use Awaba Street or Punch Street for access to Spit Road.

The combination of traffic improvements along Spit Road and Military Road is expected to relieve congestion along the corridor. This may reduce the desirability of using local streets such as Punch Lane as rat-runs.

Punch Lane is a local road and any changes to traffic arrangements would be the responsibility of Mosman Council as the road authority.

2.4.2 Impacts to Property

Cinema building at Clifford Street

Submission numbers

24, 26.

Issue description

- Request confirmation if the building next to the cinema in Clifford Street (now offices) included in the proposed development?
- Request to reopen car park below former cinema on Clifford Street
- Will the cinema car park be reopened to compensate for on-street parking loss?

Response

The proposed demolition of the Greater Union cinema (which is not part of this Proposal) does not include the office building at 20 Clifford Street. This building would remain untouched.

The future use of the Greater Union cinema site (including the underground carpark) is still being developed and would be subject to a separate assessment.

Property impacts to The Garrison retirement home

Submission numbers

266.

Issue description

- Concern about property acquisition impacts on residents of the Garrison (retirement village adjacent to Clifford Street).

Response

The proposed acquisition to the Garrison retirement complex property (13 Spit Road) is described in Table 7 in Section 3.3 of the REF. Approximately 16m2 of land is to be acquired to provide space for utilities and footpath. There would be minor impact to the existing driveway access that would be constructed to match the new footpath levels. There would be no impact to any buildings or landscaping except for some adjustments at the southwest corner of the driveway.

2.4.3 Environment

Noise impacts

Submission numbers

41, 143.

Issue description

- Concern for operational noise impacts, including consideration of increased bus traffic, to the health of residents of the Garrison (retirement village adjacent to Spit Road/Clifford Street)
- Request installation of noise barrier to mitigate potential bus traffic noise at the corner of Clifford Street and the Spit Road.

Response

Section 6.3 of the REF considers the potential operational noise impacts of the Proposal. It identifies that no substantial change to noise or vibration impacts are anticipated to be associated with the operation of the Proposal. This is due to the existing high traffic noise levels in the Proposal area.

Further operational noise assessment has been undertaken to assess the potential impacts of the Proposal as a result of increasing traffic on local roads. The results of this assessment are provided in Section 3.8 of this report. This additional assessment generally found that, given the existing relatively high levels of road traffic noise in the area, controlled primarily by Spit and Military Roads, it is unlikely that the increase in noise levels due to additional diverted traffic at any noise sensitive receiver would exceed 2.0 dB(A). Any change in noise levels that is less than 2.0 dB(A) is generally not perceptible to the human ear, and as such the impacts of additional traffic on local roads is expected to be negligible.

The installation of a noise barrier at the corner of Clifford Street and Spit Road would not be feasible or reasonable in accordance with Roads and Maritime Road Noise Criteria Guidelines or Noise Mitigation Guidelines.

2.4.4 Public Transport

Changes to existing bus services

Submission numbers

6, 7, 26, 295.

Issue description

- Where will the 263 [sic] bus stop in Clifford Street be re-located?
- Will the bus stop at the top of Clifford Street be removed? If yes, where will the 236 now stop?
- Will no more buses be able to travel through Clifford Street?

Response

The closure of Clifford Street would allow a pedestrianised area to be created in place of the intersection. This would provide an important link between the proposed B-Line bus stop and the commercial area on Military Road east. Existing bus services in this location would no longer be able to access Spit Road from Clifford Street. This means that the bus route 236, which currently stops near Civic Lane, would no longer stop at this location in Clifford Street. us service plan for the Northern Beaches. Due for release later this year, this plan will provide details of the bus network for all of the Northern Beaches and how customers can connect with the new B-Line and other services.

B-Line Service

Submission numbers

289.

Issue description

- The Proposal will increase bus traffic at this intersection

Response

There would be up to 12 additional buses per hour during the peak periods stopping at the proposed indented bus bay at Clifford Street and Spit Road intersection as a result of the introduction of the B-Line service. This additional bus traffic is not expected to affect overall traffic flow through the area.

2.5 Relocation of the M30 Bus Layover

Submission numbers

23, 26, 40, 85, 89, 110, 112, 114, 117, 124, 125, 130, 141, 147, 157, 179, 182, 198, 199, 215, 227, 236, 244, 246, 306, 307.

Issue description

As part of the public display of the REF a number of submissions were received opposing the relocation of the M30 bus layover to from Spit Road to Military Road east. The majority of responses objected to impacts that this relocation would have on local parking, local businesses and the general amenity of the area. Submissions also identified a number of alternative locations that the bus layover could utilise instead.

The submissions received in response to this element of the Proposal included the following key issues:

- Generally opposed to the proposed relocation of the bus layover (all submissions)
- The location is not a sufficient space for the buses
- Concern that the proposal would reduce amenity for the existing retail area (increased noise, air pollution and loss of natural light) resulting in adverse impacts upon trading.
- Impacts on both sides of road due to visual 'wall' effect from buses
- Concern that parking loss would negatively impact business
- Concern about shops receiving deliveries
- A 24 hour bus layover in this location would permanently compromise business visibility, which the submission said already suffers between opening and 10am ie loss of passing trade
- Will effectively create a bus depot in a heritage conservation area, compromising civic amenity
- Will increase heating and lighting bills for shops
- Loss of parking for local residents and visitors
- Concern for property values in this area
- Potential impacts to local heritage as the proposed layover is located in the Military Road Heritage Conservation Area
- Concern for pedestrian safety within the existing shopping precinct
- Several alternative suggestions were provided including the relocation of the M30 bus layover to Taronga Zoo or the former Greater Union cinema site at the corner of Clifford Street.

Response

The M30 bus layover is currently located on Spit Road near Clifford Street. The REF identified moving this layover area to the kerbside lane outside 682-700 Military Road east permanently. The REF outlined the justification for relocating the M30 bus layover area to Military Road (Section 3.1.1 of the REF) and assessed the potential impacts of this element of the scope on the local environment and community (Section 6 of the REF).

After reviewing the submissions received and further consultation with Mosman Council and local businesses, the proposal to permanently relocate the M30 bus layover to Military Road east has been removed from the scope of the Proposal. As such the M30 bus service would continue to operate as usual with no proposed changes. The service would continue to layover in Military Road east between 6am and 10am Monday to Friday as it currently does. Outside of these times the M30 would layover on Spit Road between the driveway to the Garrison retirement complex and the traffic signals at Ourimbah Road.

A long-term solution for the M30 bus layover is still under consideration. Any future changes to the bus layover would be subject to a separate environmental assessment. Alternative suggestions provided regarding the previously proposed relocation of this bus layover would be considered as part of future planning.

An assessment of this change in scope (ie maintaining the current M30 bus layover arrangements) has been considered as part of this document and is outlined in Section 3.2 below.

2.6 Cabramatta Road and Military Road intersection

The majority of submissions received relating to the proposed changes at the intersection of Cabramatta Road and Military Road were opposed to the partial closure of Cabramatta Road (banning the left turn out of Cabramatta Road onto Military Road). These objections cited increases in traffic congestion, decreased access to local businesses (both vehicular and pedestrian) and pedestrian and road safety.

Traffic congestion due to partial road closure

Submission numbers

17, 18, 19, 29, 46, 48, 62, 76, 90, 100, 111, 118, 119, 121, 145, 148, 151, 152, 172, 180, 200, 203, 209, 231, 234, 241, 249, 262, 264, 271, 286, 315, 317, 329, 338, 340, 341.

Issue description

- Questioned what studies have been done to assess the potential traffic problems that may be caused by the closure of the left turn into Military Road from Cabramatta Road
- The partial closure of Cabramatta Road would result in congestion at the Military Road/Spofforth Street intersection, Cowles Road, Spencer Road, Holt Street and Murdoch Street
- Increased congestion would make it more difficult for residents exiting Lindsay Lane, which has 'no right turn' into Spofforth Street during peak periods, and is potentially dangerous outside of these times
- Concern that the proposed partial road closure would not improve traffic congestion/flow.

Response

Section 6.1 of the REF summarises the results of the Traffic and Transport Assessment carried out to investigate the expected traffic impacts. The full Traffic and Transport report is included as Appendix D to the REF. Currently about 100 vehicles per hour exit Cabramatta Road onto Military Road during the PM peak (the busiest time of day). It is assumed that the volume of traffic using Spofforth Street to access Military Road would increase by 50 vehicles per hour and the volume of traffic using Spencer Road to access Military Road would increase by 50 vehicles per hour ie a 50% split of the traffic currently using Cabramatta Road.

The results of the modelling indicate that the performance of the Spofforth Street/Military Road intersection and the corridor as a whole would improve even with the additional traffic that would be displaced as a result of the half closure of Cabramatta Road.

The partial closure of Cabramatta Road is a required to support the proposed tidal flow system through Cremorne as described in Section 6.1 of the REF. The proposed tidal flow system would increase capacity citybound during the AM peak, thus reducing congestion caused by various 'pinch points' along the corridor. The partial closure of Cabramatta Road contributes to the easing of congestion overall by facilitating the function of the tidal flow system.

Upon implementation of the Proposal, traffic exiting Lindsay Lane would still need turn left onto Spofforth Street during peak periods (when the 'no right turn' restriction onto Spofforth Street is active). Instead of turning right into Cabramatta Road as some motorists currently do, traffic would be able to use Spencer Road to access Military Road (citybound).

Access to businesses

Submission numbers

18, 90, 118, 119, 121, 131, 152, 168, 172, 234, 249, 264, 271, 272, 288, 311, 330.

Issue description

- Submissions raised concerns about delivery vehicles servicing the Cremorne town centre, including the need for delivery trucks to perform U-turns on Cabramatta Road or to reverse onto Spofforth Street
- Concerns about adverse impact upon businesses as a result of restricting access to loading bays and the customer car park
- Concern over customers of Cremorne town centre shopping centre entering and exiting the existing underground car park which has its entry off Cabramatta Road. The exit for this car park is on Spofforth Street
- Concern whether pedestrians would still be able to cross at Spofforth Street to access Cabramatta Road, particularly the IGA carpark.

Response

The existing access to the loading bays in Cabramatta Road would remain unchanged and trucks would still be able to reverse into this bay as they currently do. The only change would be that trucks wanting to travel citybound on Military Road would have to drive along Cabramatta Road to the east, away from Military Road, and then turn left to Spofforth Street to access Military Road citybound. This would mean that they are unlikely to need to do U-turns in Cabramatta Road. Trucks wanting to travel outbound on Military Road would not be affected by the proposal as they would continue to travel out onto Military Road as per the current arrangement.

The existing underground customer carpark, which has a combined entry and exit on Cabramatta Road, would remain accessible as per the current arrangement. Vehicles exiting the carpark and wanting to travel outbound on Military Road would do so via Spofforth Street as they currently do. Vehicles wanting to travel citybound from the carpark would need to exit Cabramatta Road onto Spofforth Street and then access Military Road via the Spofforth Street or Spencer Road intersections.

The existing access arrangements to the drive-through liquor store would remain unchanged. That is, vehicles would continue to enter via Cabramatta Road and exit via Spofforth Street.

The Proposal would not alter any existing pedestrian access arrangements in this area.

Pedestrian safety

Submission numbers

118, 119, 121, 231, 311.

Issue description

- Submissions expressed concern that the proposed partial closure at Cabramatta Road would result in a reduction of pedestrian safety at Spofforth Street due to increased traffic, particularly heavy vehicles
- Altered movement patterns for delivery trucks may compromise pedestrian safety eg U-turns and reversing.

Response

The Proposal would not alter any existing pedestrian access arrangements in this area.

See above response to Access to Business concerns confirming that heavy vehicles would not need to perform U-turns in Cabramatta Road. Therefore pedestrian safety would not be compromised by the Proposal.

Impacts to Taxi routes

Submission numbers

143, 234, 271, 286.

Issue description

- The partial closure of Cabramatta Road would affect taxis as easy access to the taxi rank by drivers would be compromised. The ability for taxis to access Military Road would be reduced, leading to longer journey times and higher fares
- Taxi routes through Cabramatta Road from Spofforth Street would be affected, increasing fares.

Response

The existing taxi rank located on the northeast side of Cabramatta Road would not be altered and taxis would still be able to access the rank by turning left into Cabramatta Road from Military Road as they currently do. As the taxi rank already faces away from Military Road, the normal taxi route is to access Military Road by turning left onto Spofforth Street. This route would not change under the Proposal and as such there would be no increase in the distance of typical taxi routes and hence no effect on fares.

Road safety

Submission numbers

118, 119, 121, 172.

Issue description

- It was suggested that left turns out of Cabramatta Road onto Military Road are not currently unsafe
- The proposed half road closure would be difficult to police and may be ignored by some drivers
- Concern that the one-way street at Glover Street may become more unsafe as more drivers would disobey the one way signage.

Response

Whilst it is acknowledged that the left turn out of Cabramatta Road is currently not a safety issue, it is required to allow safe and efficient operation of the proposed tidal flow system along Military Road and to provide additional kerb space for the relocated citybound bus stop.

The existing footpath and kerb to the west of Cabramatta Road would be extended to occupy western half of the road so as to provide a physical deterrent to prevent illegal left turns onto

Military Road. This would be in addition to the NSW Road Rules which prohibit such movements where 'no left turn' is signposted.

Glover Street is currently a two-way street with no access on to Military Road. The Proposal is not expected to result in any noticeable impact upon Glover Street

2.6.2 Alternative Suggestions

Submission numbers

21, 172, 271, 286.

Issue description

- Suggest left turns only be permitted for vehicles entering Spofforth Street from Cabramatta Road (east)
- No right turn at intersection for cars exiting Cabramatta Road (west) into Spofforth Street
- Full closure of Cabramatta Road at Military Road
- Turn restrictions from Cabramatta Road onto Military Road only during peak periods
- Rephase traffic lights to allow left-out movement from Cabramatta Road onto Military Road to remain.

Response

There are no plans to change the access to Spofforth Road from either leg of Cabramatta Road as there is no evidence to suggest that changes would provide benefits to the Proposal and the local road network. These restrictions would not avoid the need for the half closure of Cabramatta Road as this is required to support the tidal flow system and relocation of the citybound Cremorne bus stop.

The full closure of Cabramatta Road at Military Road was investigated as an option but was not considered viable as it would require a large cul-de-sac that would require major property acquisition to accommodate a suitable turning head. Refer to Section 2.2.3 of the REF for more information regarding this alternative.

Allowing left turns from Cabramatta Road to Military Road outside of the AM Peak would not be compatible with the project requirements to provide additional kerb space for the relocated bus stop.

The existing issues with the left turn out of Cabramatta Road are related to the adjacent bus stop and the proposed tidal flow system, not the phasing of the signals at Spofforth Street. The phasing of the signals at Spofforth Street would remain unchanged.

2.7 Indented Bus Bay near Hampden Avenue

Submission numbers

8, 9, 10, 19, 46, 52, 79, 82, 90, 94, 118, 120, 121, 135, 143, 150, 154, 160, 274, 292, 293, 297, 304, 311.

Issue description

The majority of responses regarding changes at Military Road between Murdoch Street and Hampden Avenue opposed the Proposal. These submissions cited reasons including inadequate justification, opposition to property acquisition, and concern for environmental and amenity impacts.

The submissions received in Response to this proposal included the following key issues:

- The Proposal would have little effect in improving traffic flow
- Concern that the buses entering and exiting the indented bus bay would contribute to traffic congestion
- The bus bay would not be big enough for several buses to stop at once, as currently occurs
- The bus bay would not be big enough for an articulated bus plus a standard bus
- Concern for amenity impacts to residential property including reduced privacy, height of double decker buses, increased road noise, increased risk of vandalism, loss of private open space garden area
- Specific objection to the removal of the garden at 221 Military Road, loss of mature trees and associated amenity loss
- Concern that the bus bay will impede driveway access to private property
- Concern that the bus bay may impede emergency vehicle access to properties
- Object to property acquisition
- Property acquisition process is unfair
- Concerns for pedestrian safety - people attempting to cross Military Road after removal of the existing pedestrian fence
- Concern that the proposal would make pedestrian access more difficult along the footpath
- The proximity of the Caltex [sic] driveway and a reduction in footpath width would impact pedestrian safety
- The removal of vegetation (street trees and garden) to facilitate the works would decrease available habitat for birdlife
- Concerns for the potential to encounter/disturb asbestos during works near the Coles Express Service Station where it has been previously identified
- Concerned the proposal will increase noise and vibration impacts during construction and operation
- Concerned the proposal will result in increased air pollution during construction and operation
- The Proposal would result in negative visual and amenity impacts
- The relocated bus stops would be more logically located near the existing overhead pedestrian bridge
- Concern that the kerb is not high enough to prevent a bus mounting the kerb at the proposed indented bus bay
- Suggested the alternative of moving the indented bus bay to be located in front of the old Post Office building
- Suggests tidal flow and parking restrictions should be tried first.

Response

The bus stop near Hampden Avenue is located between the driveway to 219 Military Road (Telstra exchange building) and the exit driveway from the Shell Service Station at corner of Murdoch Street. The REF proposed to construct an indented bus bay at the existing bus stop location to provide a bus stop that was clear of the kerbside lane. The REF outlined the justification for installing this indented bus bay (Section 2.2.4 of the REF) and assessed the potential impacts on the local environment and community (Section 6 of the REF).

Following a review of submissions received, and ongoing consultation with key stakeholders, the proposed indented bus bay between Murdoch Street and Hampden Avenue has been removed from the Proposal. As such the bus stop would remain in its current location.

NBBP are investigating alternative options that provide equivalent benefits to bus travel times and reliability whilst seeking to maintain the existing level of service for general traffic within the local road network.

An assessment of this change in scope (ie maintaining the current bus stop arrangements at this location) has been considered as part of this document and is outlined in Section 3 below.

2.8 Ben Boyd Road Turn Restrictions

Submission numbers

9, 21, 30, 33, 34, 37, 38, 46, 51, 62, 66, 67, 134, 148, 153, 167, 169, 216, 233, 269, 287, 296, 300, 342.

Issue description

The majority of responses regarding Ben Boyd Road opposed the banning of various turn movements at the intersection with Military Road. The objections generally related to impacts that this would have on local traffic flow and congestion, the detours required down local roads and impacts to pedestrian safety. Submissions also identified a number of alternatives to banning the left turn movement.

The submissions received in Response to this proposal included the following key issues:

- Opposed to the Proposal because the change would promote rat-running through residential streets
- Opposed to the Proposal as it would result in increased traffic congestion on Military Road, Yeo Street, Spofforth Street, Earnest Street and/or Watson Street
- What traffic modelling was conducted regarding the impacts and benefits of the proposed no left turn at Ben Boyd Road?
- Concerned that increased traffic would impede driveway access
- Opposed to the Proposal because the changes and associated traffic impacts would reduce property values
- The proposed no left turn restriction at Ben Boyd Road are not justified and provide no benefit
- The proposed tidal flow measures at Ben Boyd Road are not needed as they will not alleviate congestion
- The Proposal is not justified as alternative options were not considered. Why was the option of a no left turn restriction at Ben Boyd Road selected as a preferred option?
- Concerned that the increased local road traffic would increase risk to cyclist safety
- Concerns that increased traffic congestion as a result of the no left turn at Ben Boyd Road would increase risks to pedestrian safety, particularly to students of Neutral Bay Public School
- Potential pedestrian safety issues if traffic is diverted via Young Street
- Delivery trucks may still attempt to turn here causing a hazard for pedestrians, cyclists and holding up traffic on Military Road
- Concern for negative business impacts. Includes specific concern that local road congestion caused by the proposed intersection changes would impact Grosvenor Lane and restrict access to loading bays associated with businesses. The Proposal would also reduce customer and staff parking which would ultimately result in impacts to businesses, including the Oaks Hotel
- Concern for impact to taxi and ride-share services, particularly near the Oaks Hotel
- Concern that the changes will reduce access to parking
- Concerns for increased operational noise
- Concern for air quality impacts
- Submissions expressed a general opposition to the proposed tidal flow measures at Ben Boyd Road on the grounds that it will not work or will increase congestion.

Response

The REF proposed restricting some allowable turn movements at the intersection of Ben Boyd Road and Military Road. This included restricting the left turn from Military Road into Ben Boyd Road north.

The REF outlined the justification for the turn restrictions at Ben Boyd Road (Section 2.2.4 of the REF) and assessed the potential impacts of this scope element on the local environment and community (Section 6 of the REF).

Following a review of submissions received and further assessment of the impacts on the surrounding community, it has been decided that the turn restrictions proposed at Ben Boyd Road would be removed from the scope of the Proposal.

NBBP are undertaking further investigations in conjunction with North Sydney Council and the community to develop a wider area-based solution that provides equivalent benefits to bus travel times and reliability whilst seeking to maintain the existing level of service for general traffic within the road network.

As the proposed turn restrictions, especially the left turn restriction for outbound traffic, were integral to the operation of the proposed tidal flow system at Ben Boyd Road, it has also been decided to remove the Ben Boyd Road section of the tidal flow system from the scope of the Proposal. The requirements for the tidal flow system at this location would be reviewed as part of the ongoing investigations described above.

A description of this change in scope (i.e. maintaining the existing traffic movements at the Military Road and Ben Boyd Road intersection) has been considered as part of this document and is outlined in Section 3 below.

2.9 Cremorne Town Centre

The majority of responses which opposed the relocation of the bus stop were due to impacts that this would have on pedestrian and commuter access to the bus stop, impacts relating to local businesses, and parking impacts. Submissions also identified a number of alternatives to relocating the bus stop.

2.9.1 Opposition of the Relocation of Bus Stop at Cremorne

Location of new bus stop

Submission numbers

16, 72, 76, 77, 143, 146, 152, 154, 200, 330, 336, 342.

Issue description

- The distance between bus stops will become too great

Response

The distance between the Prince Street citybound bus stop and the Cremorne citybound bus stop would increase from 330 metres to 500 metres. Subsequently, the distance between the Cremorne bus stop and the Hampden Avenue stop would decrease from 420 metres to 330 metres.

Similarly, the distance between the outbound bus stop at Cremorne and the outbound stop at Prince Street would increase from 420 metres to 525 metres. The distance between the outbound bus stop at Cremorne and the preceding stop opposite Hampden Avenue would be 330 metres.

The resulting spacing of the bus stops is reasonably equidistant and considered appropriate for efficient operation of bus services whilst maintaining adequate access to the service for local residents.

Pedestrian and commuter access

Submission numbers

17, 21, 42, 57, 62, 70, 71, 77, 80, 87, 90, 95, 101, 103, 104, 107, 109, 118, 120, 121, 135, 143, 144, 145, 146, 148, 154, 155, 158, 159, 163, 164, 165, 171, 173, 174, 176, 181, 183, 184, 185, 186, 189, 192, 194, 196, 197, 202, 203, 204, 205, 207, 208, 212, 213, 223, 224, 225, 228, 229, 231, 234, 235, 237, 239, 241, 242, 247, 248, 249, 251, 252, 254, 255, 256, 257, 258, 260, 261, 263, 264, 265, 267, 268, 270, 271, 272, 273, 274, 277, 278, 281, 282, 283, 286, 298, 305, 308, 311, 314, 315, 316, 317, 323, 324, 325, 326, 327, 328, 331, 332, 333, 334, 335, 337, 338, 339.

Issue description

- Inconvenience or reduced accessibility to bus transport and/or shopping centre, cinema and facilities (including medical centre) for the community and commuters, particularly those with reduced mobility
- Impacts upon access for local employees
- Concern about wheelchair accessibility to relocated bus stops from apartments
- Bus stops would not be near Opal top up providers
- Patients to medical centre in Cremorne will have difficulty accessing the centre if bus stop is directly outside.

Response

The new tidal flow system in Cremorne would require the relocation of two local bus stops. The existing citybound bus stop near 305 Military Road would be relocated approximately 95 metres further southwest to 271 Military Road. Of this 95 metres only 20 metres is not covered by existing awnings. The relocation of the outbound bus stop 105 metres southward would increase the walking distance for some customers, and reduce the distance for others.

The assessment of potential impacts of this scope on the local environment and community was included in Section 6 of the REF. Since then the design has been further developed to reduce the distance between the existing bus stops and the proposed location. The impacts of the revised locations have been further assessed in Section 3 of this report and have been found to be minor.

The relocation of bus stops at Cremorne would result in some changes to how bus stops are accessed, including for those that are mobility-impaired. The outbound bus stop would be relocated to within the same block. The footpath on this block is continuous which means accessibility would remain the same. The citybound bus stop would be moved to the west of Cabramatta Road. The existing raised threshold treatment across Cabramatta Road would be maintained so that pedestrians would have a continuous level path across this road to access the relocated bus stop. Generally some users are expected to have shorter journey distances to access bus stops whilst journeys for others would be longer.

The location of Opal card top up providers is set by Transport for New South Wales and is outside the scope of this Proposal. It is noted however that automatic and online top up is available for all Opal card users which negates the need to visit a top up provider.

Pedestrian and commuter safety

Submission numbers

65, 90, 151, 163, 187, 196, 212, 213, 221, 228, 231, 259, 311, 315, 324, 328.

Issue description

- Safety issues for people now required to cross Cabramatta Road to access the relocated bus stop
- Safety of school children having to walk further to the bus stop and also required to cross additional side streets
- New locations won't be near pedestrian lights and would encourage people to cross Military Road not at a crossing
- Concern about night time safety for passengers waiting for or alighting from the bus in the more isolated new bus stop locations
- Will endanger pedestrians through motorist confusion
- Reduction of footpath width.

Response

Upon the relocation of the bus stops within Cremorne some users are expected to have shorter journey distances to access bus stops whilst journeys for others would be longer. Depending on their origin, users arriving from the east would be required to either cross Cabramatta Road at the intersection with Spit Road or to travel along the southern side of Cabramatta Road from its intersection with Spofforth Street to access the relocated citybound bus stop. The half closure of Cabramatta Road at its intersection with Spit Road would result in a reduced crossing width of the road at this intersection with commensurate safety benefits for pedestrians. The existing raised threshold treatment across Cabramatta Road would be maintained so that pedestrians would have a continuous level path across this road to access the relocated bus stop.

The relocation of the bus stop west of Cabramatta Road would require some commuters to cross an additional side road to access the stop, but would require others to cross one less side road..

The existing citybound bus stop is 25 metres east of the signalised pedestrian crossing on Military Road near Cabramatta Road. The relocated citybound bus stop would be 70 metres west of the crossing. The difference in the journey distance to the crossing would be 40 metres which may encourage some people to cross away from the signalised crossing; however given the short additional distance this is unlikely. The potential risk would be assessed as part of a road safety audit of the Cremorne tidal flow proposal.

The proposed locations of the local bus stops in Cremorne are in visible, well-lit locations with existing night time activity such as restaurants that would not reduce 'natural surveillance' of passengers waiting or alighting. As such night time safety is unlikely to be adversely affected as a result of the Proposal.

The proposed tidal flow system through Cremorne has been designed according to current road design standards. The potential for motorist confusion and any crashes involving pedestrian access to the bus stops is considered to be minor.

The footpath width at the proposed new location is the same as the existing bus stop, and therefore has the same passenger capacity.

Shelter provisions at new location of bus stop

Submission numbers

100, 146, 154, 226, 228, 234, 235, 249, 253, 270, 271, 276, 334.

Issue description

- New stops will not have coverage for rain for 150 people
- Decreased comfort during poor weather as the current bus stop has a large extended undercover area
- Will result in crowding at relocated bus stops

Response

The proposed location of the citybound and outbound bus stops are adjacent to existing awnings providing sufficient coverage immediately adjacent the proposed bus stops. These awnings are considered adequate to shelter the expected number of passengers dwelling at peak periods. These arrangements are considered to provide a comparable level of comfort to that of the existing stops and would not result in overcrowding of the new bus stop locations.

Impacts to local businesses

Submission numbers

42, 62, 69, 70, 77, 101, 104, 109, 111, 151, 154, 158, 164, 166, 172, 173, 174, 176, 183, 189, 193, 196, 197, 205, 208, 210, 212, 213, 225, 226, 232, 233, 242, 247, 255, 256, 263, 267, 270, 273, 274, 283, 305, 311, 316, 320, 321, 325, 326, 327, 337, 338.

Issue description

- People congregating in front of store will damage their brand/image
- Loss of passing trade due to relocation of bus stop
- Businesses should be provided with compensation
- Would impact business through reduced parking, reduce amenity (noise and air pollution) reduced access to loading bays and lack of a bus stop directly outside (inconvenience) will discourage people from patronising this business.

Response

The relocation of the bus stops are required to allow the proposed tidal flow to operate safely and improve bus travel times and reliability though Cremorne and would make use of public footpath space for the benefit of local bus passengers and the community generally.

The proportion of existing footpath traffic in Cremorne comprised of bus passengers is considered to be small relative to all pedestrians. Impacts on passing trade as a result of the relocation of the bus stops are expected to be minor on the basis that a large proportion of existing bus commuters would still pass the same businesses on the way to the relocated bus stops.

Potential impacts to businesses through reduced parking, amenity, increased noise, changes to access to loading bays and the relocation of bus stops generally have been addressed in the REF and elsewhere in this report. Impacts from each of these issues have been assessed as minor and are considered unlikely to discourage people from using the Cremorne Town Centre shopping centre and surrounding businesses.

Justification for relocation of bus stop

Submission numbers

21, 63, 209, 219, 226, 230, 234, 251, 252, 265, 271, 313, 319.

Issue description

- Why was the [relocated] bus stop at Cremorne Town Centre proposed and selected as an option?

Response

The relocation of local bus stops in Cremorne was included in the scope of the Proposal to allow sufficient space between the stops so that the proposed tidal flow arrangement along Military Road could be implemented safely and provide the required road capacity. The proposed tidal flow system would reduce congestion through Cremorne and Neutral Bay and improve bus travel times and reliability.

2.9.2 Tidal flow at Cremorne town Centre

Justification and traffic improvements

Submission numbers

17.

Issue description

- Submissions expressed opposition to the introduction of tidal flow measures at Cremorne Town Centre due to concerns that it would not alleviate congestion and/or will increase congestion in the area
- Are you able to confirm that the new arrangements for Cremorne will of themselves contribute to any time saving? If so can you please advise the figures across the period of the operation of the tidal flow management? The computer microsimulation models predict traffic conditions with and without the proposed road improvements as a whole but not with and without the proposed tidal flow arrangement through Cremorne.

Response

The current arrangement through Cremorne during the AM peak period provides three citybound traffic lanes whilst the outbound direction is constrained to two traffic lanes past the right turn lane to Spofforth Street. Because of the frequency of citybound buses stopping at Cremorne town centre, the citybound direction is effectively constrained to two through lanes when buses are stopped at the kerbside bus stop. The proposed tidal flow system through Cremorne would provide three uninterrupted traffic lanes that allow traffic to 'weave' around the stopped buses thus increasing citybound capacity through Cremorne by about 50 per cent during the AM peak period. The increased capacity would reduce citybound congestion through Cremorne during the AM peak whilst having a negligible impact to outbound traffic.

Whilst the traffic modelling does not present the specific benefits provided by the tidal flow system through Cremorne, the overall benefits to bus travel times and reliability across the study area were shown to be substantial. The tidal flow system is integral to delivering these benefits by increasing the number of clear traffic lanes from two to three and reducing the impact of bottlenecks in the network, such as kerbside bus stops.

The modelling carried out to support the REF was not prepared in such a way that the contribution of each scope item could be measured individually. The modelling is intended to assess the cumulative contributions of all scope items as an integrated network. As such it is not possible to identify the individual contributions of traffic improvements through Cremorne in isolation.

Pedestrian and commuter safety

Submission numbers

52, 322.

Issue description

- Concern over removal of safety barriers - increased risk to pedestrians.

Response

The removal of the median fencing is an outcome of the proposed tidal flow system.

The existing tidal flow system already has a 100 metre section without median fencing between Wycombe Road and Rangers Road. The Proposal is to extend this tidal flow system to the east which would result in an extra 30 metres of median fencing being removed.

The proposed tidal flow system in Cremorne would result in the removal of approximately 50 metres of median fencing. This removal is adjacent to an existing signalised pedestrian crossing at Cabramatta Road.

The potential risks to pedestrians associated with the fencing removal would be assessed as part of a road safety audit of the tidal flow design and mitigation measures would be developed in consultation with North Sydney Council and local businesses.

2.9.3 Parking

Submission numbers

90, 101, 118, 151, 180, 209, 313, 330.

Issue description

- The Proposal would reduce on-street parking
- Will alternative/additional parking be supplied in the area?
- Additional free parking should be provided to offset parking lost at Cremorne
- The Proposal would result in increased car use and put pressure on the [Cremorne town] centre carpark
- Reduced on street parking at Cremorne.

Response

Impacts upon parking have been assessed with Section 6.1 of the REF. The REF assessed the loss of 19 parking spaces on Military Road in Cremorne. As a result of ongoing design development further impacts upon parking in this area have been identified. This would result in the removal of a total of 30 spaces within the Cremorne town centre area. The impact of this additional parking removal is assessed within Section 3 of this report. The removal of this parking is necessary to facilitate the proposed tidal flow system as outlined in this report. It is expected that some of the parking capacity lost on Military Road in this area may be accommodated by existing

parking availability on nearby streets such as Spencer Road, Cabramatta Road or Parraween Street. Consultation with directly affected businesses has been initiated and will continue as part of the design process.

As part of a review of parking availability throughout Spit Road and Military Road, a series of parking occupancy surveys were completed in December 2016. This investigation surveyed the number of vehicles parked along Military Road and Spit Road and within nearby side streets (within 500 metres) between 6am and 9pm during the week and on the weekend. Once processed, the results of this survey would indicate the actual demand for parking on Military and Spit Roads and would identify times during the week when adequate vacancies are available on nearby side streets to accommodate the potentially displaced vehicles parked along these roads. The impacts of the parking losses are currently under further consideration and options for offset parking would continue to be investigated.

It is recognised that the removal of on street parking along Military Road would place additional pressure upon other parking in the area and would result in impacts to local businesses. It is noted however that both sides of the road are currently designated as clearway for four hours of the day between Monday and Friday. Alternative parking is available in nearby streets and private car parks.

2.9.4 Property Impacts and Acquisition

Submission numbers

111, 143, 240, 250.

Issue description

- Reduced property values.

Response

An assessment of socio-economic impacts is provided in Section 6.6.2 of the REF. The Proposal is expected to provide a positive overall socio-economic benefit to Cremorne as a result of improvements to the local public transport network and a reduction in travel times for commuters and general traffic. Roads and Maritime does not speculate on the movement of real estate and property prices.

2.9.5 Environmental Issues

Submission numbers

104, 145, 151, 193, 212, 239.

Issue description

- Loss of trees
- Lack of assessment regarding socio-economic impacts
- Moving the Cremorne bus stops would affect the 'identity' of the suburb and its amenity
- Increased noise and air pollution.

Response

Section 6.6 of the REF provides an assessment of socio-economic impacts of the Proposal. These impacts have been further considered as part of this report. This includes impacts from reduced

parking and the relocation of bus stops. The assessment also outlines the overall benefits provided by a faster and more reliable bus service.

The revised locations of the citybound and outbound bus stops at Cremorne town centre assessed in this report would not require the removal of any additional vegetation over and above that specified in the REF.

Whilst it is recognised that public transport is important for people travelling to and from Cremorne the relocation of the two bus stops by up to 105 metres is not expected to result in any substantial adverse impact on the identity and amenity of the town centre or suburb in general.

Impacts concerning noise and air quality were addressed in Sections 6.3 and 6.9 of the REF respectively and have been further assessed in this report. These assessments concluded that the proposal would not result in substantial noise impacts and would have a positive impact on air quality due to various factors including, but not limited to, potential reduction in car use by providing a more attractive bus service, and easing congestion which would reduce the amount of braking and accelerating by cars.

2.9.6 B-Line Service

Submission numbers

104, 152, 214, 241.

Issue description

- No benefit to residents of Cremorne or Neutral Bay
- What trials of these buses or others in reasonable substitution have been undertaken to show us what the impact will be of the convoy nature of the B-Line passing through Cremorne?

Response

The B-Line bus service has been modelled as part of the commuter traffic model presented in the REF. Whilst the B-Line service is a frequent service with a bus every 5 minutes during peak periods, the number of additional B-Line buses (up to 12 per hour) represents only an 8% increase to the overall numbers of buses that travel along the corridor on the basis that over 150 buses per hour travel along Military Road during peak periods. The B-line buses would not operate in a convoy nature and would generally be spaced apart as per the stated frequencies.

Residents of Cremorne and Neutral Bay would benefit from the easing of congestion as a result of the implementation of the tidal flow system and other traffic improvements proposed. Further to this, a B-Line bus stop would be provided in Neutral Bay which would provide improved public transport access to the CBD and the Northern Beaches.

2.10 Traffic and Transport

2.10.1 Proposal Design

Tidal flow

Submissions

7, 22, 90, 148, 210, 286.

Issue description

Submissions raised generalised concerns about the introduction of tidal flow systems along Spit and Military Roads as part of the proposal (as opposed to objections about specific locations):

- A belief that there is not currently a significant traffic problem
- Opposed to the proposal on the grounds that tidal flow measures (specifically) would not improve congestion at or near the areas they are proposed
- Concern that the Proposal would not alleviate traffic throughout the project area as described in the REF as it would add more vehicles to the road network
- Military Road does not have the capacity
- Concerned that the tidal flow would increase congestion along the length of the proposal
- Modelling doesn't assume car destination could be different from CBD
- The existing right hand turn from Spit Road (citybound) onto Killarney Street should be retained.

Response

Section 6.1 of the REF includes an assessment of the traffic and transport impacts associated with the Proposal. This is further detailed in the Traffic and Transport Assessment included in Appendix D of the REF.

Under current conditions, citybound buses experience substantial delays due to congestion and 'pinch points', such as where buses are stopped in the kerbside lane. This has resulted in longer travel times and poor reliability. Consequently the main objective of this Proposal is to ease congestion along Spit Road and Military Road to improve bus travel times and reliability.

The current arrangement through Cremorne and Neutral Bay during the AM peak period provides three citybound general traffic lanes, except for the section between Rangers Road and Wycombe Road, where the existing tidal flow system provides four lanes citybound. Outbound traffic is generally constrained to two traffic lanes past the Wycombe Road tidal flow and the right turn lanes at Murdoch Street and Spofforth Street.

Due to the frequency of citybound buses stopping at kerbside bus stops in Cremorne and Neutral Bay, the citybound direction is effectively constrained to two through-lanes when buses are stopped in locations without an existing tidal flow system.

The proposed tidal flow system through Cremorne and the extension of the existing Wycombe Road tidal flow system would provide three uninterrupted traffic lanes that allow traffic to 'weave' around stopped buses, thus increasing citybound traffic capacity through Neutral Bay and Cremorne by about 50 per cent during the AM peak period. This increased capacity would reduce citybound congestion during the AM peak whilst having a negligible impact to outbound traffic.

The traffic modelling for the Proposal has been calibrated on extensive traffic surveys and other data sources so that it would appropriately represent the actual traffic movements of vehicles within the study area. The model does not assume that all vehicles are destined for the CBD but does assume that overall existing travel patterns would be maintained into the future.

As identified in Section 3 of this report, changes to the Proposal have removed the proposed tidal flow arrangements at Ben Boyd Road.

There are no plans to alter any other turn restrictions not explicitly discussed in the REF or this submissions report.

Rat running

Submission numbers

9, 36, 91, 164, 228.

Issue description

- Concern that the proposal would result in rat-running through local roads
- Concern that the proposal would lead to rat-running through Pearl Bay Avenue and Moruben Road
- Increased traffic from the proposal on arterial roads would lead to an increase in rat-running
- Concerns about lack of assessment of additional traffic flow in adjacent streets.

Response

As part of the Traffic and Transport Assessment a local area assessment was carried out to assess the impacts of the proposed changes along the corridor. The assessment identified that the Proposal would lead to varying degrees of increases in traffic on local roads. For example, the partial closure of the access from Cabramatta Road onto Military Road would increase traffic along alternative local roads by about 100 vehicles per hour during the AM peak period. Reasonable assumptions were made on the redistribution of this traffic in order to quantify potential impacts on adjacent local roads.

Despite expected changes to traffic volumes in local streets arising from the Proposal the incidence of rat-running is not expected to noticeably increase. This is concluded on the basis that:

- Some changes to local road movements arising from the Proposal are intentional and would not be considered rat-runs. For example, the proposed traffic lights at Stanton Road are designed to provide an alternative location for traffic to turn right into Spit Road (to head north), in order to relieve queues in Awaba Street. Additional traffic along Moruben Road between Awaba Street and Stanton Road is therefore a natural consequence of this redistribution of traffic and traffic using this road would not be considered to be rat-running.
- The ability for traffic to access rat-runs would not change as part of the Proposal ie all existing left/right turn bans and other restrictions active during the AM peak to discourage rat-running would remain in place
- Traffic flow along the Spit Road/Military Road corridor is expected to improve, hence reducing the incentive for motorists to seek out rat-runs during peak periods
- The Proposal has been designed to improve bus travel times and reliability generally. This has the potential to encourage mode shift from private vehicles to public transport, which would reduce the overall number of vehicles on these roads and would also reduce congestion and hence the incentive for motorists to seek out rat-runs.

Murdoch Street turning ban

Submission numbers

8, 62, 66, 294.

Issue description

- Submitters were opposed to the proposed turning restrictions at Murdoch Street as the benefit of this restriction would be minimal
- Concerned the relocation of the Redlands school entrance to Water Street would have additional cumulative impacts to traffic congestion at this location.

Response

The REF identified the proposed banning of the right turn from Military Road onto Murdoch Street in order to provide for longer 'green' light durations at this intersection. This would result in positive flow-on effects throughout the road corridor generally during the AM peak period.

The impacts of this element of the Proposal were assessed in Section 6.1 of the REF and further detailed in the Traffic and Transport Assessment in Appendix D to the REF. The assessment concluded that the elimination of the right turn here during the AM peak provides improved intersection operation overall. Commuter modelling indicates a reduction in intersection average vehicle delays from 83 seconds to 80 seconds per vehicle in the AM peak with no change in queue lengths for the intersection as a whole.

NBBP are undertaking further investigations in conjunction with North Sydney Council and the SCEGGS Redlands School to develop a wider area-based solution that provides the benefits to the project whilst seeking to maintain the existing level of service for general traffic within the road network. This would consider potential cumulative impacts to traffic congestion on Military Road and Waters Road.

2.10.2 Need for the Proposal/Justification

Submission numbers

7, 9, 10, 14, 16, 17, 38, 46, 60, 63, 64, 68, 77, 79, 88, 91, 123, 124, 129, 142, 145, 148, 150, 152, 153, 154, 156, 161, 171, 188, 190, 193, 217, 218, 233, 234, 238, 246, 284, 297, 311.

Issue description

- Unjustified cost for no real benefit. Traffic impacts to local roads outweigh the overall proposal benefits. REF benefit stated as travel time improvement of 1 minute and 15 seconds which does not seem enough to warrant the proposal
- The Proposal penalises high density population in the Lower North Shore for the benefit of a low density area of population (the Northern Beaches.

Response

As described in the REF, the proposal would provide for an improved public transport system with reduced travel times and improved reliability. As a result, the use of public transport is expected to increase which would potentially lead to a reduction in the number of private vehicles using the corridor, particularly during peak periods.

The time saving of 1 minute 15 seconds referred to is the difference between local buses and B-Line buses through the study area. A key objective of this proposal is to improve the travel times and reliability of local bus services as well as the B-Line buses. Table 22 of the REF indicates that travel times for citybound local buses would reduce by 26per cent from 33 minutes 59 seconds to 25 minutes 10 seconds (ie a saving of over nine minutes) when comparing the 'Do Nothing 2021' scenario with the 'Proposed 2021' scenario. The time savings for the B-Line service would have an even greater travel time saving. Notwithstanding this, travel time savings is only one of the benefits of the Northern Beaches B-Line Program, which also aims to improve the reliability and comfort of the service compared to existing buses on the route.

The Proposal is not expected to substantially or disproportionately disadvantage the Lower North Shore over the Northern Beaches on the basis that most impacts assessed within the REF and this report are minor, negligible and/or temporary. Further to this, in terms of public transport provision, the absolute population of each location and the necessity to provide equitable and reliable access

to employment centres (particularly the CBD) for all residents in this region of Sydney is the main priority of this and other NBBP proposals.

2.10.3 Safety

Road safety

Submission numbers

22, 52, 90, 118, 120, 121, 133, 145, 154, 155, 191, 231, 311.

Issue description

- Concern that the extended tidal flow at Spit/Ourimbah Roads would impact safety of Ourimbah Road and Macpherson, Gerard and Belgrave Streets
- Merging lanes at Murdoch Street in combination with proposed tidal flow measures will be a safety risk.

Response

The extension of the tidal flow on Spit Road at Ourimbah Road is intended to provide additional length for the right turn lane so that traffic waiting to turn right does not block the through traffic lanes. The traffic signals at Ourimbah Road/Spit Road would retain the same signal phasing and timing (i.e. the same 'green' time) and as such the volume of traffic entering Ourimbah Road would stay the same as existing. Consequently the volume of traffic entering subsequent streets on this route including Macpherson, Gerard and Belgrave Streets would remain the same. Overall the traffic improvements at this intersection would simply provide more queuing space while the traffic flow into Ourimbah Road would remain unchanged.

As the volume of traffic entering Ourimbah Road and travelling along subsequent collector roads including Macpherson, Gerard, and Belgrave Streets would remain the same there would be no safety new issues introduced by this Proposal.

Pedestrian safety

Submission numbers

52, 90, 118, 120, 121, 133, 145, 154, 155, 191, 231, 311.

Issue description

- Concern that the removal of pedestrian fencing at tidal flow areas would decrease pedestrian safety
- Concern that the safety of intoxicated people may be jeopardised near Minsky's Hotel
- Concern that the kerb will not be high enough to prevent cars and buses from mounting the kerb
- Reducing footpath width at Holt Avenue and Spit Road would reduce safety
- Relocation of bus stop at Prince Street would reduce pedestrian safety
- Concern that the proposed turning restrictions at Murdoch Street would impact the safety of pedestrians (particularly school children).

Response

The Proposal would require the removal of some pedestrian fencing from the medians along Military Road to facilitate the tidal flow system. However, the tidal flow design through Neutral Bay

and Cremorne would be subject to road safety audits with specific focus on pedestrian safety as part of the detailed design process, including the potential need for additional/reinstallation of pedestrian fencing in high risk areas. Should this identify additional required changes to the Proposal these would be subject to further assessment.

Kerb heights as part of the Proposal would be consistent with existing infrastructure, road safety standards and Roads and Maritime specifications.

The Proposal would require changes to the width of the footpath along Military Road between Murdoch Street and Spencer Road. The proposed width of the pedestrian path in this location would be a consistent three metres wide. The proposed footpath width meets the Australian Standard AS1428.1 for safety requirements.

As part of the REF a pedestrian study was undertaken (refer to Section 6.1 and Appendix E of the REF). The impacts to pedestrian movement identified that 'due to relatively low pedestrian demand in these locations, the reduced footpath widths would not have an adverse impact on the level of service provide to the pedestrian.

The Proposal requires the relocation of the existing citybound bus stop from the corner of Military Road and Belmont Road to a new location about 75 metres north, near Prince Street. The proposed new location is within the same block as the existing bus stop and does not require crossing of any additional roads to access the bus stop. Therefore this proposed change is not expected to affect pedestrian safety.

The Proposal is not expected to change the existing pedestrian movements at the intersection of Murdoch Street and Military Road. The proposed ban of the right turn movement from Military Road onto Murdoch Street in the AM peak period may lead to an increase in traffic using local roads in this area. However, the existing pedestrian provisions along these roads would remain, providing for formalised crossing of local roads.

In addition, NBBP are undertaking further investigations in conjunction with North Sydney Council and the SCEGGS Redlands School to develop a wider area-based solution that provides the benefits to the project whilst seeking to maintain the existing level of service for general traffic within the road network. This would consider pedestrian movements through the area.

2.10.4 Parking

Submission numbers

13, 28, 31, 46, 51, 59, 66, 101, 140, 142, 144, 153, 166, 191, 195, 200, 206, 210, 241, 245, 254, 271, 291.

Issue description

- Concern that the proposal would reduce access to on-street parking while simultaneously encouraging car use
- Concern that the proposal would result in increased parking pressure particularly along Military Road and Spit Road
- Concerned that the proposal would result in increased parking pressure on local roads
- Opposed to the proposed tidal flow outside of 73 Spit Road due to the loss of parking at this location.
- Will Military Road become a 24 hour clearway in both directions?

Response

Section 6.1.2 of the REF summarised the impacts to parking that were expected to be incurred due to the operation of the Proposal. The REF identified that the Proposal would require the removal of a number of on-street parking spaces across the length of the proposal (about 5 km). This would include:

- A total of 61 on-street parking spaces (on both Military Road/Spit Road and local roads) would be impacted by the Proposal:
  - Forty-nine of these parking spaces would be permanently removed
  - The times of day in which 12 of these spaces would be available for parking would be reduced (ie availability would be restricted to off-peak hours only).

The removal of the above parking spaces would result in some localised impacts on parking availability; however this impact is expected to be minor given the relatively small number of spaces removed from each individual location.

In Response to community feedback and ongoing design development, a number of changes have been made to the parking. These changes however require that parking be removed in several additional locations on Military Road and Spit Road during the operation of the Proposal. Additional impacts to parking, as a result of these changes, have been considered further in section 3 of this report. These changes include:

- Loss of four AM peak and off peak parking spaces on Spit Road outbound opposite Stanton Road (134 to 140A Spit Road)
- Loss of two AM peak and off peak parking spaces on Spit Road outbound opposite Stanton Road (128 to 134 Spit Road)
- Loss of two unrestricted parking spaces on the westbound side of Stanton Road between Spit Road and the existing council carpark driveway
- Loss of nine AM peak and off peak parking spaces on Spit Road outbound between Awaba Street and Killarney Street
- Loss of eleven AM peak and off peak parking spaces on Military Road outbound, between Winnie Street and Spofforth Street (324 Military Road to Cremorne Garden Plaza).

As part of a review of parking availability throughout Spit Road and Military Road, a series of parking occupancy surveys were completed in December 2016. The study is currently being reviewed and would be made available on the Northern Beaches B-Line website in due course.

Currently there are clearway restrictions on parking outside 73 Spit Road during the AM peak. The Proposal would not change the existing parking conditions at this location.

2.10.5 Cyclists

Submission numbers

116.

Issue description

- Bus efficiency is and will continue to be compromised by cyclists along the bus route

Response

Cyclists would continue to be permitted to use all roads within the Proposal area in accordance with NSW Road Rules. These rules allow cyclists to use bus lanes and transit lanes, though not ‘bus only’ lanes.

2.11 Public Transport – B-Line Service

Submission numbers

2, 8, 9, 13, 16, 46, 51, 52, 60, 66, 89, 145, 150, 152, 153, 154, 160, 217, 296.

Issue description

- Requested information about traffic modelling for B-Line buses between The Spit and the CBD
- Can you please explain how much time will be saved for B-Line buses on their way to the CBD during peak AM, peak PM peak and other off peak times of the day, and the data used to do this?
- How were the bus time savings measured?
- The REF fails to address the time saving outcome of the Proposal for B-Line
- There will still be delays to bus running times due to the additional time taken to exit indented bus bays and re-enter traffic
- The B-Line proposal will not work as buses will continue to bottleneck at the Spit
- Would the update of bus transport warrant the cost and congestion caused by the proposal and running the B-Line
- Are the bus stops at non-indented bus bays along Military Road proposed to be removed?

Response

Bus travel times have been measured using a Commuter simulation model. The traffic and transport assessment in Appendix D to the REF outlines the inputs and assumptions used in the traffic model between The Spit Bridge and Neutral Bay. The traffic modelling to support this REF does not cover sections of the corridor north of Burnt Bridge Creek Deviation/Condamine Street or south of Neural Bay.

The REF assesses the impacts of the Proposal during AM and PM peak periods, which are the busiest periods for both general traffic and bus patronage. Section 6.1 of the REF summarises the travel time outcomes for this Proposal for B-Line buses, local buses and general traffic.

The additional time taken to exit an indented bus bay has been built into the traffic modelling and hence the travel time and reliability benefits reported in the REF are accurate in this regard. The modelling also takes into account the existing traffic constraints at The Spit Bridge.

The REF has assessed the impacts of the Proposal and has determined that there is a clear benefit to both bus passengers and motorists that justifies the Proposal.

The Proposal would not remove any bus stops along Military Road.

2.12 Emergency Services Access

Submission numbers

9, 160.

Issue description

- The Proposal would lead to reduced response time for emergency services.

Response

Section 6.6.2 of the REF states that access through and within the corridor for emergency services would be maintained at all times during construction and operation of the Proposal. This

commitment has been formalised as a project mitigation measure and has also been carried through to this report.

Further to this, the Proposal would generally improve traffic flow along the corridor, particularly within transit lanes. Given emergency services are permitted to utilise transit lanes when responding to emergencies it is likely that response times would improve over the current scenario.

2.13 Support for the Proposal (general)

Submission numbers

4, 7, 22, 134, 145, 318.

Issue description

- Submissions expressed support for the Proposal generally
- One submission specifically supported of the demolition of the former Greater Union cinema

Response

NBBP appreciates support shown for the Proposal and looks forward to delivering the benefits that the Proposal would provide.

2.14 Cost Benefit Analysis

Submission numbers

9, 46, 89, 150, 160.

Issue description

- No analysis of the benefit versus the collective losses to the community of the Proposal has been carried out
- No cost benefit analysis provided on the budget for the Proposal
- How can the original cost-benefit analysis be used considering the increase in cost of the Project?

Response

A comprehensive Cost Benefit Analysis (CBA) was undertaken for the Northern Beaches B-Line Program as part of the program's business case. This found that the Proposal would generate economic benefits for Northern Beaches and Lower North Shore through improved transport and productivity outcomes. The analysis showed that the estimated economic benefits arising from the B-Line Program are likely to exceed the costs. The improvement in public transport efficiency is also expected to generate productivity benefits, including an increase in business to business connections as a result of a reduction in journey times between economic centres.

The Final Business Case containing the CBA is a Cabinet-in-Confidence document, and therefore not available for public release at present.

The Proposal has not substantially increased in cost since the business case was finalised and hence the original CBA is still considered valid.

2.15 Noise and Vibration

2.15.1 Operational Noise

Submission numbers

17, 53, 55, 73, 75, 78, 81, 84, 86, 93, 96, 108, 170, 234, 302, 303.

Issue description

Submissions expressed concern that the Proposal would result in increased noise impacts for residents and businesses of Mosman, Cremorne, and Neutral Bay.

Response

Operational noise from traffic would generally not increase throughout the corridor as a result of the Proposal on the basis that the B-Line service would encourage a degree of mode shift and subsequent decrease in overall road traffic, and improved congestion and network efficiency through the proposal area. It is recognised however that the Proposal may result in changes to traffic volumes on some secondary roads along the corridor. This has been further assessed within this report (Section 3). This identifies that the increase in operation noise from traffic along local roads would be unlikely to exceed 2.0 dB(A). Therefore, no additional noise mitigation measures would be required in accordance with the *Noise Criteria Guideline* (Roads and Maritime, 2015).

2.15.2 Construction Noise

Submission numbers

46, 140.

Issue description

Submissions expressed concern regarding the impacts of noise during construction – particularly during out of hours works. It was requested that works do not continue past 10:30pm when in proximity to residents, particularly those at the intersection of Prince Street and Military Road.

Response

Noise and vibration impacts during construction were identified and assessed within Section 6.3 of the REF. This assessment modelled the impacts associated with typical construction scenarios likely to be undertaken throughout the corridor. This assessment indicated exceedances of Noise Management Levels of between 5 and 43 dB(A) for all noise catchment areas during standard hours. During night time works exceedances ranged between 30 and 65 dB(A). The REF also outlines for specific noise mitigation measures to be employed during construction, including notification, respite periods and alternative accommodation, where relevant.

NBBP is committed to ensuring that noise impacts are minimised wherever practicable throughout the construction of the Proposal. In this regard a Noise and Vibration Management Plan would be prepared by the construction contractor in order to manage impacts and mitigation measures. Where impacts upon residents and businesses are likely notification of construction periods and durations would be undertaken as a minimum. Additional mitigation measures would be employed as appropriate. Whilst night works are likely to be necessary for much of the proposed construction in order to avoid operational traffic impacts, no noisy works would be undertaken in any part of the Proposal Area after midnight. Noisy works would include the operation of high noise generating equipment such as concrete saws or jackhammers.

2.16 Air Quality

Submission numbers

17, 47, 81, 84, 86, 96, 108, 137, 302, 303.

Issue description

Submissions expressed concern that the Proposal would result in air quality impacts for the residents and businesses of Mosman, Cremorne and Neutral Bay.

Response

Air quality impacts during construction and operation were identified and assessed within Section 6.9 of the REF. Despite minor updates to the Proposal to accommodate changes to some intersection changes and relocation of bus stops air quality impacts associated with the Proposal are expected to remain similar to those outlined in the REF. That is, impacts are likely to be temporary in nature and limited to minor dust and exhaust emissions generated by construction activities.

Operational air quality impacts are also discussed within the REF. This assessment identifies that air operational quality impacts are likely to be minimal due to the potential for the reduction in traffic through mode shift as well as by avoiding the need for traffic to stop behind waiting buses stopping in kerbside bus lanes once indented bus bays are operational. These conclusions are still considered to be valid despite the changes to the Proposal (most of which have reduced the scope of the Proposal).

2.17 Socio-economic Impacts

2.17.1 Amenity

Submission numbers

17, 22, 43, 143.

Issue description

Submissions raised concerns that the Proposal would affect the local communities of Mosman, Cremorne and Neutral Bay due to a reduction in amenity. Submissions noted that:

- There would be a decreased level of amenity for pedestrians caused by vehicles, including trucks and buses, passing right next to narrower footpaths ie in the kerbside lane
- The extended tidal flow at Spit/Ourimbah Roads would impact the amenity of Ourimbah Road and Macpherson, Gerard and Belgrave Streets.

Response

Impacts upon the amenity of residents and pedestrians were assessed within Section 6.1 of the REF. This assessment outlines impacts upon pedestrians including the loss of the pedestrian crossing north of Stanton Road and the narrowing of footpaths through Cremorne. A pedestrian analysis was also undertaken which concluded that due to relatively low pedestrian demand in these locations, the reduced footpath widths would not have an adverse impact on the level of service provided. The limiting factor for reducing footpath widths in these locations is the minimum clear width available between footpath obstructions (e.g. trees, street furniture, etc) to provide adequate clear width for mobility impaired pedestrians to manoeuvre. The proposed works have been designed to ensure that the existing clear widths are not reduced below the recommended

minimum 1.8 metre width. On this basis the risk to pedestrians from heavy vehicles passing along the kerbside lane is expected to remain low.

The extension of the tidal flow system on Spit Road would maintain the existing right turn facility for vehicles travelling south on Spit Road wishing to turn right into Ourimbah Road. This is unlikely to affect the amount of traffic likely to divert along Ourimbah Road and Macpherson, Gerard and Belgrave Streets as a rat–run as the 'green' phase timing of the traffic lights would remain the same duration. Traffic volumes in these streets may however decrease, should the traffic flow improvements proposed be realised and the disincentive for travelling on Spit and Military Roads through this area is reduced or removed.

2.17.2 Business Impacts

Submission numbers

36, 51, 60, 63, 64, 79, 122, 123, 250, 264, 272, 294, 342.

Issue description

Submissions raised concerns that businesses would be impacted by the Proposal particularly due to:

- a loss of parking in the area
- a loss of passing trade
- decreased ability to receive deliveries – attributed to the proposed turning restrictions along the alignment.

Submissions also expressed concern that the REF does not adequately assess the potential impacts of the B-line Bus Proposal on the shopping centres at Spit Junction, Mosman and Neutral Bay.

Response

Parking impacts associated with the Proposal are discussed in a separate response above.

Section 6.6 of the REF describes the socio-economic impacts associated with the Proposal. It was recognised that construction and operation of the Proposal are likely to result in impacts to local businesses, in addition to other socio-economic impacts. The REF identified that impacts upon businesses arising from the Proposal are likely to be moderate-high in work locations during construction. During operation the Proposal is likely to affect different businesses along the corridor in different ways depending on their type, location, opening hours and customer base.

It is recognised that certain businesses whose trade may be assisted by the presence of waiting bus commuters may be disadvantaged by the relocation of bus stops within Cremorne. NBBP has responded to concerns raised by businesses and the community in this area by adjusting the proposed location of these stops. These have now been brought closer to their original position, so as to reduce impacts upon businesses and shoppers. NBBP considers the revised locations to be an adequate compromise between the desire to maintain the location of the stops and the need for traffic improvements through this area that would directly benefit bus commuters, as well as traffic generally, through reduced travel times.

Several responses raised potential issues around businesses receiving deliveries and how the proposed changes would affect them. These concerns were particularly prevalent around the proposed changes at Ben Boyd Road and Cabramatta Road, including turn restrictions and a partial road closure respectively. NBBP have responded to these concerns by removing the turn restrictions at the intersection of Ben Boyd Road and Military Road from the scope of the Proposal.

This would allow local businesses to continue to receive deliveries as per the current arrangements.

At Cabramatta Road, it is proposed to implement a half closure at the intersection with Military Road to prevent vehicles turning left from Cabramatta Road onto Military Road. This closure is considered necessary to ensure the Proposal objectives of improving bus travel times along the corridor are met. NBBP has consulted with businesses in this area and has gained an understanding of the movements generally undertaken by delivery vehicles. It is understood that most delivery vehicles enter Cabramatta Road from Military Road, stopping behind the Cremorne Town Centre shopping centre to make deliveries, before exiting by turning left onto Spofforth Street. This movement would be fully retained by the updated Proposal. On this basis the overall impact upon deliveries is expected to be negligible.

2.18 Consultation

Submission numbers

7, 8, 9, 13, 16, 21, 37, 44, 46, 51, 52, 60, 63, 88, 89, 96, 106, 108, 113, 115, 118, 122, 126, 136, 148, 149, 150, 152, 154, 155, 160, 166, 171, 173, 191, 201, 225, 229, 233, 238, 239, 243, 250, 259, 264, 272, 284, 294, 302, 311, 342.

Issue description

Submissions raised concern regarding the adequacy of the consultation undertaken for the Proposal. Issues regarding consultation have been broken down and summarised in the following sections.

Consultation process
- An info desk or signs at bus stops would have been a better consultation method
- Did not receive consultation material directly
- Why were no public meetings held?
- Meetings were not well publicised.

Business consultation
- Concern regarding consultation with businesses on Cabramatta Road and residents generally in Cremorne
- Has the developer at Grosvenor Street been consulted regarding potential lack of access to construction site? Questioned the level of consultation with local business owners at this location.

Consultation information
- A lack of information was provided to the community in order to make informed submissions (for example, the bus service plan),
- B-Line brochure not clear
- Info sessions not helpful – too many people around too small tables
- Webpage is inadequate – no Cremorne or Mosman specific pages.

Consultation timeframes
- Requests consultation deadline extension
- Consultation timing was poor, that is, over Christmas break and school holidays.

Consultation responses
- What information can you provide concerning discussions you have had with those using the relevant local bus services concerning the proposed changes
- Lack of community input into the design

- How can we be sure you will take on board our comments?

Future consultation
- How will the community be contacted regarding subsequent studies (particularly parking)
- Requests for additional opportunities to meet with key decisions makers to discuss issues and suggestions.

Response

Consultation process
A consultation strategy was developed for the Proposal in order to ensure that relevant stakeholders within the vicinity of the Proposal were afforded the opportunity to understand the Proposal and to provide comment. This included the provision of the REF on the Northern Beaches B-Line website, as well as physical displays at several locations. Staffed public information sessions were also held for people to ask questions directly of project staff.

The consultation period for The Spit Bridge to Neutral Bay B-Line Road Infrastructure REF was extended from 5 December 2016 to 1 February 2017 in recognition of the large footprint involved and the consultation spanning the holiday period. There were 9,100 notifications sent to residents and businesses along the corridor in early December and mid-January.
Specifically, consultation activities for the Proposal included:
- Four community information sessions to give local residents and businesses an opportunity to view the plans and discuss the Proposal with members of the project team at the following times:
  - Saturday 10 December 2016 – Mosman Seniors Centre, Mosman Council Civic Centre (Mosman Square, Spit Junction), 11.00am – 1.00pm
  - Monday 16 January 2017– Neutral Bay Community Centre (190-192 Military Road, Neutral Bay), 5.00pm – 7.00pm
  - Thursday 19 January 2017 - Mosman Seniors Centre, Mosman Council Civic Centre (Mosman Square, Spit Junction), 5.00pm – 7.00pm
  - Wednesday 25 January 2017 – Big Bear Shopping Centre (Neutral Bay), 5.00pm – 7.00pm
- advertisements in the Mosman Daily to publicise the REF display and community information sessions
- a newsletter delivered by letterbox drop to properties within 500 metres of the study area publicising the REF display and community information sessions and inviting feedback (9,100 notifications)
- door knocking and targeted letterbox drops to provide more detailed information about proposed changes in the local area and invite feedback from specifically affected residents and businesses.
- public display of the REF documents at the following locations:
  - North Sydney Council Customer Service Centre, 200 Miller Street, North Sydney
  - Mosman Council Civic Centre, Mosman Square, Spit Junction
  - Barry O'Keefe Library, 605 Military Road, Mosman
  - Transport for NSW, Level 5, Tower A, Zenith Centre, 821 Pacific Highway, Chatswood
- all documents available on the B-Line website at www.b-line.transport.nsw.gov.au
- targeted meetings and briefings for key stakeholders to provide an overview of the REF findings and identify potential issues
- project Infoline: 1800 048 751 and projects@transport.nsw.gov.au.

Several submitters stated that they failed to receive notification of the consultation campaign. In Response to this NBBP is reviewing its advertising processes to ensure that the community is adequately informed for future campaigns.

Business consultation

As part of the consultation process NBBP undertook several stakeholder-specific meetings to listen to community and business concerns.

Specific consultation with local businesses was carried out as follows:

- A kiosk was established at a local shopping centre where the community could meet the project team
- Flyers were distributed to the Hayden Orpheum, IGA Cremorne and Cremorne Town Centre shopping centre
- Approximately 30 businesses in Cremorne were contacted directly during the display period and encouraged to attend one of the remaining information sessions.

The outcomes of this consultation have been taken into consideration in the development of the Proposal.

Consultation information

As part of the consultation process for the Proposal NBBP sought to ensure that all consultation activities and materials were provided in a manner which made project information clear and easy to understand. Feedback provided during this consultation process has been taken on board and would be used to improve processes and materials for similar future consultation campaigns.

Information sessions conducted for the Proposal were designed to provide interested stakeholders the opportunity to discuss the Proposal with project staff and provide feedback directly. These events proved to be more popular than originally envisaged and hence some of the physical layout of the venues or materials may not have been optimal. These concerns have been noted and would be considered for future campaigns.

The Northern Beaches B-Line website has generally been developed around the nine proposed B-Line stops along the route. It is however recognised that impacts are not exclusively limited to these locations. Despite this the information provided on the project generally and within the pages for adjacent locations such as Neutral bay and Spit Junction are likely to cover much of the project related information for areas such as Mosman and Cremorne. Further to this, the REF itself includes specific detail on each of these locations alongside an assessment of likely impacts upon each.

Consultation timeframes

Consultation on the REF was undertaken between 5 December 2016 and 1 February 2017. Whilst this spanned Christmas and New Year period the consultation period was extended to allow sufficient opportunity for the community to provide comment on the REF. This extension was considered to be sufficient to allow all interested stakeholder an opportunity to understand the Proposal and provide comment, despite the time of year.

In addition to the extended consultation period NBBP also continued to accept late submissions up until 1 March 2017. These submissions have been considered and responses provided within this report.

Consultation responses

As part of the design of the Proposal, NBBP undertook several investigations of public transport and traffic patterns through the Spit Road and Military Road corridors. This included detailed consultation with Sydney Buses in order to understand the nature of bus movements and passenger needs through the area. This information was then used to shape specific elements of the Proposal.

As part of the consultation process for the REF NBBP have invited community feedback on the Proposal. This process resulted in the receipt of over 340 submissions from residents, businesses and the community. This feedback has been carefully considered and has formed the basis of changes to specific elements of the Proposal. This includes changes to the M30 bus layover at Spit

Junction, changes to the location of bus stops in Cremorne and the removal of turn restrictions at Ben Boyd Road from the scope of works, among others.

The changes to the Proposal outlined in this report have been further assessed where necessary. Detail of this assessment is provided in Section 3 below.

The next step in this process would be for the project to be determined by Roads and Maritime. This submissions report and the main REF would form the basis of this process, providing relevant information so that the advantages and disadvantages of the Proposal may be adequately considered.

Future consultation
As part of the ongoing investigation NBBP would undertake additional parking and local road noise assessments in certain areas of the corridor, should the Proposal be approved. These studies would seek to engage with relevant stakeholders in order to understand specific concerns and to communicate results of the studies. The mechanism for such consultation would be developed prior to undertaking the studies and would be prepared to capture as many relevant interested stakeholders as possible.

2.19 Biodiversity Impacts

Submission numbers

9, 27, 44, 124, 210, 275.

Issue description

Submissions expressed opposition to the project on the grounds of:
- proposed vegetation removal (generally) without like-for-like replacement
- no environmental impact assessments were carried out respect to the local bird and possum populations
- one submission asked how many trees are required to be removed.
- One submission suggested the removal of all plane trees (and other infrastructure) along Spit Road and Military Road to avoid the need for road widening.

Response

The removal of vegetation along the corridor was assessed within Section 6.7 of the REF. This section identified specific trees and other vegetation that would be required to be removed as part of the Proposal and assessed the subsequent impacts upon local biodiversity. This included assessment of impacts upon mobile fauna species such as birds and possums, impacts to which were expected to be limited.

As part of the mitigation measures for the loss of trees along the corridor, NBBP have committed to applying the TfNSW vegetation offset policy. This policy seeks to offset vegetation to be removed with a greater ratio of replacement plantings, depending on the size of the vegetation removed. For the majority of trees to be removed along the alignment replacement is likely to be at a ratio of eight new trees for each tree removed.

All planting would be undertaken in consultation with North Sydney and Mosman councils, and/or the owner of the land upon which the vegetation would be planted.

2.20 Visual Impacts

Submission numbers

280.

Issue description

Submissions expressed concern regarding the visual impact of the project generally. In particular, one submission expressed concern regarding the installation of no stopping signs as they consider them are visually unappealing.

Response

The installation of bus shelters and relevant signage associated with the Proposal is integral to passenger wayfinding, amenity and safety. These elements are necessary to either enforce traffic regulations (no stopping signs) or to provide for ease of access for passengers. The visual impact of elements such as the installation of bus stops and vegetation removal has been assessed within the REF. These impacts were identified as likely to range from negligible to high-moderate depending on the scenario. These impacts would still generally apply to the revised Proposal unless otherwise assessed below.

2.21 Out of Scope

Issue description

A number of the submissions raised issues/requests which are out of the scope of the Proposal. These have been summarised and responded to below in Table 2-2.

Table 2-2: Out of scope submissions

Submission No.	Out of scope suggestion/issue/concern	Response
1, 160	No improved transport flow is planned for entrance of the new (and existing) buses on to the Warringah Freeway from Falcon St - traffic lights at corner Falcon St and Warringah Freeway could be removed right now to start improving the traffic flow	The scope of this assessment does not extend to traffic issues on the Warringah Freeway or the intersection of Warringah Freeway and Falcon Street.

Submission No.	Out of scope suggestion/issue/concern	Response
2	Can we please have B-Line buses to (and from) Warringah which don't travel all-stops along Military Road after picking up at Wynyard Stand-A?	The timetables and fares of the NBBP buses and existing local and express bus services are determined by the State Government using criteria such as the route and distance travelled, and are not within the scope of this Proposal. To support the introduction of the Northern Beaches B-Line, Transport for NSW is developing a bus service plan for the Northern Beaches. Due for release later this year, this plan will provide details of the bus network for all of the Northern Beaches and how customers can connect with the new B-Line and other services.
4	The REF fails to underline road upgrades for the Neutral Bay bus stop near Watson Street	The scope of this Proposal does not include any changes to the Neutral Bay bus stop near Watson Street.
8	According to the guide, buses should not line up with front doors, but it does at this property	Bus stops throughout the alignment have been generally prepared according to the Sydney Bus Infrastructure Guide. In certain cases minor departures from the guideline that do not affect the overall safety or operation of the bus stops have been necessary.
9	Where is the B-Line going to terminate in the CBD, considering Wynyard is already badly congested in the morning?	The timetables and fares of the NBBP buses and existing local and express bus services are determined by the State Government using criteria such as the route and distance travelled, and are not within the scope of this Proposal.
9	Why hasn't there been any consideration in regards to the corner of Falcon Street and Warringah Freeway being a huge congestion point, especially in the AM peak?	The scope of this assessment does not extend to traffic issues on the Warringah Freeway or the intersection of Warringah Freeway and Falcon Street.

Submission No.	Out of scope suggestion/issue/concern	Response
11	Will there be a set down provision at Spit Junction so we can transfer to Balgowlah and Manly buses?	The proposed B-Line bus stop at Spit Junction would allow passengers to alight the B-Line service in order to change on to other local bus services. Local bus services would be subject to the new bus service plan being prepared by Transport for NSW for the Northern Beaches. Due for release later this year, this plan will provide details of the bus network for all of the Northern Beaches and how customers can connect with the new B-Line and other services.
13	• A pedestrian bridge or tunnel at Bickell Road and Spit Road intersection • Right hand turns from Spit Road heading south need to be abandoned. In particular, the right hand turn at the lights into Medusa and Killarney Street • Indent as many bus stops (B-Line and otherwise) as possible along Spit Road and Military Road	• Improvements to pedestrian facilities are outside the scope of this Proposal • Changes to existing right turn restrictions outside of those addressed specifically in the REF and Submissions Report are not part of the scope of this Proposal • NBBP have investigated indenting as many bus stops as possible throughout this corridor though this is not feasible at all stops due to existing property restrictions.
13	Are there plans to remove the pedestrian lights near Bickell Road and Spit Road intersection?	The Proposal does not include any changes to this crossing.
16	Strongly oppose the permanent closure of Heaton Avenue, it will cause traffic problems	The scope of this assessment does not extend to changes Heaton Avenue. This section of road is being assessed under a separate proposal as part of the NBBP, and is documented in the Brookvale to Seaforth B-Line Road Infrastructure Review of Environmental Factors (Roads and Maritime Services, November 2016).
22	Suggests a toll on Spit Bridge	The scope of this assessment does not include changes to The Spit Bridge.

Submission No.	Out of scope suggestion/issue/concern	Response
25, 49	Requests that bus stops at Wudgong Street, Bond Street and Awaba Street are not moved.	These stops would not be moved as part of this Proposal.
37	Couldn't see any info on future of Spit bridge in the REF	The scope of this assessment does not include changes to The Spit Bridge.
43	Requests more detail on bus stop seating	Bus stop layout is not included in the scope of this Proposal.
63	Build a railway both above the existing roads where possible, and go underground where necessary, or construct a new bridge at The Spit, capable of carrying both vehicles and trains.	The provision of a railway line and/or tunnel is outside the scope of this this Proposal.
68	Suggests two bus lanes and one car lane to encourage public transport use	This suggested alternative would not result in a substantial benefit for bus traffic whilst severely restricting general traffic through the corridor.
83	Suggests a dedicated right hand turn lane citybound into Medusa Street	A right hand turn lane for general traffic at this location is outside the scope of this Proposal which is focused on improvements to bus travel times.
91	Where will existing buses go at Cremorne and Neutral Bay?	This is not part of the scope of this Proposal though it is expected that existing local bus stopping patterns will remain unchanged.
124	Ex-cinema site is not suitable as a bus depot	The scope of this assessment does not provide for a bus depot at the former cinema site at the corner of Clifford Street and Military Road. The future use of this site is still under consideration.
142	Suggests outbound bus lane from Medusa Street to Spit Bridge during the AM peak	This is not part of the scope of this Proposal.
143	No bus stop between Belmont Road and Cabramatta Road	There are no proposed B-Line service bus stops proposed between Belmont Road and Cabramatta Road included as part of this assessment.

Submission No.	Out of scope suggestion/issue/concern	Response
143	B-Line should go to Artarmon, Chatswood and St Leonards stations instead as Military Road is already too congested.	The NBBP is a NSW Government initiative to provide a more frequent and reliable bus service between the Northern Beaches and Sydney's Central Business District. The scope of this assessment does not include the provision of B-Line services from the Northern Beaches suburbs to Artarmon, Chatswood. The traffic assessment as part of this Proposal has considered the existing traffic congestion along Military Road (refer to section 6.1 of the REF).
143	There should be a B-line stop on Spit Hill at Pearl Bay Avenue after 7 o'clock at night, and at all times on weekends and public holidays, as there is no transport into Beauty Point after 7 or on weekends or public holidays.	The scope of this Proposal does not provide for a B-Line serviced bus stop on The Spit hill at Pearl Bay.
145	Buses will still be held up on the Harbour bridge.	The scope of this assessment does not extend to traffic issues on the Warringah Freeway or the Harbour Bridge.
150	Why are there no proposed changes beyond Watson Street?	The scope of this assessment does not include any changes beyond Watson Street.
150	A pinch point exists at the corner of Falcon Street and Warringah Freeway	The scope of this assessment does not extend to traffic issues on the Warringah Freeway or the intersection of Warringah Freeway and Falcon Street.
153	Will the cost of the B-Line ticket be different from the other express services	The timetables and fares of the NBBP buses and existing local and express bus services are determined by the State Government using criteria such as the route and distance travelled, and are not within the scope of this Proposal.

Submission No.	Out of scope suggestion/issue/concern	Response
153	Commuters coming from Palm Beach etc will still need to find other transport to Mona Vale, how does this new B-Line service help them when the L90 will take them directly?	The NBBP is a NSW Government initiative to provide a more frequent and reliable bus service between the Northern Beaches and Sydney's Central Business District. To support the introduction of the Northern Beaches B-Line, Transport for NSW is developing a bus service plan for the Northern Beaches. Due for release later this year, this plan will provide details of the bus network for all of the Northern Beaches and how customers can connect with the new B-Line and other services. Despite this the Proposal would still include changes to Route 236 at the intersection of Clifford Street and Spit Road. This change would be necessitated by the closure of the Clifford Street at this intersection.
153	Why is there not a B-Line service from Mona Vale or Brookvale to Chatswood (major train station)?	The NBBP is a NSW Government initiative to provide a more frequent and reliable bus service between the Northern Beaches and Sydney's Central Business District. The scope of this assessment does not include the provision of B-Line services from the Northern Beaches suburbs to Chatswood.
153	What is the contingency plan for breakdowns?	The operation of the B-Line service would be managed by the State Government and the State Transit Authority. As part of the ongoing operation of these services, contingency plans for breakdowns would be developed.
154	Suggest encourage more people to use the ferry through cheaper fares	Fares and other operational aspects of Sydney Ferries are not part of the scope of this assessment.

Submission No.	Out of scope suggestion/issue/concern	Response
154	Will the existing express buses continue? Can some buses go to Chatswood instead?	The NBBP is a NSW Government initiative to provide a more frequent and reliable bus service between the Northern Beaches and Sydney's Central Business District. The scope of this assessment does not include the provision of B-Line services to Chatswood. To support the introduction of the Northern Beaches B-Line, Transport for NSW is developing a bus service plan for the Northern Beaches. Due for release later this year, this plan will provide details of the bus network for all of the Northern Beaches and how customers can connect with the new B-Line and other services.
158	Suggests routing B-line through back streets instead	This alternative would not improve travel reliability, efficiency or travel times through the proposal area. This would also remove the ability to service a large number of passengers adjacent to the existing route.
160	Will B-Line buses have defibrillators?	The internal fit out and design of the B-Line buses is outside the scope of this Proposal, however further information would be available on the B-Line website as it becomes available: *www.b-line.transport.nsw.gov.au*
167	With more B-Line buses to be added into the traffic queue as buses enter the CBD, are there any proposed infrastructure changes to ease the traffic congestion across the bridge?	The scope of this assessment does not include changes to infrastructure or traffic congestion on the Sydney Harbour Bridge.
167	As buses come off Watson Street towards Warringah Expressway, bus lanes blocked up by private cars trying to change lanes	The scope of this assessment does not extend to traffic issues on the Warringah Freeway. Private vehicles are permitted to travel in bus lanes for a maximum distance of 100 metres in order to access other general traffic lanes and/or to turn into side streets.
180	Concerned about residential unit development on Military Road have no provision for increased infrastructure or parking provision to cater for extra people	The residential and urban development of Military Road is outside the scope of this assessment. Concerns about the provision for parking as part of new/proposed urban developments should be referred to local council.

Submission No.	Out of scope suggestion/issue/concern	Response
191	Suggests B-line buses use electric power rather than diesel to reduce noise and air pollution	The design and operation of the B-Line buses is outside the scope of this Proposal.
217	Suggest to convert the existing T3 lane to a bus lane only to improve journey times instead of implementing the B-Line service	The existing T3 lane is integral to the flow of traffic through the Proposal area. The conversion of this lane into a bus lane is likely to exacerbate traffic congestion by forcing a large number of vehicles into the remaining general traffic lanes, with little overall benefit to bus travel times.
243	What is happening to express bus services north of Mona Vale? What is happening to Bilgola Plateau's E89, Newport's E87, Avalon's E88 or Church Point's E86 or the L88 and L90.	The NBBP is a NSW Government initiative to provide a more frequent and reliable bus service between the Northern Beaches and Sydney's Central Business District. To support the introduction of the Northern Beaches B-Line, Transport for NSW is developing a bus service plan for the Northern Beaches. Due for release later this year, this plan will provide details of the bus network for all of the Northern Beaches and how customers can connect with the new B-Line and other services. Despite this the Proposal would still include changes to Route 236 at the intersection of Clifford Street and Spit Road. This change would be necessitated by the closure of the Clifford Street at this intersection.
243	Unhappy regarding the operation of roads (currently), including: Mona Vale Road. Wakehurst Parkway is a single lane each way closed in wet weather. Motorists can't turn right at the Warringah Road/Wakehurst Parkway intersection.	The scope of this assessment does not extend to traffic issues on Mona Vale Road or Wakehurst Parkway.
243	Unhappy regarding Northern Beaches Hospital, as will not be used by just Northern Beaches but also be used by Frenches Forest, Roseville Chatswood and even further west	The scope of this assessment does not include consideration of the Northern Beaches Hospital development.

Submission No.	Out of scope suggestion/issue/concern	Response
243	Unhappy regarding changes to E89 bus service (delayed from 6.20pm to 6.26pm)	To support the introduction of the Northern Beaches B-Line, Transport for NSW is developing a bus service plan for the Northern Beaches. Due for release later this year, this plan will provide details of the bus network for all of the Northern Beaches and how customers can connect with the new B-Line and other services.
275	I would like to ask that more bus services stop at Cremorne Junction. Neutral Bay Junction fairs much better by comparison.	To support the introduction of the Northern Beaches B-Line, Transport for NSW is developing a bus service plan for the Northern Beaches. Due for release later this year, this plan will provide details of the bus network for all of the Northern Beaches and how customers can connect with the new B-Line and other services. The timetables and fares of existing local and express bus services are determined by the State Government using criteria such as the route and distance travelled, and are not within the scope of this Proposal.
295	White shop fittings, shopping trolley, sofa and more items have been dumped on the corner of Clifford Street and Spit Road- please remove it	Current road maintenance and waste disposal are outside the scope of this Proposal.
311	Buses will still be held up on the Harbour bridge. Sydney Ferries are underutilised.	The scope of this assessment does not extend to traffic issues on the Warringah Freeway or the Harbour Bridge. Fares and other operational aspects of Sydney Ferries are not part of the scope of this assessment.
316, 150	Suggests tunnel should be the focus of our government	The provision of a tunnel is outside the scope of this assessment and this Proposal.
335	Suggests linking Ourimbah Rd and Gerard St as access to Harbour Bridge	The provision of a link to the Harbour Bridge is outside the scope of this assessment and this Proposal.
9, 16, 52, 118, 120, 121, 145, 154, 167	Bus congestion at Wynyard remains an issue.	The scope of this assessment does not extend to Wynyard.

2.22 Council Submissions

Submission numbers

46, 191.

Issue description

Mosman Council made a submission which included several issues. These are provided in Table 2-3 below. It is noted that Council also made a submission prior to the REF being put on public display; the contents of this submission were the same as the submission received after the display of the REF.

Table 2-3: Mosman Council issues and responses

Issue Category	Issue Sub-Category	Issue Description	Response
Traffic and transport	Parking	Opposition to the relocation of the existing M30 bus layover on the grounds it would result in a loss of on-street parking.	After reviewing the submissions received and further consultation with Mosman Council and local businesses, the Proposal to relocate the M30 layover to Military Road east permanently has been removed from the scope. The M30 bus service would continue to layover in Military Road east between 6am and 10am Monday to Friday as it currently does. Outside of these times the M30 bus would layover in its current position until such time as the project can find an alternative layover location. The project expects that the overall benefits during AM and PM Peak periods would not be adversely affected by the deletion of this scope item.
Socio-economic	Impacts to business	Opposition to the relocation of the existing M30 bus layover as the increased idling of buses in front of retail shops in Military Road would result in increased noise impacts on local shops and businesses.	
Socio-economic	Impacts to business	Opposition to the relocation of the existing M30 bus layover as the increased idling of buses in front of retail shops in Military Road would result in increased pollution impacts on local shops and businesses.	

Issue Category	Issue Sub-Category	Issue Description	Response
Socio-economic	Impacts to business	Opposition to the relocation of the existing M30 bus layover on the basis of impacts to business parking in that area	
Project description	Alternative solution/suggestion	Council requests TfNSW investigate the feasibility of providing a double layover at the former cinema site on Spit Road and if feasible submit plans to Council for review and comment. The design should attempt to minimise the use of open space at the Clifford Street end.	NBBP is investigating alternative locations for the M30 bus layover and would continue to consult with Council on any options that are identified.
Project description	Alternative solution/suggestion	The M30 route should be changed to arrive at its destination by travelling up Punch Street instead of Awaba Street.	NBBP will consult with State Transit and Service Planning and Development to verify the feasibility of Punch Street as the dedicated access route.

Issue Category	Issue Sub-Category	Issue Description	Response
Project description	Alternative solution/suggestion	Council suggests the construction of a pedestrian plaza connecting the new bus bay with surrounding businesses that is functional and aesthetically pleasing and allows for pedestrian accessibility at the western end of Clifford Street at Spit Road where the road is to be closed. Design of the pedestrian plaza and cul-de-sac should be undertaken by a suitably qualified person in consultation with Council and in consideration of the Mosman Pedestrian Access and Mobility Plan, Council's requirements for paving, footpaths, kerb and gutters and in accordance with Council Standards and the appropriate Australian Standards The design of the suggested plaza and cul-de-sac should ensure adequate turning space for heavy vehicles.	A pedestrian plaza would be introduced at the end of Clifford Street and would include appropriate landscaping and urban design in consultation with Mosman Council.

Issue Category	Issue Sub-Category	Issue Description	Response
Project description	Alternative solution/suggestion	Plans for development on 7 Spit Road (former cinema site), including temporary use, B-Line bus stop and indented bus bay, and other future development, should consider existing planning controls, benefits to the community, impacts on neighbouring properties and urban design and be developed in consultation with Council	The future use of the Greater Union cinema site is still being developed. Council's requests would be considered as part of any long term strategy for the property.
Project description	Alternative solution/suggestion	A condition of sale or development on 7 Spit Road (former cinema site), is that Council be dedicated a stratum lot containing underground parking of at least two levels. This will be for the purposes of a public car park to be managed by Council	

Issue Category	Issue Sub-Category	Issue Description	Response
Parking/project description	Consultation	In Response to the loss of three parking spaces along Military Road, Spit Road and Clifford Street in the AM Peak, 24 parking spaces in the off-peak and 21 parking spaces in the PM peak, options to accommodate displaced parking through the re-configuration of parking arrangements on side-streets, such as the conversion of some parallel spaces to angled parking or time restricted parking arrangements, should be subject to further consultation with local residents and businesses, and approval by Council's Local Traffic Committee.	B-Line would continue to work with Council and the local community to develop alternative parking solutions.
Traffic and transport	Alternative solution/suggestion (bus routes)	Options being investigated to determine an alternative location for the existing bus infrastructure in Clifford Street from where the Route 236 bus service would commence should occur in consultation with Council's traffic engineers.	TfNSW Service Planning and Development are currently developing the new bus service plan and information regarding the Bus Route 236 will be made available for consultation in due course.

Issue Category	Issue Sub-Category	Issue Description	Response
Biodiversity	Alternative solution/suggestion	All replacement planting is to be undertaken at the ratio of two trees planted for every one tree or shrub removed. The trees are to be planted in locations agreed with by Council that will not affect Ausgrid assets and include appropriate root barriers. They are to be maintained for a minimum of 6 months at the cost of RMS. Where replacement trees/shrubs cannot be planted in an adjacent location to those removed Council would reserve the right to identify areas within its own LGA to compensate through grove plantings of appropriate tree species. Should any additional trees or shrubs require removal to facilitate the works, these would also need to be replaced	Trees are to be retained to be clearly identified using Tree Protection Zones (TPZ) where they are in close proximity to the proposed works Vegetation offsets and/or landscaping would be undertaken in accordance with the Roads and Maritime *Environmental Impact Assessment Practice Note – Guidelines for Landscape Character and Visual Impact Assessment* (2013), the Roads and Traffic Authority *Biodiversity Guidelines* (2011) and the TfNSW *Vegetation Offset Guide* (TfNSW, 2013b). All planting would be undertaken in consultation with North Sydney and Mosman councils, and/or the owner of the land upon which the vegetation would be planted.

Issue Category	Issue Sub-Category	Issue Description	Response
Land use and property	Amenity	Concern the indented left turn lane at Awaba Street will impact the quality of life of nearby and adjacent residents. Mature trees will be removed which protect several apartments from the afternoon western sun. In addition pollution, noise, privacy and reduced driveway access would decrease amenity.	Following a review of submissions received, the design of Awaba Street/Spit Road intersection has been reassessed and the left turn bay has been removed. The project expects that the overall travel time benefits achieved by the Proposal would not be adversely affected by the deletion of this scope item because of additional benefits provided by the tidal flow system extension that were not apparent at the time the REF was issued.
Noise and vibration	Heavy vehicle	Concern the indented left turn lane at Awaba Street would cause an increase in noise levels will increase from large double decker buses and heavy trucks closer to their windows.	
Traffic and access	Safety	The left turn proposal from Spit Road into Awaba Street will reduce the safety of cars driving out of the underground garage.	
Traffic and transport	Modelling	The data provided in the traffic report attached to the REF with regards to the left turn at Awaba Street is not considered adequate to justify this scope item and further traffic modelling is required to justify that the left turn lane is required to improve capacity.	

Issue Category	Issue Sub-Category	Issue Description	Response
Traffic and transport	Safety	Concerns were raised for the road safety of commuter cyclists sharing the T3 lane with buses during the morning peak and requests RMS complete a safety audit	The design of the B-Line works would be subject to road safety audits at various stages of the design development and delivery and every effort would be taken to ensure that the Proposal does not adversely impact the safety of the local community.
Support	Nil	Council strongly supports the retention of the no left turn into Stanton Road in the morning peak.	B-Line confirms that the 'No Left Turn' to Stanton Road would remain during the morning peak.
Traffic and transport	Alternative solution/suggestion	It was requested that the right-turn from Spit Road into Pearl Bay Avenue is closed to reduce the risk of crashes occurring at this intersection.	The closure of the right hand turn into Pearl Bay Avenue is not included in the Northern Beaches B-Line Program scope of works. The initial advice from the RMS Principal Network Manager is that RMS would not consider any change to the current arrangements at Pearl Bay Avenue. Council should to raise this matter at the Council's Local Traffic Committee in the first instance.
Traffic and transport	Emergency services	Spit Road/Military Road is the only major traffic corridor into the lower Warringah Peninsula and as such concern was raised that any disruption to traffic along this corridor could have an impact on emergency services to the area.	There would be no adverse impacts to emergency services access to the Mosman area as a result of any of the B-Line road infrastructure improvements. Emergency services would likely benefit from reduced congestion expected from the Proposal.

Issue Category	Issue Sub-Category	Issue Description	Response
Traffic and transport	Safety	The Spit Road/Military Road corridor also passes through a predominately residential area which has potential risk implications	The design of the B-Line works would be subject to road safety audits at various stages of the design development and delivery and every effort would be taken to ensure that the Proposal does not adversely impact the safety of the local community.
Project description	Alternative solution/suggestion	A road tunnel based solution is necessary as is improving flows along the east- west corridor to address capacity issues along the Spit Rd Military Rd corridor.	On 16 March 2017, the Premier of NSW announced the status of the Beaches Link tunnel.
Consultation	Alternative solution/suggestion	The Mayor requests new Premier provides an update on the Northern Beaches Tunnel Project and the east-west corridor.	

North Sydney Council made a submission which included several issues. These are provided in Table 2-4 below. It is noted that Council also made a submission prior to the REF being put on public display; the contents of this submission were the same as the submission received after the display of the REF.

Table 2-4: North Sydney Council issues and responses

Issue Category	Issue Sub-Category	Issue Description	Response
Air quality	Nil	Increased priority for traffic on Military Road and local side roads, combined with road safety and travel security concerns will reduce walking, cycling and public transport mode share and increase motor vehicle mode share in Cremorne and Neutral Bay. This will have knock on impacts on increased particulate emissions from more traffic will deliver poorer air quality.	Refer to Section 2.16 of this Submissions Report
Biodiversity	Vegetation removal	The trees proposed for removal along Military Road between Cabramatta Road and Hampden Avenue are considered of high value due to their location adjacent a high trafficked arterial road. The removal of these trees will have an impact on North Sydney Council's ability to achieve its Street Tree Strategy and Urban Forest Strategy goals. Once trees are lost in these high traffic areas it is very difficult to replace or offset the benefits they once provided.	Refer to Section 2.19 of this Submissions Report

Issue Category	Issue Sub-Category	Issue Description	Response
Greenhouse gas	Nil	Reduced uptake of less polluting forms of travel and planning for significant increases in traffic on major arterials and local roads will result in significant increases in greenhouse gas emissions unless significant changes to the vehicle fleet, from internal combustion engine to e-vehicles, is completed. Removal of street trees will also impact local carbon sequestration capacity.	Section 6.11 of the REF assessed the impacts of the Proposal on greenhouse gas emissions. The REF concluded that once operational, the Proposal would encourage the increased use of public transport. Any resultant shift would potentially reduce the amount of fuel consumed by private vehicles, resulting in a relative reduction in associated greenhouse gas emissions throughout Spit Road and Military Road generally.
Noise and vibration	Nil	Increased priority for traffic on Military Road and local side roads, combined with road safety and travel security concerns will reduce walking, cycling and public transport mode share and increase motor vehicle mode share in Cremorne and Neutral Bay. This will have knock on impacts on local environments in terms of increased engine and tyre noise from both buses and traffic.	Refer to Section 2.15 Noise and Vibration of this Submissions Report
Project description	Active Transport	The B-line project should commit to supporting the delivery of active transport and streetscape improvement works in Cremorne and Neutral Bay.	NBBP is committed to working with Councils to integrate the B-Line's pedestrian and cycle ways with local active transport plans, and provide incentives to increase the connections between selected bus stops.

Issue Category	Issue Sub-Category	Issue Description	Response
Project description	North Sydney CBD B-Line Stop	There has been no inclusion of a North Sydney CBD Northern Beaches B-Line stop in the Proposal.	Providing a B-Line stop at North Sydney does not form part of the Northern Beaches B-Line Program scope. However as part of the new Northern Beaches Bus Service Plan, services to and from North Sydney are being reviewed.
Public Transport	North Sydney CBD B-Line Stop	NSC requested revised B-line business case demonstrating how the project will deliver increased connectivity between the northern beaches and the wider public transport network, particularly Sydney Metro services.	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this REF.
Traffic and Transport – Parking	Clarification	Clearway extensions continue to be discussed as an essential component of the B-line project however no details are provided in the REF council requests clarification regarding the point that that RMS will seek clearway extensions separately through alternative RMS processes.	Investigations into Clearway extensions are continuing and Council would be consulted prior to any planning approval process.
Project description	Justification	The lack of a publically released business case reduces confidence in the likely benefits of the project, the success of the project and overall value for money.	The Final Business Case is a Cabinet in Confidence document, and therefore not for public release.

Issue Category	Issue Sub-Category	Issue Description	Response
Project description	Options Assessment	The Proposal is not representative of a typical BRT project. As such, there is concern that the Proposal will deliver the benefits usually associated with a BRT project (including significantly reduced travel time, mode shift, traffic reduction and value for money). There is concern the project will not meet its objectives of: • Reduced travel times • Improving public transport reliability • Growing patronage on public transport • Increased service frequency • Improved public transport integration • Improved customer experience	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this Proposal.
Project description	Justification	The high cost of the Proposal is considered to outweigh the potential benefits. It is assumed that for every dollar spent, the region will only receive a 60 cent return on investment.	A comprehensive Cost Benefit Analysis was undertaken for the Northern Beaches B-Line Program and it found that the Proposal would generate economic benefits for Northern Beaches and Lower North Shore through improved transport and productivity outcomes. The analysis showed that the estimated economic benefits from the B-Line Program are likely to exceed the costs. The improvement in public transport is also expected to generate productivity benefits, including an increase in business to business connections as a result of a reduction in journey times between economic centres.

Issue Category	Issue Sub-Category	Issue Description	Response
Traffic and Transport – Safety	Pedestrian Safety and Amenity	Consideration should be given to improving the customer experience in terms of the safety and amenity of the local walking (or cycling) leg of the B-line journey.	Refer to Section 2.10.3 Safety of this Submissions Report.
Improved Customer Experience	Pedestrian Safety and Amenity	The project team should revisit the introduction of 40km/h High Pedestrian Activity Area speed limits in Cremorne and Neutral Bay as per Council's recommendations.	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this Proposal.
Improved Customer Experience	Active Transport	NSC request that improved walking and cycling links to local centres, local bus stops and B-line stops be included in the scope of the B-line project.	TfNSW is committed to working with Councils to integrate the B-Line's pedestrian and cycle ways with local active transport plans, and provide incentives to increase the connections between selected bus stops. However the provision of new or upgraded pedestrian or cyclist infrastructure is not part of this Proposal.
Parking Removal and Clearway Extensions	Amenity	Concern the loss of on street parking would affect the positive impact that on-street parking has on walkability as parked cars natural provide a buffer for pedestrians and slow traffic speeds.	NBBP has committed to investigating the feasibility of providing alternative buffer options to mitigate impacts on walkability. Any solution would be developed in consultation with Council and local Chamber of Commerce.

Issue Category	Issue Sub-Category	Issue Description	Response
Transport Security	Public Security	Relocation of bus stops away from Cremorne and Neutral Bay centres will also reduce natural surveillance of passengers waiting at these bus stops. This will result in reduced passive surveillance, starting a downwards spiral of reduced activity, reduced security and increased dominance of traffic in local centres.	The proposed locations of the local bus stops in Cremorne are in visible, well-lit locations that would not reduce 'natural surveillance' of passengers. The citybound bus stop in Neutral Bay is not being moved away from its current location and the outbound bus stop is being permanently located to its existing AM Peak location.
Social Well-being	Socio-economic	Social activities, such as outdoor dining, can also contribute to community connectedness. Consideration should be given to how the location/relocation of local and B-line bus stops will affect existing Military Road social spaces throughout Cremorne and Neutral Bay (outdoor dining, etc.).	The relocation of the local bus stops in Cremorne would have no impact on existing social spaces. The outbound bus stop is being relocated permanently to the existing AM Peak location. This area of Neutral Bay already experiences a high volume of bus standing during peak periods so no negative impacts are expected as a result of this bus stop relocation.
Active Health	Health	Reduced uptake of active travel modes will negatively affect the health of individuals and the North Sydney community.	TfNSW is committed to working with Councils to integrate the B-Line's pedestrian and cycle ways with local active transport plans, and provide incentives to increase the connections between selected bus stops.

Issue Category	Issue Sub-Category	Issue Description	Response
Parking Removal and Clearway Extensions	Impacts to business	Businesses will be impacted by the Removal of parking will also result in the loss of informal loading areas servicing businesses on Military Road. Concern that coordinating deliveries/pickups for periods outside of clearway times or from local side streets will increase operational costs for businesses. In addition, reduced safety and amenity in Cremorne and Neutral Bay retail precincts will negatively impact business activity and increased traffic on Military Road will increase the cost of congestion along the project corridor.	Refer to Section 2.9.1 Opposition of the Relocation of Bus Stops at Cremorne of this Submissions Report.
Ben Boyd Road	Active transport	Council has previously received concerns about the volume of traffic on Watson Street and Yeo Street and poor pedestrian access due to the volume of vehicles using this route. Any increase in traffic is likely to exacerbate these issues. Pedestrian facilities should be considered at this intersection.	Refer to Section 2.8 Ben Boyd Road in this Submissions Report

Issue Category	Issue Sub-Category	Issue Description	Response
Ben Boyd Road	Alternative routes	No consideration has been given to the Woolworths delivery trucks which currently access the Woolworths Loading Dock via Ben Boyd Road and Grosvenor Lane. These trucks cannot physically use Young Street and it is not desirable for these trucks to use the alternative route via Watson Street and Yeo Street which passes a residential area and Neutral Bay Public School.	Following a review of submissions received and further assessment of the impacts on the surrounding community, it has been decided that the turn restrictions proposed at Ben Boyd Road would be removed from the scope of the proposal. This decision has been made following ongoing consultation with North Sydney Council regarding alternative options that would provide comparable benefits to the B-Line project. The project would continue to work with Council to develop a wider area-based solution.
Cabramatta Road	Traffic and transport	Concern regarding the potential removal of parking spaces in Cabramatta Road to enable a heavy vehicle turning facility near the partial road closure.	Refer to Section 2.6 Cabramatta Road in this Submissions Report
Traffic and transport	Congestion	The proposal would decrease business output in Cremorne and Neutral Bay which would increase the number of resident journeys that will need to be made to more regional centres with better pedestrian/shopping amenity, thereby generating traffic	Refer to Section 2.17 Business in this Submissions Report

Issue Category	Issue Sub-Category	Issue Description	Response
Cabramatta Road Closure	Local roads	The traffic report notes that 86 vehicles per hour turn left into Military Road from Cabramatta Road. The report assumes that these vehicles will either divert to Spofforth Street or Spencer Road to turn left. Appendix D of the REF includes an assessment of the relative increases in traffic on these roads; however there is no comparison of existing traffic volumes. This assessment estimates 50% of displaced vehicles will use Spencer Road and 50% will use Spofforth Street to turn left onto Military Road. Spencer Road has an average daily volume of 913 vehicles. There is a predominant flow of traffic in the north-west direction (65%). Peak hourly volumes on Spencer Road are in the order of 80 vehicles per hour. Based on the assessment in Appendix D which estimates 50% of displaced vehicles using Spencer Road, this would see traffic volumes on Spencer Street increase by 63%. This relative increase is likely to be adversely felt by local residents of Spencer Road. NSC request B-Line to demonstrate how overarching benefits of the project will off-set the significant dis-benefits associated with the displacement of traffic on to Spencer Road: poorer travel safety, reduced uptake of active travel modes, poorer local environments, etc.	Refer to Section 2.6 Cabramatta Road of this Submissions Report.

Issue Category	Issue Sub-Category	Issue Description	Response
Ben Boyd Road Turn Restrictions	Local roads	The Proposal will place around 71-101% more traffic on Young Street, which is the centre of the Neutral Bay Shopping area and has a very high volume of pedestrians. This conflicts with Council's plans to downgrade the vehicular role of Young Street and enhance the streetscape and pedestrian amenity of the area. NSC request B-Line to demonstrate how overarching benefits of the project will off-set the significant dis-benefits associated with the displacement of traffic on to Watson St and Yeo St: poorer travel safety, reduced uptake of active travel modes, poorer local environments, etc. NSC request B-Line to further investigation of the closure of Young Street to traffic at Military Road, including significant upgrades to walking and cycling infrastructure to improve access to the Neutral Bay centre and B-line bus stops.	Refer to Section 2.8 Ben Boyd Road in this Submissions Report
Parking Removal and Clearway Extensions	Parking	Concern with regards to the loss of on-street parking in terms of convenience for drivers parking proximate to their destination, particularly for mobility impaired users in Cremorne and Neutral Bay	Refer to Section 2.10.4 Parking in this Submissions Report
Parking Removal and Clearway Extensions	Parking	Concern the suggestion to replace lost parking by increasing on-street parking numbers in local side streets is unfeasible.	Refer to Section 2.10.4 Parking in this Submissions Report

Issue Category	Issue Sub-Category	Issue Description	Response
Traffic and transport	Pedestrian Safety	During construction temporary pedestrian facilities should be provided on the same side of Military Road as the footway closure with appropriate ramping provided for mobility access, even where this requires the temporary closure of a Military Road traffic lane.	Noted.
Cremorne Bus Stops	Pedestrian Safety	The proposed location of the new bus stop opposite Holt Avenue is located approximately 120 metres to the west of the existing stop. The nearest pedestrian crossing is 130 metres away at Winnie Street. Without any formal pedestrian crossings nearby for people travelling from the south side of Military Road this is likely to result in fewer passengers choosing to use this stop.	Refer to Section 2.9 Cremorne Town Centre in this Submissions Report
Murdoch Street Right Turn	Congestion	The proposal will therefore see a 39% increase in traffic on Waters Road in the AM peak. This increase in traffic volumes is likely to be adversely felt by local residents, businesses and the school community. NSC request B-Line to demonstrate how overarching benefits of the project will off-set the significant dis-benefits associated with the displacement of traffic on to Waters Road: poorer travel safety, reduced uptake of active travel modes, poorer local environments, etc.	Refer to Section 2.10 Traffic and Transport in this Submissions Report

Issue Category	Issue Sub-Category	Issue Description	Response
Social Well-being	Urban design and visual impact	All B-line works should contribute to the delivery of streetscape improvement works by delivering the streetscape pallet identified in North Sydney Council's Public Domain Style Manual. Any B-line works should be coordinated with North Sydney streetscape improvements to ensure the consistent delivery of streetscape improvements throughout Cremorne and Neutral Bay.	NBBP would work with NSC to coordinate the B-Line works with NSC streetscape improvement works.
Local Environments	Water quality	Increased priority for traffic on Military Road and local side roads, combined with road safety and travel security concerns will reduce walking, cycling and public transport mode share and increase motor vehicle mode share in Cremorne and Neutral Bay. This will have knock on impacts on local environments in terms of decreased water quality	Refer to Section 6.8 of the REF for assessment of impacts on soils and water.
Traffic and Transport	Travel safety	Increases in the visual width of the road will result in increased traffic speeds will increase the risk of all crash types occurring and the severity of injuries when crashes occur.	Refer to Section 6.1 of the REF and this submissions report for assessment of traffic and transport impacts of the Proposal.
Reduced Travel Times		NSC requesting B-Line to prepare a revised business case demonstrating how the B-Line project will deliver targeted travel time benefits for public transport passengers travelling between the northern beaches and Global Sydney.	Refer to Section 6.1 of the REF and this submissions report for assessment of traffic and transport impacts of the Proposal.

Issue Category	Issue Sub-Category	Issue Description	Response
Improved Public Transport Reliability	Bus Lanes	NSC claim that not pursuing dedicated bus lanes as part of this project will make it impossible to guarantee the reliability of the B-line bus service as it will depend entirely on the level to which 'other vehicles' interfere with the operation bus services within the T3 lane. These 'other vehicle' journeys are likely to increase significantly as population led traffic growth increases congestion on the project corridor over time.	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this REF. As stated in the REF, the project team is also exploring other initiatives to improve bus journey times such as extending clearways and bus lanes in some sections of the B-Line corridor. If a decision is made to undertake more detailed investigations of these options they would be subject to separate environmental impact assessments and local residents and businesses would be consulted as part of that process.
Grow Patronage on Public Transport	Mode Shift	NSC have requested a revised business case demonstrating how the project will incentivise public transport use without incentivising private vehicle use in order to maximise growth of public transport patronage.	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this REF.
Increased Service Frequency		NSC understanding is that existing express services will be re-branded as B-line services and new double-decker buses introduced as opposed to a real increase in service frequency. Requested revised business case demonstrating how the project will deliver increased public transport service frequency	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this REF.

Issue Category	Issue Sub-Category	Issue Description	Response
Accessibility		Accessibility improvements (above what is currently provided by kneeling bus technology) do not appear to have been considered as part of the proposal.	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this REF.
Future Demand		The REF notes that, over the next 15 years, NSW will require infrastructure to support 40 per cent more train trips, 30% more car trips and 31% more households. A similar understanding of Northern Beaches/B-line travel demand and infrastructure requirements would be useful for understanding TfNSW's vision for the B-line project.	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this REF.
Transport Affordability		NSC requested a revised business case demonstrating how the project will address community priorities in regards to the financial impacts of the project in terms of its overall cost as well as the financial implications of its impact on safety, security, social well-being, health, fair access to parking, environmental sustainability, local environments, the cost of fares, congestion and business activity.	Refer to the REF and this Submissions Report for assessment of impacts from the Proposal and proposed mitigation measures.
Transport Affordability	B-Line Operation	NSC does not support the privatisation of the B-Line services following the delivery of the B-Line project. NSC request commitment to the retention of the B-Line under public management in perpetuity.	This REF relates to the proposed road infrastructure works to support the B-Line service. This issue is not within the scope of this REF.

Issue Category	Issue Sub-Category	Issue Description	Response
Business Activity		NSC request a revised business case demonstrating how the project will address community priorities in regards to business activity and the viability of Cremorne and Neutral Bay centres.	Refer to the REF and this Submissions Report for assessment of impacts from the Proposal and proposed mitigation measures.

3 Changes to the Proposal

Since the display of the REF, NBBP has made further updates and refinements to the Proposal in Response to specific community concerns and further investigations. These changes have been made in Response to submissions received from the community (Section 2) and in accordance with the original objectives of the Proposal (as defined in Section 2.1.4 of the REF).

The following items have been amended in the scope of the Proposal:

- The construction of a new left hand turn lane from Spit Road (city bound) into Awaba Street has been removed from the scope of the Proposal
- The permanent relocation of the M30 bus layover from Spit Road to Military Road east has been removed from the scope of the Proposal
- The construction of an indented bus bay on Military Road (citybound) between Murdoch Street and Hampden Avenue has been removed from the Proposal scope. Subsequently the relocation of the bus shelter and ancillary infrastructure at this location has been also been removed from the scope of the Proposal
- The relocation of outbound and citybound local bus stops at Cremorne has been reassessed and the proposed locations of the Cremorne bus stops have been revised. The outbound bus stop would now be moved 105 metres west (towards Neutral Bay) from its current location. A bus shelter would be provided in this new location to provide protection from inclement weather. The citybound bus stop at Cremorne would be moved 95 metres west (towards Neutral Bay) from its current location. No bus shelter would be provided in this new location as this bus stop would be adjacent to an existing shop awning
- All proposed turn restrictions at the intersection of Military Road/Ben Boyd Road have been removed as part of the scope of the Proposal. Traffic restrictions at this intersection would remain as per the existing scenario
- The proposed section of tidal flow between Watson Street and Ben Boyd Road at Neutral Bay has been removed from the scope as part of the Proposal. Changes at this intersection are still being considered as part of a wider area-based solution which is being developed in consultation with North Sydney Council, but are no longer part of this proposal
- Additional parking impacts in Zones A2, A5, B1, and C5 as a result of ongoing design development
- Changes to the setup and operation of the construction compound on the corner of Clifford Street and Spit Road. The compound would now operate from ground level rather than underground, as the former cinema is currently being demolished. The compound will also operate 24 hours a day during construction of the Proposal.

These changes are discussed in further detail below.

3.1 Left turn bay at Awaba Street/Spit Road

3.1.1 Description

The REF proposed to construct a dedicated indented left turn lane from Spit Road into Awaba Street. This would have required the acquisition of private property adjacent to this intersection, including the removal of vegetation and an existing garden wall.

A number of submissions were received that objected to this both generally and specifically. These submissions expressed concerns that the new left turn bay would increase congestion on both Awaba Street and other local roads such as Moruben Road, would result in an increased risk to pedestrian safety and that the removal of vegetation and an existing garden wall would result in increased noise, decrease air quality and reduced visual amenity for nearby residents.

These concerns from the community have been directly addressed by removing this left turn bay from the updated scope of works for the Proposal.

The original Proposal included this turning lane in order to reduce delays to B-Line buses, local buses and general traffic travelling south on Spit Road by allowing turning traffic to wait for pedestrians to cross Awaba Street without blocking the kerb lane. The REF was prepared on the basis of modelling predicting travel time benefits that would arise from removing this obstruction to traffic in the kerbside lane. Upon further analysis it is expected that the overall travel time benefits achieved by the REF Proposal would not be substantially reduced by the deletion of this scope item because of additional benefits provided by other aspects of the Proposal.

3.1.2 Additional Environmental Assessment and Potential Impacts

There would be no additional environmental impact arising from the changes to the Proposal presented in this report as the left hand turning bay from Spit Road (citybound) into Awaba Street described in the REF has been removed from the scope of works. There would be no change to the current structure or operation of the Awaba Street/Spit Road intersection and the proposed partial property acquisition, vegetation removal, road widening works, or utility adjustments as outlined in the REF would not be undertaken. Some minor works as described in the REF would continue to take place at this location including pavement works for median replacement and resurfacing for the tidal flow extension, however these are not additional to the proposed works described at this location in the REF. Consequently, the existing situation in this location would be retained; as such no additional environmental assessment is required.

3.1.3 Revised Management and Mitigation Measures

No additional management or mitigation measures are required as a result of this design change. Mitigation measures included in the REF were generalised across the various works locations and as such no measures were specific to this location. Hence no mitigation measures have been altered or removed from those outlined in the REF.

Impact	Environmental safeguard	Responsibility	Timing
Nil	No additional environmental safeguards are required.	N/A	N/A

3.2 Relocation of M30 bus Layover at Military Road East

3.2.1 Description

The REF proposed to permanently relocate the M30 bus layover from the kerbside lane of the citybound carriageway of Spit Road just north of Clifford Street to Military Road east. At present the M30 bus stands in Military Road east only between 6am and 10am weekdays when the clearway is active along Spit Road. The Proposal in the REF was for the layover to be placed on Military Road full time.

A number of submissions were received from residents and local business owners on this issue. All of these submissions objected to this element of the Proposal. These submissions expressed particular concerns that the permanent relocation of the bus layover would result in increased noise, decreased air quality, reduced visual amenity and loss of visual exposure for nearby businesses. Business owners submitted that this would adversely affect their trading potential.

These concerns from the community have been directly addressed by removing the proposed changes to the M30 layover from the scope of the Proposal. As such the M30 layover would

remain active on Military Road east between 6am and 10am Monday to Friday as per the current scenario.

Outside of the AM peak period the M30 bus layover would move slightly north of its current location. At present the non-peak period layover is adjacent to the former Greater Union cinema (11 Spit Road, Mosman), just north of Clifford Street. The layover would now move north by about 60 metres so as to be located between the driveway entrance to The Garrison Retirement Centre and the pedestrian crossing for Ourimbah Road.

This update to the Proposal would retain existing traffic scenario along Spit Road and Military Road east i.e. the M30 would only lay over in Military Road east between 6am and 10am Monday to Friday. The benefits proposed in the REF for traffic flow along Spit Road are not expected to substantially diminish as a result of the deletion of this scope item.

3.2.2 Additional environmental assessment and potential impacts

The removal of this scope item from the Proposal would mean that there would be no changes to the operation of the M30 layover on Military Road east. Impacts likely to arise as a result of the original Proposal, including loss of on-street parking, permanently reduced visibility of businesses and localised noise and air quality impacts would now be avoided. As such the impact of this change to receptors on Military Road east is expected to be neutral in the context of the existing scenario.

On Spit Road it is proposed that the existing M30 layover be moved slightly north of its existing location, as described above. This would place the layover directly in front of The Garrison Retirement Centre, a distance of about 60 metres from its current location. This would place standing buses directly in front of residents and would expose them to a slight increase in traffic noise associated with buses stopping and starting in this location. Given that buses generally switch off their engines while waiting at the layover, the momentary noise impacts associated with buses stopping and starting are not expected to be substantial in the context of the existing traffic on Spit Road, particularly given the current high levels of congestion and stopping and starting movements of general traffic through this location resulting from the Spit Junction traffic lights.

Air quality impacts associated with the revised bus layover location are expected to be negligible in the context of the emissions currently present on Spit Road.

The visual impact of the presence of the M30 in the revised layover location is expected to be negligible on the basis of the presence of thick screening vegetation in the front setback of The Garrison. This vegetation would screen most views of Spit Road and as such the outlook for residents would not be substantially affected.

The revised location of the M30 layover would not result in any adverse impacts upon traffic flow in this location over the existing scenario. The relocation may result in a minor improvement for traffic when combined with the proposed bus indent in that it would increase the distance between buses waiting in the layover and the traffic lights at Spit Junction. This would allow traffic to move more freely through the intersection with fewer obstructions.

3.2.3 Revised Management and Mitigation Measures

No additional management or mitigation measures are required as a result of this design change as works would not be carried out in this location and it would not constitute a change in the current design or use of the M30 bus layover at the Spit Road.

Impact	Environmental safeguard	Responsibility	Timing
Nil	No additional environmental safeguards are required.	N/A	N/A

3.3 Relocation of Local Bus Stops in Cremorne

3.3.1 Description

A key element of the Proposal described in the REF was to provide for additional bus and general traffic flow during the AM peak through Military and Spit Roads. In light of this the REF Proposal included the provision of a tidal flow system on Military Road between Cabramatta Road and Spencer Road to provide three uninterrupted citybound general traffic lanes through Cremorne town centre during the AM peak. This Proposal included the relocation of the existing bus stops on both sides of the road Cremorne town centre to the west.

A number of submissions were received from residents and local business owners on this issue. All of these submissions objected to this element of the Proposal. These submissions expressed particular concerns that the relocation of the bus stop would result in adverse impacts upon access to shops and increased walking distances to bus stops. Local business owners submitted that this would adversely affect their trading potential.

These concerns have been addressed through a revision to the scope of works presented in the REF. The Proposal at this location now includes the relocation of the citybound bus stop at Cremorne about 95 metres west of its current location (towards Neutral Bay). This would place the revised bus stop location outside 271 Military Road. No bus shelter would be provided in this location as the new bus stop would be adjacent to an existing shop awning.

The outbound bus stop at Cremorne would be moved about 105 metres west of its current location (towards Neutral Bay). This would place the revised bus stop location outside 326 Military Road. A new bus shelter would be provided in this location to provide shelter from inclement weather. These changes have been included so as to maintain accessibility to bus services for the community whilst still allowing traffic changes to be implemented. The locations of the bus stops have also been considered in light of minimising potential impacts upon local businesses.

Given that the revised bus stop locations would still allow the implementation of the tidal flow system it is expected that the overall travel time benefits achieved by the Proposal would not be adversely reduced by this revision to this scope.

3.3.2 Additional Environmental Assessment and Potential Impacts

The revised locations of the two bus stops at Cremorne have changed only slightly from those proposed in the REF. The citybound bus stop has been moved closer to its existing location compared to the location previously proposed in the REF (now 95 metres west of the existing stop compared to 110 metres previously). The outbound bus stop has also moved closer to the existing location, now being 105 metres from the existing stop compared to 130 metres previously. As such this change to the proposed scope of works is not expected to result in any impacts that are different or additional to those described in the REF. As such no additional environmental assessment is required.

The relocation of the outbound bus stop at Cremorne would involve the construction of a new bus shelter outside 322 Military Road. As the construction of the new bus shelter constitutes a new scope item, the potential impacts of the bus shelter were not assessed in the REF. As such, additional assessment of this scope item has been undertaken below with relevant additional safeguards provided in Section 3.6.3.

Traffic and transport

Traffic and transport impacts were originally assessed and described in Section 6.1 of the REF. The traffic and transport impacts described in the REF are considered to remain applicable in regards to the relocation of the outbound and citybound bus stops at Cremorne with the exception of potential impacts to bus services during construction.

Construction

During construction there is the potential for existing local bus services to be disrupted as the construction of the new bus shelter may result in the temporary relocation of bus stops and lane closures. The majority of works that would require lane closures would be carried out as night works and as such would result in a limited overall level of impact to bus services and general traffic movements. In addition, any temporary traffic diversions and changes to bus services (including zones and stops) would be minimised where possible and would be adequately sign-posted, with advance notification provided to the community. It is considered that the mitigation measures outlined in section 7.2 of the REF would remain appropriate to manage any potential impacts to traffic and transport during construction. No additional mitigation or management measures are required.

Access to buildings and driveways would be maintained throughout the duration of construction.

Operation

To accommodate the citybound bus stop at 271 Military Road it would be necessary to remove approximately 10 on-street parking spaces, as assessed in the REF. These spaces are available as a restricted one hour stay between 10am and 6pm Monday to Friday and 8.30am and 12.30pm Saturday. Parking is unrestricted outside of these times with the exception of 3pm to 7pm Monday to Friday when the kerbside lane is designated as a T3 transit lane.

To accommodate the outbound bus stop it would be necessary to remove approximately 20 on-street parking spaces between 308 and Cremorne Garden Plaza, which is 11 more spaces than assessed within the REF. All spaces in this location are available as a restricted one hour stay between 6.30am and 3pm Monday to Friday and 8.30am and 12.30pm Saturday. Parking is unrestricted outside of these times with the exception of 6am to 10am Monday to Friday when the citybound kerbside lane is designated as a T3 transit lane and 3pm to 7pm Monday to Friday when the outbound kerbside lane is designated as a T3 transit lane.

No new parking spaces would be introduced at place of the existing citybound bus stop at 306 Military Road. This space would be required for the transition into a new lane as necessitated by the new tidal flow system.

Overall the Proposal would result in a net loss of 30 parking spaces along Military Road within Cremorne town centre. Whilst it is possible that most trade in this area is undertaken by customers on foot or public transport the loss of these spaces is likely to have a minor impact upon local businesses. It is expected that customers seeking to patronise businesses in this location would be able to find alternative parking in nearby side streets when other on-street spaces on Military Road are fully occupied.

Urban design, landscape and visual amenity

As described in the REF, the visual character of the Proposal area and the revised locations of the outbound and citybound bus stops at Cremorne are typical of a main arterial road within an established urban environment. Surrounding land uses include low to medium/high density

residential and commercial land uses. The density of these land uses intensifies closer to local centres such as the subject site at Cremorne. Visual features dominating the Proposal area comprise road (and related) infrastructure, traffic, pedestrian footpaths, and commercial buildings. Visual receivers include community facility users, local businesses, residents, vehicle-based receptors, pedestrians and cyclists.

Urban design, landscape and visual amenity impacts were assessed and described in Section 6.2 of the REF. The urban design, landscape and visual amenity impacts described in the REF are considered to remain applicable in regards to the relocation of the outbound and citybound bus stops at Cremorne with the exception of following:

Construction

The relocation of the citybound and outbound bus zones at Cremorne would result in temporary visual impacts for receivers located on and nearby Military Road during construction. This is particularly relevant to construction of the new bus shelter at the relocated citybound bus stop. Potential visual impacts during construction may include the presence of construction vehicles, plant and machinery on site. It may also be necessary to stockpile materials at the site of the new bus shelter, however this would generally be temporary and the materials would be utilised or removed by the end of each construction shift.

It is noted that the majority of works within the Proposal area would be carried out as night works. As such, the construction of the bus shelter may include temporary lighting for operational, safety and security purposes. Lighting installations would be placed to minimise light spill to adjoining road corridors and occupied residential or commercial areas.

All disturbed areas would be restored to their pre-construction condition upon completion of construction.

Potential construction impacts associated with the relocation of the citybound and outbound bus stops at Cremorne would be temporary in nature. The implementation of safeguards outlined in Section 7.2 of the REF would minimise these impacts on surrounding receivers and the environment. No additional mitigation or management measures are required.

Operation

An assessment of the visual sensitivity and magnitude of the relocated outbound and citybound bus stops and bus shelter was undertaken for the operational phase of the Proposal. As per the REF, the sensitivity of the receiver is assessed based upon the extent to which it can accept change of a particular type and scale without adverse impacts on its character. The magnitude of change affecting a visual receiver depends on factors such as extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the Proposal. The visual impact grading matrix was used to assign a rating to each visual receiver (refer to Table 3-1).

Table 3-1: Visual impact grading matrix

Sensitivity	Magnitude: High change	Moderate change	Low change	Negligible change
High	High	High-moderate	Moderate	Negligible
Moderate	High-moderate	Moderate	Moderate-low	Negligible
Low	Moderate	Moderate-low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

The area to which the citybound and outbound bus stops at Cremorne are proposed to be relocated consist of a busy urban road corridor, including the footpath adjacent to commercial premises. This is very similar to that of the current bus stop locations. The commercial premises at the proposed revised location of the bus stops would be accustomed to heavy pedestrian and vehicular traffic. As such, the proposed sites for the relocation of the bus stops are considered to be of low sensitivity.

The installation of signage associated with the bus stops would be generally consistent with the existing local visual environment. No commercial advertising material is proposed at either bus stop location. As such, the magnitude of visual impact would be low at the proposed outbound bus stop. The proposed installation of the new bus shelter at the citybound bus stop is considered to constitute a moderate-low visual impact.

Based on the above, the overall visual impact of the relocation of the outbound bus stop at Cremorne, as determined by the visual impact grading matrix, is considered to be low. The overall visual impact of the relocation of the outbound bus stop at Cremorne including the installation of a new bus shelter, as determined by the visual impact grading matrix, is considered to be moderate.

Whilst the construction of a new bus shelter at the relocated citybound bus stop at Cremorne would result in a moderate alteration to the existing visual environment, this change would be generally consistent with the existing visual environment and would not result in a substantial adverse impact upon the general landscape character of the Proposal area.

The implementation of safeguards outlined in Section 7.2 of the REF would minimise the potential impacts to urban design, landscape and visual amenity associated with the relocation of the bus stops at Cremorne, including the installation of a new bus shelter. No additional mitigation or management measures are required.

Noise and vibration

Construction

During construction, there is likely to be a short term localised increase in noise and vibration associated with construction of the new citybound bus shelter. The operation of machinery, tools

and equipment in addition to construction vehicle movements are expected to generate noise consistent with those described in Section 6.3 of the REF.

The implementation of safeguards outlined in Section 7.2 of the REF would minimise the potential noise and vibration impacts associated with the relocation of bus stops at Cremorne, including the installation of a new bus shelter. No additional mitigation or management measures are required.

Operation

The relocation of both citybound and outbound bus stops at Cremorne would result in buses stopping and accelerating into and out of the stops. This would result in a minor increase in operational noise at the new locations, with a commensurate decrease in operational noise at their existing locations. The additional operation noise at the relocated bus stops would be consistent with the use of Military Road as a major arterial transport corridor. This road currently accommodates numerous bus services, the frequency of which is generally consistent with other general traffic. As such the additional operation noise impact in this location is not expected to substantially increase or to be different in nature to existing road noise. On this basis the overall operational noise impact at the new bus stop locations is expected to be negligible.

No additional mitigation or management measures are required.

Socio-economic

Socio-economic impacts of the Proposal were assessed and described in Section 6.6 of the REF. This included the loss of on-street parking for customer of local businesses and impacts upon visual amenity. These impacts would also apply to the relocated bus stop locations.

The relocation of both bus stops and removal of available on street parking would result in commuters waiting for buses in different locations to those currently, and the requirement for some motorists to find alternative parking locations not directly outside of some business frontages. It is recognised that this may result in the reduction in passing trade for some businesses currently located adjacent to these bus stops. This would be offset by the increase in passing trade for those businesses adjacent to the new bus stops. It is further recognised that the types of businesses differ in these locations, with those adjacent to the existing stops more likely to offer goods and services relevant to commuters, such as coffee shops and newsagents.

There is however the potential for many commuters and motorists to continue to patronise the business near to the existing stops (particularly pedestrians en route to the relocated bus stops). There is also the potential for some businesses to experience an increase in passing trade and potentially revenue.

No additional mitigation or management measures to those which are provided in Section 7.2 of the REF are required.

Biodiversity

The relocation of the citybound and outbound bus stops at Cremorne town centre would not require the removal of any additional vegetation over and above that specified in the REF.

Air quality

Air quality impacts were originally assessed and described in Section 6.9 of the REF. The air quality impacts described in the REF are considered to remain the same as assessed with the exception of the following:

Construction

The construction of the new bus shelter would involve additional ground disturbance and as such, has the potential to result in dust emissions that are different or additional to that assessed in the

REF. These works are likely to be undertaken at night which would reduce risks to passers-by and local businesses. In addition, construction works would be temporary in nature and mitigation measures as described in Section 7.2 of the REF would be implemented to manage any potential air quality impacts. This would include the removal of any stockpiles at the end of each construction shift. As such, the potential for construction of the new bus shelter to result in an adverse effect on air quality is considered to be low.

No additional mitigation or management measures to those which are provided in Section 7.2 of the REF are required.

Operation

The relocation of the citybound and outbound bus stops at Cremorne would mean that buses would now stop in a different location. The relocation of the bus stops has been proposed in such a way as to maintain convenient access to public transport and shopping facilities for local shoppers as this was raised as a particularly concern in the submissions received from the community. Overall it is considered that air quality impacts during the operation phase would remain similar to those described in the REF. That is, air emissions from operational traffic, including buses, are expected to remain broadly similar to the existing scenario. Also, as the Proposal would increase reliability and quality of public transport, the use of this service would be expected to increase, leading to a relative reduction in the amount of private vehicle related emissions in the long-term.

No additional mitigation or management measures to those which are provided in Section 7.2 of the REF are required.

3.3.3 Revised Management and Mitigation Measures

No additional management or mitigation measures are required as a result of this design change. Mitigation measures included in the REF were generalised across the various works locations and as such no measures were specific to this location. Hence no mitigation measures have been altered or removed from those outlined in the REF.

Impact	Environmental safeguard	Responsibility	Timing
Nil	No additional environmental safeguards are required.	N/A	N/A

3.4 Indented Bus Bay Near Hampden Avenue

3.4.1 Description

The REF proposed to create an indented bus bay on Military Road between Murdoch Street and Hampden Avenue. This included the relocation of the existing bus shelter and associated infrastructure away from the existing kerb line to account for the indent.

A number of submissions were received from the community relating to this element of the Proposal. These submissions suggested that this element of the Proposal would result in a series of adverse impacts upon local amenity, private property, vegetation, noise, privacy and air quality, among others.

These concerns from the community have been directly addressed by removing this element of from the scope of the Proposal. As such the bus stop in this location would remain in its present location and would not be indented. The existing bus stop and associated infrastructure would remain in its current location.

NBBP would continue to investigate alternative options that would seek to provide the benefits to bus travel times and reliability provided by the previous design whilst seeking to maintain the existing level of service for general traffic within the local road network and minimising impacts on the community.

3.4.2 Additional Environmental Assessment and Potential Impacts

As works to construct a new indented bus bay on Military Road between Murdoch Street and Hampden Avenue are no longer required, this change to the proposed scope of works is not expected to result in any impacts additional to those described in the REF. Consequently, as the removal of this scope item would not result in any changes to the existing situation in this location, no additional environmental assessment is required.

3.4.3 Revised Management and Mitigation Measures

No additional management or mitigation measures are required as a result of this design change. Mitigation measures included in the REF were generalised across the various works locations and as such no measures were specific to this location. Hence no mitigation measures have been altered or removed from those outlined in the REF.

Impact	Environmental safeguard	Responsibility	Timing
Nil	No additional environmental safeguards are required.	N/A	N/A

3.5 Ben Boyd Road Turn Restrictions

3.5.1 Description

As part of the changes to the Proposal presented in this report, the following traffic movement restrictions along Military Road have been deleted from the scope of works:

- No left turn from Military Road (outbound) into Ben Boyd Road, except for buses
- No right turn when travelling south bound from Ben Boyd Road into Military Road
- No left turn when travelling north bound from Ben Boyd Road into Military Road.

A number of submissions were received from residents and other local groups on this issue. All of these submissions objected to this element of the Proposal. These submissions expressed particular concerns that the proposed turn restrictions would result in additional congestion, endanger the safety of pedestrians (including school children at Neutral bay Primary School), impact upon the ability for taxis and ride sharing services to pick up and drop off passengers in front of local businesses and result in an adverse impact upon local air quality, noise levels and parking availability. Submissions also expressed concern that these impacts, in addition to a reduced ability to access to loading bays, would adversely affect the trading potential of local businesses.

Following a review of submissions received and upon further assessment of the potential impacts of these allowable traffic movement restrictions on the surrounding community, it has been determined that the turn restrictions proposed at Ben Boyd Road would be removed from the scope of the works. This decision has been made following consultation with North Sydney Council regarding alternative options that may provide comparable benefits to the B-Line project. The project would continue to work with Council to develop a wider area-based solution that provides the benefits to bus travel times and reliability whilst seeking to maintain the existing level of service for general traffic within the road network.

3.5.2 Additional Environmental Assessment and Potential Impacts

The removal of this scope item from the Proposal would mean that there would be no changes to the existing Military Road/Ben Boyd Road intersection restrictions. As such impacts upon the local environment described in the REF such as congestion, pedestrian safety and business impacts would not occur. In the absence of these previous impacts or any new impacts the Proposal is expected overall to result in a neutral impact upon the community and the environment in this location. As such, no additional environmental assessment is required.

3.5.3 Revised Management and Mitigation Measures

The removal of the proposed traffic movement restriction at the Ben Boyd Road/ Military Road intersection from the proposed scope of works is not expected to result in any impacts additional to that described in the REF. Consequently, as the deletion of this scope item would not result in any changes to the existing situation in this location, no additional environmental assessment is required.

Impact	Environmental safeguard	Responsibility	Timing
Nil	No additional environmental safeguards are required.	N/A	N/A

3.6 Tidal Flow System at Ben Boyd Road

3.6.1 Description

The proposed scope of works as described in the REF included the construction of a new lane management (tidal flow) system on Military Road between Spofforth Street and Watson Street and the restriction of allowable traffic movements including the implementation of a no right turn from Military Road (outbound) into Murdoch Street during AM peak (6am–10am).

As part of the changes to the Proposal, the proposed section of tidal flow on Military Road at Ben Boyd Road intersection in Neutral Bay has been removed from the REF. This decision was made because of the removal of the turn restrictions at Ben Boyd Road from the Proposal.

NBBP are undertaking further investigations in conjunction with North Sydney Council and the community to develop a wider area-based solution that provides the benefits to bus travel times and reliability whilst seeking to maintain the existing level of service for general traffic within the road network. The requirements for tidal flow system at this location would be reviewed as part of the ongoing investigations described above.

3.6.2 Environmental Assessment

As the proposed tidal flow system in this location has been removed from the scope of the Proposal, impacts previously identified in the REF would be avoided. In the absence of these previous impacts or any new impacts the Proposal is expected to result in an overall neutral impact upon the community and the environment in this location. As such, no additional environmental assessment is required.

3.6.3 Revised Management and Mitigation Measures

Table 3-2: Revised management and mitigation measures

Impact	Environmental safeguard	Responsibility	Timing
Nil	• No additional environmental safeguards are required.	N/A	N/A

3.7 Construction compound

3.7.1 Description

The proposed construction compound at the corner of Clifford Street and Spit Road is discussed in several places throughout the REF, including within the noise specialist report. This assessment was prepared on the basis that the construction compound would be enclosed within, and operated from, the existing underground car park at the site of the former Greater Union cinema at the corner of Clifford Street and Spit Road. This site is currently owned by Transport for New South Wales.

Due to a change in the construction programming of this site TfNSW have now commenced the demolition of this building. As such it will no longer be possible to locate the construction compound within the underground car park. Instead, the construction compound would now be located at ground level within the site once the building has been fully demolished and the site made safe.

It should also be noted that in order to provide for night works to be undertaken throughout the corridor it would be necessary for this compound to operate 24 hours a day. Night works are required in order to avoid impacts upon traffic during the day time, particularly the AM and PM peak periods.

3.7.2 Environmental Assessment

The main impacts associated with the setup and operation of the construction compound would be those associated with traffic, noise and air quality. These are addressed in Sections 6.1, 6.3 and 6.9 respectively.

The changes to the set up and operation of the construction compound would not alter the impacts upon local traffic from those assessed within the REF.

Within this assessment ‘operation’ of the construction compound refers to the period during which other elements of the Proposal are under construction ie the construction period for those elements.

Noise

Construction

Further assessment of noise impacts associated with the proposed construction compound has been undertaken since publishing the REF (Appendix 1). This revised assessment accounts for the change to the construction compound from being underground to now being at ground level. This change has reduced the amount of natural shielding around the compound and hence increased the amount of noise that would be emitted from the site. During set up this has the potential to result in exceedances of up to 23 dB(A) during the evening and 45 dB(A) during the night. It should be noted however that the noise scenarios modelled represent a worst case scenario and that these noise levels are only expected on an intermittent in infrequent basis during site set up.

One additional mitigation or management measure is required over and above those are provided in Section 7.2 of the REF.

Operation

As outlined above, the construction compound would operate 24 hours a day in order to support night time road works throughout the corridor. Noise arising from the compound during operation has the potential to result in exceedances of up to 18 dB(A) during the evening and 40 dB(A) during the night. As with the construction noise scenario it should be noted that the noise scenarios

modelled represent a worst case and that these noise levels are only expected on an intermittent in infrequent basis during operation.

One additional mitigation or management measure is required over and above those are provided in Section 7.2 of the REF.

Air quality

Construction

Previously the setup of the construction compound would have occurred on a sealed base, within the underground car park. As such the potential for release of dust was negligible. Exhaust emissions from plant and machinery would however still have been expected.

Under the revised Proposal the compound would now be set up within the cleared site after demolition. As a result there is the potential that some levelling and preparation of the ground would be required, which has the potential to generate dust. Given the scale of the site and the potential that some degree of sealed surface may be left on site post-demolition the expected impacts from dust generation on nearby receivers are expected to be minor.

Impacts associated with exhaust emissions from vehicles, plant and machinery are expected to remain as per those assessed within the REF. No additional mitigation or management measures to those which are provided in Section 7.2 of the REF are required.

Operation

The construction compound would include a stabilised base in order to provide areas for movement and storage of machinery, parking of vehicles and the lay down of plant and equipment. As such the potential for operational activities to generate dust is considered to be minor.

Exhaust emissions from vehicles, plant and machinery during operation are expected to remain as per those assessed within the REF. No additional mitigation or management measures to those which are provided in Section 7.2 of the REF are required.

3.7.3 Revised Management and Mitigation Measures

Table 3-3: Revised management and mitigation measures

Impact	Environmental safeguard	Responsibility	Timing
Noise and vibration	• Construction hoarding is to be maintained around the construction compound during setup and operation.	Contractor	Construction

3.8 Summary of Parking Changes

Section 6.1.2 of the REF summarised the impacts to parking that were expected to be incurred the operation of the Proposal. Design development has continued since publishing the REF and as a result of further changes to the Proposal. These changes require that parking be removed in several locations long Military Road during the operation of the Proposal. Parking to be removed as a result of the design changes includes:

- Loss of four AM peak and off peak parking spaces on Spit Road outbound opposite Stanton Road (134 to 140A Spit Road)
- Loss of two AM peak and off peak parking spaces on Spit Road outbound opposite Stanton Road (128 to 134 Spit Road)

- Loss of two all day parking spaces on the westbound side of Stanton Road between Spit Road and existing council carpark driveway
- Loss of nine AM peak and off peak parking spaces on Spit Road outbound between Awaba Street and Killarney Street
- Loss of eleven AM peak and off peak parking spaces at Military Road outbound, between Winnie Street and Spofforth Street (324 Military Road to Cremorne Garden Plaza).

The retention of the M30 bus layover in its present location would result in the retention of eight parking spaces on Military Road east after 10am on weekdays. Note that these spaces would continue to remain unavailable between 6am and 10am weekdays when this location would continue to be used for the M30 layover.

A summary of the changes to operational car parking spaces since publishing the REF is provided below in Table 3-4. This would include:

- Total of 81 on-street parking spaces (both Military Road and Spit Road and local roads) would be affected by the Proposal
    - Sixty nine of these parking spaces would be permanently removed
    - Twelve spaces would be reduced in parking time permitted (ie to off-peak hours only).

The reasons for the revised parking impacts are as follows:

- Zone A2 – Design development of the traffic control signals at Stanton Road has confirmed the extent of 'No Stopping' areas required by the design
- Zone A5 – Design development of the extension of tidal flow system has confirmed the extent of 'No Stopping' areas required by the design
- Zone B1 Military Road East – Deletion of M30 bus layover after 10am in Military Road east has resulted in current parking availability remaining unchanged
- Zone C5 – Design development of the tidal flow system has identified additional 'No Stopping' areas that are required to provide a safe arrangement for the right turn bay to Spofforth Street when the tidal flow system is in the 'out of AM peak' arrangement.

As part of a review of parking availability throughout Spit Road and Military Road, a series parking occupancy surveys were completed in December 2016. The study is currently being reviewed and would be made available on the Northern Beaches B-Line website in due course.

A preliminary assessment of the parking occupancy surveys indicates that because of relatively low demand for the parking along Spit Road north of Ourimbah Road, it is expected that the parking capacity lost on Spit Road in the vicinity of Stanton Road and Awaba Street may be accommodated by existing parking availability on adjacent sections of Spit Road and on nearby side streets.

Assessment of parking occupancy surveys on Military Road through Neutral Bay and Cremorne would continue as part of the detailed design phase.

At this stage of the assessment, the implementation of the traffic management measures, specifically regarding parking, described in Section 6.1.3 of the REF are considered to be appropriate. No additional mitigation or management measures are required.

Table 3-4: Revised operational parking impacts (parking losses) – changes to the scope of works presented in the REF are indicated by shading and are noted as 'NEW' or 'REVISED'.

Subzone	Location	AM peak	Off Peak Day	PM peak
Zone A	**Spit Bridge to Ourimbah Road**			
A2	Spit Road citybound near Stanton Road (111 to 113 Spit Road)	-	2[1]	2[1]
	Spit Road outbound opposite Stanton Road (134 to 140A Spit Road) - **NEW**	4[5]	4[5]	-
	Spit Road outbound opposite Stanton Road (128 to 134 Spit Road) - **NEW**	2[1]	2[1]	-
	Stanton Road south side between Spit Road and carpark driveway - **NEW**	2[1]	2[1]	2[1]
A5	Spit Road outbound between Awaba Street and Killarney Street - **NEW**	9[1]	9[1]	-
Zone B	**Ourimbah Road to Spofforth Street**			
B1	Spit Road citybound, north of Clifford Street	-	3[2]	3[2]
	Clifford Street, north side between Spit Road and cinema driveway	5[3]	5[3]	5[3]
	Military Road east, north side east of Civic Lane (for M30 layover) - **REVISED**	-	0 (8 in REF)	0 (8 in REF)
	Spit Road outbound, north of Military Road (24 Spit Road)	3[5]	3[5]	-
B2	Military Road citybound at Prince Street (375 to 377 Military Road)	-	3[1]	3[1]
Zone C	**Spofforth Street to Watson Street**			
C5	Military Road citybound, between Cabramatta Road and Spencer Road	-	10[6]	10[6]
	Military Road outbound, between Winnie Street and Spofforth Street (308 to 324 Military Road)	9[7]	9[7]	-
	Military Road outbound, between Winnie Street and Spofforth Street (324 to Cremorne Garden Plaza) - **NEW**	11[7]	11[7]	-
	Military Road outbound, between Waters Road and Winnie Street (230 to 260 Military Road)	3[8] 10[7]	1[8]	-
	Military Road outbound, between Young Street and Wycombe Road (162 to 166 Military Road)	-	5[9]	-

(1) Unrestricted
(2) 15min 10am to 6pm
(3) 1 hour 8:30am to 6pm Mon to Fri; 8:30am to 12:30pm Sat
(4) 1 hour 10am to 6pm Mon to Fri; 8:30am to 6pm Sat & Sun
(5) ½ hour 8:30am to 3pm Mon to Fri; 8:30am to 12:30pm Sat
(6) 1 hour 10am to 6pm Mon to Fri; 8:30am to 12:30pm Sat
(7) 1 hour 6:30am to 3pm Mon to Fri; 8:30am to 12:30pm Sat
(8) 1 hour 8:30am to 3pm Mon to Fri; 8:30am to 12:30pm Sat; ¼ hour 7pm to 11pm Mon to Sun
(9) ½ hour 10am to 3pm Mon to Fri; 8:30am to 4pm Sat

3.9 Operational Noise

Changes to road infrastructure throughout the Spit Road/Military Road corridor would result in changes to traffic in adjacent and nearby local roads. This would include likely changes to traffic volumes along roads such as Stanton Road, Moruben Road, Clifford Street and Cabramatta Road. In some case the Proposal would result in a reduction of traffic, and hence road noise, whereas other roads would experience an increase. The Noise Criteria Guideline (Roads and Maritime, 2015) considers any project to be a 'traffic generating development' if it is predicted to increase noise levels by greater than 2.0 dB(A) on any other road.

Given the existing relatively high levels of road traffic noise in the area, controlled primarily by the existing high levels of traffic on Spit and Military Roads, it is unlikely that the increase in noise levels due to additional diverted traffic at any noise sensitive receiver on local roads would exceed 2.0 dB(A).

4 Environmental Management

The REF for the Spit Bridge to Neutral Bay B-Line Road Infrastructure identified the framework for environmental management, including safeguards and management measures that would be adopted to avoid or reduce environmental impacts (Section 7.2) of the review of environmental factors).

The issues raised in the public submissions and changes to the Proposal have been considered in regards to the safeguards and management measures proposed. These measures would still apply and no changes have been made with the exception of the addition of mitigation measure NV1b. NBBP will continue to review these measures throughout the life of the Proposal to ensure that they remain adequate and effective. The measures will be subject to ongoing review and continual improvement and will be amended where necessary.

Should the Proposal proceed, environmental management will be guided by the framework and measures outlined below.

4.1 Environmental Management Plans (or systems)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the Proposal. Should the Proposal proceed, these management measures would be incorporated into the detailed design and applied during the construction and operation of the Proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the Proposal and must be reviewed and certified by environment staff, Sydney Region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

The CEMP for the construction phase of the Proposal would be prepared in accordance with the requirements of TfNSW's Environmental Management System (EMS). The CEMP would incorporate as a minimum all environmental mitigation measures identified in Section 7.2 of the REF and Section 3.7.3 of this report, any conditions from licences or approvals required by legislation, and a process for demonstrating compliance with such mitigation measures and conditions. The following plans would be included in the CEMP:

- Construction Noise and Vibration Management Plan
- Erosion and Sediment Control Plan
- Waste Management Plan.

The CEMP would be developed in accordance with the specifications set out in the QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing and QA Specification G10 - Traffic Management]

4.2 Summary of Safeguards and Management Measures

The review of environmental factors for the B-Line Program: Spit Bridge to Neutral Bay identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the issues raised in the public submissions, the environmental management measures for the project (refer to Chapter 3 of the REF) have been revised. Should the proposal proceed, the environmental management measures in Table 4-1 will guide the subsequent phases of the B-Line Program: Spit Bridge to Neutral Bay development. Additional and/or modified environmental safeguards and management measures to those presented in the REF have been underlined and deleted measures, or parts of measures, have been struck out.

Table 4-1: Summary of environmental safeguards and management measures

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
G1	General	If the scope of the works changes at any time, review under the Roads and Maritime Services Environmental assessment procedure for routine and minor works (EIA-PO5-1) to determine any new measures to take.	NBBP	All times
G2	General	An environmental management plan is prepared and implemented prior to the commencement of works.	NBBP/Contractor	Pre-construction
G3	General	No new access tracks to be created for the works.	Contractor	Construction
G4	General	Parking of vehicles and storage of plant/equipment is to occur on existing paved areas. Where this is not possible, vehicles and plant/equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees.	Contractor	Construction
T1	Traffic and site access	A Traffic Management Plan would be prepared and implemented for the construction phase of the Proposal and would outline: • Road closures and alternatives • Pedestrian and cycle provisions throughout the construction period • The consultation process to inform the community of any road, pedestrian or cycle changes	Contractor/NBBP	Pre-construction
T2	Traffic and site access	Property accesses are to be maintained during the works. Any unexpected disturbances to property access would be discussed with the affected resident(s).	Contractor	Construction
T3	Traffic and site access	To manage the potential for cumulative traffic impacts during construction, the Traffic Management Centre would coordinate road occupancy licences throughout the corridor.	Contractor	Pre-construction
T4	Pedestrian safety	A comprehensive road safety audit with specific focus on pedestrian safety would to be carried out during the detailed design of the tidal flow systems	NBBP	Pre-construction and Post-construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
V1	Urban design, landscape and visual amenity	The site would be kept tidy and well maintained during construction, including removal of all rubbish at regular intervals. There should be no storage of materials beyond the construction boundaries	Contractor	Construction
V2	Urban design, landscape and visual amenity	Light spill from the road corridor into adjacent visually sensitive properties is to be minimised by the use of cut-off lighting, directing construction lighting into the construction areas and ensuring the site is not over-lit. This includes the sensitive placement and specification of lighting to minimise any potential increase in light pollution	Contractor	Construction
V3	Urban design, landscape and visual amenity	Temporary hoardings, barriers, traffic management and signage would be removed when no longer required	Contractor	Construction/post - Construction
V4	Urban design, landscape and visual amenity	Work/site compounds would be screened where practical, with shade cloth or similar material to minimise visual impacts	Contractor	Construction
V5	Urban design, landscape and visual amenity	The construction contractor would restore any areas that are affected by construction with appropriate landscape treatments	Contractor	
V6	Urban design, landscape and visual amenity	An urban design and landscape plan would be prepared in consultation with relevant stakeholders	NBBP/Contractor	Pre-construction
V7	Urban design, landscape and visual amenity	Vegetation offsets and/or landscaping would be undertaken in accordance with the Roads and Maritime Environmental Impact Assessment Practice Note – Guidelines for Landscape Character and Visual Impact Assessment (2013), the Roads and Traffic Authority Biodiversity Guidelines (2011) and the TfNSW Vegetation Offset Guide (TfNSW, 2013b). All planting would be undertaken in consultation with Mosman and North Sydney councils, and/or the owner of the land upon which the vegetation would be planted.	NBBP/Contractor	Construction/post - Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
N1	Noise and vibration	A Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented. The CNVMP would include the following: • identification of nearby residences and other sensitive land uses • description of all approved hours of work • description and identification of all construction activities, including work areas, equipment and duration • description of what work practices (generic and specific) would be applied to minimise noise and vibration • a complaints handling process • noise and vibration monitoring procedures • overview of community consultation required for identified high impact works.	NBBP/Contractor	Pre-construction
N2	Noise and vibration	All residents impacted by noise from the proposed works which are expected to exceed the construction noise management levels should be consulted prior to the commencement of construction. The highest consideration should be given to those that are predicted to be most affected as a result of the works. Information provided to residents should include: • programmed times and locations of construction work • the hours of proposed works • construction noise and vibration impact predictions • construction noise and vibration mitigation measures to be implemented on site.	Contractor	Pre-construction
N3	Noise and vibration	Community consultation regarding construction noise and vibration would be detailed in the Community Involvement Plan for the construction of the project and would include a 24 hour hotline and complaints management process	Contractor	Pre-construction
N4	Noise and vibration	For out-of-hours works, consultation would take place with consideration to measures outlined in Roads and Maritime's Construction Noise and Vibration Guideline and Strategy 2 of the ICNG	Contractor	Pre-construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
N5	Noise and vibration	Induction and training would be provided to relevant staff and sub-contractors outlining their responsibilities with regard to noise and vibration	Contractor	Pre-construction/construction
N6	Noise and vibration	Deliveries would be carried out during standard construction hours where feasible and reasonable	Contractor	Construction
N7	Noise and vibration	A protocol would be developed to identify the need for, and provision of, respite measures for residential receivers in accordance with the ICNG. Respite measures may include appropriate timetabling of noisy works or the restriction to the hours of construction activities resulting in impulsive or tonal noise (such as rock hammering, pile driving), or other appropriate measures agreed between the contractor and residential receiver such as temporary alternative accommodation	Contractor	Pre-construction/construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
N8	Noise and vibration	The following measures would be implemented to reduce and manage noise and vibration impacts associated with construction traffic: • Truck drivers would be advised of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (i.e. minimising/restricting the use of engine compression brakes, and no extended periods of engine idling) • Site access and egress points would be located away from residences and other sensitive land uses, where feasible and reasonable • Deliveries and spoil removal would be planned to avoid queuing of trucks on or around the compounds • Construction sites would be arranged to limit the need for reversing associated with regular/repeatable movements (e.g. trucks transporting spoil) to minimise the use of reversing alarms • Where feasible and reasonable, non-tonal reversing alarms would be used, taking into account the requirements of the Workplace Health and Safety legislation • Spoil would be moved during the day where practical, and feasible and reasonable management strategies would be investigated in consultation with the NSW Environment Protection Authority to minimise the volume of heavy vehicle movements at night	Contractor	Pre-construction
N9	Noise and vibration	Appropriate plant would be selected for each task to minimise the noise contributions	Contractor	Pre-construction/construction
N10	Noise and vibration	Alternative works methods such as the use of hydraulic or electric-controlled units in place of diesel units would be considered and implemented where feasible and reasonable. The use of alternative machines that perform the same function, such as rubber wheeled plant, would be considered in place of steel tracked plant	Contractor	Construction
N11	Noise and vibration	All equipment would be regularly inspected and maintained to ensure it is in good working order	Contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
N12	Noise and vibration	Plant should be located on site with as much distance as possible between the plant and noise sensitive receivers. Noisy equipment would be orientated away from residential receivers where feasible and reasonable	Contractor	Construction
N13	Noise and vibration	A noise monitoring program would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during construction. The results would be reviewed to determine if additional mitigation measures are required. All measurements would be undertaken in accordance with Australian Standard 1055.1-1997 – Acoustics – Description and measurement of environmental noise, Part 1: General procedures	Contractor	Construction
N14	Noise and vibration	If regenerated noise is reported to be a problem during vibration intensive works, attended and/or unattended noise measurements would be undertaken within the relevant building spaces to determine the level of regenerated noise	Contractor	Construction
N15	Noise and vibration	Equipment size would be selected taking into account the safe working distances and the distance between the area of construction and the most affected sensitive receiver. The use of less vibration intensive methods of construction or equipment would be considered where feasible and reasonable when working in proximity to existing structures		Construction
N16	Noise and vibration	Wherever reasonable and feasible, vibration intensive works should be limited to less sensitive times of the day	Contractor	Construction
N17	Noise and vibration	If the use of vibration intensive plant cannot be avoided within the safe working distance for cosmetic damage to existing structures the following procedure would occur as a minimum: • Notification of the works to the affected residents and community • Works would not proceed until attended vibration measurements are undertaken.	Contractor	Pre-construction/construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
N18	Noise and vibration	If ongoing works are required a temporary relocatable vibration monitoring system would be installed to warn operators (via flashing light, audible alarm, short message service (SMS) etc.) when vibration levels are approaching the cosmetic damage objective	Contractor	Construction
N19	Noise and vibration	No noisy works (including concrete sawing) are to be undertaken after midnight	Contractor	Construction
N20	Noise and vibration	Construction hoarding is to be maintained around the construction compound during setup and operation	Contractor	Construction
B1	Aboriginal heritage	If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and Roads and Maritime Environment staff contacted immediately. Steps in the Roads and Maritime Services *Standard Management Procedure: Unexpected Heritage Items* must be followed.	Contractor	Construction
H1	Non-Aboriginal heritage	If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Roads and Maritime Services Standard Management Procedure: Unexpected Heritage Items must be followed. Roads and Maritime Services Environment staff must be contacted immediately.	Contractor	Construction
H2	Non-Aboriginal heritage	If any items defined as relics under the *NSW Heritage Act 1977* are uncovered during the works, all works must cease in the vicinity of the find and the Roads and Maritime Services Environment staff must be contacted immediately.	Contractor	Construction
H3	Non-Aboriginal heritage	If an existing heritage item or item identified on the Roads and Maritime Services s.170 register is on site or in the near vicinity of the works, the item is to be protected to prevent any damage or disturbance.	Contractor	Construction
C1	Socio-economic	Access for emergency services would be maintained at all times.	Contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
C2	Socio-economic	Community consultation is to be undertaken in accordance with *the Community Involvement Practice Notes and Resource Manual.*	Contractor	Pre-construction
C3	Socio-economic	Complaints received are to be recorded and attended to promptly in accordance with the *Community Involvement Practice Notes and Resource Manual.*	Contractor	Construction
C4	Socio-economic	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Contractor	Construction
F1	Biodiversity	If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Roads and Maritime Services Unexpected Threatened Species Find Procedure in the Roads and Maritime Services Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process).	Contractor	Construction
F2	Biodiversity	All pathogens (e.g. Chytrid, Myrtle Rust and Phytophthora) are to be managed in accordance with the Roads and Maritime *Services Biodiversity Guidelines - Guide 7 (Pathogen Management)* and DECC Statement of Intent 1: Infection of native plants by Phytophthora cinnamomi *(for Phytophthora).*	Contractor	Construction
F3	Biodiversity	Declared noxious weeds are to be managed according to requirements under the Noxious Weeds Act 1993 and Guide 6 (Weed Management) of the Roads and Maritime Services Biodiversity Guidelines 2011.	Contractor	Construction
F4	Biodiversity	All pruning and trimming of trees is to be in accordance with the Australian Standard 4373-2007 Pruning of amenity trees. Pruning of mature trees is to be approved by Roads and Maritime and undertaken by a qualified arborist.	Contractor	Construction
F5	Biodiversity	Trees to be retained to be clearly identified using Tree Protection Zones (TPZ) where they are in close proximity to the proposed works.	Contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
F6	Biodiversity	Vegetation offsets and/or landscaping would be undertaken in accordance with the Roads and Maritime Environmental Impact Assessment Practice Note – Guidelines for Landscape Character and Visual Impact Assessment (2013), the Roads and Traffic Authority Biodiversity Guidelines (2011) and the TfNSW Vegetation Offset Guide (TfNSW, 2013b). All planting would be undertaken in consultation with North Sydney and Mosman councils, and/or the owner of the land upon which the vegetation would be planted.	Contractor	Construction/Post-construction
E1	Soil and water	Erosion and sediment control measures are to be implemented and maintained to: • Minimise sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert off site water around the site	Contractor	Construction
E2	Soil and water	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Contractor	Construction
E3	Soil and water	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	Construction/Post-construction
E4	Soil and water	Work areas are to be stabilised progressively during the works.	Contractor	Construction/Post-construction
E5	Soil and water	A progressive erosion and sediment control plan is to be prepared for the works.	Contractor	Pre-construction
E6	Soil and water	The maintenance of established stockpile sites during construction is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).	Contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
E7	Soil and water	Adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented during the construction phase in accordance with relevant EPA and Roads and Maritime guidelines. All staff would be made aware of the location of spill kits and be trained in their use.	Contractor	Construction
E8	Soil and water	Vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks.	Contractor	Construction
E9	Soil and water	The existing Sydney Water and Council drainage systems would remain operational and be protected throughout construction.	Contractor	Construction
E10	Soil and water	Should groundwater be encountered during excavation works, this would be managed in accordance with the requirements of the Waste Classification Guidelines (EPA, 2014) and Water Discharge and Reuse Guidelines (TfNSW, 2015e).	Contractor	Construction
E11	Soil and water	Potential or actual acid sulphate soils are to be managed in accordance with the Roads and Maritime Services Guidelines for the Management of Acid Sulphate Materials 2005. The contractor is to prepare an Acid Sulphate Materials management plan.	Contractor	Pre-construction/construction
A1	Air quality	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	Construction
A2	Air quality	Vegetation or other materials are not to be burnt on site.	Contractor	Construction
A3	Air quality	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.	Contractor	Construction
A4	Air quality	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).	Contractor	Construction

4.3 Licensing and Approvals

In addition to the REF prepared under the *Environmental Planning and Assessment Act 1979 (EP&A Act)*, Table 4.2 identifies relevant licences, permits, notifications and approvals needed to construct and operate the Proposal.

Table 4-2: Summary of licensing and approval required

Instrument	Requirement	Timing
Noxious Weeds Act 1993 (NW Act) (NSW)	This Act establishes a system for the identification and control of noxious weeds in NSW. Under section 13 of the NW Act, public authorities are required to control weeds that are likely to spread to adjoining land. The majority of the Proposal would be undertaken in previously cleared and disturbed areas, and noxious weeds are not expected to be encountered or disturbed. However, if noxious weeds are encountered, they would be managed and disposed of in accordance with the NW Act to an appropriate waste facility.	Construction stage
Protection of the Environment Operations Act 1997 (POEO Act) (NSW)	The Proposal does not involve a 'scheduled activity' under Schedule 1 of the POEO Act. Accordingly, an Environment Protection Licence is not required for the Proposal. However, in accordance with Part 5.7 of the Act, the NBBP would notify the EPA if any pollution incidents occur on site during construction. This would be managed within the CEMP to be prepared and implemented by the Contractor.	Prior to start of the activity
Roads Act 1993 (Roads Act) (NSW)	Section 138 of the Roads Act requires consent from the relevant road authority for the carrying out of work in, on or over a public road. Clause 5(1) in Schedule 2 of the Roads Act states that public authorities do not require consent for works on unclassified roads. The Proposal would involve works on Spit Road and Military Road, which are classified roads maintained by Roads and Maritime. Other roads such as Stanton Road and Clifford Street are local roads and consent is not required for those works. Regardless, consultation with the Mosman and North Sydney Councils has commenced and is ongoing. Consent under the Roads Act is not required; however Road Occupancy Licence/s would be obtained from the relevant roads authority by the Contractor for road works and any temporary road closures.	Prior to start of the activity

Instrument	Requirement	Timing
Waste Avoidance and Resource Recovery Act 2001 (WARR Act) (NSW)	The NBBP would carry out the Proposal having regard to the requirements of the WARR Act. A site specific Waste Management Plan would be prepared and implemented during construction as part of the CEMP.	Pre-construction and construction stage
State Environmental Planning Policy (Infrastructure) 2007	The Proposal is permissible without development consent and can be assessed under Part 5 of the EP&A Act. Part 2 of the *State Environmental Planning Policy (Infrastructure) 2007* contains provisions for public authorities to consult with local councils and other agencies prior to the commencement of certain types of development. Section 5 of the REF outlines the consultation undertaken in accordance with the requirements of the *State Environmental Planning Policy (Infrastructure) 2007*.	Prior to construction
North Sydney Local Environment Plan 2011	The North Sydney Local Environment Plan is a relevant governing plan for about half of the area of the Proposal. Section 4.4 of the REF described the relevant provisions for the Proposal.	Design stage and construction
Mosman Local Environment Plan 2011	The Mosman Local Environment Plan is a relevant governing plan for about half of the area of the Proposal. Section 4.4 of the REF described the relevant provisions for the Proposal.	Design stage and construction

5 References

NSW Government Department of Transport, Roads and Maritime Services (2016) *B-Line Program: Spit Bridge to Neutral Bay Infrastructure Review of Environmental Factors*, Sydney.

Roads and Maritime Services (2015) Noise Criteria Guideline

Roads and Maritime Services (2016) *Construction Noise and Vibration Guideline*

Appendix 1

Revised Noise and Vibration Assessment

AECOM

Easing Sydneys Congestion
Roads and Maritime Services
21-Feb-2017
Doc No. 60491201-RPNV-00_C

Northern Beaches B-line Package 12

Noise and Vibration Impact Assessment

Northern Beaches B-line Package 12

Noise and Vibration Impact Assessment

Client: Roads and Maritime Services

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B	18-Nov-2016	For Issue	Jamie McMahon Associate Director	
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1.0 Introduction

1.1 Background

AECOM has been commissioned by Roads and Maritime Services (Roads and Maritime) to carry out an acoustic assessment of the proposed construction of part of the Northern Beaches B-Line Program (hereafter referred to as B-line). The overall B-line Program involves a series of road infrastructure and bus service improvements that will aim to deliver a more frequent and reliable bus service for customers travelling between the Northern Beaches and the Sydney CBD.

This report provides a construction noise and vibration assessment of the impact of construction of road infrastructure associated within one section of the B-Line Program. The subject section commences from the Spit Bridge from the north and follows Spit Road south which transitions into Military Road, and finishes at the intersection of Watson Street and Military Road, Neutral Bay. The assessment also includes activity associated with the proposed construction compound at Clifford Street Mosman, located on the former Greater Union cinema site. This subject section is referred to as Package 12 throughout this report and within the project Review of Environmental Factors (REF).

Roads and Maritime do not expect a change in traffic volumes as a result of the project. As such as an operational noise assessment is not warranted for this project.

1.2 Scope

Provided below is a summary of the assessed construction activities associated with the Proposal separated into three relevant Zones and several Subzones. It is noted that although each Subzone would have a number of construction scenarios associated with the proposed works, only the loudest construction scenario which has been identified to be carried out in that Subzone has been modelled.

Zone A: Spit Bridge to Ourimbah Road

Zone A extends from the Spit Bridge to Ourimbah Road in Mosman and includes Subzones A1 to A5 as described below.

- A1 Extension of indented bus bay on Spit Road (southbound), near Parriwi Road south
  - Extending the length of the bus bay to 26 metres long to accommodate two rigid buses or one articulated bus
    - Partial acquisition of one residential property and a section of Council-owned park
    - Relocation of existing below and above ground services and utilities
    - Demolition of existing kerbs, road and pedestrian pavement
    - Permanent relocation of bus shelter adjacent to the extended bus bay
    - Removal of vegetation including one mature tree and some landscaping vegetation
    - Provision of new road pavement for the lengthened bus bay and new concrete kerb.
- A2 - Stanton Road/Spit Road intersection
  - Installation of new traffic control signals at Stanton Road/Spit Road intersection:
    - Installation of below and above ground services
    - Installation of new signage and traffic signal infrastructure
    - New line marking
    - Resurfacing Spit Road in vicinity of Stanton Road
  - Removal of the existing mid-block signalised pedestrian crossing on Spit Road between Warringah Road and Stanton Road:
    - Removal and/or relocation of below and above ground services

  - Demolition of existing pedestrian ramps and partial demolition of concrete median
  - Construction of new barrier kerb and extended concrete median
  - Removal of existing line marking
  - Resurfacing Spit Road in vicinity of removed pedestrian crossing.
- Extension of indented bus bay on Spit Road (southbound) at intersection with Stanton Road to 26 metres long to accommodate two rigid buses or one articulated bus
  - Partial acquisition of three residential properties and one Council-owned car park
  - Relocation of existing below and above ground services and utilities
  - Permanent relocation of bus shelter adjacent to the lengthened bus bay
  - Removal of four trees and some landscaping vegetation
  - Installation of pedestrian pavement and landscaping.
- Widening of Spit Road in the north east corner of the Stanton Road/Spit Road intersection to allow southbound buses to safely turn into Stanton Road:
  - Partial acquisition of one residential property
  - Relocation of existing below and above ground services and utilities
  - Demolition of existing kerbs, road and pedestrian pavement
  - Removal of vegetation
  - Construction of new road pavement for road widening
  - Construction of new concrete kerb, ramps and footpath

- A3 Awaba Street/Spit Road intersection
  - Construction of a left hand turn bay from Spit Road southbound to Awaba Street:
    - Partial acquisition of one residential property
    - Relocation of existing below and above ground services and utilities
    - Removal of vegetation within verge and residential property and replanting of vegetation where possible
    - Demolition of existing kerb, pedestrian pavement and wall of residential apartment block
    - Reconstruction of residential apartment block wall
    - Replanting of vegetation within residential property
    - Relocation of existing traffic control signals and associated infrastructure
    - New line marking
    - Resurfacing approximately 30 m of Awaba Street up to intersection with Spit Road.
- A4 Spit road near Punch Street
  - Widening of Spit Road on the northbound side with subsequent lane reconfigurations to provide a wider southbound kerb lane north of Punch Street:
    - Removal of vegetation, including street trees
    - Relocation of existing below and above ground services and utilities, including street light poles
    - Demolition of existing northbound kerb between 76 Spit Road and 86 Spit Road
    - Construction of new road pavement and concrete kerb
    - Installation of new road pavement over widened part of kerb lane

- Changes to line marking across northbound and southbound carriageways.

- A5 Tidal flow between Killarney Street and Ourimbah road
  - Extension of the existing lane management (tidal flow) system between Killarney Street and Ourimbah Road:
    - Removal of existing concrete medians
    - Installation of a new movable median at northern end of tidal flow system north of Awaba Street
    - Installation of “candy bar” non-automated tidal flow system between movable medians
    - Resurfacing full width of Spit Road through this section
    - Installation of new overhead gantry signage at Awaba Street for informing lane status
    - Installation of new signage and line marking.

Zone B: Ourimbah Road to Spofforth Street

Zone B extends from Ourimbah Road in Mosman to Spofforth Street, Cremorne and would include Subzones B1 to B2 as detailed below.

- B1 Clifford Street/Spit Road intersection
  - Closure of Clifford Street, forming a cul-de-sac, to facilitate a new indented bus bay:
    - Permanent closure of Clifford Street at Spit Road
    - Partial acquisition of one residential property
    - Removal of one mature tree on Clifford Street and two trees on Spit Road
    - Relocation of existing below and above ground services and utilities
    - Demolition of existing kerb, road pavement, and pedestrian pavement along northern side of Clifford Street
    - Removal of existing bus infrastructure to the north (Spit Road at Clifford Street) and south (Spit Road Near Military Road) of Clifford Street
    - Construction of expanded road and pedestrian pavement and concrete kerb along northern side of Clifford Street around new turning head
    - New pavement and resurfacing over new turning head in Clifford Street
    - Construction of 60 metre long indented B-Line bus stop on Spit Road in place of Clifford Street intersection
    - Demolition of existing kerb, road and pedestrian pavement along eastern side of Spit Road
    - Construction of new kerb, pedestrian pavement and landscaping along eastern side of Spit Road

- B2 Prince Street/Military Road intersection
  - Construction of an indented bus bay on Military Road (southbound), at currently closed intersection of Prince Street (east):
    - Partial acquisition of two residential properties
    - Relocation of existing below and above ground services and utilities
    - Removal of five trees on the eastern side of Military Road
    - Demolition of existing kerbs and road and pedestrian pavement along eastern side of Military Road

- Construction of new kerb, pedestrian pavement and landscaping around new indented bus bay
- Construction of new road pavement within the new indented B-Line bus bay

Zone C: Spofforth Street to Watson Street

- Zone C extends from Spofforth Street in Cremorne to Watson Street in Neutral Bay. Zone C includes Subzones C1 to C6.
- C1 Cabramatta Road/Military Road intersection
  - Half closure of Cabramatta Road to allow left-in access from Military Road (southbound) only:
    - Relocation of existing below and above ground services and utilities
    - Demolition of existing kerb, road and pedestrian pavement
    - Construction of new kerb, road and pedestrian pavement and landscaping
    - New pavement and resurfacing over new turning head in Cabramatta Road.
- C2 Military Road, near Holt Avenue
  - Widening of Military Road southbound kerb lane to the north and south of Holt Avenue:
    - Partial acquisition of one residential property
    - Relocation of existing below and above ground services and utilities
    - Demolition of existing kerb, road and pedestrian pavement
    - Removal of eight mature street trees
    - Construction of new road pavement and concrete kerb over widened lane
    - Installation of new pedestrian pavement and landscaping. Footpath widths would be reduced to a minimum of 3 metres to minimise property impacts.
- C3 Murdoch Street to Hampden Avenue
  - Construction of a new southbound indented bus bay on the southern side of Military Road between Murdoch Street and Hampden Avenue:
    - Partial acquisition of two residential properties and one commercial properties
    - Relocation of existing below and above ground services and utilities
    - Demolition of existing kerb, road and pedestrian pavement
    - Removal of vegetation including three mature street trees and landscaping vegetation within residential properties
    - Construction of new kerb and road pavement for indented bus stop
    - Construction of new pedestrian pavement and landscaping
  - Extension of the northbound bus zone opposite Hampden Avenue from 33 metres to 40 metres to accommodate one articulated bus. The position of the eastern end of the bus zone will remain the same and the western end will be extended.
  - Restriction of right turn from Military Road into Murdoch Street during the AM Peak.
- C4 Military Road, near Young Street
  - Reduction of speed limit along Military Road from 60 to 50 km/h
- C5 Ben Boyd Road/Military Road intersection
  - Restriction of allowable traffic movements
- C6 Tidal Flow through Neutral Bay and Cremorne Town Centre

- Installation of signage to ban right hand turn (6am – 10am peak period only) from Military Road (northbound) into Murdoch Street
- Construction of new lane management (tidal flow) system on Military Road between Spofforth Street Cremorne and Watson Street Neutral Bay
    - Removal of existing concrete medians
    - Installation of six sections of automated moveable medians including control system
    - Installation of underground conduits and cabling within existing footpaths
    - Installation of in-pavement lighting to delineate traffic lanes
    - Installation of additional changeable message signs and lane status signage gantries
    - Resurfacing of road where new line marking is required
    - Relocation of several bus stops
    - Parking changes to achieve the required lane configuration of the tidal flow system
    - New line marking

All zones: Corner of Clifford Street and Spit Road, Mosman

Use of underground carpark of the former Greater Union cinema on corner of Clifford Street and Spit road, Mosman as the construction compound for all works.

2.0 Existing ambient noise environment

2.1 Overview

Package 12 of the B-line program is situated along Spit Road and Military Road which are both major arterial roads. The two roads facilitate a large proportion of north and south vehicle travel within the Northern Beaches and North Shore. As such the existing noise environment consists primarily of road traffic noise.

2.2 Ambient noise monitoring

Ambient noise monitoring was undertaken at nine locations throughout the study area from 31 August 2016 to 12 September 2016. The locations for the noise logging were chosen through examination of aerial photography and site inspections. However it is noted that the logging locations were ultimately directed by Roads and Maritime.

Attended noise measurements were also undertaken to determine the nature of the local noise environment and confirm road traffic was the controlling noise source (for validation of the operational noise model).

The background noise logging locations are illustrated in Appendix B. The noise logging results are provided graphically in Appendix C.

A noise logger measures the noise level over the sample period and then determines L_{A1}, L_{A10}, L_{A90}, L_{Amax} and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1 per cent, 10 per cent and 90 per cent of the sample period respectively. The L_{Amax} is indicative of maximum noise levels due to individual noise events. The L_{A90} is taken as the background noise level. The L_{Aeq} is the energy averaged noise level over a defined period.

The results of the noise monitoring have been processed in accordance with the procedures contained in the *NSW Road Noise Policy* (RNP) and the *NSW Industrial Noise Policy* (INP). Weather data recorded during the noise monitoring survey periods was obtained from the Bureau of Meteorology weather station, located at Sydney Olympic Park. Periods which were affected by noise from extraneous wind and rain were omitted from the results.

Details of each noise logging location and the noise monitoring equipment are provided in Table 1 below.

Table 1 Noise logging locations

No.	Address	Location on property	Logger	Serial number	Measurement period
P12_1	May Gibbs Place, Neutral Bay	Base of pedestrian road barrier	ARL 316	16-306-037	2 Sep 16 to 12 Sep 16
P12_2	223 Military Road, Cremorne	Base of light pole by the side of the road	ARL 316	16-707-037	2 Sep 16 to 10 Sep 16
P12_3	143 Holt Avenue, Cremorne	Within hedges, with mic attached to parking sign pole	ARL 316	16-306-036	2 Sep 16 to 12 Sep 16
P12_4	116 Cabramatta Road, Cremorne	Parking island garden	ARL 316	16-707-038	2 Sep 16 to 11 Sep 16
P12_5	Prince Street Reserve, Mosman	Reserve adjacent carpark and Pittwater Road	ARL 316	16-707-007	2 Sep 16 to 12 Sep 16
P12_6	82 Spit Road, Mosman	Base of sign post by the side of the road	ARL 316	16-306-035	2 Sep 16 to 7 Sep 16[1]
P12_7	31-33 Awaba Street, Mosman	Attached beneath a tree by the side of the road	ARL 316	16-707-005	2 Sep 16 to 12 Sep 16
P12_8	45 Stanton Road, Mosman	In nature strip/garden by sidewalk	ARL 216	194662	2 Sep 16 to 12 Sep 16
P12_9	162 Spit Road, Mosman	Located on raised up garden by side of the road.	ARL 316	16-707-006	31 Aug 16 to 7 Sep 16

Note 1: Logger was retrieved after five days due to damage reported to logger.

2.3 Unattended background noise monitoring results

The background noise monitoring results are provided in Table 2. These noise levels were used to define the appropriate construction noise management levels, consistent with *Interim Construction Noise Guideline* (Department of Environment and Climate Change NSW, 2009). . The assessment background levels (ABL) were established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each assessment period of interest. The background noise level or rating background levels (RBL) representing the day, evening and night-time assessment periods were based on the median of individual ABLs determined over the entire monitoring duration.

Table 2 also presents the ambient L_{Aeq} levels at each monitoring location. The L_{Aeq} level is the equivalent continuous sound level and has the same sound energy over the sample period as the actual noise environment with fluctuating sound levels.

The noise levels presented in Table 2 indicate that the noise environment at the measurement locations are typical of suburban/urban noise environments located alongside major transport corridors, where day time and evening background levels are high due to heavy and continuous traffic flows. The night time background levels tend to decrease as a result of reduced traffic flows.

Table 2 Ambient noise measurements

Noise logging location	Rating background level, dB(A)			Ambient L_{Aeq} noise level, dB(A)		
	Day (7am to 6pm) $L_{A90,15\ minute}$	Evening (6pm to 10pm) $L_{A90,15\ minute}$	Night (10pm to 7am) $L_{A90,15\ minute}$	Day (7am to 6pm) $L_{Aeq,15\ hour}$	Evening (6pm to 10pm) $L_{Aeq,4\ hour}$	Night (10pm to 7am) $L_{Aeq,9\ hour}$
P12_1	62	59	45	76	74	73
P12_2	64	59	45	76	79	75
P12_3	69	65	53	78	76	73
P12_4	67	63	56	76	73	70
P12_5	51	51	34	65	64	62
P12_6	66	58	36	76	75	71
P12_7	62	55	34	71	68	66
P12_8	62	60	36	72	71	68
P12_9	61	60	38	73	72	68

2.4 Attended noise monitoring results

Attended monitoring was conducted at two unattended noise monitoring locations and also at a receiver set back from the road. Each attended measurement was conducted over a 15 minute period. The monitoring was carried out on 31 August, 7 September and 12 September 2016. Skies were clear with scattered clouds and conditions were calm with a slight breeze during monitoring. Measurement details are provided below in Table 3 and Table 4.

Table 3 Attended noise monitoring results (logger location)

Location	Date	Time	Description	Attended measurement results, dB(A)			
				$L_{max, 15min}$	$L_{10, 15min}$	$L_{eq, 15min}$	$L_{90, 15min}$
P12_1	12/09/16	16:03	• Located by side of Military Road. • Traffic noise dominates.	90	77	74	66
P12_2	12/09/16	15:28	• Located by side of Military Road. • Traffic noise dominates.	96	76	75	64
P12_3	12/09/16	14:36	• Located near corner of Military Road. • Traffic noise dominates.	84	70	68	61
P12_4	12/09/16	14:14	• Located on parking island. • Entrance to local shopping centre parking nearby. • Ambient noise controlled by passing traffic along Cabramatta Road. • Background noise controlled by passing traffic along Military Road.	77	63	60	53
P12_5	07/09/16	15:10	• Located in Prince Street Reserve/walkway, adjacent to Military Road. • Traffic noise dominates.	86	68	66	59
P12_6	07/09/16	14:23	• Located by side of Spit Road. • Traffic noise dominates.	96	77	74	67
P12_7	07/09/16	12:14	• Located on nature strip beneath tree, near Spit Road. • Traffic noise dominates.	87	72	69	60
P12_8	07/09/16	12:54	• Located in vegetation cornering Spit road. • Traffic noise dominates.	89	76	74	66
P12_9	07/09/16	11:50	• Located on raised up garden bed by side of Spit Road. • Corner Spit Road, Bickell Road and Mitchell Road • Traffic noise dominates.	88	76	73	65

Table 4 Attended noise monitoring results (back receiver location)

Location	Date	Time	Description	Attended measurement results, dB(A)			
				L_{max} 15min	L_{10}, 15min	L_{eq}, 15min	L_{90}, 15min
P12_1	12/09/16	16:19	• Located in front of 40 May Lane. • Ambient noise controlled by vehicle pass by. • Background noise controlled by traffic along Military Road	73	61	58	54
P12_2	12/09/16	14:53	• Note 1	76	59	57	45
P12_3	12/09/16	14:53	• Located in front of 140 Holt Avenue. • No line of sight to Military Road due to alignment of the road. • Ambient noise controlled by passing traffic along Holt Avenue. • Background noise controlled by traffic along Military Road.	76	59	57	45
P12_4	12/09/16	14:53	• Note 1	76	59	57	45
P12_5	12/09/16	13:53	• Located in front of 51 Prince Street. • No line of sight to Military Road. • Ambient noise controlled by local traffic and passing pedestrians. • Background noise controlled by traffic along Military Road and also nature.	73	52	51	44
P12_6	07/09/16	14:41	• Located in front of 10 Heydon Street (corner Ourimbah Road). • Ambient noise controlled by traffic passing along Ourimbah road. • Background noise controlled by traffic along Spit Road.	89	67	64	53
P12_7	07/09/16	12:31	• Located in front of 4/2 Rawson Street (corner Awaba Street). • Ambient noise controlled by local traffic along Awaba Street. • Background noise controlled by traffic along Spit Road.	76	64	60	48
P12_8	07/09/16	13:18	• Located in front of 35A Stanton Road. • No line of sight to Spit Road due to alignment of the road. • Ambient noise controlled by passing traffic along Stanton Road. • Background noise controlled by traffic along Spit Road and nature.	74	61	54	41

Location	Date	Time	Description	Attended measurement results, dB(A)			
				$L_{max, 15min}$	$L_{10, 15min}$	$L_{eq, 15min}$	$L_{90, 15min}$
P12_9	31/08/16	15:32	• Located in front of 25 Bapaume Road. • No line of sight to Spit Road. • Ambient noise controlled by passing traffic along Bickell Road and trucks/buses along Spit Road. • Background controlled by regular traffic along Spit Road and nature.	75	59	58	52

Note 1: The noise environment at the back receiver locations for P12_2 and P12_4 are deemed to be represented by the back receiver location of P12_3.

3.0 Construction noise and vibration criteria

3.1 Construction noise

The risk of adverse impact of construction noise on a community is determined by the extent of its emergence above the existing background noise level, the duration of the event and the characteristics of the noise.

The Interim Construction Noise Guideline is a NSW Government document that sets out ways to deal with the impacts of construction noise on residences and other sensitive land uses. It presents assessment approaches tailored to the scale of the construction project and identifies practices to minimise noise impacts. The Interim Construction Noise Guideline recommends that a quantitative assessment is carried out for all major construction proposals that are typically subject to the environmental impact assessment processes. A quantitative assessment, based on the likely construction scenarios, has been carried out for the project.

Predicted noise levels at nearby noise sensitive receivers (eg residences, schools, hospitals, places of worship, passive and active recreation areas) are compared to the levels provided in the Interim Construction Noise Guideline. Where an exceedance of the management levels is predicted the Interim Construction Noise Guideline advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially impacted residents of the nature of the works to be carried out, the expected noise level and duration, as well as contact details.

Where construction noise levels reach 75 dB(A) residential receivers can be considered as 'highly noise affected' and the proponent should, in consultation with the community, consider restricting hours to provide respite periods.

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

- Feasible - A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.
- Reasonable - Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.

Work that is proposed outside of standard working hours, as defined in the Interim Construction Noise Guideline, generally requires strong justification.

Noise management levels for residential receivers are derived using the information in Table 5.

Table 5 Construction noise management levels - Residential receivers from the Interim Construction Noise Guideline

Time of day	Management level $L_{Aeq(15\ min)}$ [1]	How to apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. Noise levels may be higher at upper floors of the noise affected residence.

3.2 Noise catchment areas

The study area has been divided into ten distinct noise catchment areas (NCAs). The noise environment at each of the sensitive receivers within a noise catchment area is considered to have a similar noise environment to the unattended monitoring location within that NCA. As such each of these sensitive receivers is assigned the same background noise level and noise management level. The location of each NCA is provided graphically in Appendix D. Table 6 provides details of the representative logger, the rating background levels and the construction noise management levels for each NCA.

Table 6 Noise catchment areas and construction noise management levels

NCA	Representative logger	Period	Rating background level[1] (RBL)	Construction noise management levels (NML)[2]
NCA_1	P12_9	Day	61	71
		Evening	60	65
		Night	38	43
NCA_2	P12_8	Day	62	72
		Evening	60	65
		Night	36	41
NCA_3	P12_7	Day	62	72
		Evening	55	60
		Night	34	39
NCA_4	P12_6	Day	66	76
		Evening	58	63
		Night	36	41
NCA_5	P12_5	Day	51	61
		Evening	51	56
		Night	34	39
NCA_6	P12_4	Day	67	77
		Evening	63	68
		Night	56	61
NCA_7	P12_3	Day	69	79
		Evening	65	70
		Night	53	58
NCA_8	P12_2	Day	64	74
		Evening	59	64
		Night	45	50

NCA	Representative logger	Period	Rating background level[1] (RBL)	Construction noise management levels (NML)[2]
NCA_9	P12_1	Day	62	72
		Evening	59	64
		Night	45	50

Note 1: Day noise management levels = RBL + 10 dB(A)

Note 2: Evening/night noise management levels = RBL + 5 dB(A)

3.2.1 Non-residential criteria

Noise management levels recommended by the Interim Construction Noise Guideline for other sensitive land uses, such as schools, hospitals or places of worship are shown in Table 7. Noise management levels for commercial and industrial premises are provided in Table 8.

Table 7 Construction noise management levels – Sensitive land uses other than residential

Land use	Construction noise management level, $L_{Aeq(15min)}$ (applies when properties are in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended “maximum” internal levels in AS2107 for specific uses.

Table 8 Construction noise management levels – Commercial and industrial land uses

Land use	Construction noise management level, $L_{Aeq(15min)}$ (applies when properties are in use)
Industrial premises	External noise level 75 dB(A)
Offices, retail outlets	External noise level 70 dB(A)

3.2.2 Sleep disturbance (construction)

The ICNG requires a sleep disturbance assessment to be undertaken where construction works are planned to extend over more than two consecutive nights. The ICNG makes reference to the EPA's NSW Environment Criteria for Road Traffic Noise (ECRTN), now superseded by the NSW Road Noise Road Noise Policy, for assessment of sleep disturbance. The Road Noise Policy references the recommendations in the Environmental Criteria for Road Traffic Noise as providing the most appropriate assessment guidance.

The guidance provided in the NSW Road Noise Policy for assessing the potential for sleep disturbance recommends that to minimise the risk of sleep disturbance during the night-time period (10pm to 7am), the $L_{A1(1\ min)}$ noise level outside a bedroom window should not exceed the $L_{A90(15\ minute)}$ background noise level by more than 15 dB(A). The EPA considers it appropriate to use this metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

The Road Noise Policy contains a review of research into sleep disturbance which represents NSW EPA advice on the subject of sleep disturbance due to noise events. It concludes that having considered the results of research to date that, 'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions'. Therefore, given that an open window provides around 10 dB(A) in noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

Table 9 presents the sleep disturbance screening and sleep disturbance awakening reaction criteria.

Table 9 Construction noise sleep disturbance criteria

NCA	Rating background level (RBL), dB(A)	Sleep disturbance screening LA1(1min) criteria, dB(A)	Sleep disturbance awakening reaction LA1(1min) criteria, dB(A)
NCA_1	38	53	65
NCA_2	36	51	65
NCA_3	34	49	65
NCA_4	36	51	65
NCA_5	34	49	65
NCA_6	56	65[1]	65
NCA_7	53	65[1]	65
NCA_8	45	60	65
NCA_9	45	60	65

Note 1: Sleep disturbance screening criteria has been lowered to meet the sleep disturbance awakening reaction

3.2.3 Construction road traffic noise

Noise from construction traffic on public roads is not covered by the Interim Construction Noise Guideline. However the Interim Construction Noise Guideline does refer to the ECRTN, now superseded by the NSW Road Noise Policy, for the assessment of noise arising from construction traffic on public roads.

In assessing feasible and reasonable mitigation measures under the *NSW Road Noise Policy*, an increase of up to 2 dB(A) represents a minor impact that is considered barely perceptible to the average person.

Therefore, the noise goal applied to traffic movements on public roads generated during the construction phase of the project is an increase in existing road traffic noise levels of no more than 2 dB(A).

3.3 Construction vibration criteria

The relevant standards / guidelines for the assessment of construction vibration are summarised in Table 10.

Table 10 Standards / guidelines used for assessing construction vibration

Item	Standard / guideline
Structural damage	German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures (DIN 4150)
Human comfort (tactile vibration)[1]	Assessing Vibration: A Technical Guideline (AVATG)[1]
Human comfort (regenerated noise)	Interim Construction Noise Guideline (ICNG)

Note 1: This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard was superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. Although a new version of BS 6472 has been published, the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.

Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- Continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities for example, a tunnel boring machine.
- Impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with a duration of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities.
- Intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

3.3.1 Structural damage

At present, no Australian Standards exist for the assessment of building damage caused by vibration.

DIN 4150 provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in Table 11. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage.

Table 11 DIN 4150: Structural damage safe limits for building vibration

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

3.3.2 Human comfort

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

3.3.2.1 Intermittent vibration

The assessment of intermittent vibration outlined in Assessing Vibration: A Technical Guideline (DEC, 2006) is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the day time and night time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in Table 12. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 12 Preferred and maximum vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Day time		Night time	
	Preferred	Max	Preferred	Max
Critical areas	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8
Workshops	0.8	1.6	0.8	1.6

3.3.2.2 Continuous and impulsive vibration

Acceptable levels of human exposure to continuous and impulsive vibration are dependent on the time of day and the activity taking place in the occupied space. Assessing Vibration: A Technical Guideline provides the preferred values for continuous and impulsive vibration. These are presented in Table 13.

There is low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values in Table 13. Situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances and infrequent events of short duration. Vibration levels above those indicated in Table 13 may be dealt with through negotiation with the regulator of the affected community. The following axes are defined in relation to the human body:

- x – back to chest.
- y – right side to left side.
- z – foot to head.

Table 13 Preferred and maximum peak particle velocity for continuous and impulsive vibration acceleration (mm/s)

Location	Assessment period	Preferred	Maximum	
		z axis x and y axes	z axis	x and y axes
Continuous vibration				
Critical areas1	When in use	0.14	0.28	
Residences2	Day Night	0.28 0.20	0.56 0.40	
Offices, schools, educational institutions and places of worship	When in use	0.56	1.1	
Workshops	When in use	1.1	2.2	
Impulsive vibration				
Critical areas	When in use	0.14	0.28	
Residences2	Day Night	8.6 2.8	17.0 5.6	
Offices, schools, educational institutions and places of worship	When in use	18.0	36.0	
Workshops	When in use	18.0	36.0	

Note 1: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria.

Note 2: Criteria for residences are lower than schools as people expect to be able to relax/sleep in their homes without annoyance and are generally more concerned about structural damage than would be the case within schools and offices.

4.0 Construction noise assessment

4.1 Construction scenarios

The construction scenarios used in this assessment are based on the scope of works as outlined in Section 1.2. Specific elements relating to construction of the proposed B-Line package have been assigned a specific works scenario with a corresponding L_{eq} sound power level (SWL). The construction scenarios have been assumed based on the Roads and Maritime construction noise estimator tool.

Table 14 Construction scenarios

Scenario	Works code	Equipment	SWL, dBA	No of units	Overall SWL
Utility, property, service adjustment	UTL	Excavator (tracked) 35t	110	1	116
		Dump truck	110	4 per hour	
		Franna crane 20t	98	1	
		Pneumatic hammer	113	-	
		Concrete saw	118	1	
		Vacuum truck	109	-	
		Backhoe	111	-	
		Power generator	103	1	
Paving/ asphalting (inc concrete sawing)	PAV	Pavement laying machine	114	1	118
		Dump truck	110	4 per hour	
		Asphalt truck & sprayer	103	1	
		Concrete truck	109	1	
		Smooth drum roller	107	1	
		Concrete saw	118	1	
Construction compound operation	CCO	Front end loader	91	1	114
		Excavator (tracked) 35t	110	-	
		Road truck	108	4 per hour	
		Compressor	109	1	
		Welding equipment	105	1	
		Light vehicles	88	12 per hour	
		Power generator	103	1	
Construction compound establishment	CCE	Chainsaw 4-5hp	114	2	119
		Pneumatic hammer	113	-	
		Fixed crane	113	1	
		Front end loader	112	1	
		Excavator (tracked) 35t	110	-	
		Grader	113	1	
		Vibratory roller	109	-	
		Concrete truck	109	4 per hour	

Scenario	Works code	Equipment	SWL, dBA	No of units	Overall SWL
		Dump truck	110	4 per hour	
		Water cart	107	-	
		Concrete vibrator	113	1	
		Concrete pump	109	1	
		Power generator	103	1	
		Light vehicles (eg 4WD)	103	2	
Road furniture installation	FURN	Road truck	108	4 per hour	110
		Scissor lift	98	1	
		Franna crane 20t	98	1	
		Line marking truck	108	1	
Tree removal	TREE	Bulldozer D9	116	1	121
		Excavator (tracked) 35t	110	1	
		Chainsaw 4-5hp	114	2	
		Tub grinder/ mulcher 40-50hp	116	1	
		Dump truck	110	4 per hour	

The construction scenarios applicable to each Subzone are identified in Table 15 below. The scenarios which are considered to be most significant/worst case and are assessed in this report are demarcated bold.

Table 15 Construction scenarios within each Subzone

Subzone	Scenarios
A1	UTL, PAV, **TREE**
A2_1	FURN, UTL, **TREE**
A2_2	PAV, **TREE**
A3	FURN, **UTL**
A4	FURN, UTL, **PAV**
A5_1	**FURN**
A5_2	FURN, **PAV**
B1	FURN, UTL, PAV, **TREE**, **CCO**, **CCE**
B2	UTL, PAV, **TREE**
C1	**PAV**
C2	UTL, PAV, **TREE**
C3	UTL, PAV, **TREE**
C6_1 - C6_6	FURN, UTL, **PAV**

4.2 Modelling and conditions

In order to assess noise impacts from the works, a noise model was created to represent 'reasonable' worst case scenarios. The construction works have been modelled in SoundPLAN Version 7.3. The following features were included in the noise model:

- ground topography (the level and shape of the surrounding land)
- ground absorption and reflection
- buildings (including shielding of noise)
- construction noise sources (listed in Table 14).

Noise emissions from the construction site have been modelled using an implementation of the ISO 9613 propagation algorithm with neutral metrological conditions.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment. The acoustic shielding calculated in the model due to fixed building structures will also vary as the construction equipment moves around the site.

4.3 Results

Construction noise levels at the identified residential and non-residential receivers have been assessed against the standard hours, out-of-hours daytime and evening and out-of-hours night-time NMLs (as shown in Table 6). However, the level of impact may change depending on the final construction methodology which would be developed by the Contractor and further assessment would be undertaken if required.

During construction not all equipment will be operating simultaneously at all times or at all, which will result in a slight reduction in the predicted noise levels. Reasonable and feasible mitigation measures for receivers have been specified in section 6.0 which would reduce the impact of these exceedances. The proposed works for each Subzone have been modelled as presented in Table 15 and as such the assessment considers the worst case scenario. Therefore the predicted levels are unlikely to be exceeded in practice. Works which span more than one NCA are assessed based on the NML of the applicable NCAs as noted.

Noise results are presented as noise contour layers over aerial maps in Appendix E.

The modelling identified that there would likely be exceedances of the NMLs at most residential receivers during all hours of work for all assessed construction scenarios. Key noisy activities include tree removal and paving/asphalting.

4.3.1 L_{Aeq} noise impacts at residences during standard working hours

Table 16 shows predicted noise impacts at the most affected residential receiver during standard hours.

Table 16 Predicted noise impacts at representative residential receivers - Standard hours

Subzone	NCA	NML	Construction Scenario	Most affected receiver		
				Offset (m)[2]	Predicted Level	Exceedance
A1	NCA_1	71	TREE	10	91	20
A2_1	NCA_2	72	TREE	10	94	22
A2_2	NCA_2	72	PAV	10	93	21
A3	NCA_3	72	UTL	5	93[1]	21
A4	NCA_4	76	PAV	5	101[1]	25
A5_1	NCA_3	72	FURN	5	95[1]	23
A5_2	NCA_3	72	PAV	5	95[1]	23
A5_2	NCA_4	76	PAV	10	91	15
Construction compound (establishment)	NCA_4	76	CCE	5	86	10
Construction compound (operation)	NCA_4	76	CCO	5	81	5
B1	NCA_4	76	TREE	10	98	22
B2	NCA_5	61	TREE	5	104[1]	43
C1	NCA_6	77	PAV	5	96[1]	19
C2	NCA_7	79	TREE	10	106	27
C3	NCA_8	74	TREE	5	104[1]	30
C6_1	NCA_9	72	PAV	10	92	20
C6_2	NCA_9	72	PAV	10	91	19
C6_3	NCA_9	72	PAV	10	92	20
C6_4	NCA_8	74	PAV	10	93	19
C6_5	NCA_6	77	PAV	10	93	16
C6_5	NCA_7	79	PAV	10	91	12
C6_6	NCA_6	77	PAV	10	92	15

Note 1 Sound level is exceptionally high as the receiver is in close proximity to the proposed works area
Note 2 the offset distances have been rounded down to the nearest 5 m

4.3.2 L_{Aeq} noise impacts at residences during out of hours works

The predicted construction noise levels at residential receivers during out of hours works are shown in:

- Table 17 for representative residential receivers during daytime out of hours works (e.g. weekends)
- Table 18 for representative residential receivers during evening out of hours works
- Table 19 for representative residential receivers during night time out of hours works.

The results of the modelling show exceedances of the out of hours NMLs (daytime, evening and night time) at residential receivers during all assessed work packages.

The majority of residential receivers are predicted to exceed daytime NMLs during most of the out of hours construction stages, with a similar number of exceedances predicted during the evening period. A larger number of receivers are predicted to exceed night-time NMLs.

It should be noted that night works will occur to minimise the impact on traffic (e.g. road resurfacing, and concrete median removal).

Table 17 Predicted noise impacts at representative residential receivers - Out of hours (day)

Subzone	NCA	NML	Construction Scenario	Most affected receiver		
				Offset (m)[2]	Predicted Level	Exceedance
A1	NCA_1	66	TREE	10	91	25
A2_1	NCA_2	67	PAV	10	94	27
A2_2	NCA_2	67	TREE	10	93	26
A3	NCA_3	67	UTL	5	93	26
A4	NCA_4	71	PAV	5	101	30
A5_1	NCA_3	67	FURN	5	95	28
A5_2	NCA_3	67	PAV	5	95	28
A5_2	NCA_4	71	PAV	10	91	20
Construction compound (establishment)	NCA_4	71	CCE	5	86	15
Construction compound (operation)	NCA_4	71	CCO	5	81	10
B1	NCA_4	71	TREE	10	98	27
B2	NCA_5	56	TREE	5	104	48
C1	NCA_6	72	PAV	5	96	24
C2	NCA_7	74	TREE	10	106	32
C3	NCA_8	69	TREE	5	104	35
C6_1	NCA_9	67	PAV	10	92	25
C6_2	NCA_9	67	PAV	10	91	24
C6_3	NCA_9	67	PAV	10	92	25
C6_4	NCA_8	69	PAV	10	93	24
C6_5	NCA_6	72	PAV	10	93	21
C6_5	NCA_7	74	PAV	10	91	17
C6_6	NCA_6	72	PAV	10	92	20

Note 1 Sound level is exceptionally high as the receiver is in close proximity to the proposed works area
Note 2 the offset distances have been rounded down to the nearest 5 m

Table 18 Predicted noise impacts at representative residential receivers - Out of hours (evening)

Subzone	NCA	NML	Construction Scenario	Most affected receiver		
				Offset (m)[2]	Predicted Level	Exceedance
A1	NCA_1	65	TREE	10	91	26
A2_1	NCA_2	65	PAV	10	94	29
A2_2	NCA_2	65	TREE	10	93	28
A3	NCA_3	60	UTL	5	93	33
A4	NCA_4	63	PAV	5	101	38
A5_1	NCA_3	60	FURN	5	95	35
A5_2	NCA_3	60	PAV	5	95	35
A5_2	NCA_4	63	PAV	10	91	28
Construction compound (establishment)	NCA_4	63	CCE	5	86	23
Construction compound (operation)	NCA_4	63	CCO	5	81	18
B1	NCA_4	63	TREE	10	98	35
B2	NCA_5	56	TREE	5	104	48
C1	NCA_6	68	PAV	5	96	28
C2	NCA_7	70	TREE	10	106	36
C3	NCA_8	64	TREE	5	104	40
C6_1	NCA_9	64	PAV	10	92	28
C6_2	NCA_9	64	PAV	10	91	27
C6_3	NCA_9	64	PAV	10	92	28
C6_4	NCA_8	64	PAV	10	93	29
C6_5	NCA_6	68	PAV	10	93	25
C6_5	NCA_7	70	PAV	10	91	21
C6_6	NCA_6	68	PAV	10	92	24

Note 1 Sound level is exceptionally high as the receiver is in close proximity to the proposed works area
Note 2 the offset distances have been rounded down to the nearest 5 m

Table 19 Predicted noise impacts at representative residential receivers - Out of hours (night)

Subzone	NCA	NML	Construction Scenario	Most affected receiver		
				Offset (m)[2]	Predicted Level	Exceedance
A1	NCA_1	43	TREE	10	91	48
A2_1	NCA_2	41	PAV	10	94	53
A2_2	NCA_2	41	TREE	10	93	52
A3	NCA_3	39	UTL	5	93	54
A4	NCA_4	41	PAV	5	101	60
A5_1	NCA_3	39	FURN	5	95	56
A5_2	NCA_3	39	PAV	5	95	56
A5_2	NCA_4	41	PAV	10	91	50
Construction compound (establishment)	NCA_4	41	CCE	5	86	45
Construction compound (operation)	NCA_4	41	CCO	5	81	40
B1	NCA_4	41	TREE	10	98	57
B2	NCA_5	39	TREE	5	104	65
C1	NCA_6	61	PAV	5	96	35
C2	NCA_7	58	TREE	10	106	48
C3	NCA_8	50	TREE	5	104	54
C6_1	NCA_9	50	PAV	10	92	42
C6_2	NCA_9	50	PAV	10	91	41
C6_3	NCA_9	50	PAV	10	92	42
C6_4	NCA_8	50	PAV	10	93	43
C6_5	NCA_6	61	PAV	10	93	32
C6_5	NCA_7	58	PAV	10	91	33
C6_6	NCA_6	61	PAV	10	92	31

Note 1 Sound level is exceptionally high as the receiver is in close proximity to the proposed works area
Note 2 the offset distances have been rounded down to the nearest 5 m

4.3.3 Sleep disturbance

Due to the high noise levels, sleep disturbance can be expected for noise intensive works during the night-time period. Mitigation should be employed in accordance with the recommendations provided in Section 6.0 of this report.

4.4 Construction traffic noise impacts

The traffic report has identified that approximately 5 heavy vehicles would be required on site per day. It is estimated that a maximum of two vehicles per hour would access the site. Additionally 18 light vehicles would make two-way trips. Light vehicles would generally arrive between 6.30 am and 7.00 am and depart between 5.00 pm and 5.30 pm. Existing hourly movements (both heavy and light vehicles combined) on Pittwater road are between approximately 500 movements per hour at 5.00 am with an afternoon peak of 3,500 movements at 5.00 pm. The movements associated with the construction traffic are relatively insignificant and may increase noise levels by up to 0.2 dB(A). This increase in noise would not have a perceptible change on existing road traffic throughout the project area.

5.0 Construction vibration assessment

In order to comply with the cosmetic/structural damage and human discomfort criteria presented in Section 3.2.3 the safe working distances presented in Table 20 should not be encroached.

Table 20 Recommended safe working distances for vibration intensive plant

Plant	Rating/description	Safe working distance	
		Cosmetic damage (metres)	Human response (metres)
Vibratory roller	< 50 kN (Typically 1-2 T)	5	15-20
	< 100 kN (Typically 2-4 T)	6	20
	< 200 kN (Typically 4-6 T)	12	40
	< 300 kN (Typically 7-13 T)	15	100
	> 300 kN (Typically 13-18 T)	20	100
	> 300 kN (> 18 T)	25	100
Small hydraulic hammer	(300 kg – 5-12 T excavator)	2	7
Medium hydraulic hammer	(900 kg – 12-18 T excavator)	7	23
Large hydraulic hammer	(1,600 kg – 18-34 T excavator)	22	73
Vibratory pile driver	Sheet piles	2-20	20
Pile boring	≤ 800 mm	2 nominal	N/A
Jack hammer	Handheld	Avoid contact with structure	Avoid contact with structure

Note1: 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

Depending on the construction equipment that is used, the safe working distances outlined in Table 20 may be encroached. If vibration intensive works are required within the safe working distances identified, alternative equipment should be identified and vibration monitoring implemented. Further mitigation of vibration would not be required where the safe working distances do not coincide with sensitive receivers.

In some circumstances, construction activity within the safe working distance cannot be avoided due to the work required and the prevalent geological site conditions. These conditions may not be fully understood until work has commenced, resulting in a potential change in operating equipment. Approaches to manage such circumstances are discussed in Section 6.2.

6.0 Recommended mitigation measures

This section of the report presents construction noise and vibration mitigation measures to be considered for implementation to avoid and/or manage construction noise and vibration impacts.

The construction noise and vibration assessment presented in Chapter 4.0 of this report detailed a number of exceedances of the noise management levels associated with the proposed B-line works. These were predicted as a result of various construction activities. A number of exceedances of the 'highly noise affected' criteria were also predicted. As a result of these exceedances, and potential exceedances of vibration criteria, generic and receiver-specific mitigation measures have been identified.

6.1 Standard noise mitigation

In addition to the specific noise mitigation, where reasonable and feasible the following noise mitigation should be employed.

6.1.1 Construction noise and vibration management plan

A Construction Noise and Vibration Management Plan (CNVMP) would be prepared. The CNVMP would include the following:

- Identification of nearby residences and other sensitive land uses
- Description of approved hours of work
- Description and identification of all construction activities, including work areas, equipment and duration
- Description of what work practices (generic and specific) would be applied to minimise noise and vibration
- A complaints handling process
- Noise and vibration monitoring procedures
- Overview of community consultation required for identified high impact works.

The CNVMP should include consideration of the following issues:

- Cumulative construction noise impacts
- Construction noise fatigue.

Feasible and reasonable mitigation measures would be detailed within the CNVMP to manage predicted noise levels at sensitive receivers and areas where construction fatigue could occur. Consultation with the affected community would also occur prior to and during construction.

6.1.2 Community consultation and complaints handling

All residents impacted by noise from the proposed works which are expected to exceed the construction noise management levels (NML) should be consulted prior to the commencement of construction. The highest consideration should be given to those that are predicted to be most affected as a result of the works.

The information provided to the residents should include:

- Programmed times and locations of construction work
- The hours of proposed works
- Construction noise and vibration impact predictions
- Construction noise and vibration mitigation measures to be implemented on site.

Community consultation regarding construction noise and vibration would be detailed in the Community Involvement Plan for the construction of the project and would include a 24 hour hotline and complaints management process.

For out-of-hours works, consultation would take place with consideration to Practice Note vii of Roads and Maritime's *Environmental Noise Management Manual* (ENMM) and Strategy 2 of the ICNG.

6.1.3 Work practices

Induction and training would be provided to relevant staff and sub-contractors outlining their responsibilities with regard to noise and vibration.

6.1.4 Construction hours and work scheduling

Details of all out of hours work required would form part of the CNVMP.

Noisy work would be scheduled to be undertaken during the standard hours as far as possible. Noisy activities that cannot be undertaken during standard construction hours are to be scheduled as early as possible during the evening and/or night-time periods.

Particularly noisy activities such as the use of impact piling rigs, road and concrete saws, rock hammers, should be scheduled where feasible and reasonable around times of high background noise to provide masking.

Deliveries would be carried out during standard construction hours where feasible and reasonable.

Consideration would be given to construction timetabling to minimise noise impacts, such as the use of respite periods.

6.1.5 Respite

A protocol would be developed to identify the need for, and provision of, respite measures for residential receivers in accordance with the *ICNG*. Respite measures may include the restriction to the hours of construction activities resulting in impulsive or tonal noise (such as rock hammering, pile driving), or other appropriate measures agreed between the contractor and residential receiver such as temporary alternative accommodation.

The protocol would form part of the CNVMP.

6.1.6 Construction traffic

The following measures would be implemented to reduce and manage noise and vibration impacts associated with construction traffic:

- Truck drivers would be advised of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (ie minimising/restricting the use of engine compression brakes, and no extended periods of engine idling)
- Site access and egress points would be located away from residences and other sensitive land uses, where feasible and reasonable
- Deliveries and spoil removal would be planned to avoid queuing of trucks on or around the compounds
- Construction sites would be arranged to limit the need for reversing associated with regular/repeatable movements (eg trucks transporting spoil) to minimise the use of reversing alarms
- Where feasible and reasonable, non-tonal reversing alarms would be used, taking into account the requirements of the Workplace Health and Safety legislation
- Spoil would be moved during the day where practical, and feasible and reasonable management strategies would be investigated in consultation with the NSW Environment Protection Authority to minimise the volume of heavy vehicle movements at night.

6.1.7 Plant and equipment selection and location

The selection of plant and equipment can have a significant impact on construction noise levels. Appropriate plant would be selected for each task to minimise the noise contributions.

Alternative works methods such as the use of hydraulic or electric-controlled units in place of diesel units would be considered and implemented where feasible and reasonable. The use of alternative

machines that perform the same function, such as rubber wheeled plant, would be considered in place of steel tracked plant.

Equipment would be regularly inspected and maintained to ensure it is in good working order.

Plant should be located on site with as much distance as possible between the plant and noise sensitive receivers. Noisy equipment would be orientated away from residential receivers where feasible and reasonable.

6.1.8 Noise monitoring

A noise monitoring program would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during construction. The results would be reviewed to determine if additional mitigation measures are required. All measurements would be undertaken in accordance with *Australian Standard 1055. 1-1997 – Acoustics – Description and measurement of environmental noise, Part 1: General procedures*.

A noise monitoring program would be presented in the CNVMP.

If regenerated noise is reported to be a problem during vibration intensive works, attended and/or unattended noise measurements would be undertaken within the relevant building spaces to determine the level of regenerated noise.

6.2 Standard construction vibration mitigation measures

In some circumstances, construction activity within the safe working distance cannot be avoided based on the type of work required and the prevalent geological site conditions. These conditions may not be fully understood until work has commenced. Provided below is a summary of management measures for vibration intensive activities that occur within safe working distances.

6.2.1 Equipment selection and maintenance

Equipment size would be selected taking into account the safe working distances and the distance between the area of construction and the most affected sensitive receiver.

The use of less vibration intensive methods of construction or equipment would be considered where feasible and reasonable when working in proximity to existing structures.

Equipment would be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse vibration impacts.

6.2.2 Scheduling of construction activities

Wherever reasonable and reasonable, vibration intensive works should be limited to the least sensitive times of the day.

6.2.3 Supplementary vibration monitoring

If the use of vibration intensive plant cannot be avoided within the safe working distance for cosmetic damage to existing structures the following procedure would occur as a minimum:

- Notification of the works to the affected residents and community
- Works would not proceed until attended vibration measurements are undertaken.

If ongoing works are required a temporary relocatable vibration monitoring system would be installed to warn operators (via flashing light, audible alarm, short message service (SMS) etc) when vibration levels are approaching the cosmetic damage objective.

6.3 Additional mitigation measures

Specific noise mitigation has been recommended in accordance with the *RMS Construction Noise Guideline*. Provided below is a summary of the details of various types of noise mitigation.

Table 21 Specific noise mitigation measures

Measure	Description
Notification (letterbox drop or equivalent)	Advanced warning of works and potential disruptions can assist in reducing the impact on the community. The notification may consist of a letterbox drop (or equivalent) detailing work activities, time periods over which these will occur, impacts and mitigation measures. Notification should be a minimum of 5 working days prior to the start of works. The approval conditions for projects may also specify requirements for notification to the community about works that may impact on them.
Specific notifications	Specific notifications are letterbox dropped (or equivalent) to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. The specific notification provides additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops. This form of communication is used to support periodic notifications, or to advertise unscheduled works.
Phone calls	Phone calls detailing relevant information made to identified/affected stakeholders within seven calendar days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs. Where the resident cannot be telephoned then an alternative form of engagement should be used.
Individual briefings	Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Project representatives would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project. Where the resident cannot be met with individually then an alternative form of engagement should be used.
Respite offers	Respite Offers should be considered made where there are high noise and vibration generating activities near receivers. As a guide work should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers. The purpose of such an offer is to provide residents with respite from an ongoing impact. This measure is evaluated on a project-by-project basis, and may not be applicable to all projects.
Respite Period 1 Mon – Fri 6pm – 10pm Sat 7am – 9am & 1pm – 10pm, Sun/Pub Hol 8am – 6pm	Out of hours construction noise in out of hours period 1 shall be limited to no more than three consecutive evenings per week except where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and no more than 6 evenings per month
Respite Period 2 Mon – Fri 10pm – 7am Sat 10pm – 8am Sun/Pub Hol 6pm – 7am	Night time construction noise in out of hours period 2 shall be limited to two consecutive nights except for where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and no more than 6 nights per month. Where possible, high noise generating works shall be completed before 11pm.

Measure	Description
Duration respite	Respite offers and respite periods 1 and 2 may be counterproductive in reducing the impact on the community for longer duration projects. In this instance and where it can be strongly justified it may be beneficial to increase the work duration, number of evenings or nights worked through Duration Respite so that the project can be completed more quickly. The project team should engage with the community where noise levels are expected to exceed the NML to demonstrate support for Duration Respite. Where there are few receivers above the NML each of these receivers should be visited to discuss the project to gain support for Duration Respite. Support may be demonstrated from surveys, online feedback, contact phone numbers and community events.
Alternative accommodation	Alternative accommodation options may be offered to residents living in close proximity to construction works that are likely to experience highly intrusive noise levels . The specifics of the offer will be identified on a project-by-project basis. Additional aspects for consideration shall include whether the highly intrusive activities occur throughout the night or before midnight.
Verification	Verification should include measurement of the background noise level and construction noise. Note this is not required for projects less than three weeks unless to assist in managing complaints.

6.3.1 Specific noise mitigation -Noise Catchment Area NCA_1

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_1:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, notification, respite period 1, duration respite
- Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.

6.3.2 Specific noise mitigation -Noise Catchment Area NCA_2

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_2:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.

6.3.3 Specific noise mitigation -Noise Catchment Area NCA_3

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_3:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications

- Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.

6.3.4 Specific noise mitigation -Noise Catchment Area NCA_4

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_4:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, notification, respite period 1, duration respite
- Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.
- Construction hoardings to be maintained around the construction compound.

6.3.5 Specific noise mitigation -Noise Catchment Area NCA_5

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_5:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.

6.3.6 Specific noise mitigation -Noise Catchment Area NCA_6

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_6:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, notification, respite period 1, duration respite
- Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.

6.3.7 Specific noise mitigation -Noise Catchment Area NCA_7

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_7:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications

- Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.

6.3.8 Specific noise mitigation -Noise Catchment Area NCA_8

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_8:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.

6.3.9 Specific noise mitigation -Noise Catchment Area NCA_9

In accordance with the *RMS Construction Noise Guideline and Vibration Guideline*, provided below is a summary of the required noise mitigation and management measures for the most affected sensitive receivers in NCA_9:

- Standard work hours – Notification, verification
- Day out of hours work – Verification, notification, respite period 1, duration respite
- Evening out of hours work - Verification, individual briefings, notification, respite period 1, duration respite, phone calls, specific notifications
- Night-time out of hours work – Alternative accommodation, verification, individual briefings, notifications, phone calls, specific notifications, respite period 2, duration respite.

7.0 Conclusion

A detailed construction noise and vibration assessment has been undertaken to determine likely impacts to nearby sensitive residential receivers of the proposed Northern Beaches B-Line Program Package 12. Roads and Maritime do not expect a change in traffic volumes as a result of the project. As such as operational noise assessment is not warranted for this project.

The project is divided up into three areas:

- Zone A is located on Spit Road between the Spit Bridge to the north and Ourimbah Road to the south.
- Zone B is located between the intersection of Ourimbah Road and Spit Road and the intersection of Spofforth Street and Military Road.
- Zone C is located on Spit Road between Spofforth Street and Watson Street.

Background noise logging has been undertaken at each of the Zones within the Proposal area to quantify the existing noise levels. The background noise logging was used to define the construction noise management levels in accordance with the EPA's *Interim Construction Noise Guideline*.

Noise has been assessed at the most affected noise sensitive receiver within each zone of works. The results identify that the community has the potential to be adversely impacted by the proposed works, particularly if out of hours works will be required. Provided in Section 6.0 are standard and additional specific noise mitigation measures for the proposed works in each Subzone. These recommendations have been made in accordance with the *Roads and Maritime Construction Noise and Vibration Guideline*. Due to small offset distances between the source and receivers, all works are expected to exceed the noise management levels. Standard noise mitigation measures have also been recommended to be included, where found reasonable and feasible. These practices are detailed in Section 6.3.9.

Vibration criteria have been based on the EPA's *Assessing Vibration: A technical guideline*. Dependent on the specific equipment used in the construction process, the vibration generated by the proposed construction works has the potential to impact sensitive receivers. Measures to manage vibration impacts have been recommended primarily in the form of selecting equipment which will comply with the safe working distances identified in Section 5.0. If vibration intensive work is proposed within these safe working distances, additional mitigation measures should be implemented as outlined in Section 6.2.

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Appendix A

Acoustic Glossary

D R A F T

Appendix A Acoustic Glossary

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

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

D R A F T

Term	Definition
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 L90 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	Construction noise The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays. Road traffic noise The period from 0700 to 2200 h every day of the week.
Evening	Construction noise The period from 1800 to 2200 h Monday to Sunday and Public Holidays. Road traffic noise Not applicable.
Night	Construction noise The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays. Road traffic noise The period from 2200 to 0700 h every day of the week.
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.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 “Acoustics – Glossary of terms and related symbols”, the EPA’s Industrial Noise Policy and Road Noise Policy.

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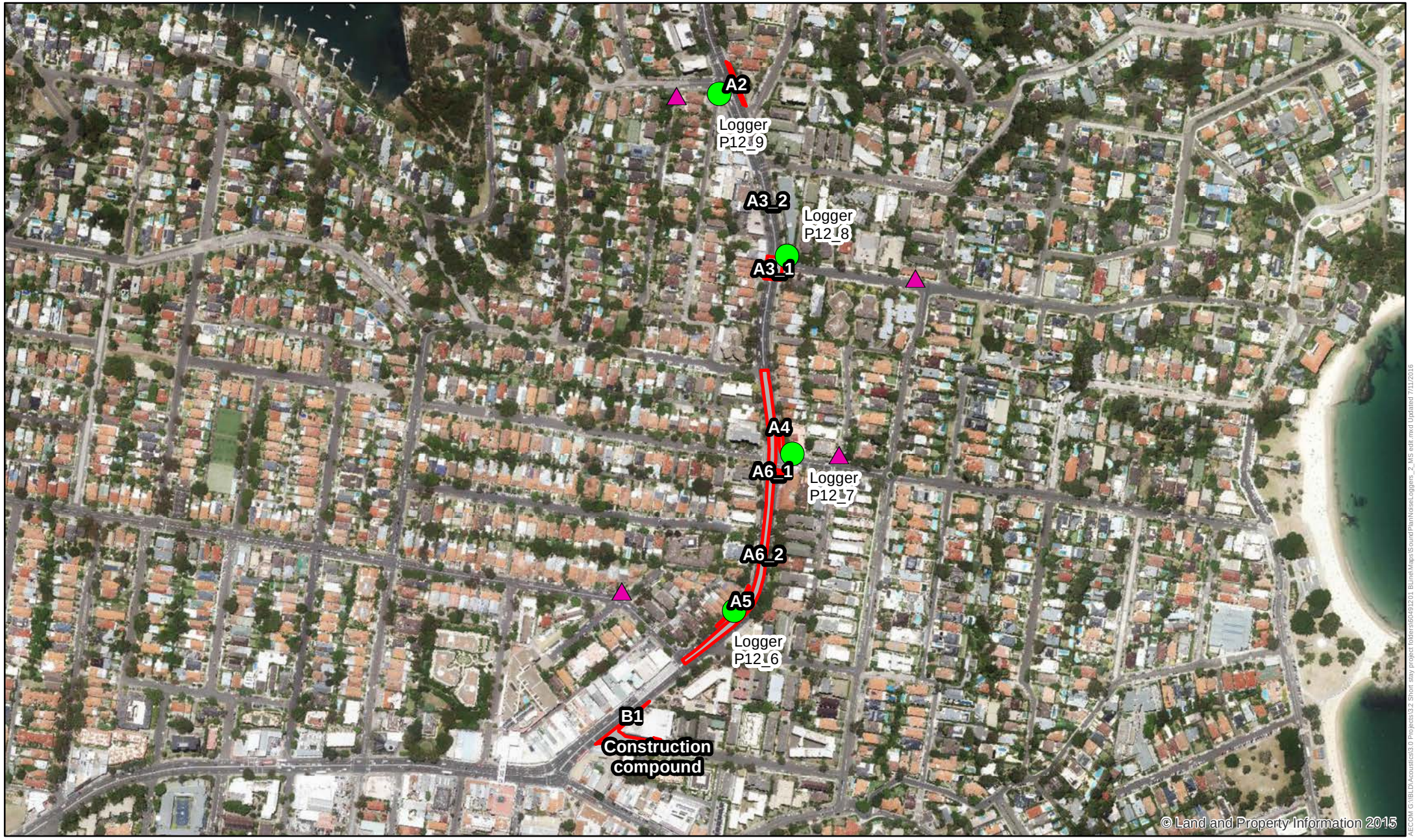
Appendix B

Noise logging locations



Legend

- Extension of works (approximate)
- Package 12 Noise loggers
- Attended noise logging locations, shielded location

B-Line

Package 12 Noise Loggers

N

0 100 200 400 Meters

NOV 2016

60491201

Fig. **1**

Legend

- Extension of works (approximate)
- Package 12 Noise loggers
- Attended noise logging locations, shielded location

B-Line

Package 12 Noise Loggers

N

0 100 200 400 Meters

NOV 2016

60491201

Fig. **2**

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Appendix C

Noise logging charts

P12_1 - May Gibbs Place - 02/09/16 - 12/09/16

Logger Setup

Logger Type: ARL 315

Serial No : 16-306-037

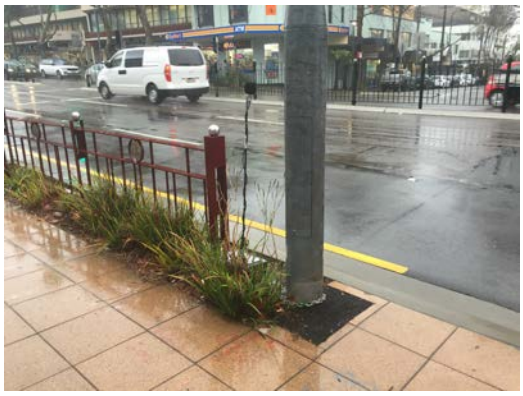
Address: May Gibbs Pl Neutral Bay , North Sydney

Location: At base of guard rail, on side of road.

Facade / Free Field: Free Field

Environment: Traffic noise dominates. Logger location is adjacent to a T instersection and by the side of Military Road.

Logger Setup Photo



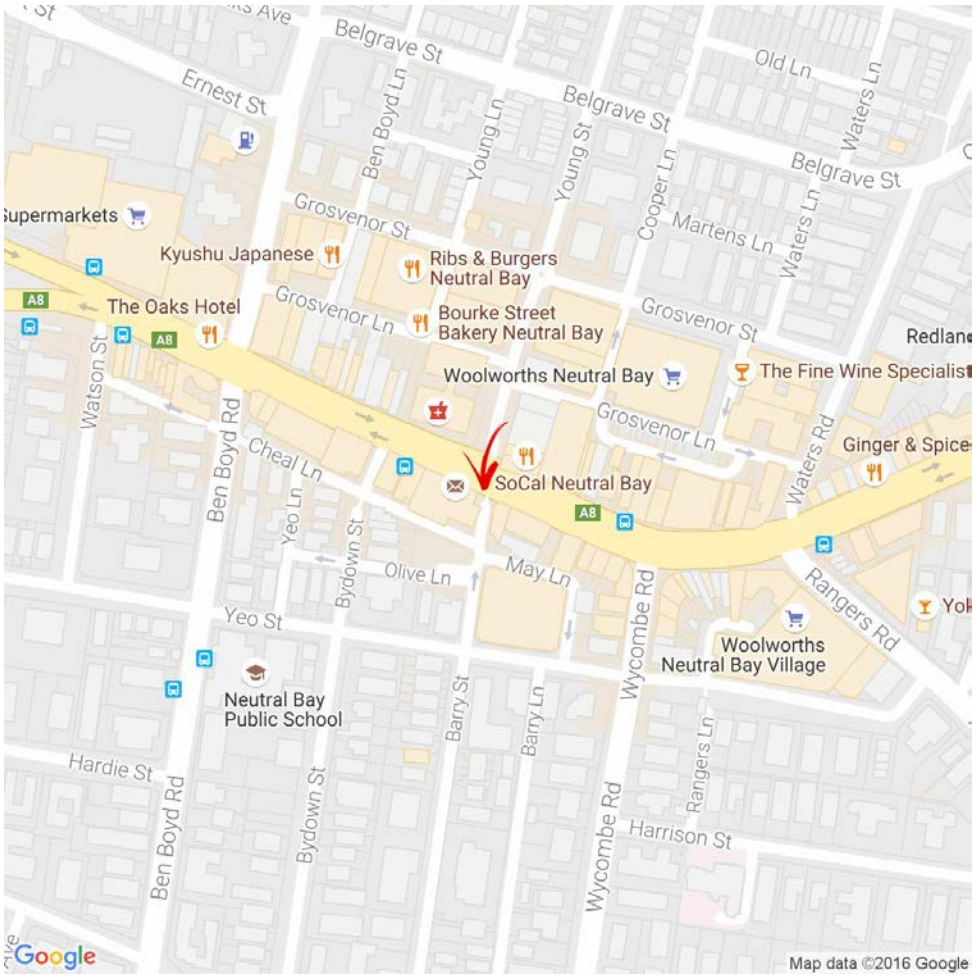
INP Noise Level, dB(A)

	Log Average	RBL
Day	76	62
Evening	74	59
Night	73	45

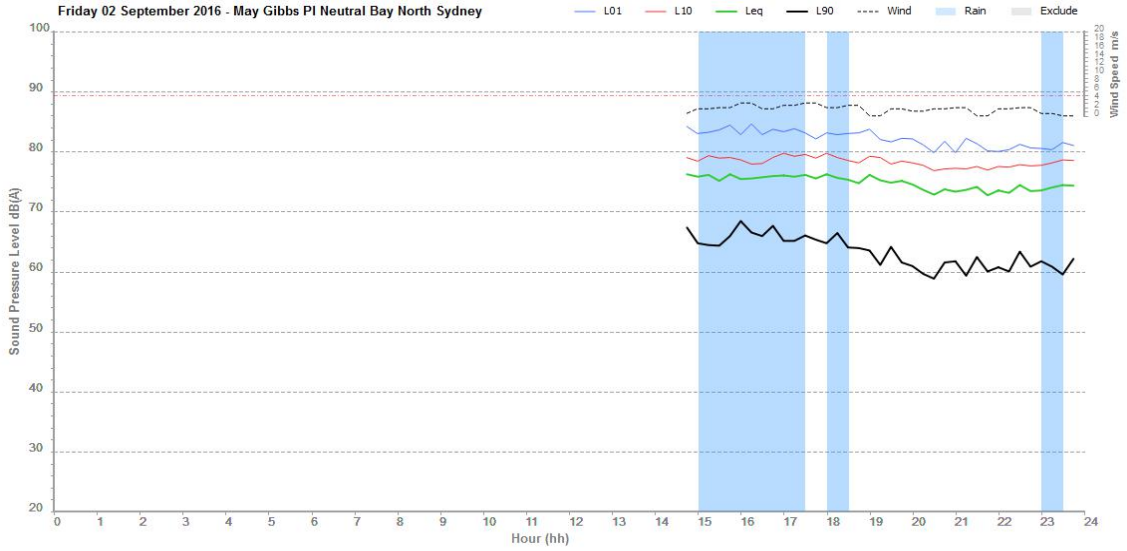
RNP Noise Level, dB(A)

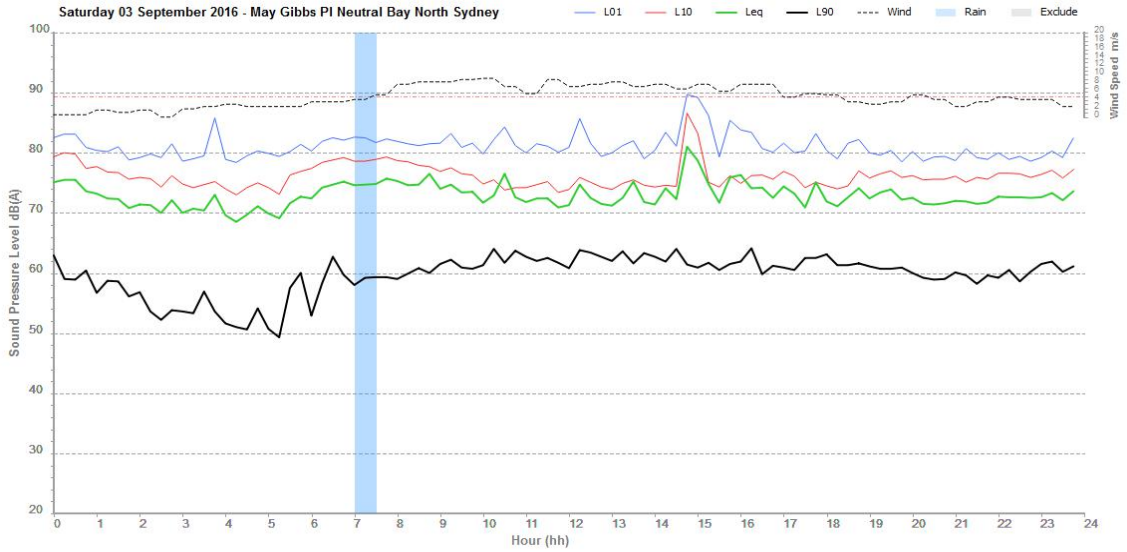
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

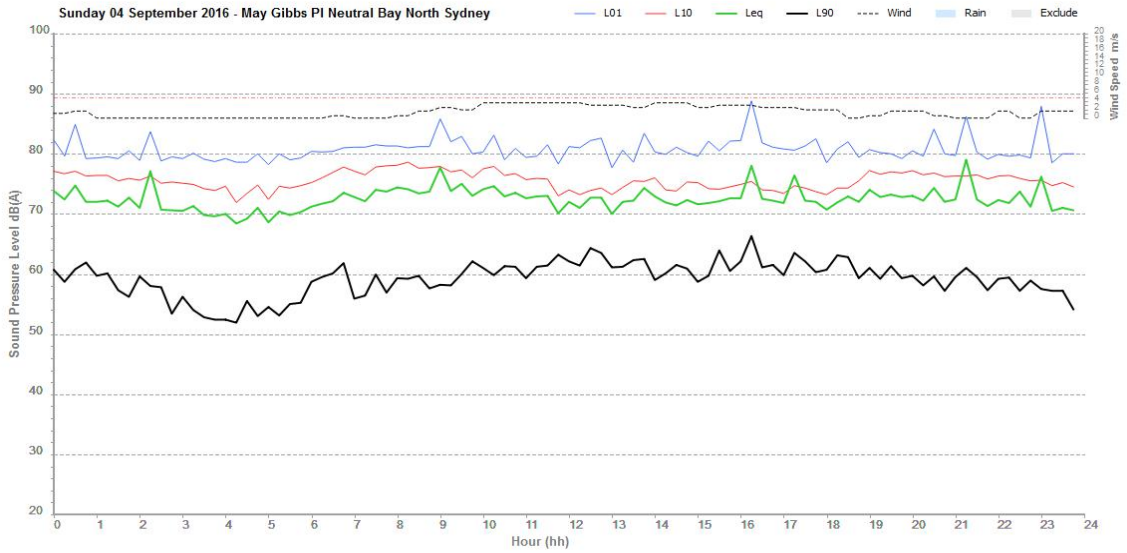
Logger Location Map



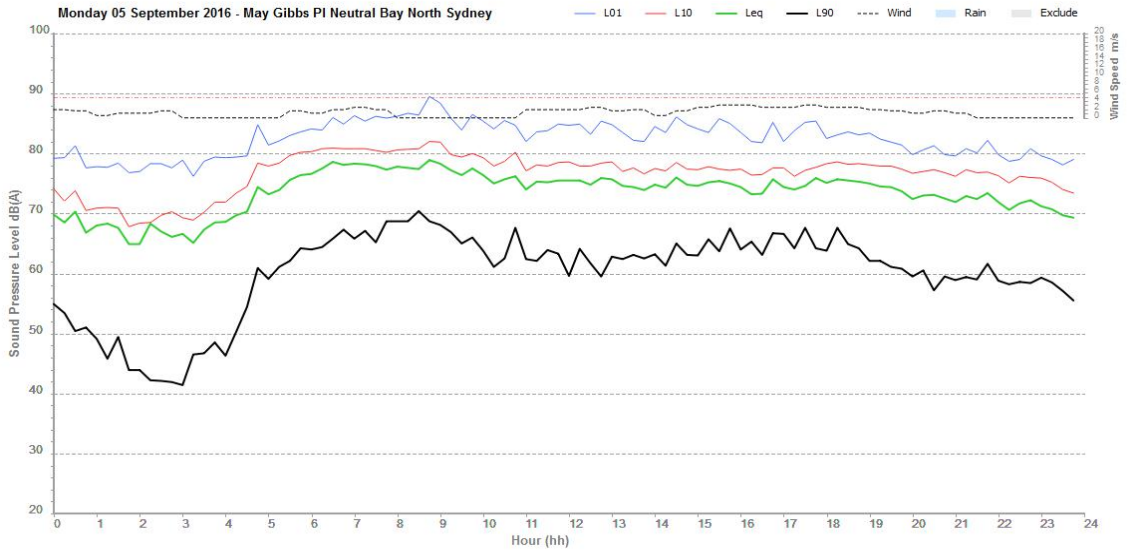
Logger Graphs

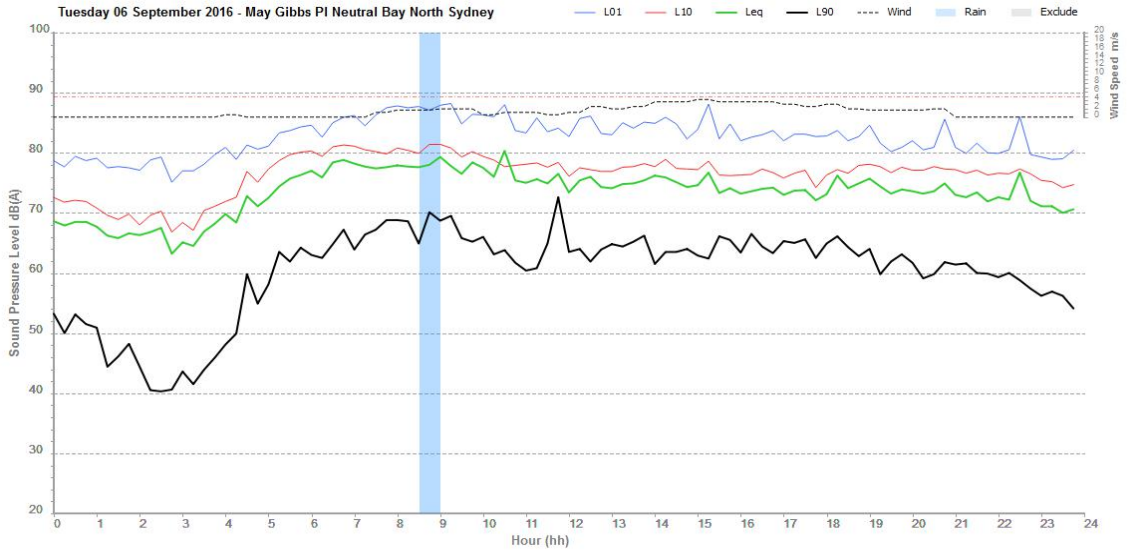


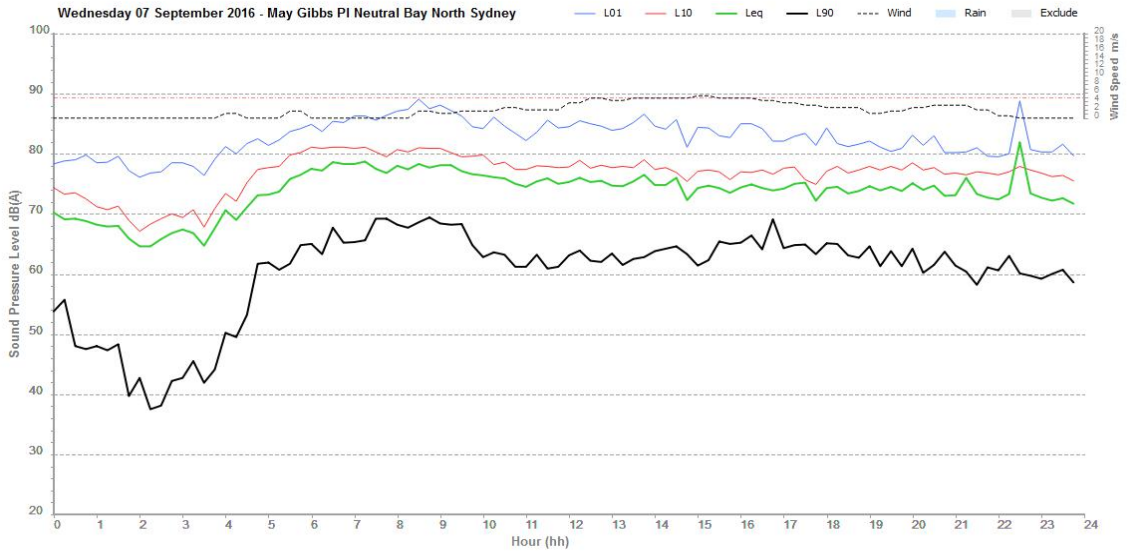




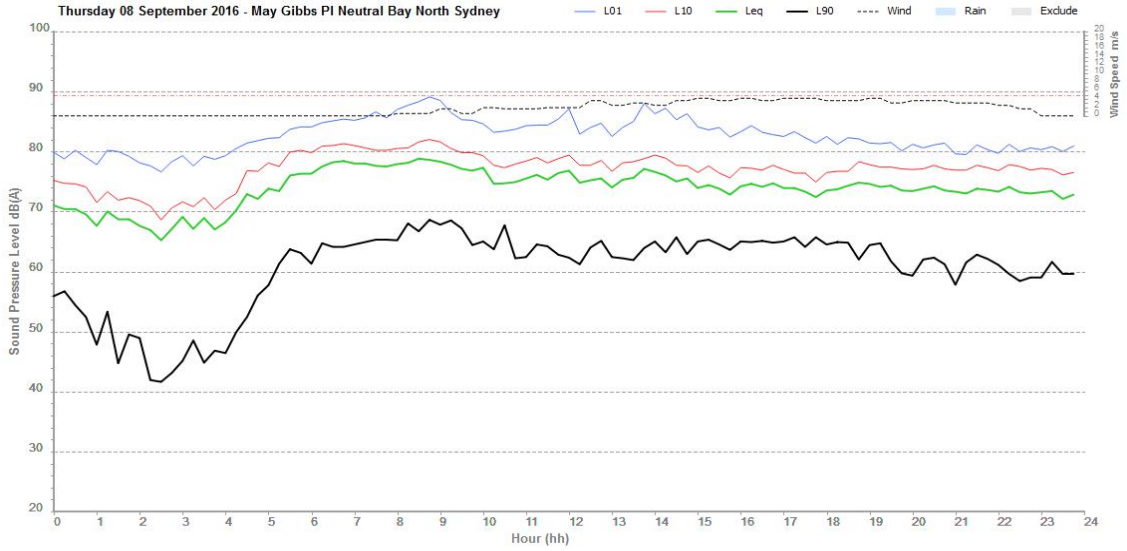
Logger Graphs

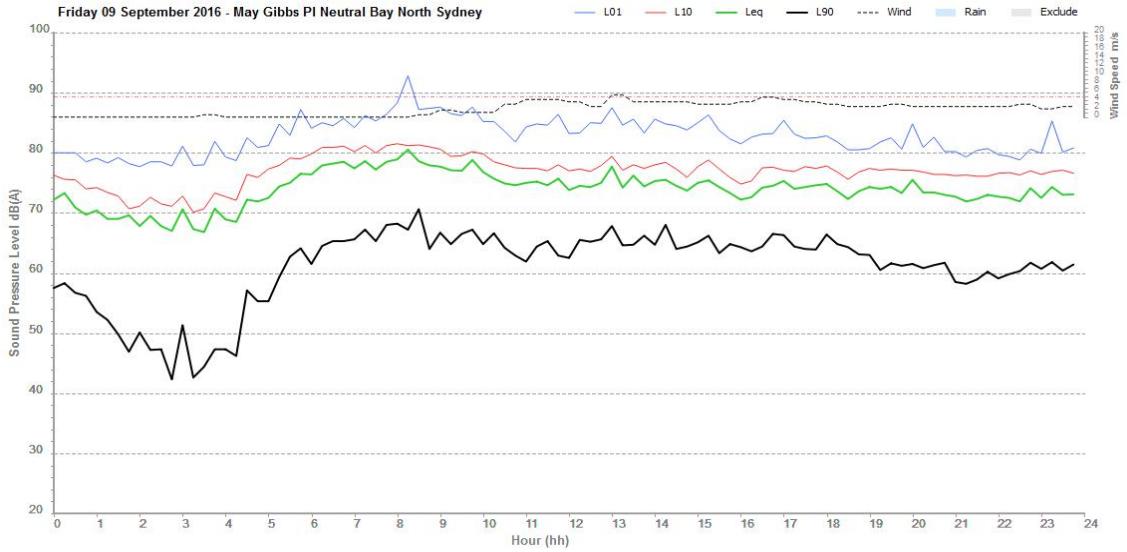


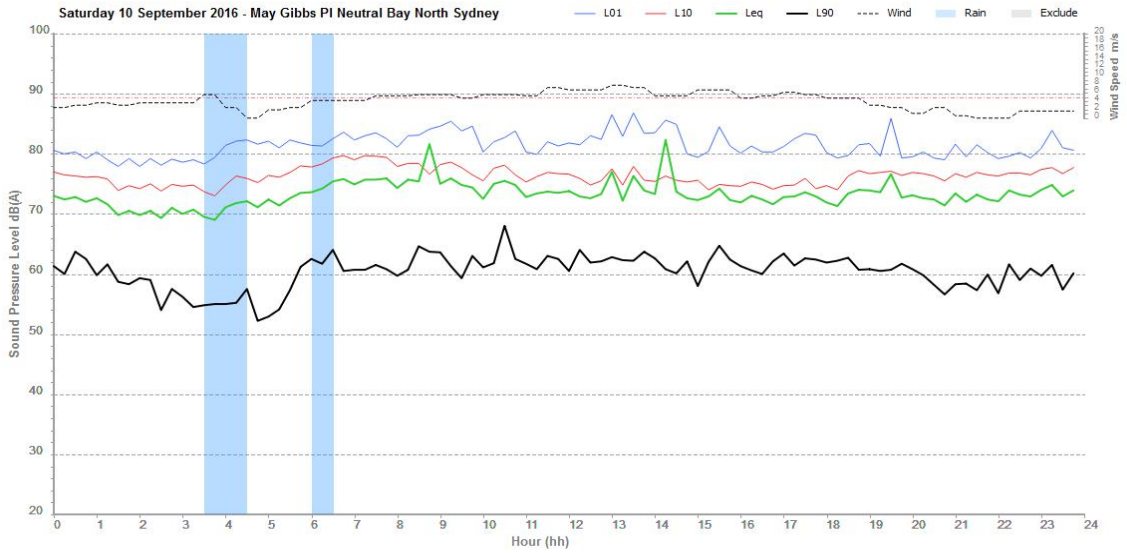




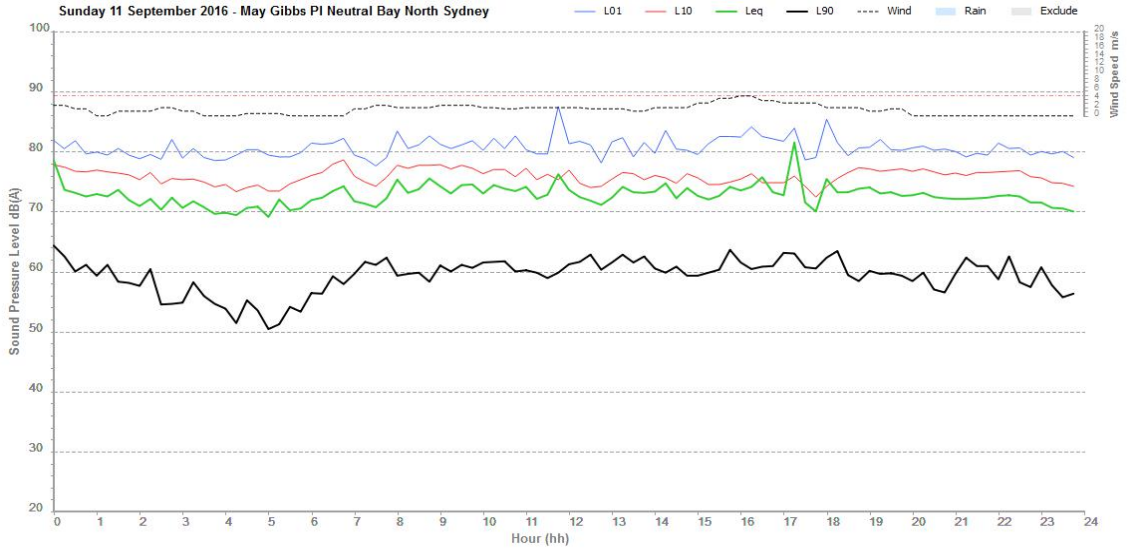
Logger Graphs

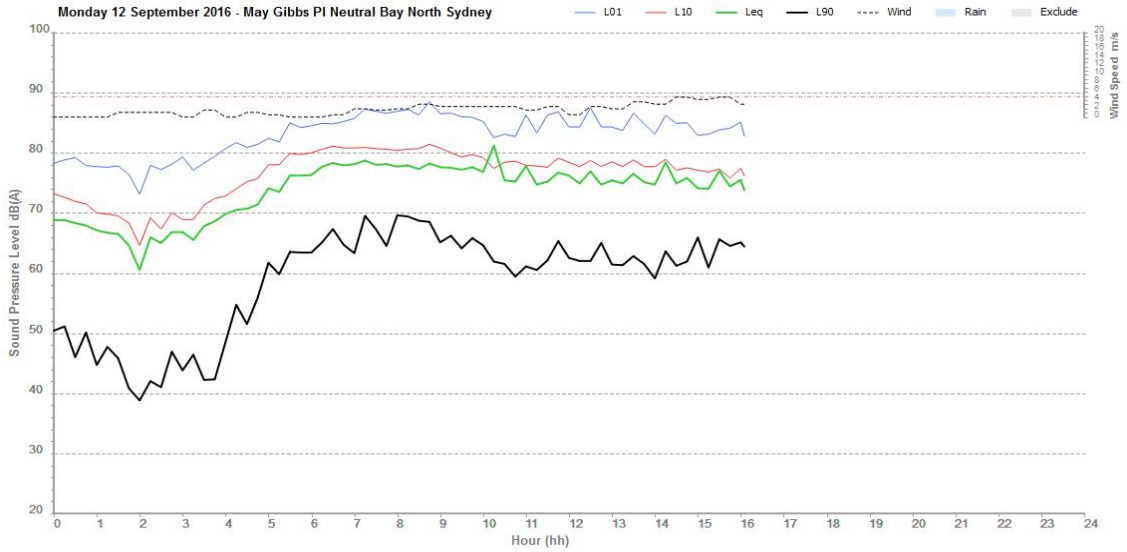






Logger Graphs





P12_2 - 225 Military Road - 02/09/16 - 10/09/16

Logger Setup

Logger Type: ARL 315

Serial No : 16-707-037

Address: 225 Military Road , Cremorne

Location: Base of power pole.

Facade / Free Field: Free Field

Environment: Traffic noise dominates. Logger location is by the side of Military Road.

Logger Setup Photo

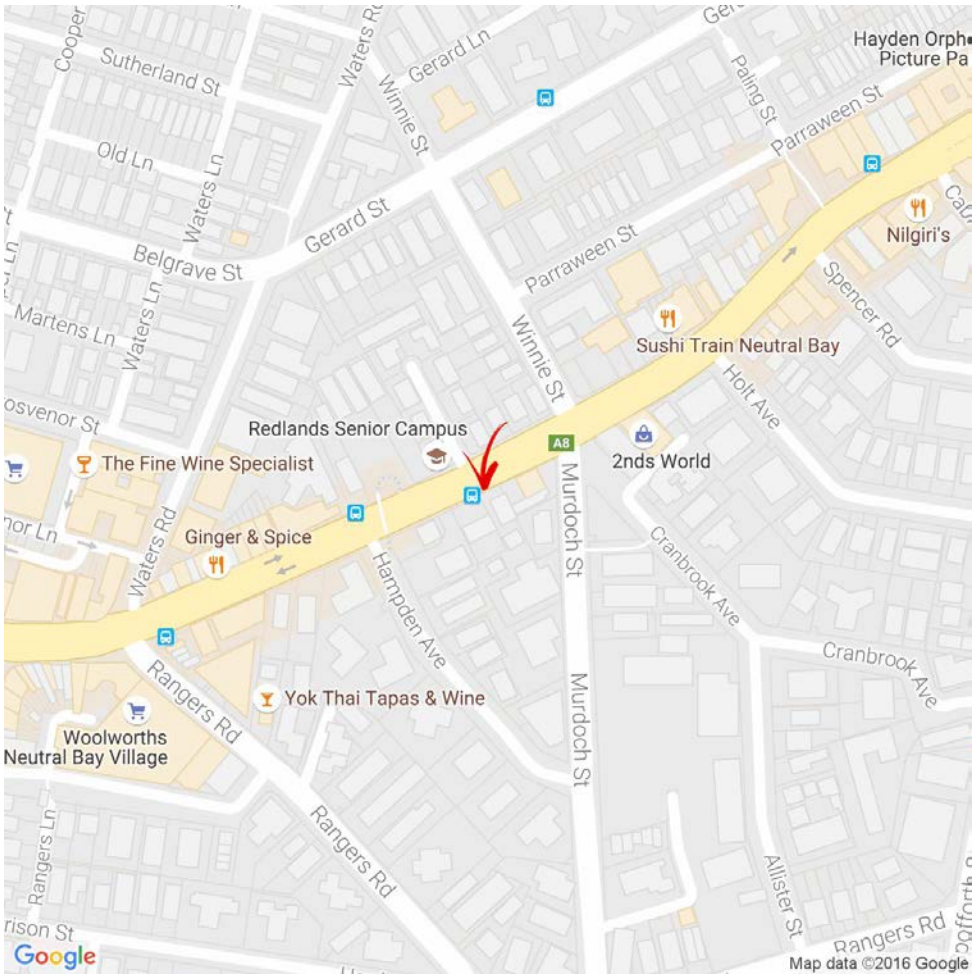
INP Noise Level, dB(A)

	Log Average	RBL
Day	76	64
Evening	79	59
Night	75	45

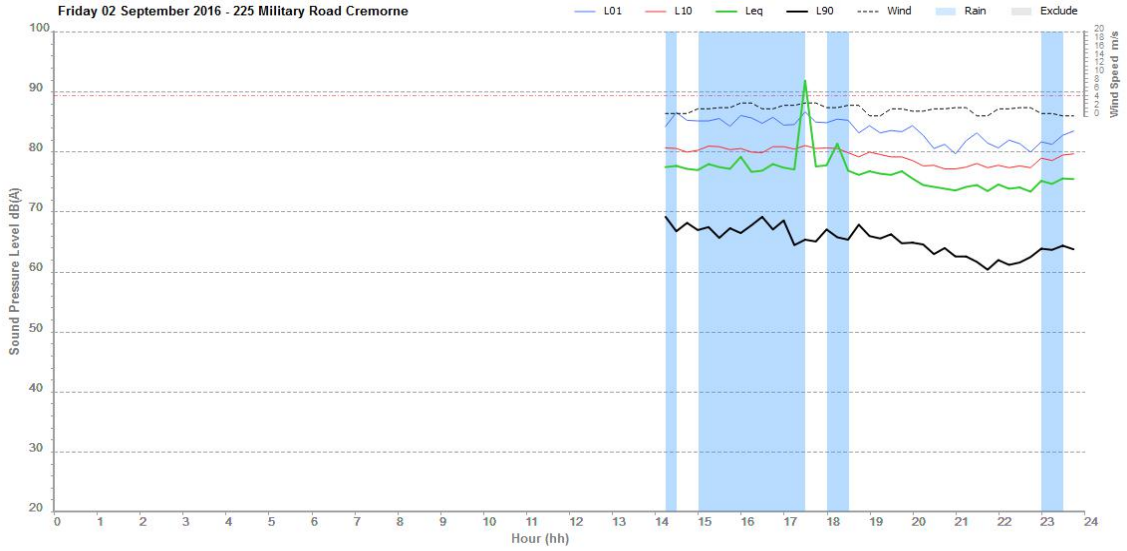
RNP Noise Level, dB(A)

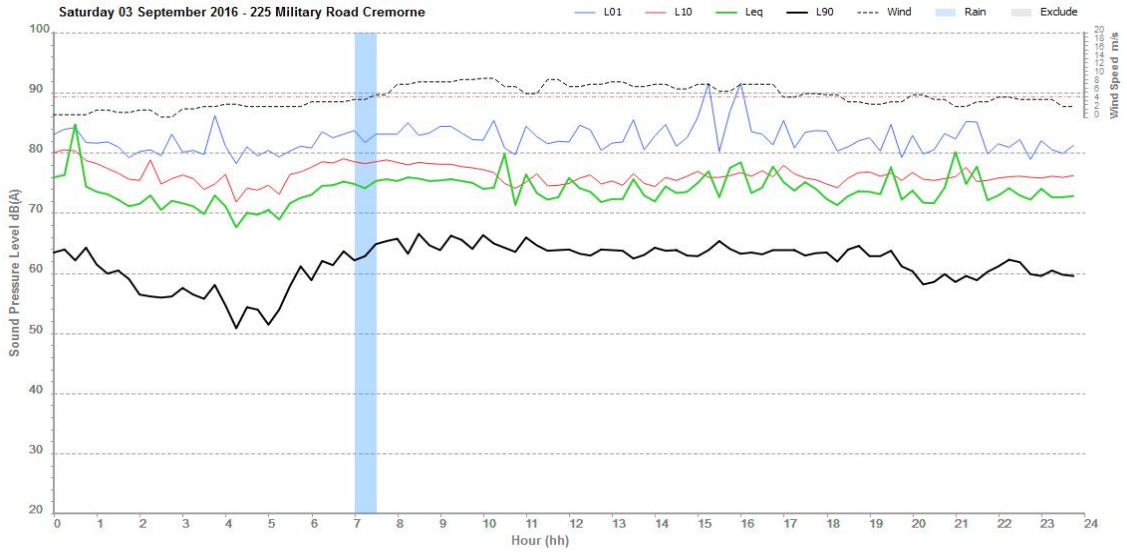
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

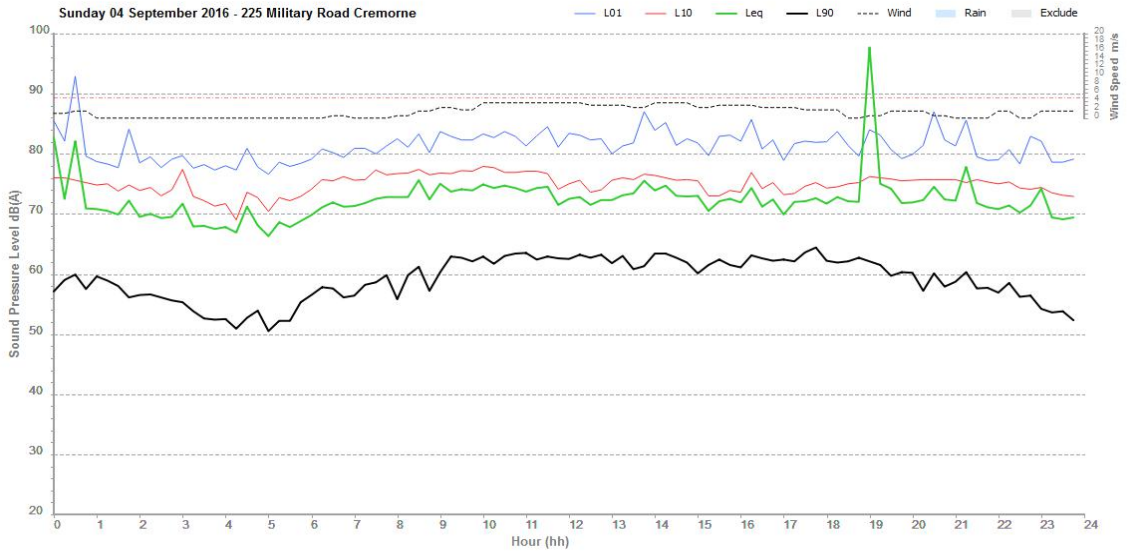
Logger Location Map



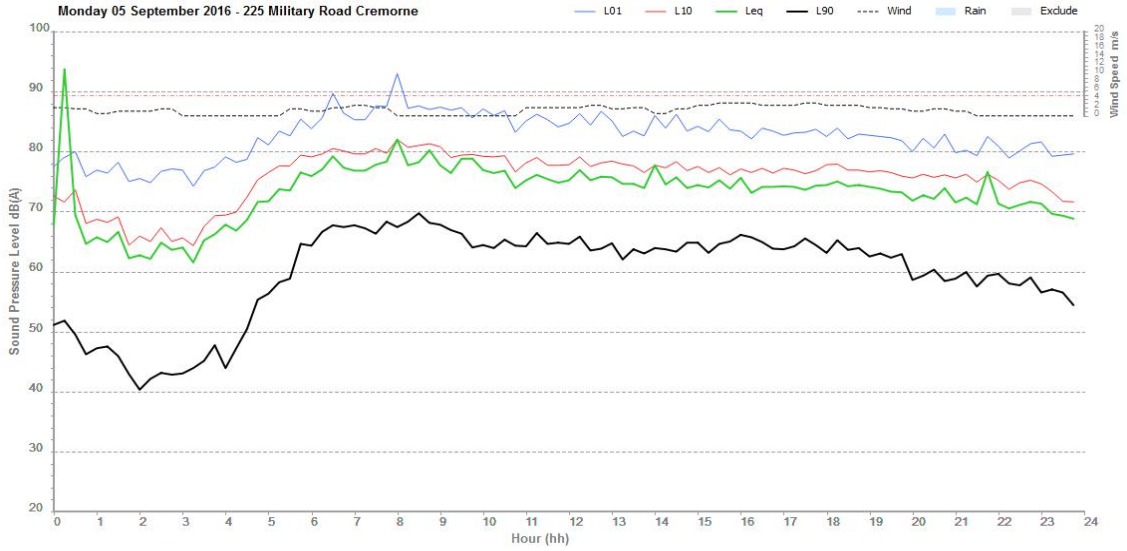
Logger Graphs

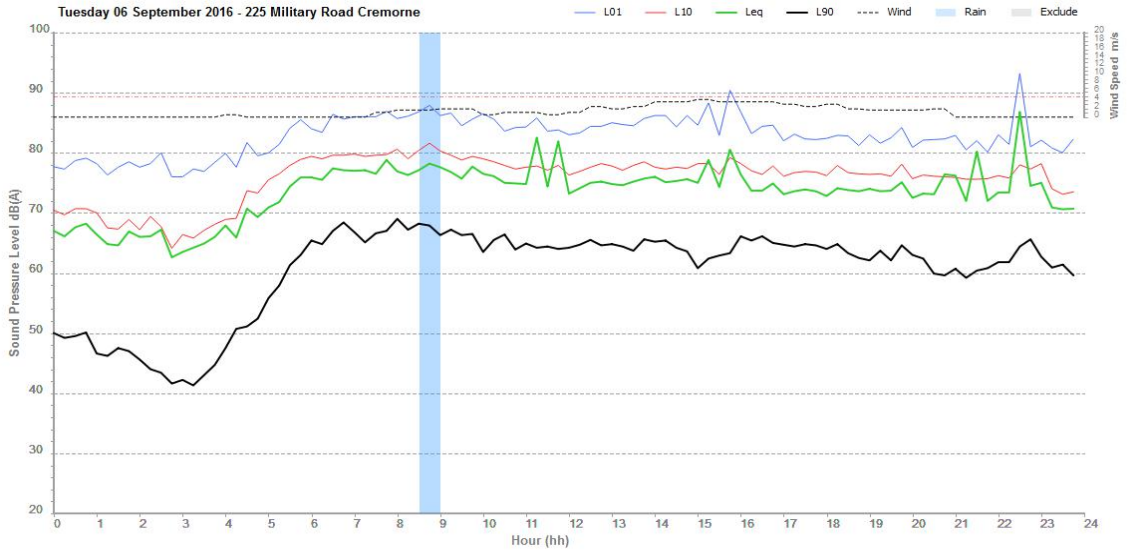


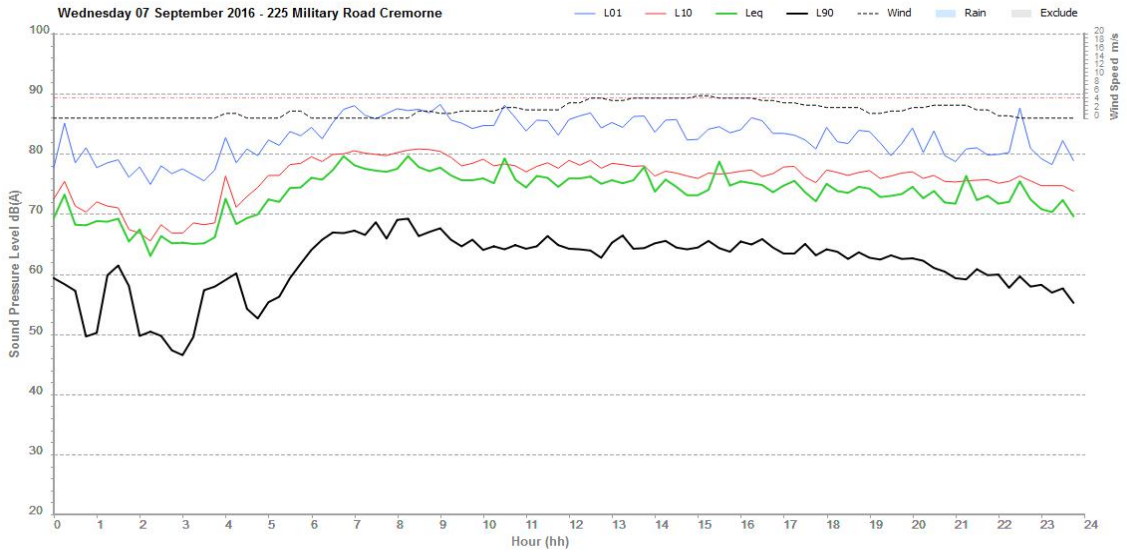




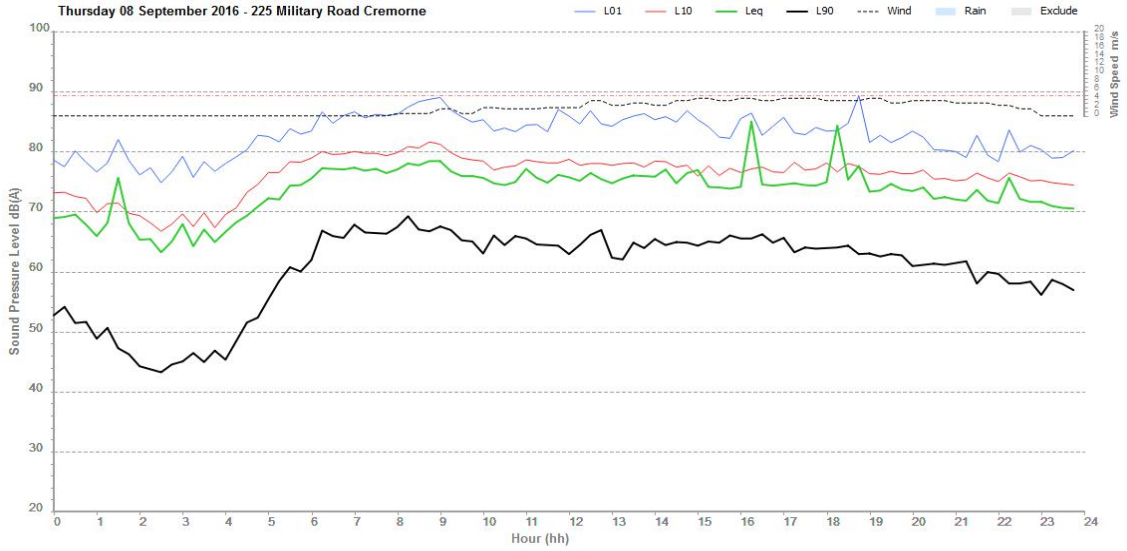
Logger Graphs

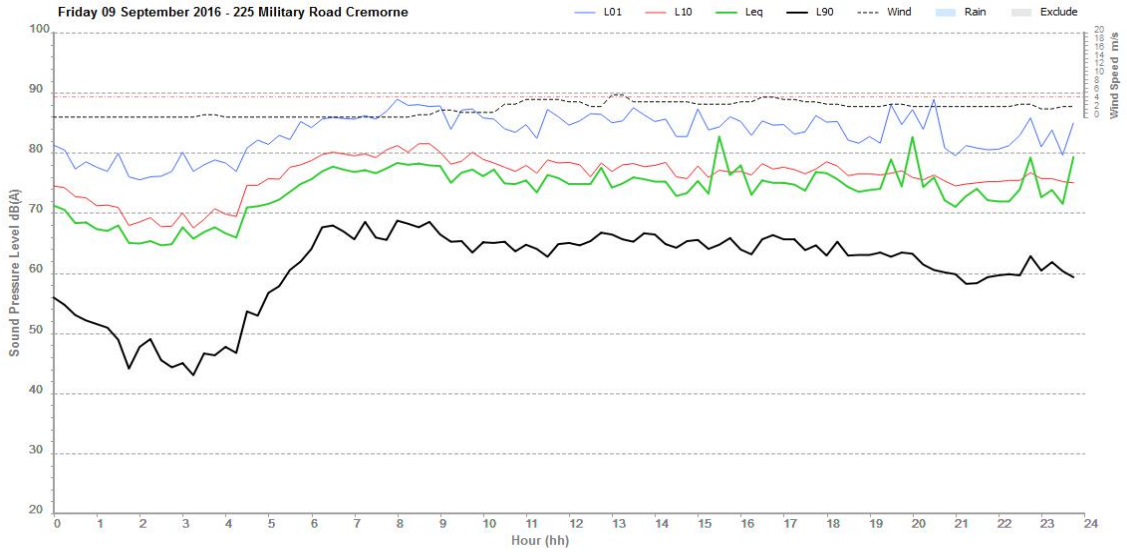


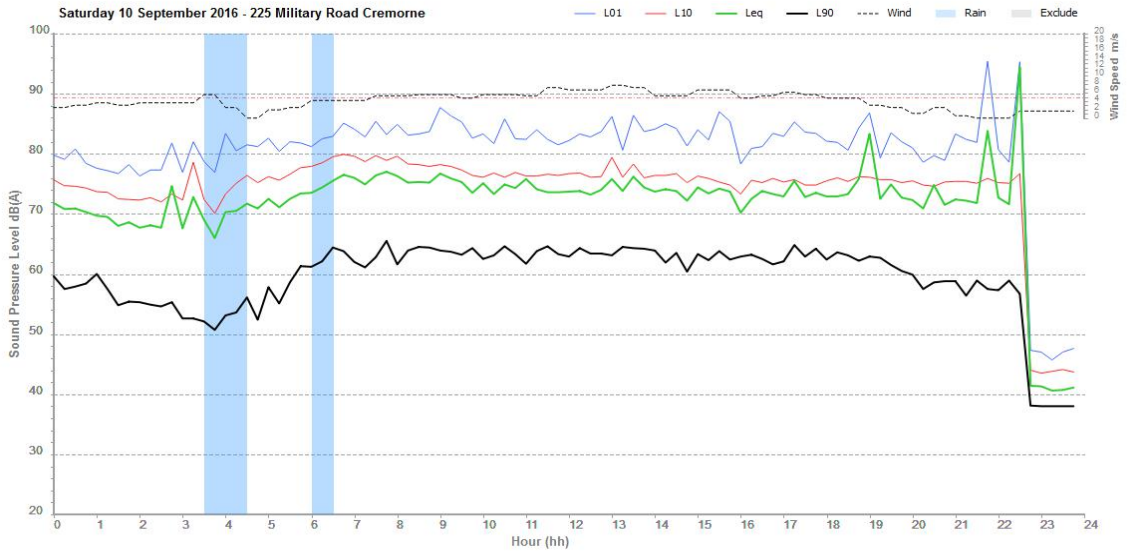




Logger Graphs







P12_3 - 143 Holt Avenue - 02/09/16 - 12/09/16

Logger Setup

Logger Type: ARL 315

Serial No : 16-306-036

Address: 143 Holt Avenue , Cremorne

Location: In hedges by side walk.

Facade / Free Field: Free Field

Environment: Traffic noise dominates. Microphone attached to parking signage.

Logger Setup Photo

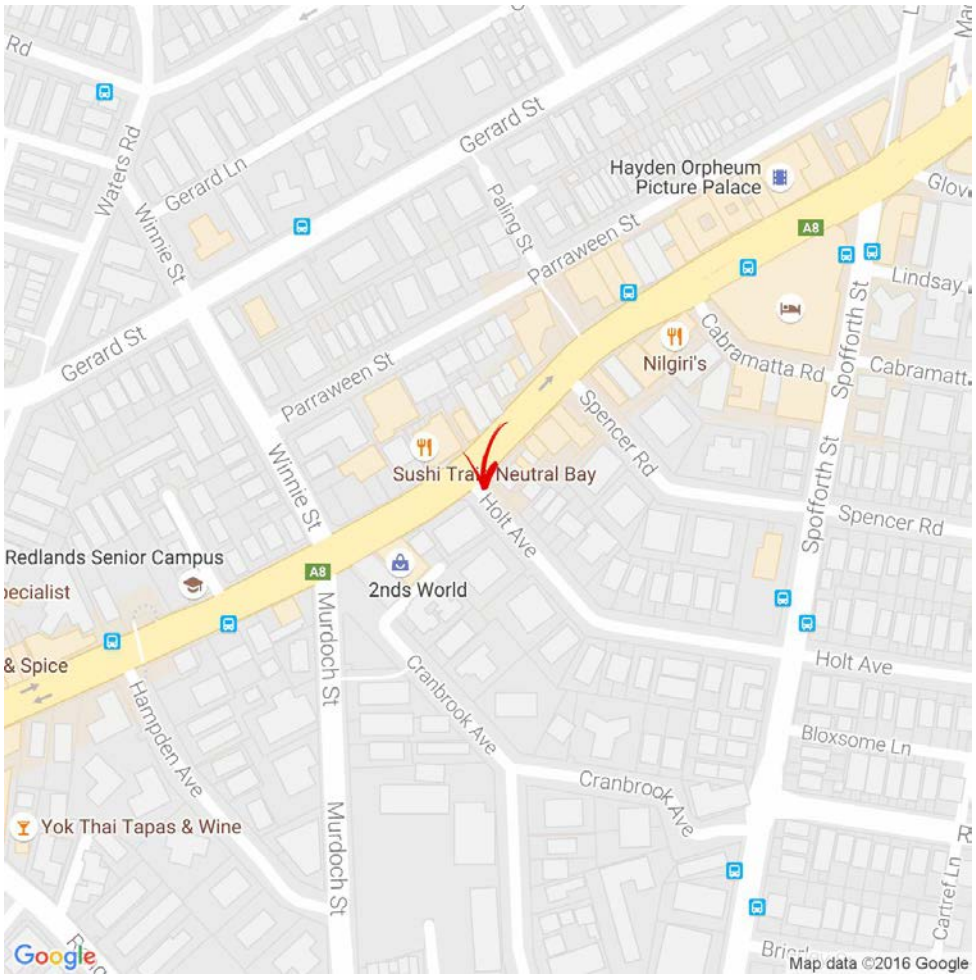
INP Noise Level, dB(A)

	Log Average	RBL
Day	78	69
Evening	76	65
Night	73	53

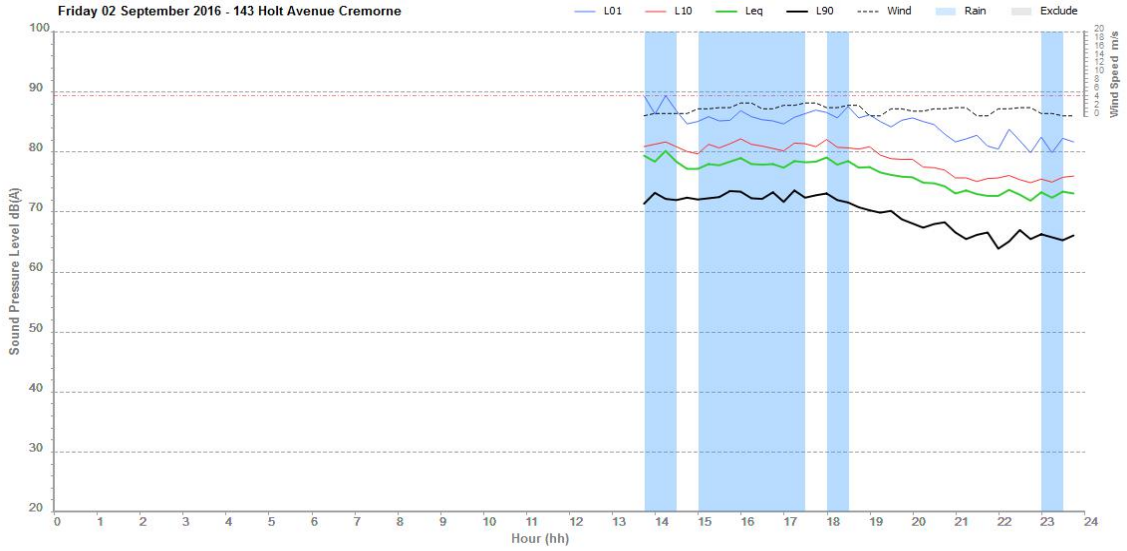
RNP Noise Level, dB(A)

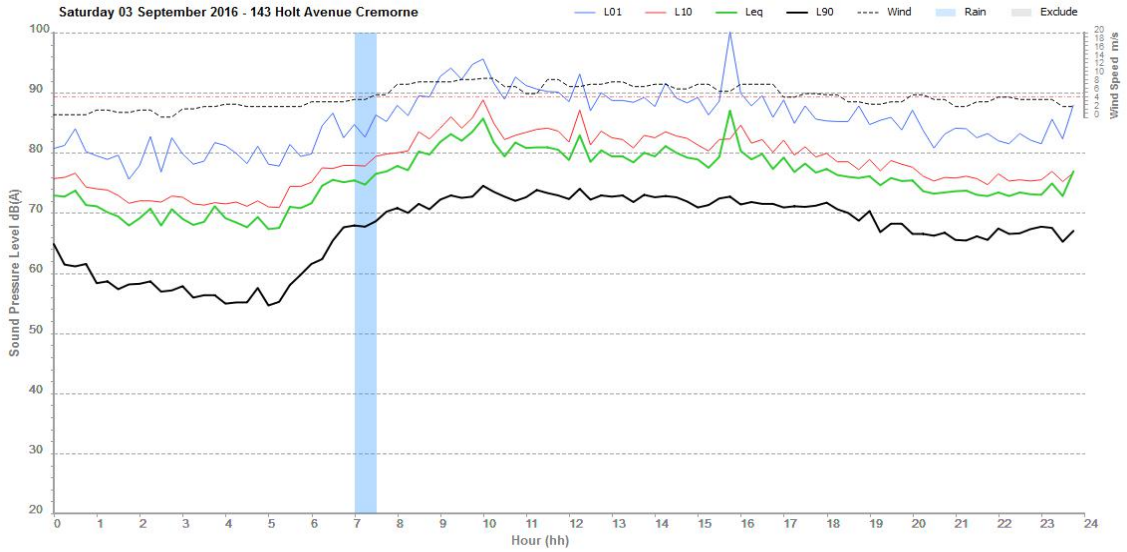
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

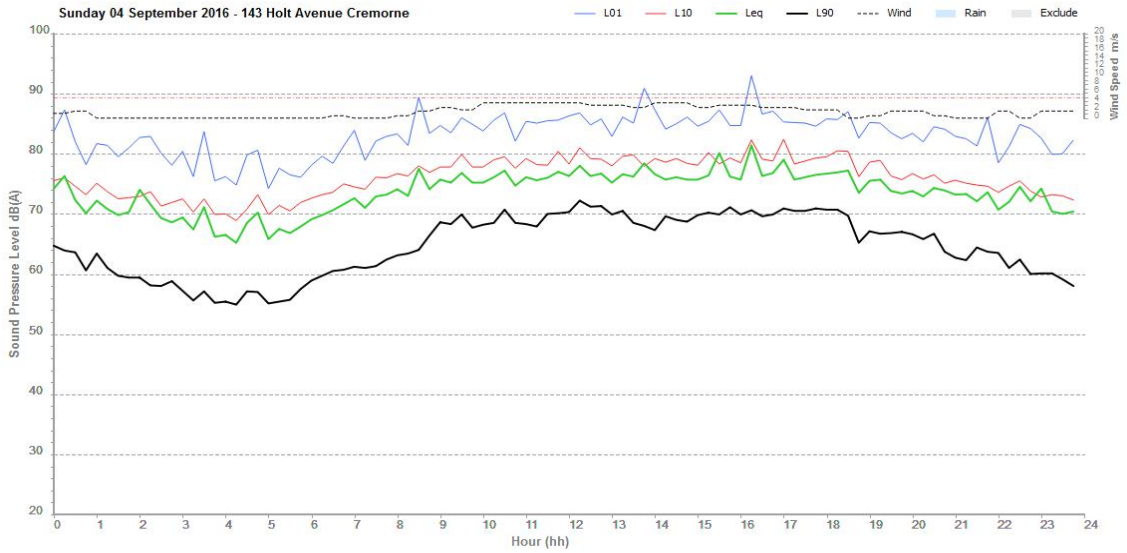
Logger Location Map



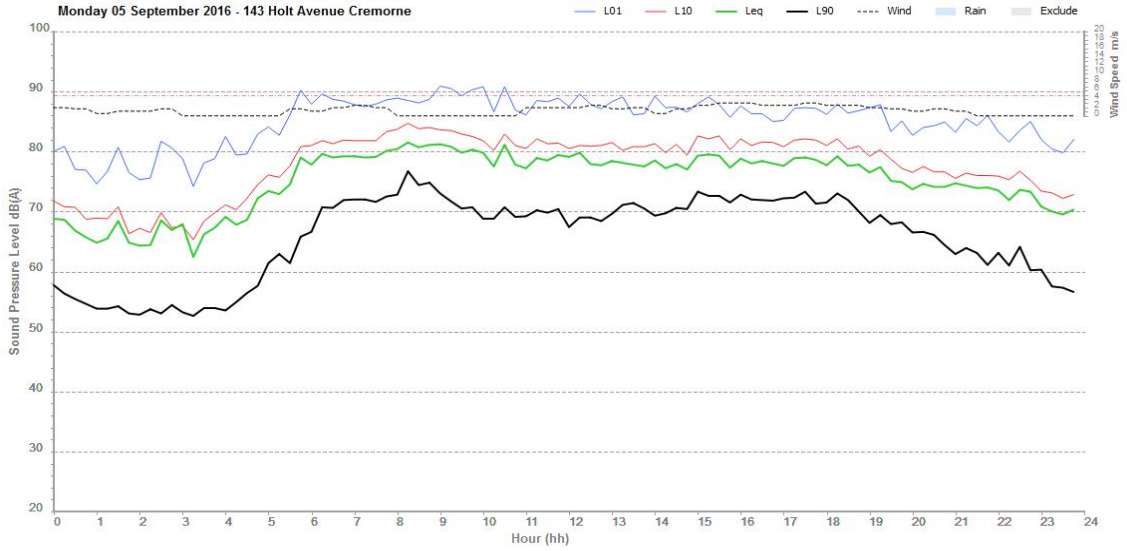
Logger Graphs

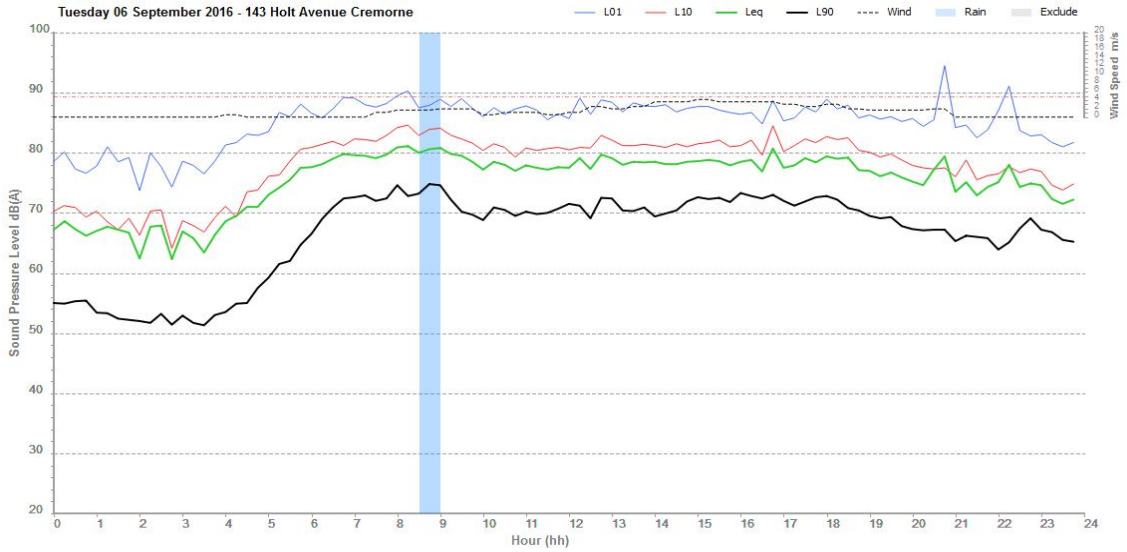


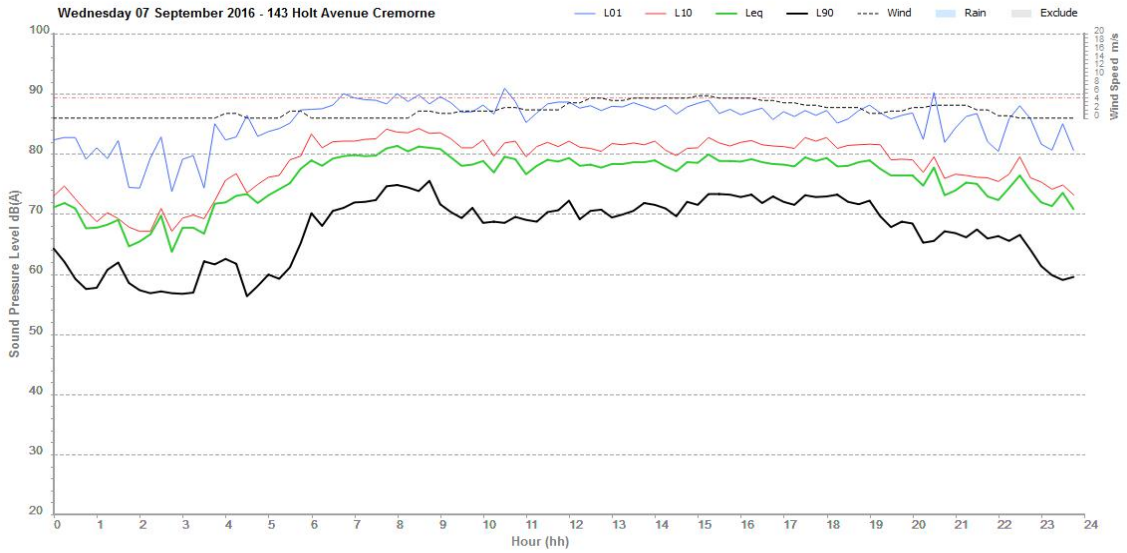




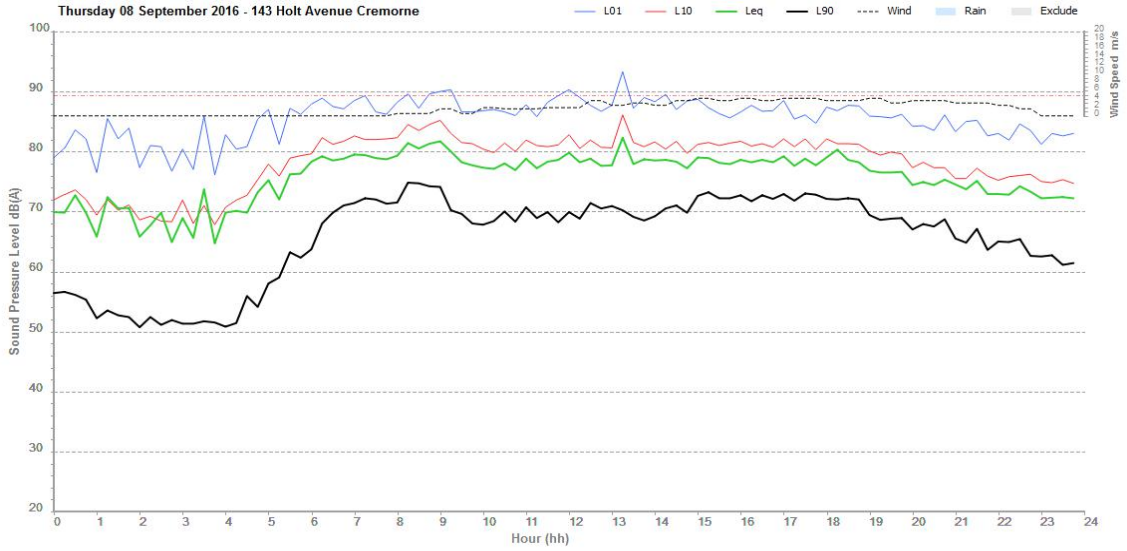
Logger Graphs

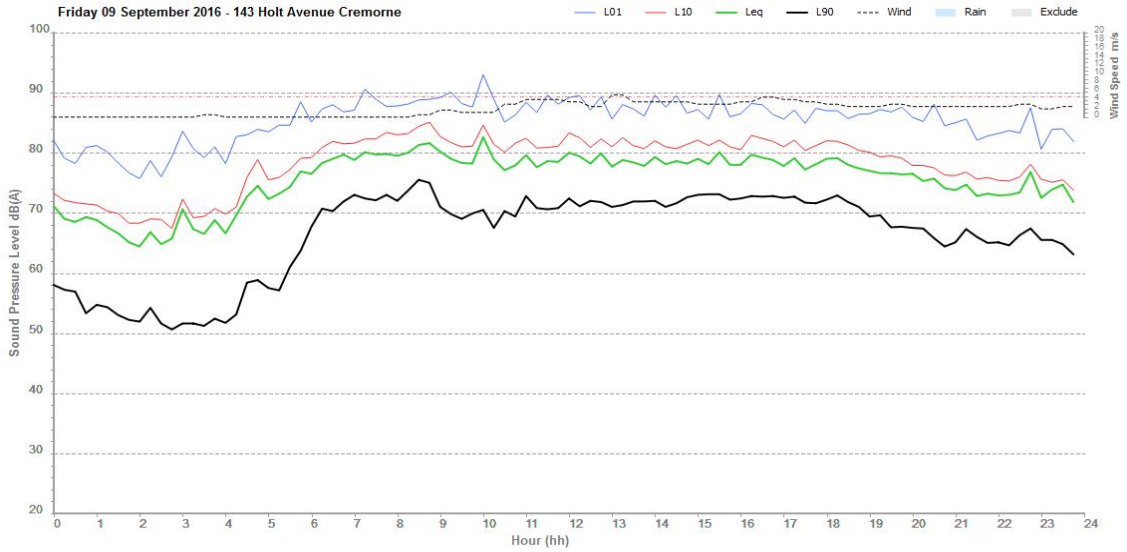


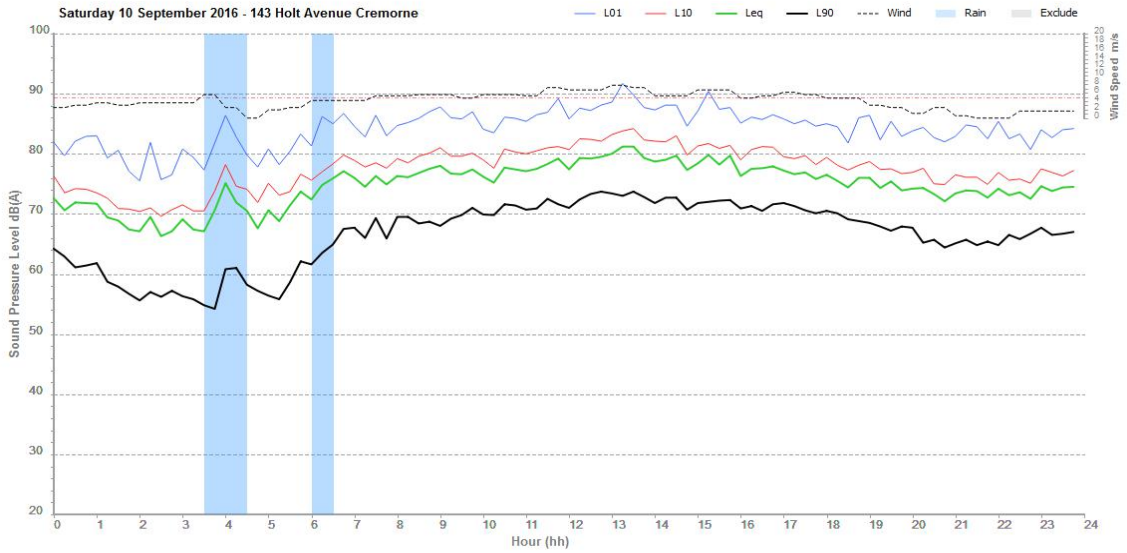




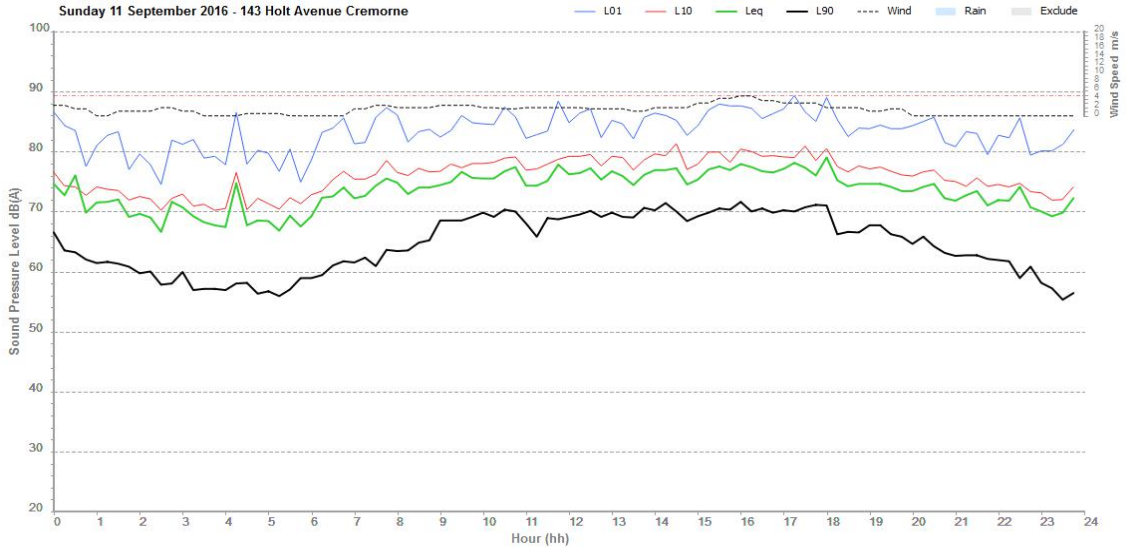
Logger Graphs

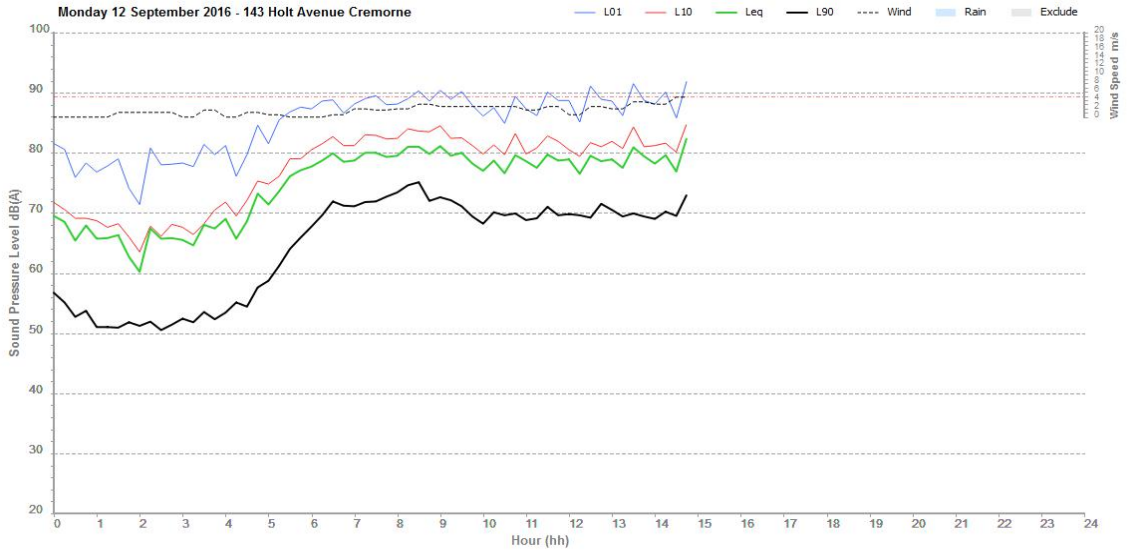






Logger Graphs





P12_4 - 116 Cabramatta Road - 02/09/16 - 11/09/16

Logger Setup

Logger Type: ARL 315

Serial No : 16-707-038

Address: 114-116 Cabramatta Road , Cremorne

Location: Garden on parking island.

Facade / Free Field: Free Field

Environment: Traffic noise is dominant. Logger located on parking island garden and also adjacent to nearby shopping centre parking entrance.

Logger Setup Photo

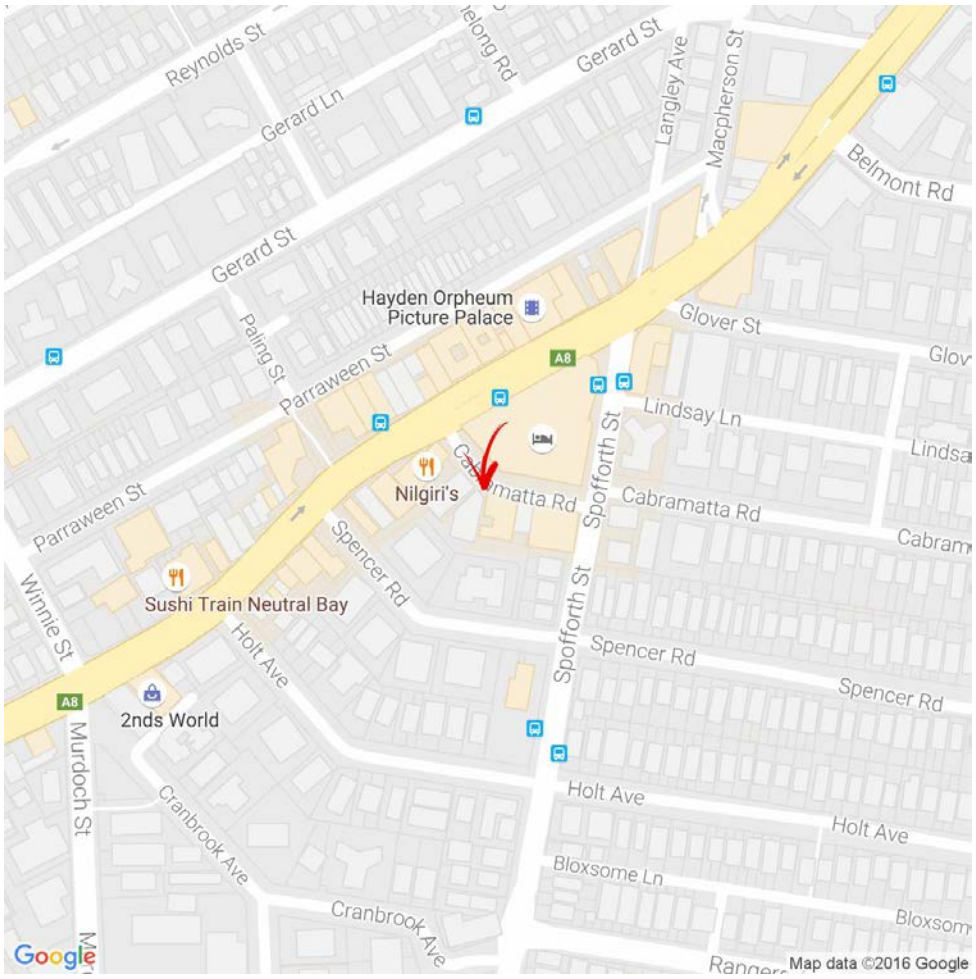
INP Noise Level, dB(A)

	Log Average	RBL
Day	76	67
Evening	73	63
Night	70	56

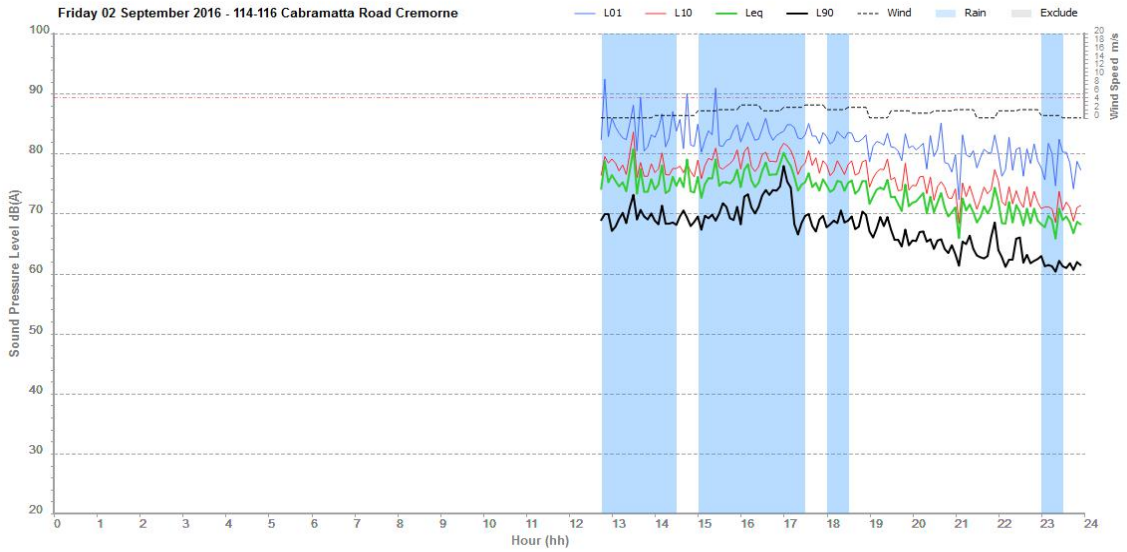
RNP Noise Level, dB(A)

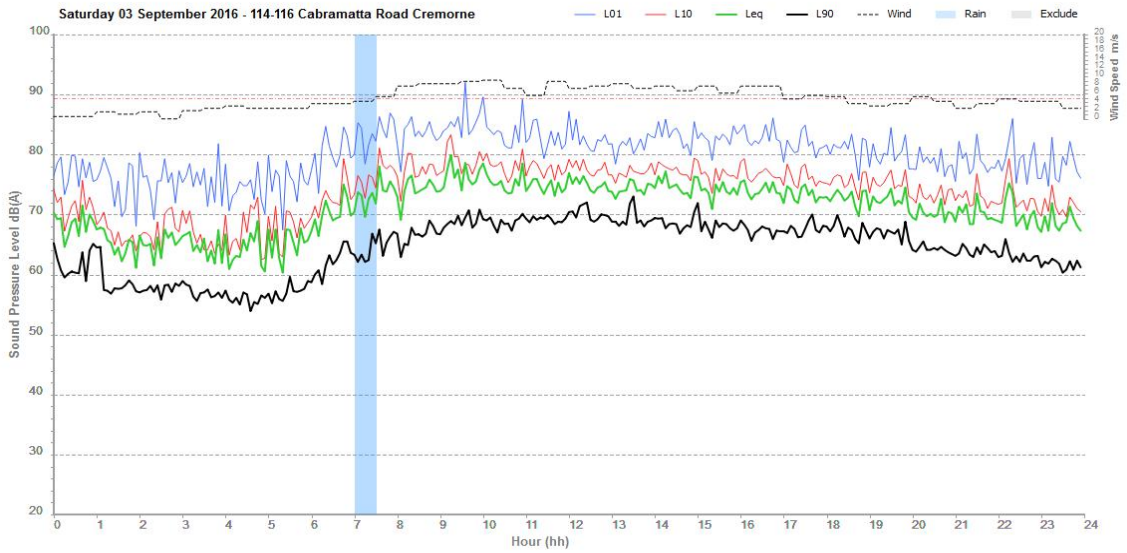
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

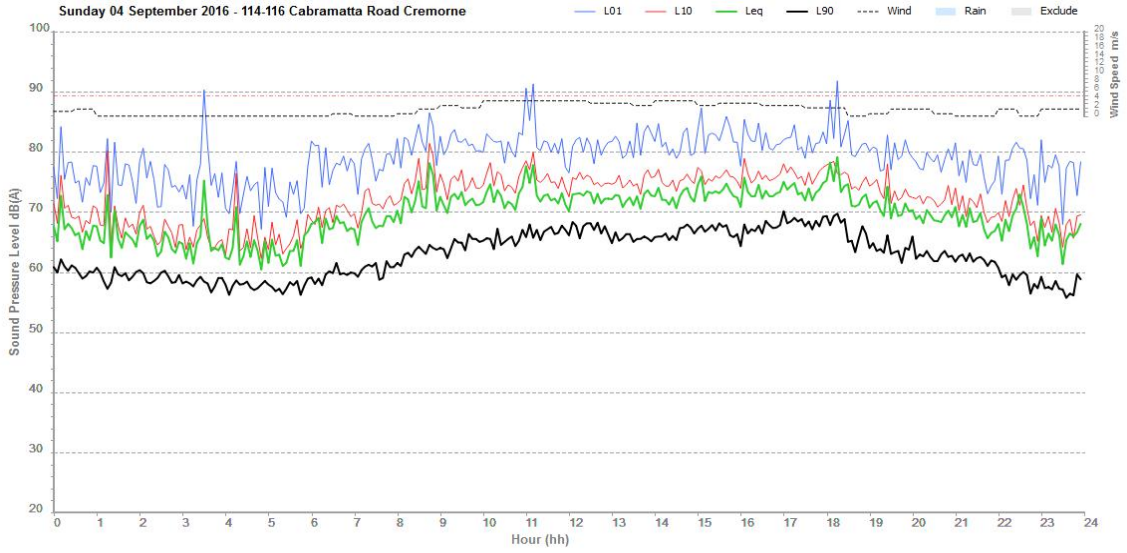
Logger Location Map



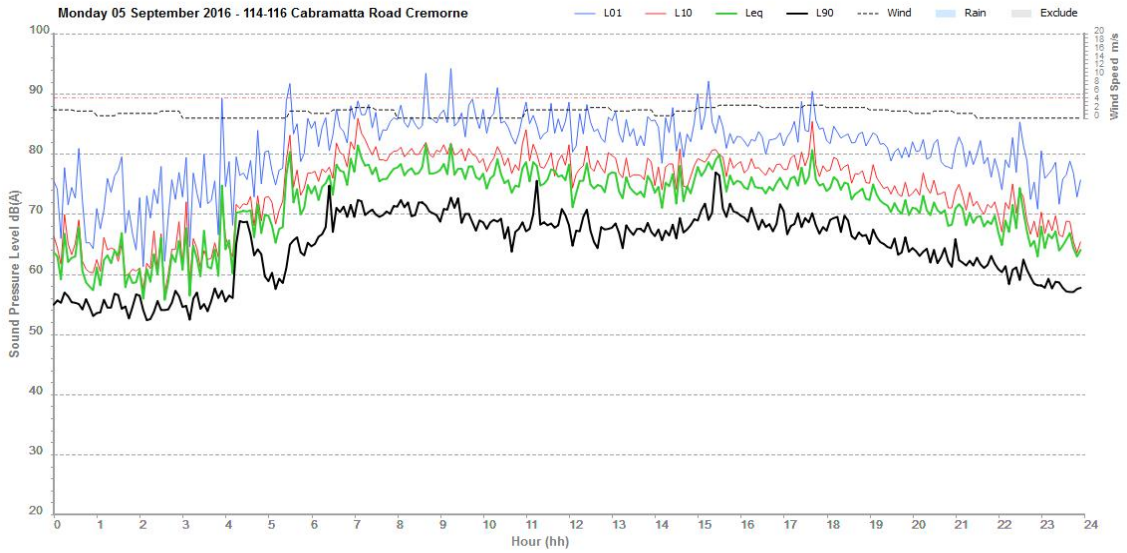
Logger Graphs

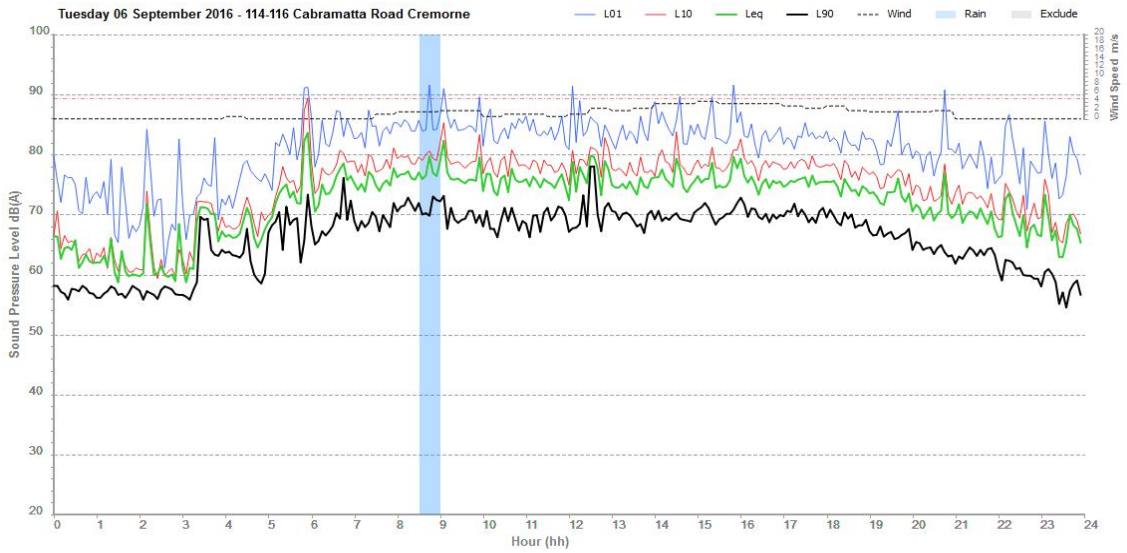


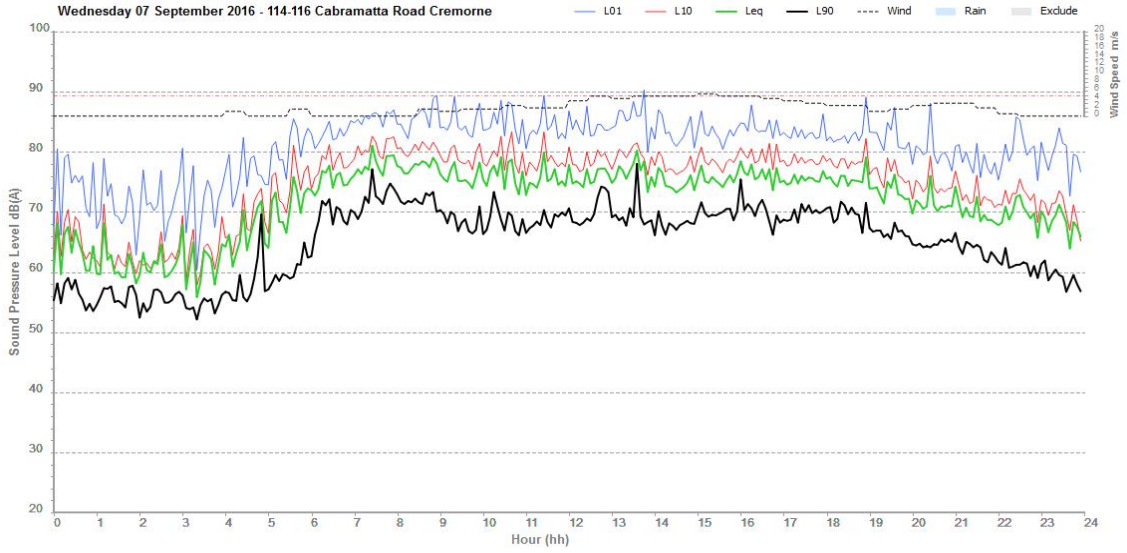




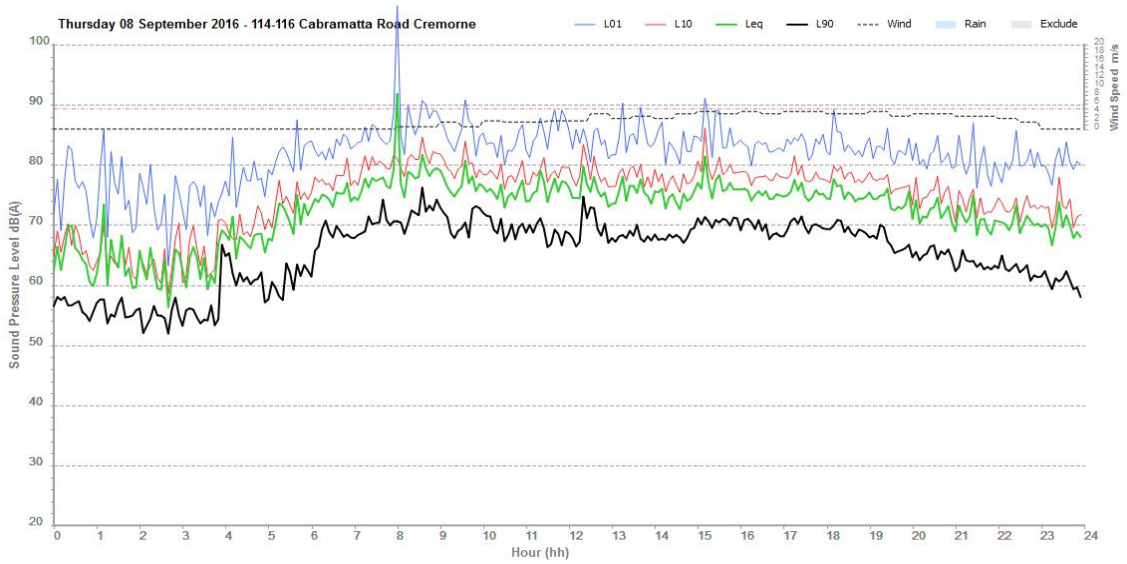
Logger Graphs

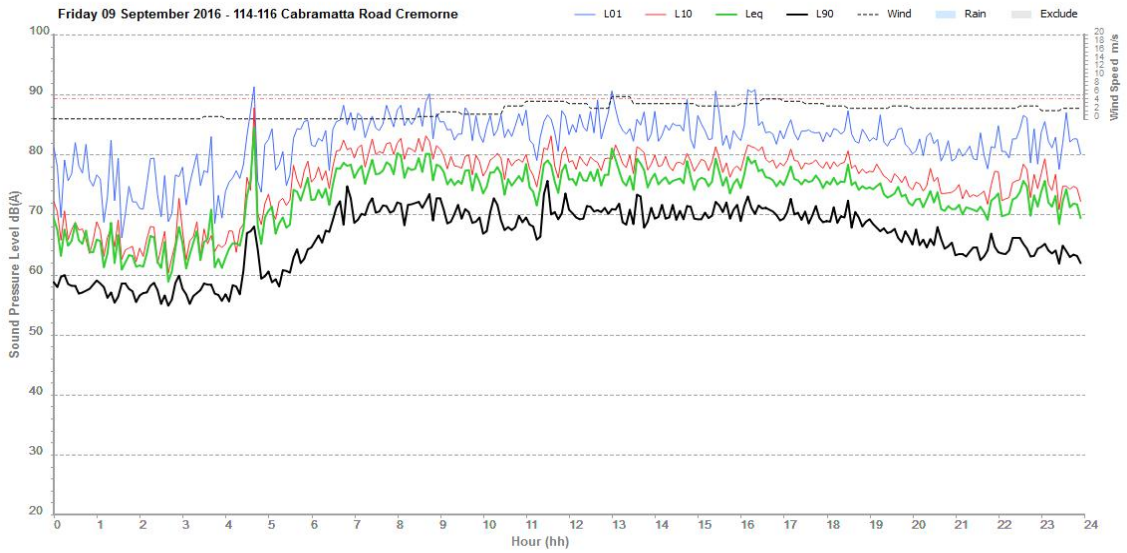


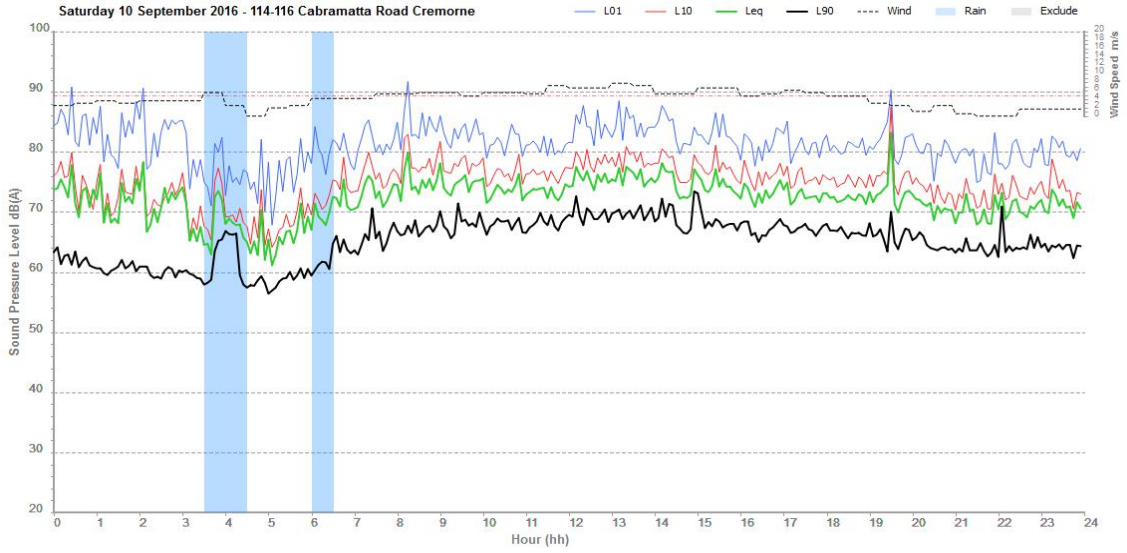




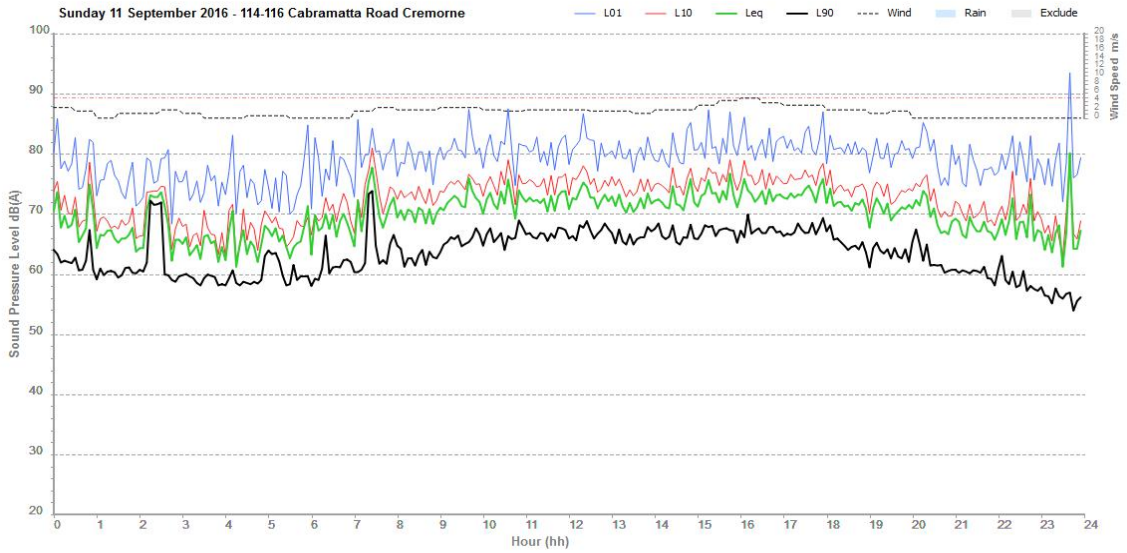
Logger Graphs







Logger Graphs



P12_5 - Prince Street reserve - 02/09/16 - 12/09/16

Logger Setup

Logger Type: ARL 315

Serial No : 16-707-007

Address: 55 Prince Street , Mosman

Location: Prince Street Reserve under tree.

Facade / Free Field: Free Field

Environment: Traffic noise dominates. Logger located beneath a tree in a public reserve which is adjacent to Military Road.

Logger Setup Photo

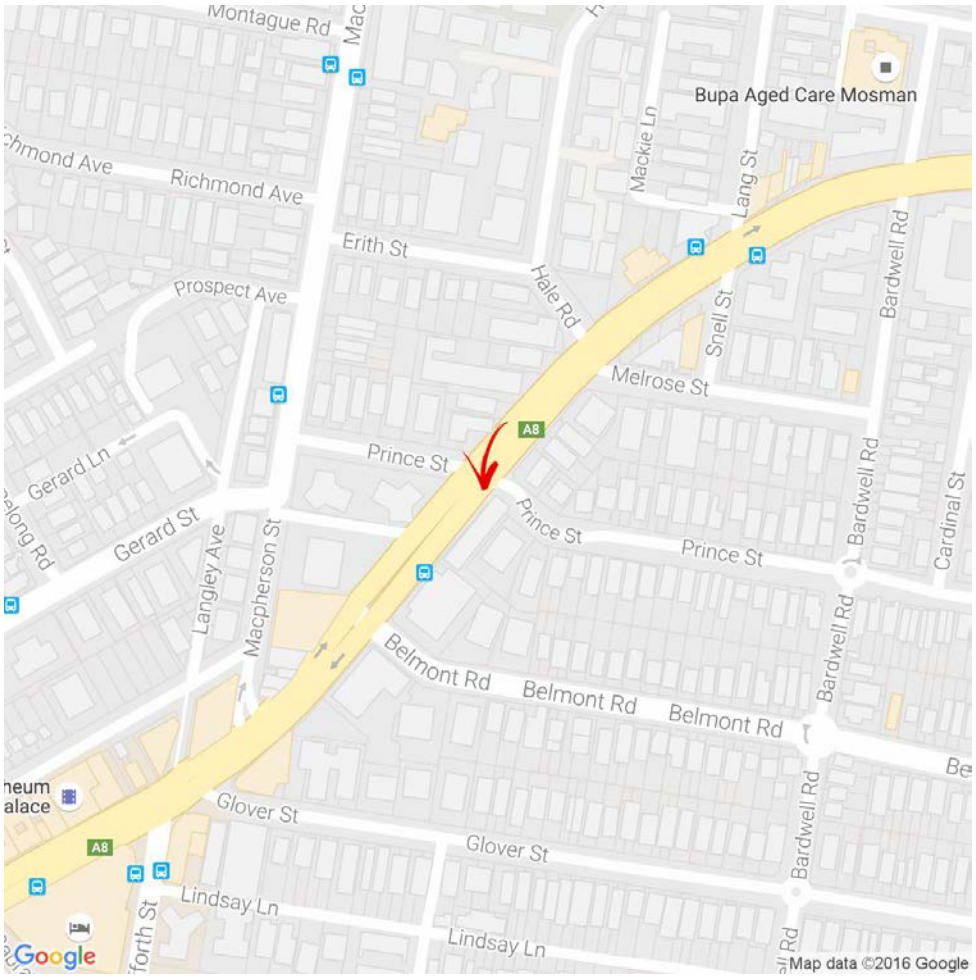
INP Noise Level, dB(A)

	Log Average	RBL
Day	65	51
Evening	64	51
Night	62	34

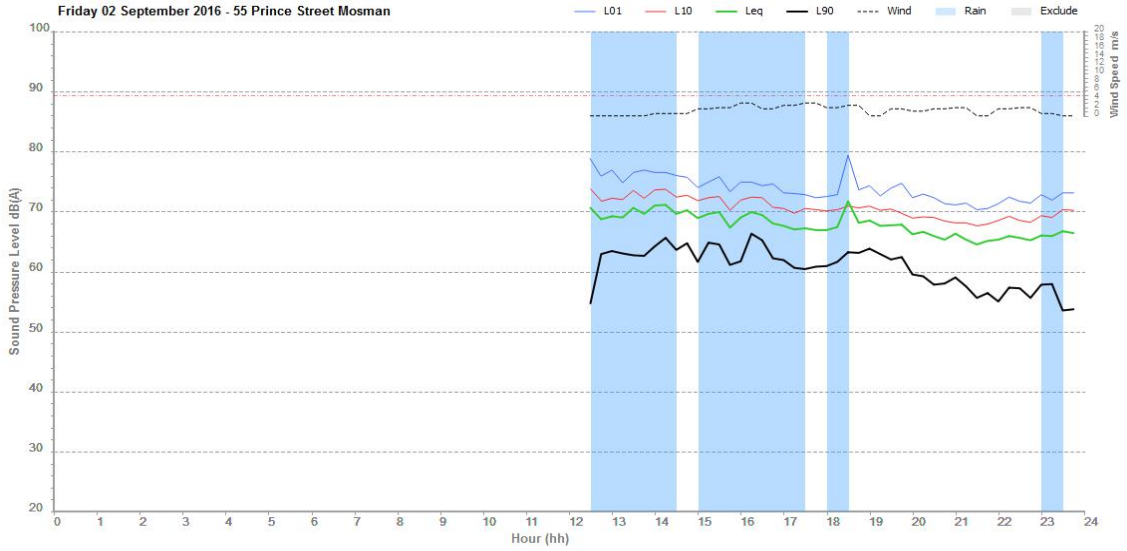
RNP Noise Level, dB(A)

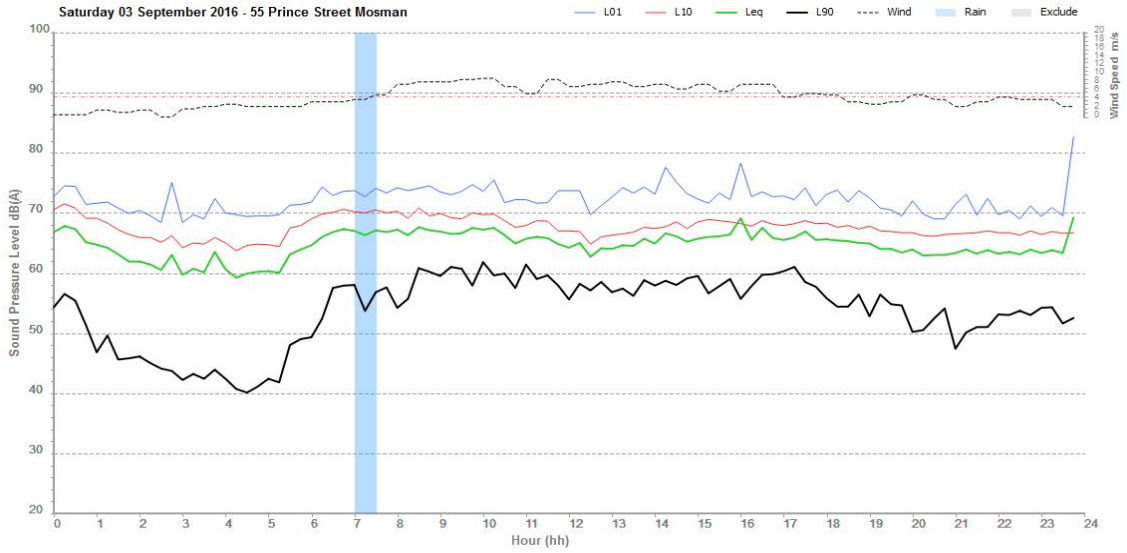
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

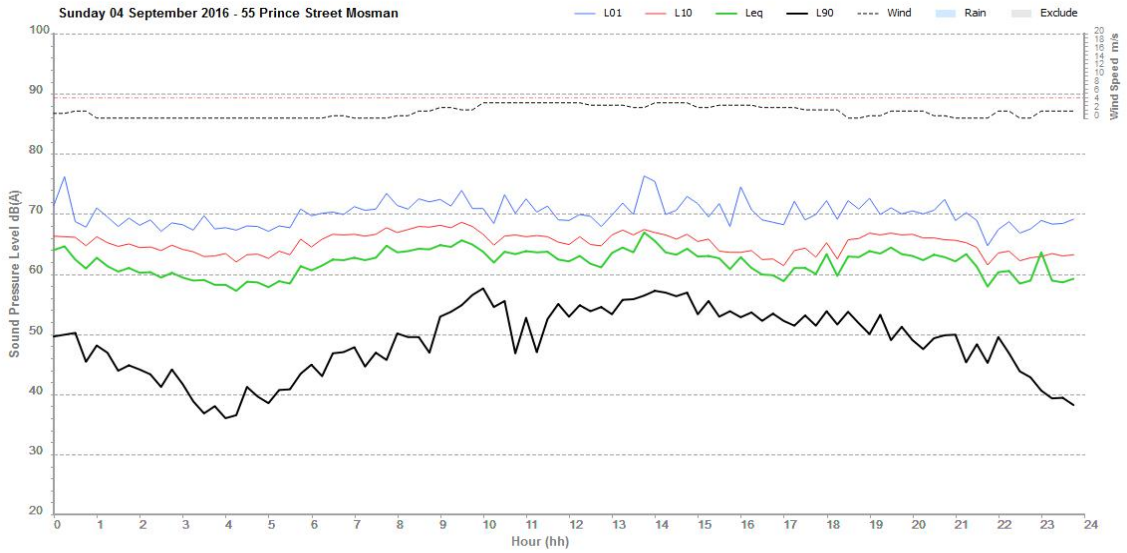
Logger Location Map



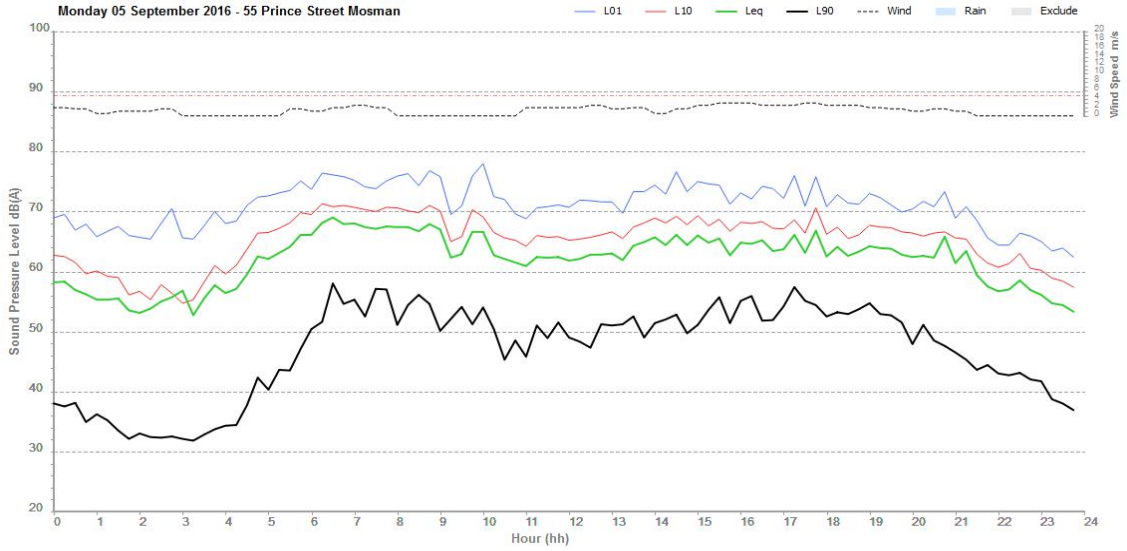
Logger Graphs

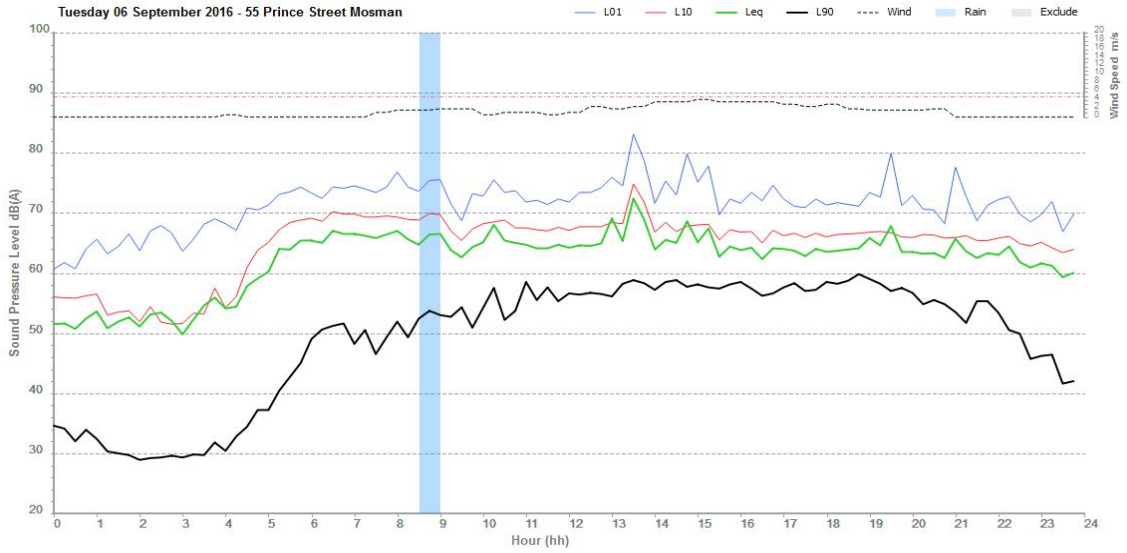


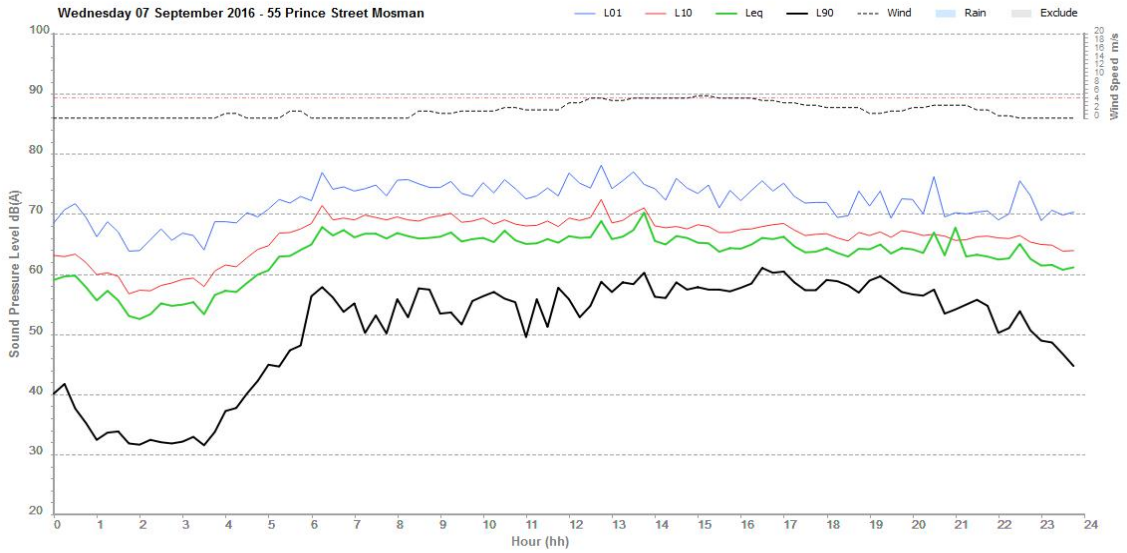




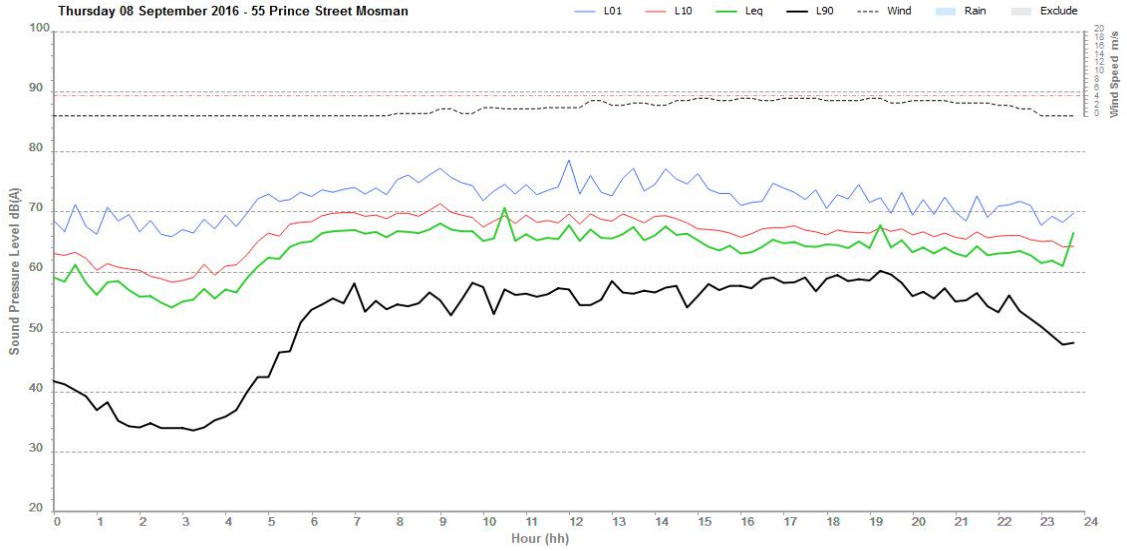
Logger Graphs

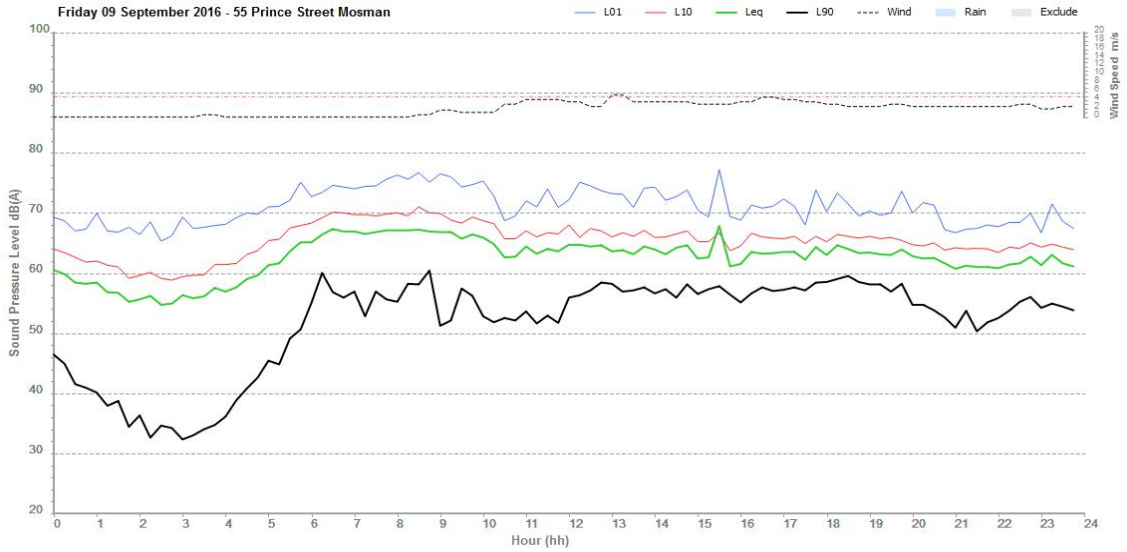


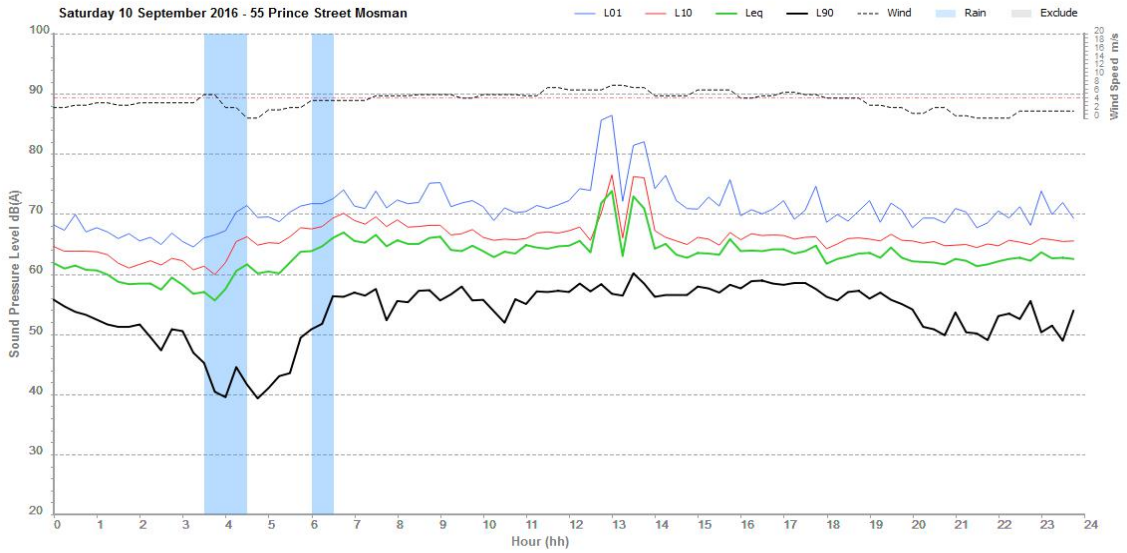




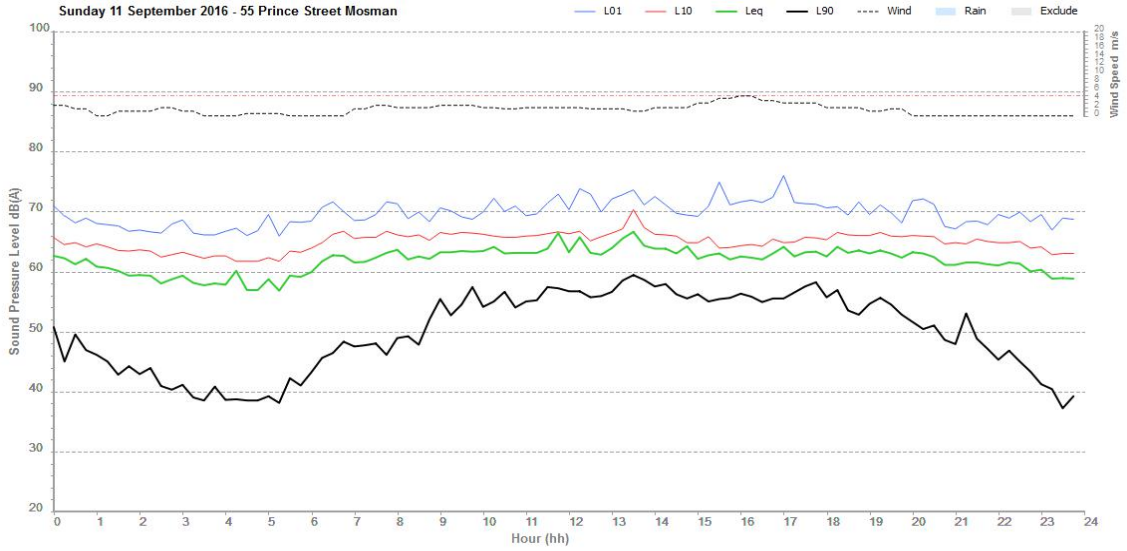
Logger Graphs

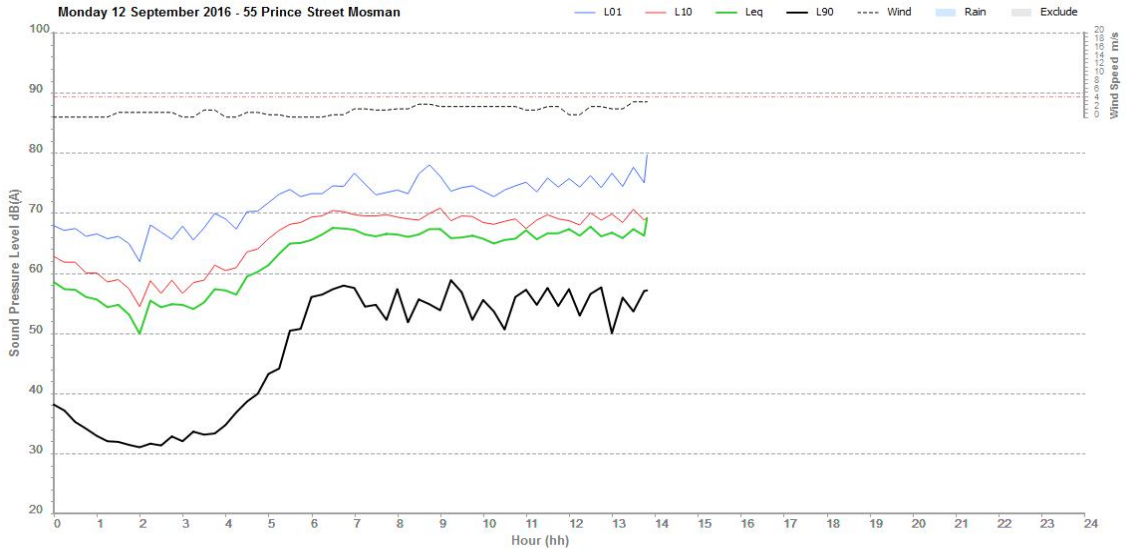






Logger Graphs





P12_6 - 82 Spit Road - 02/09/16 - 07/09/16

Logger Setup

Logger Type: ARL 315

Serial No : 16-306-035

Address: 78 Spit Road , Mosman

Location: Base of light pole in front of property

Facade / Free Field: Free Field

Environment: Traffic noise dominates. Logger located by the side of Spit road.

Logger Setup Photo

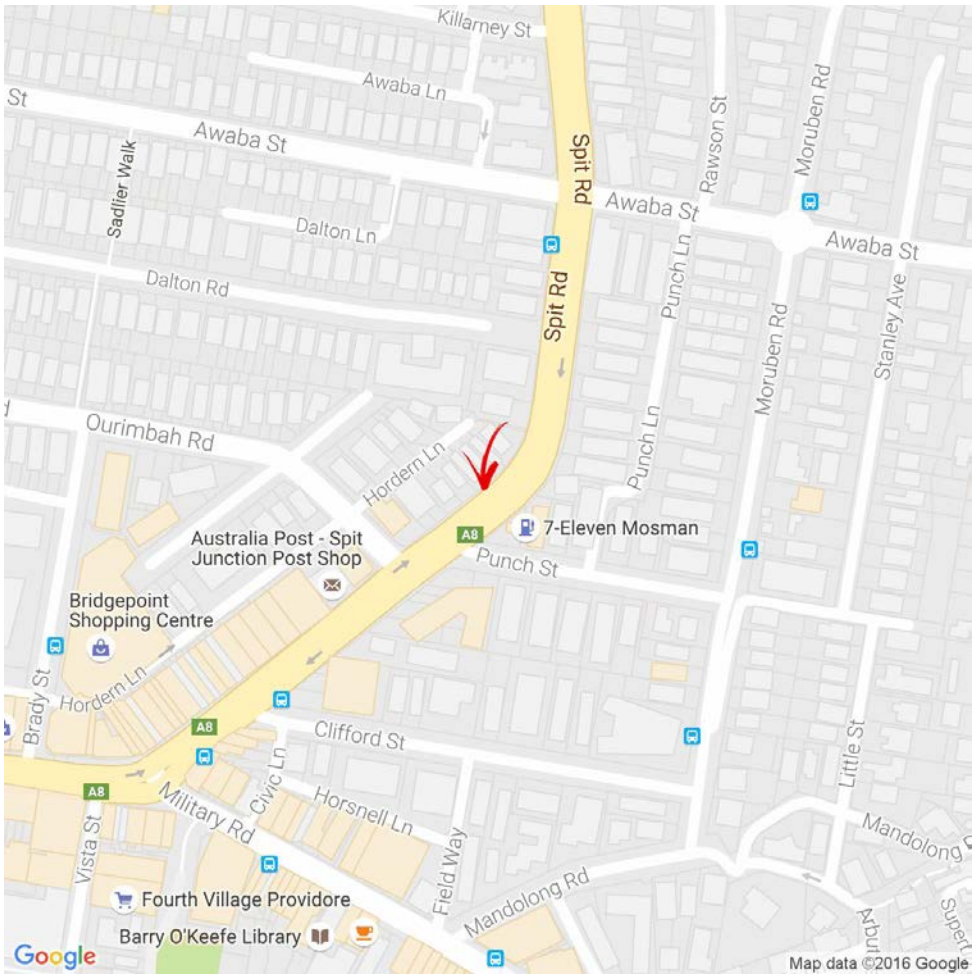
INP Noise Level, dB(A)

	Log Average	RBL
Day	75	66
Evening	75	58
Night	71	36

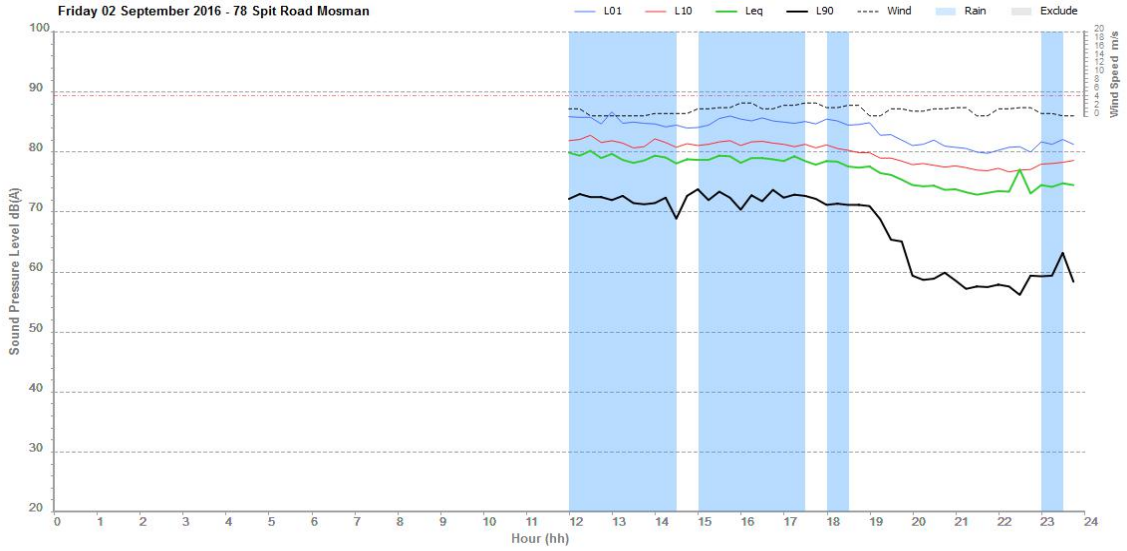
RNP Noise Level, dB(A)

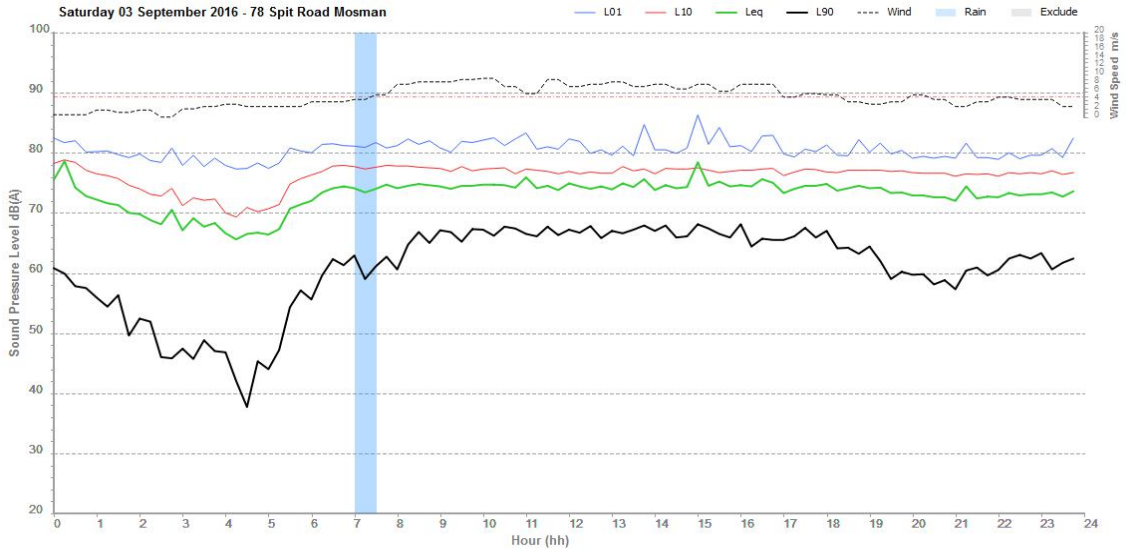
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

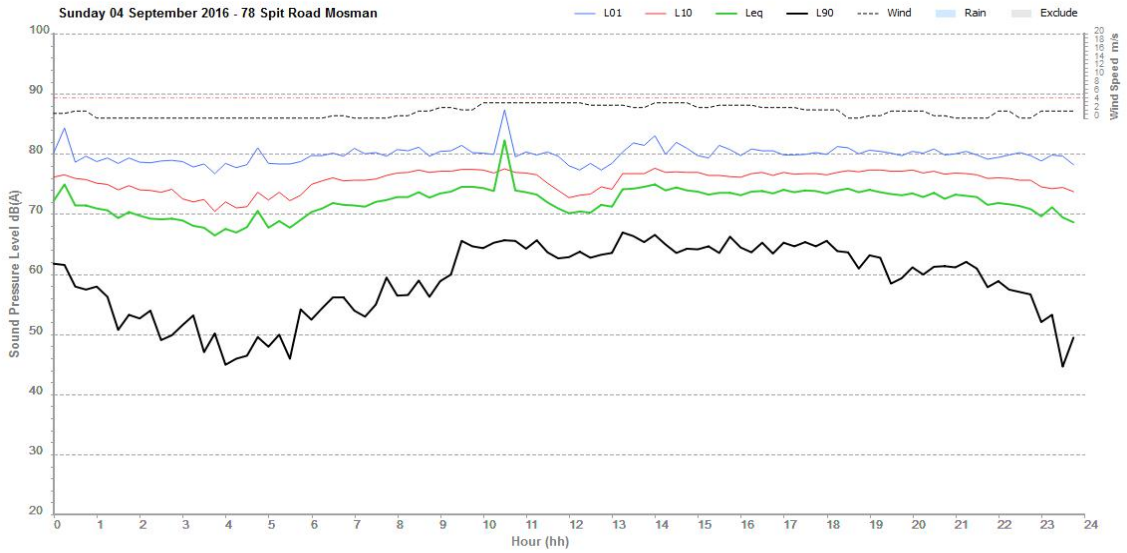
Logger Location Map



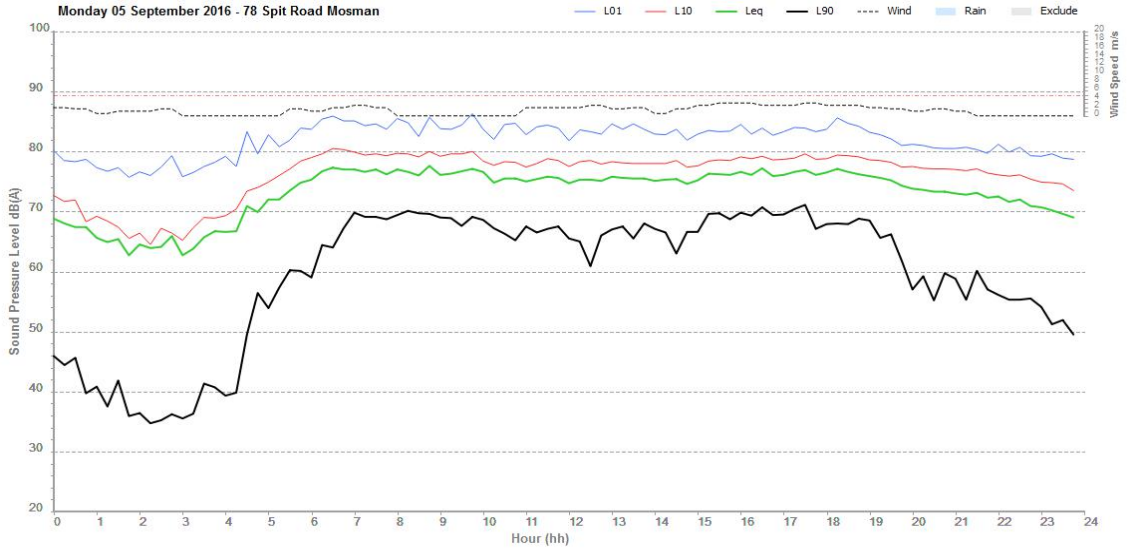
Logger Graphs

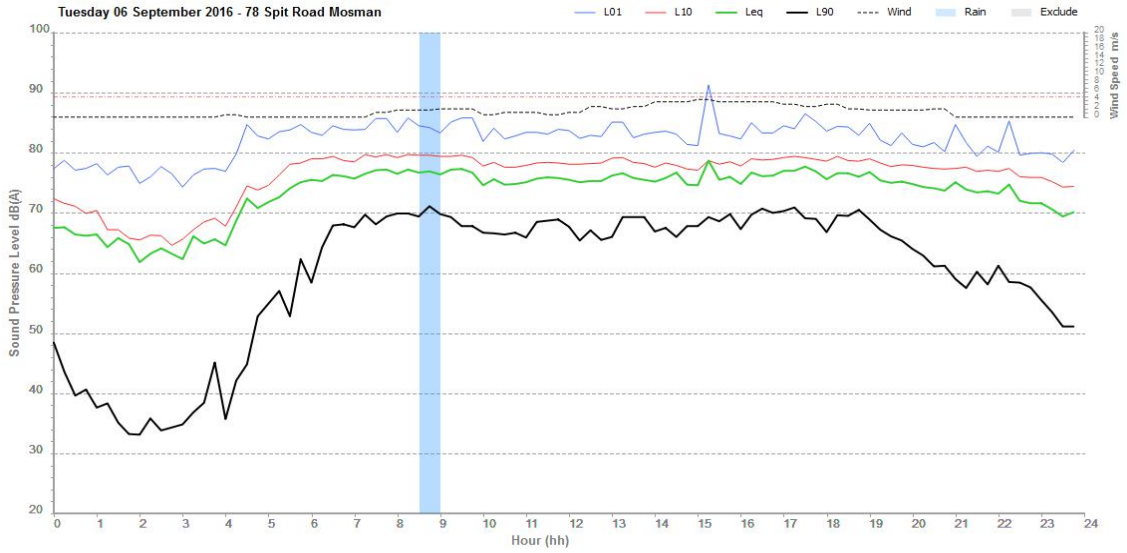






Logger Graphs





P12_7 - 31-33 Awaba Street - 02/09/16 - 12/09/16

Logger Setup

Logger Type: ARL 315

Serial No : 16-707-005

Address: 31-33 Awaba Street , Mosman

Location: Side of road, attached to tree

Facade / Free Field: Free Field

Environment: Traffic noise dominates. Logger located near intersection of Spit Road and Awaba Street.

Logger Setup Photo

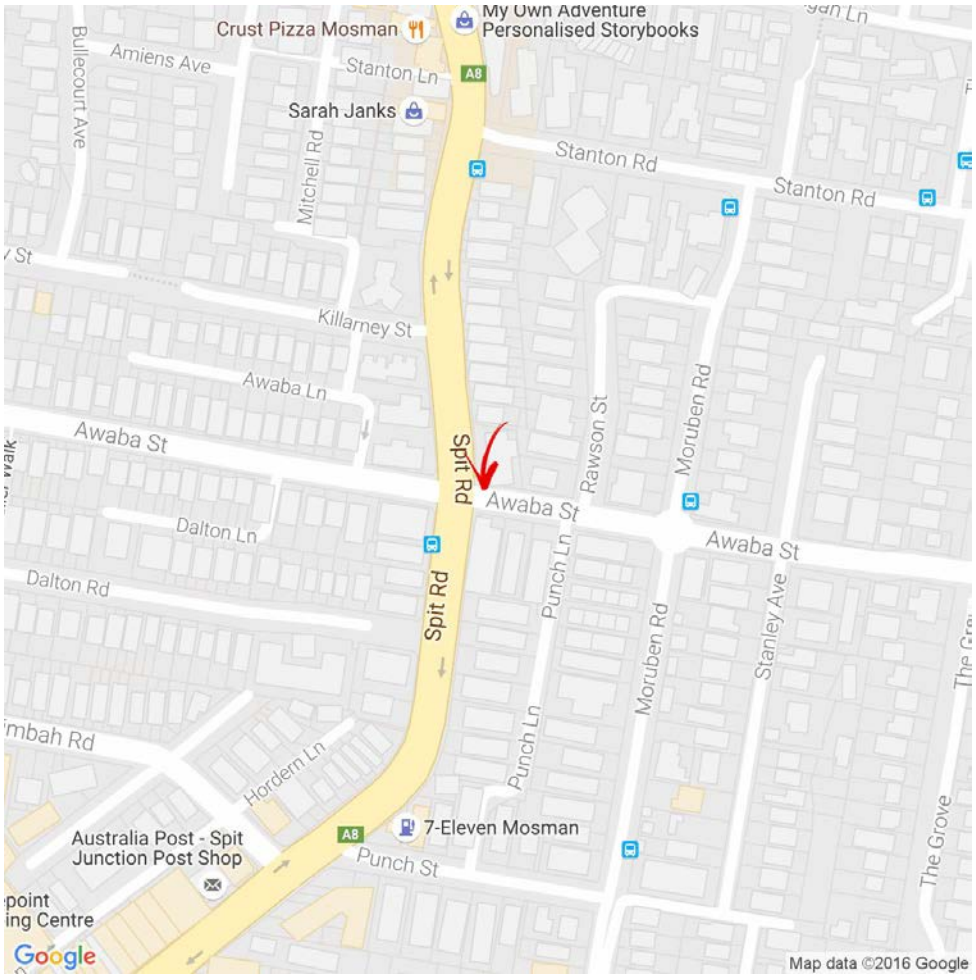
INP Noise Level, dB(A)

	Log Average	RBL
Day	71	62
Evening	68	55
Night	66	34

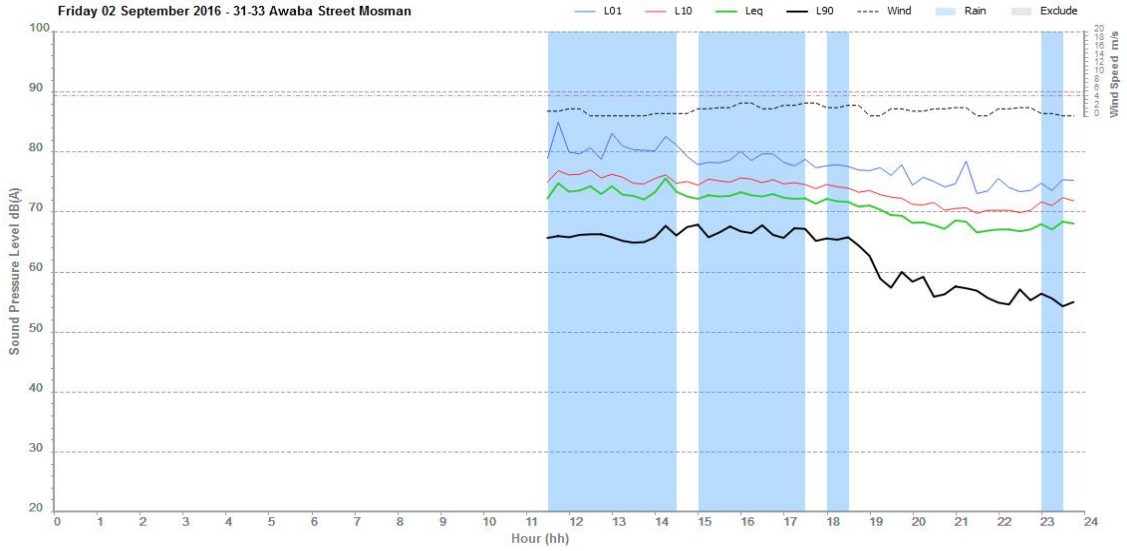
RNP Noise Level, dB(A)

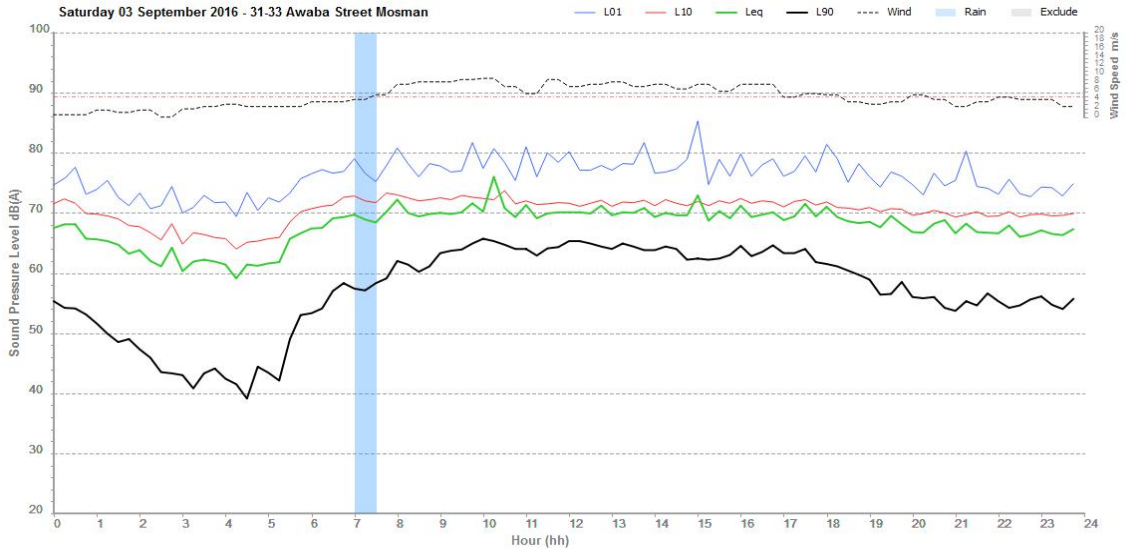
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

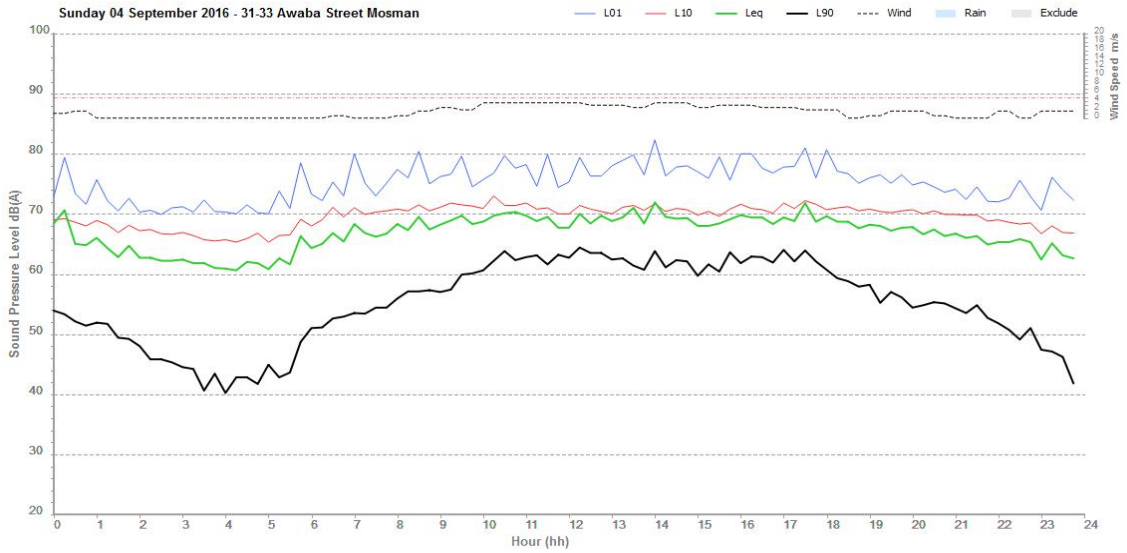
Logger Location Map



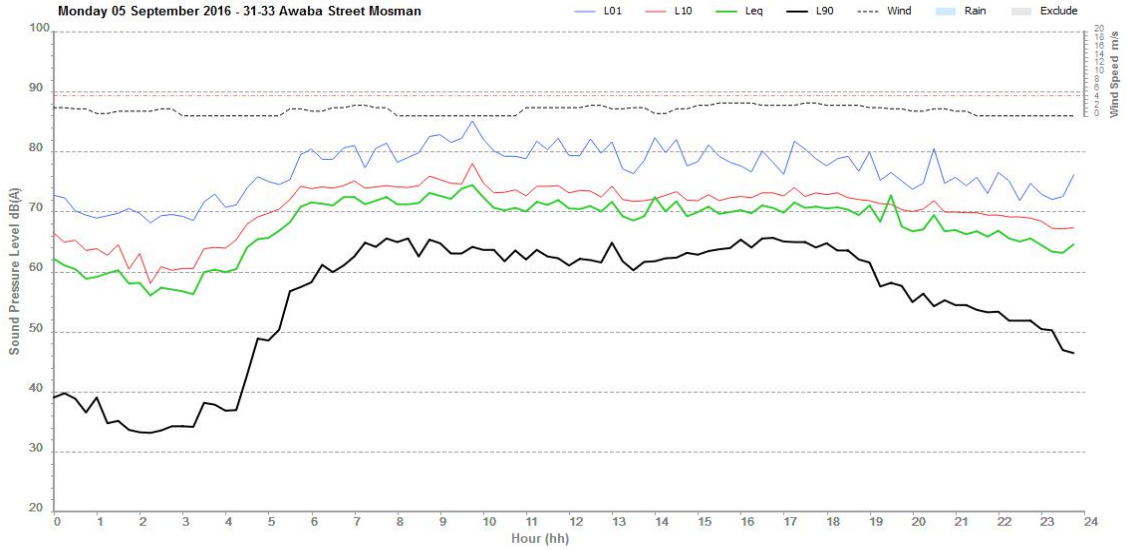
Logger Graphs

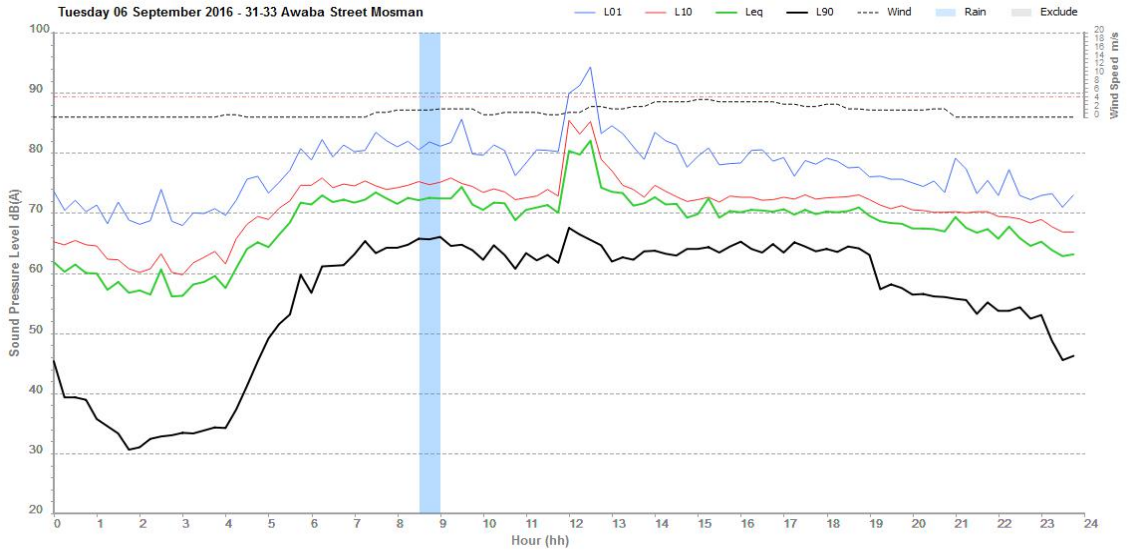


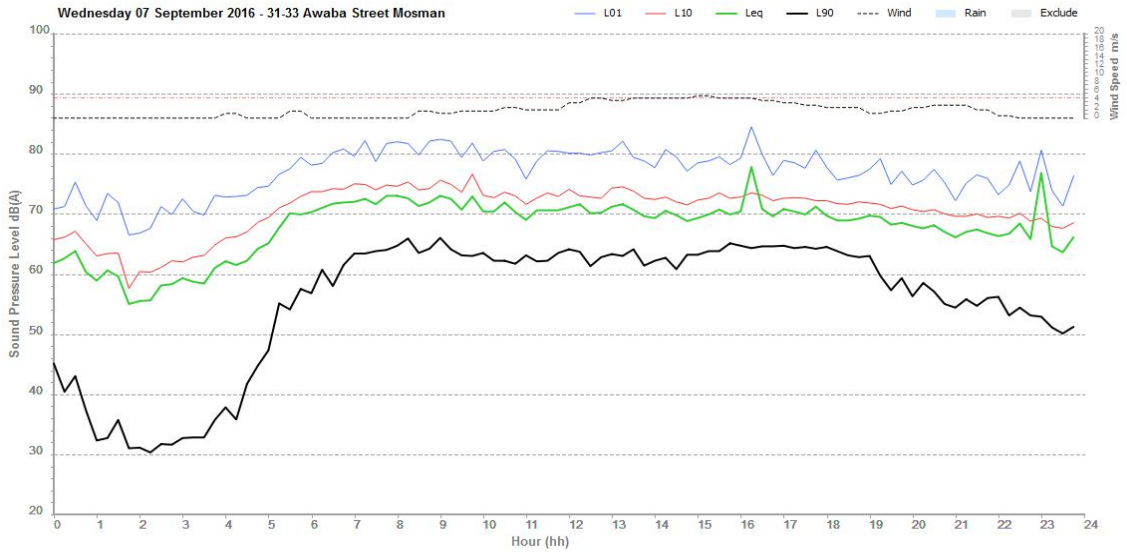




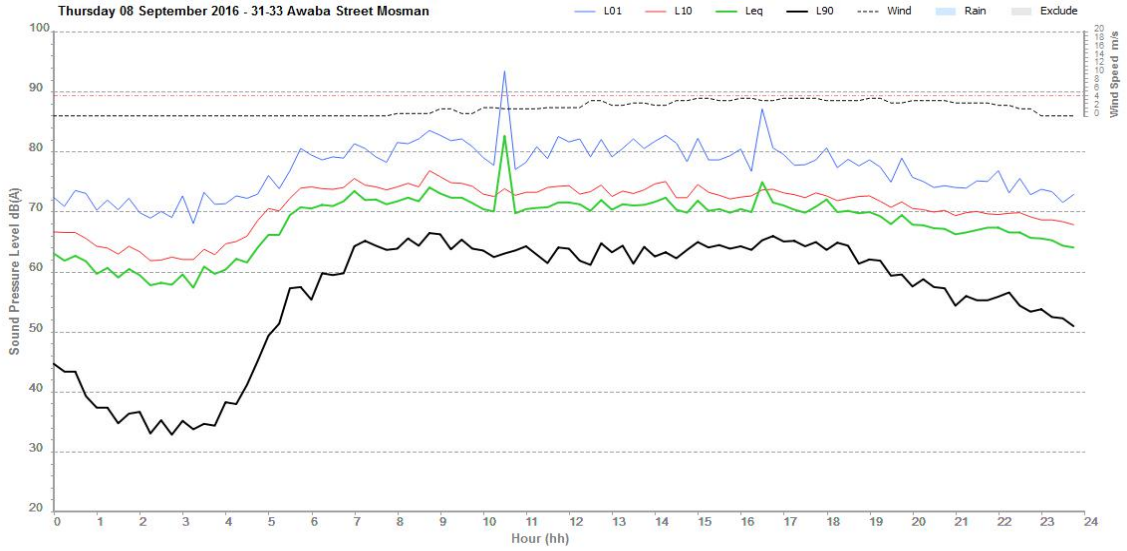
Logger Graphs

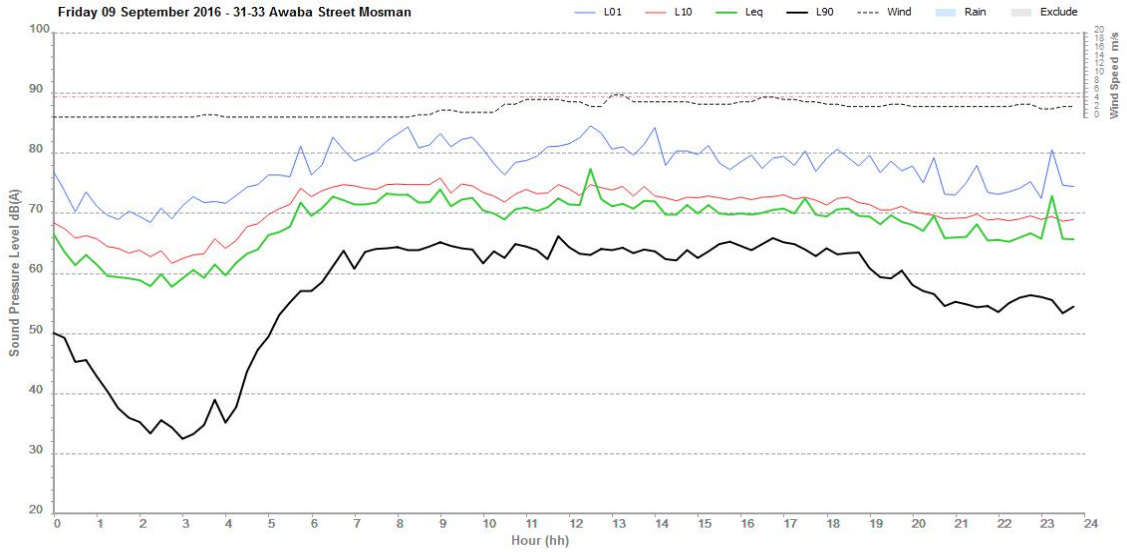


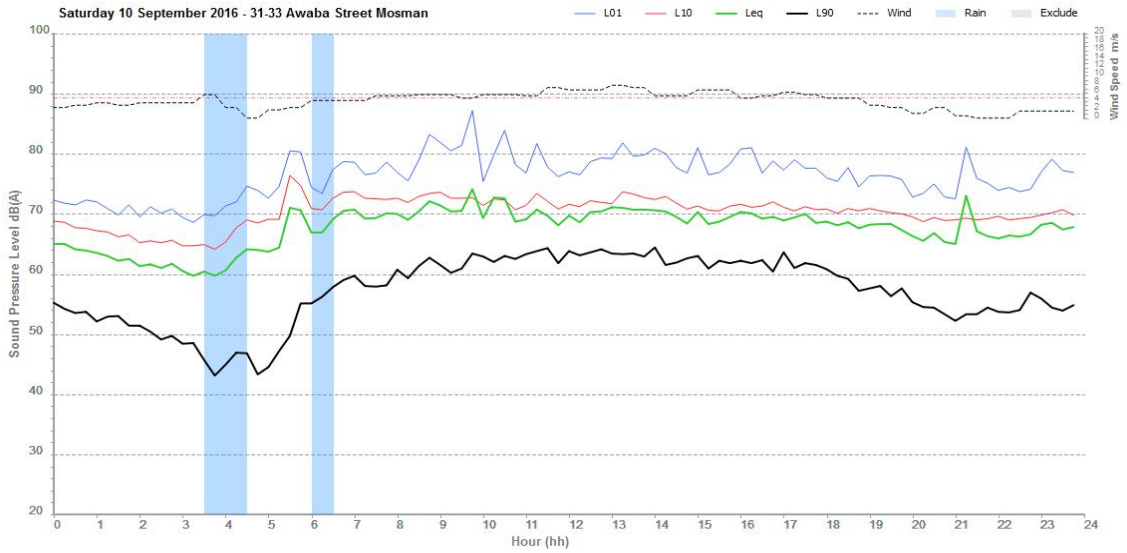




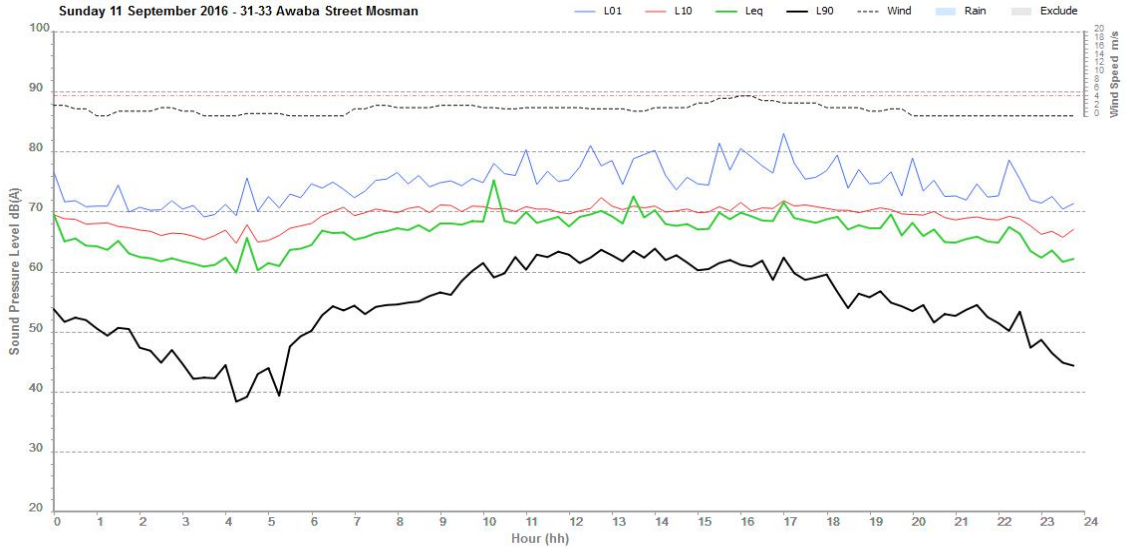
Logger Graphs







Logger Graphs



P12_8 - 45 Stanton Road - 02/09/16 - 12/09/16

Logger Setup

Logger Type: ARL 215

Serial No : 194662

Address: 45 Stanton Road , Mosman

Location: Garden/nature strip next to property

Facade / Free Field: Free Field

Environment: Traffic noise dominates. Logger located on corner of Stanton Road and Spit Road.

Logger Setup Photo

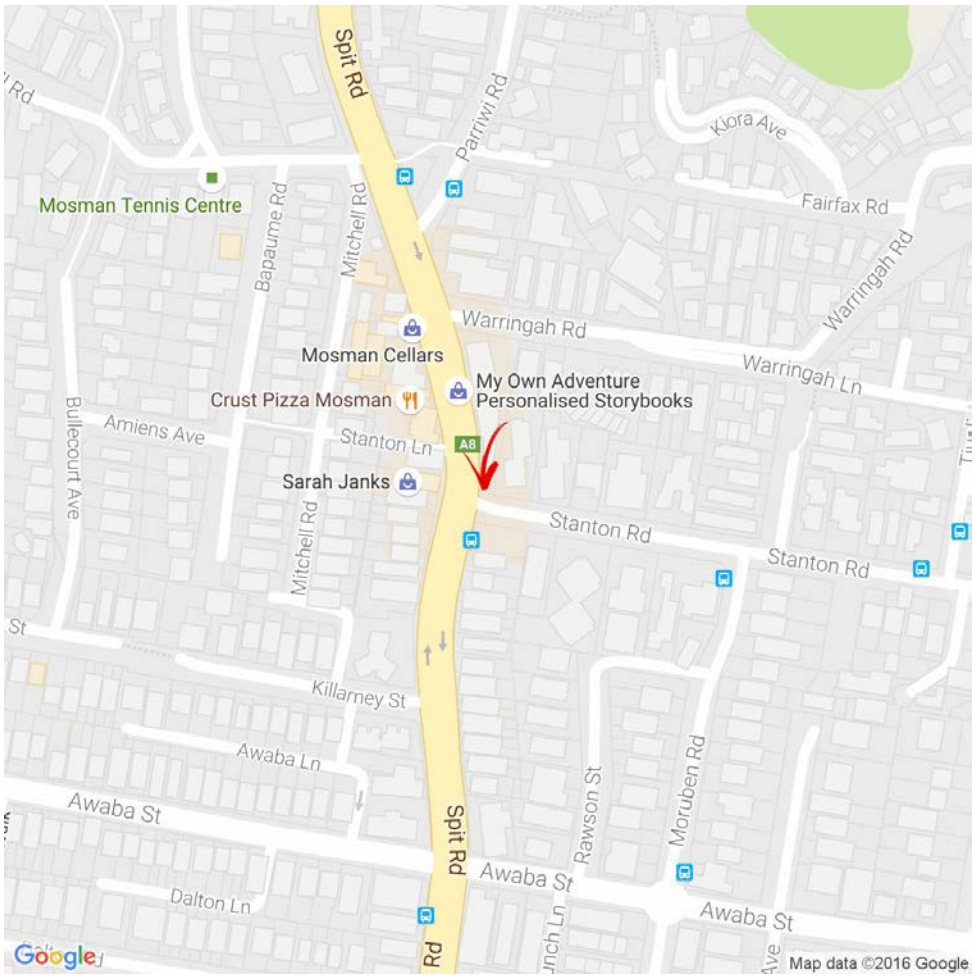
INP Noise Level, dB(A)

	Log Average	RBL
Day	72	62
Evening	71	60
Night	68	36

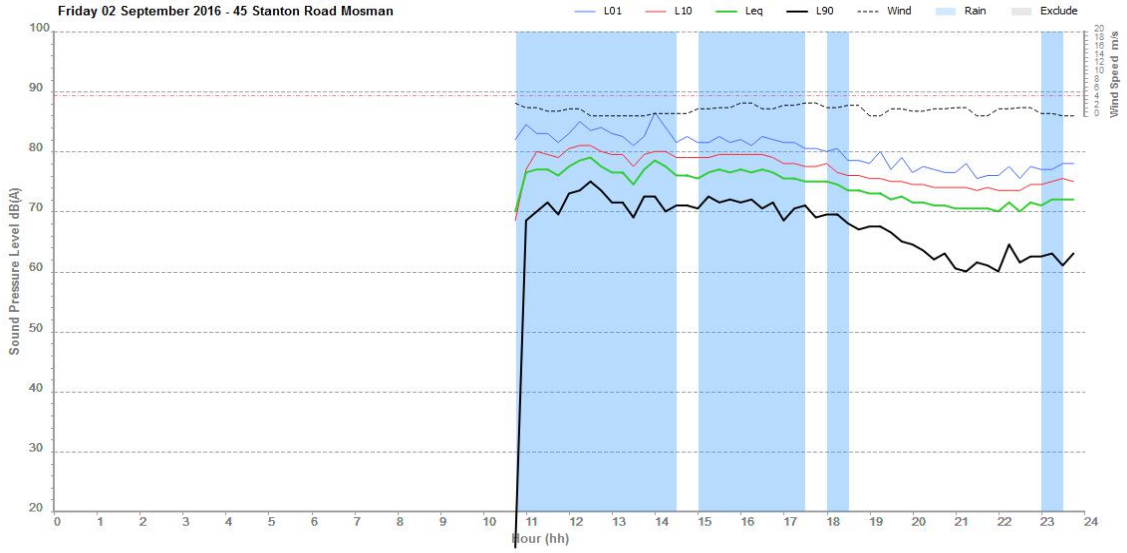
RNP Noise Level, dB(A)

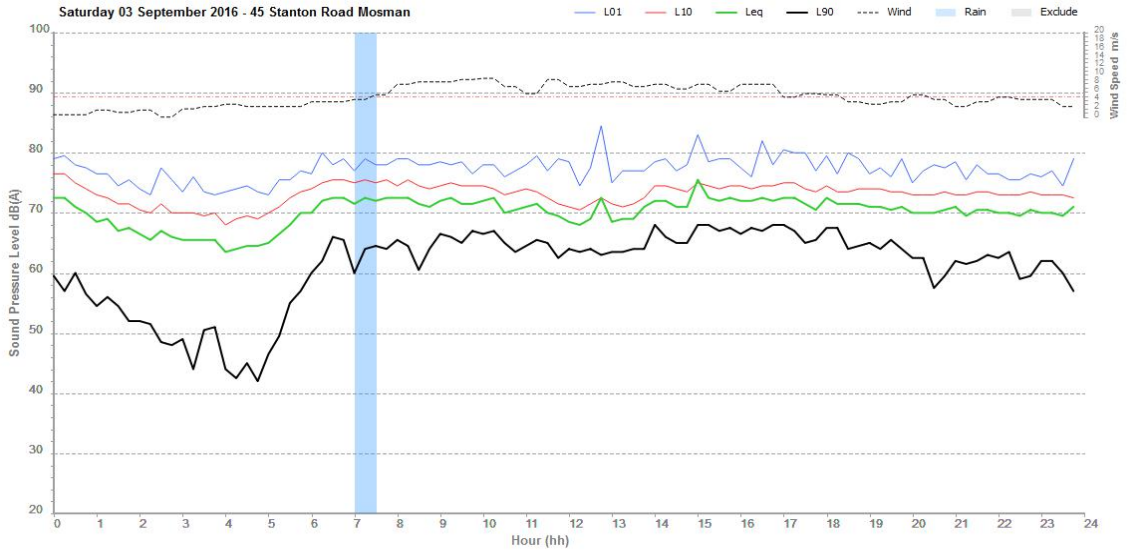
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

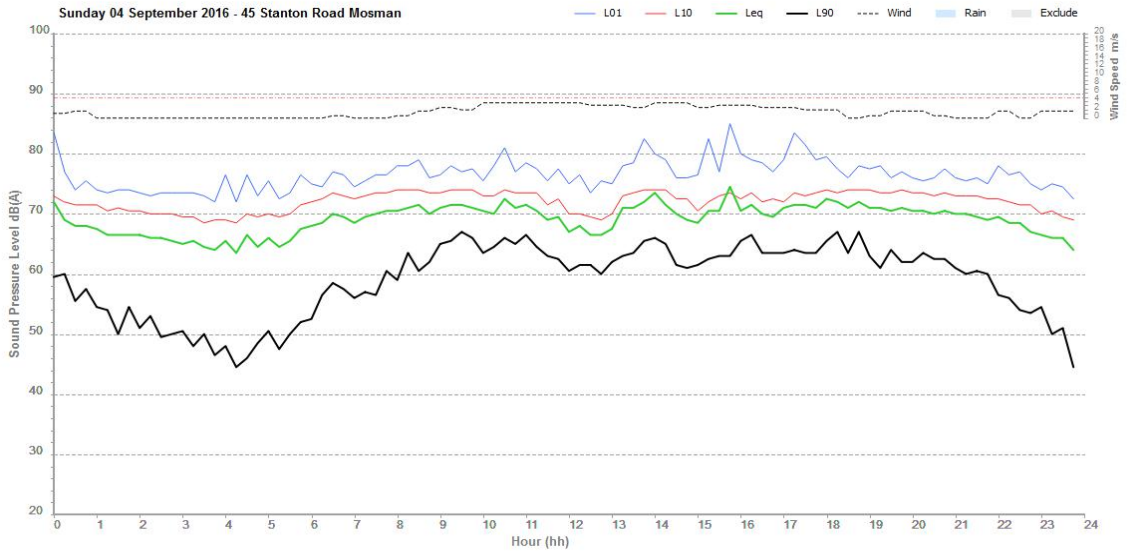
Logger Location Map



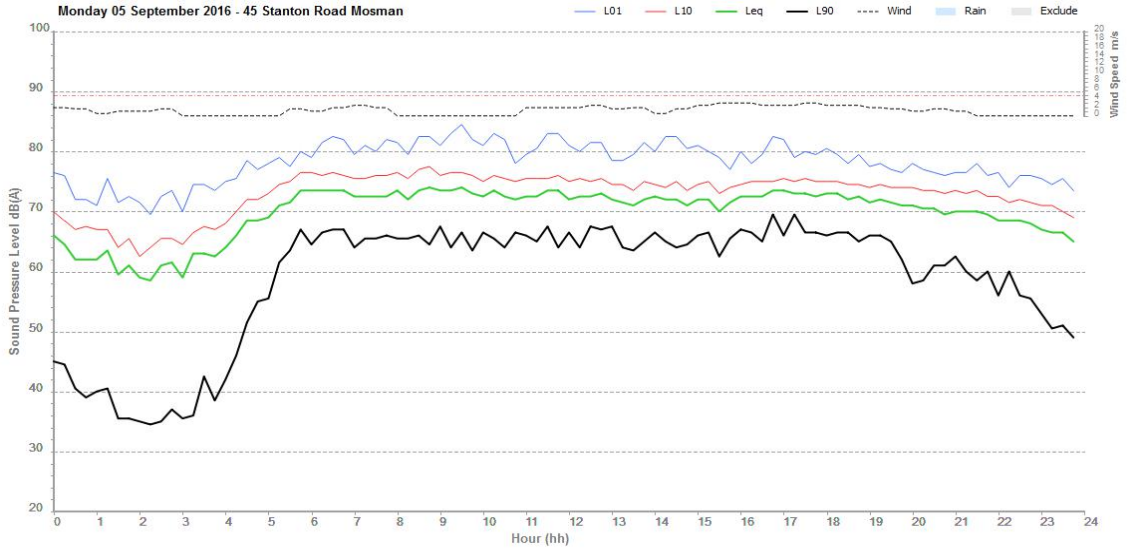
Logger Graphs

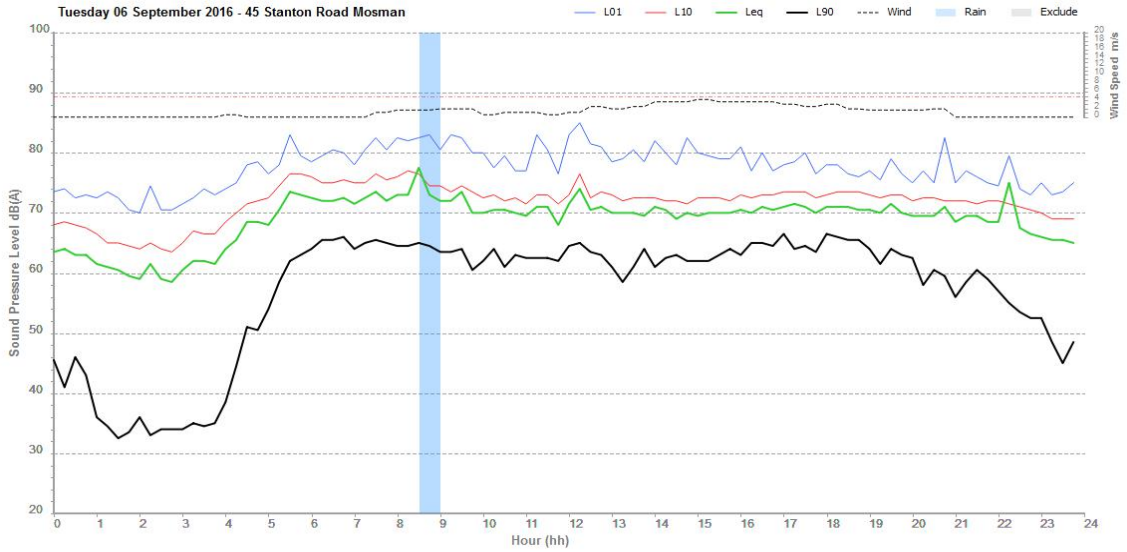


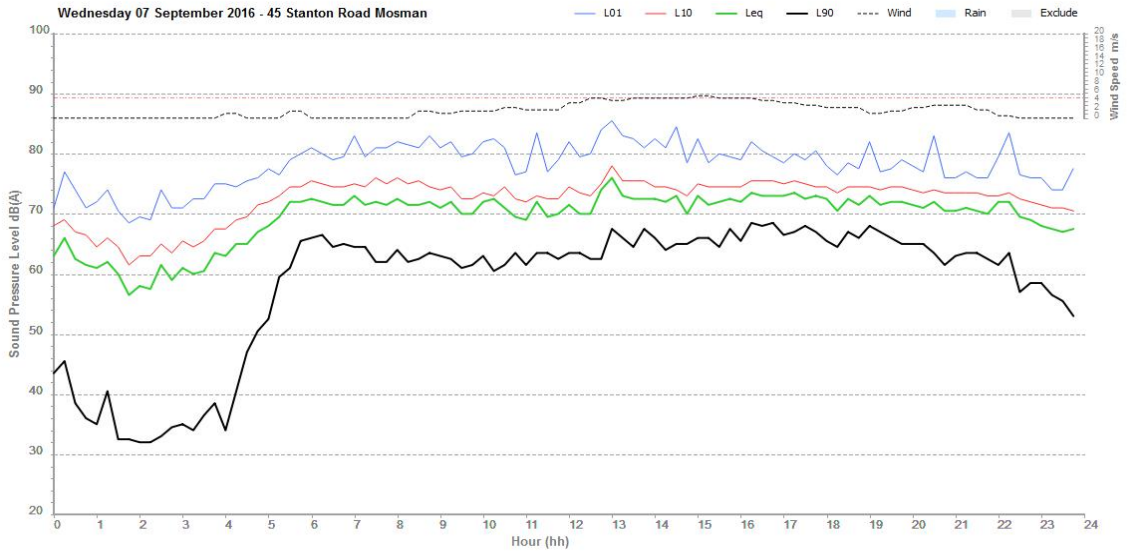




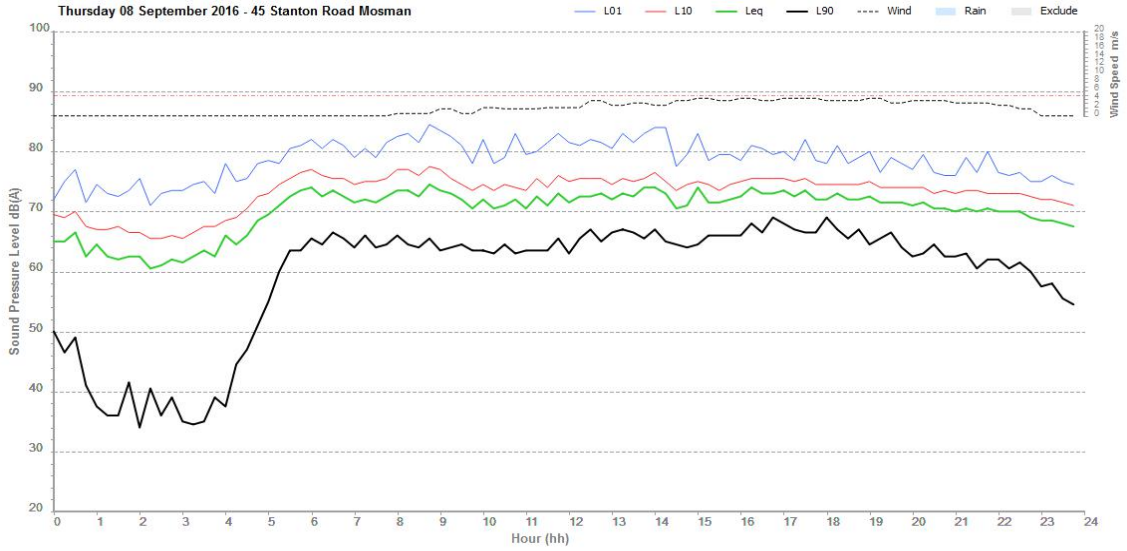
Logger Graphs

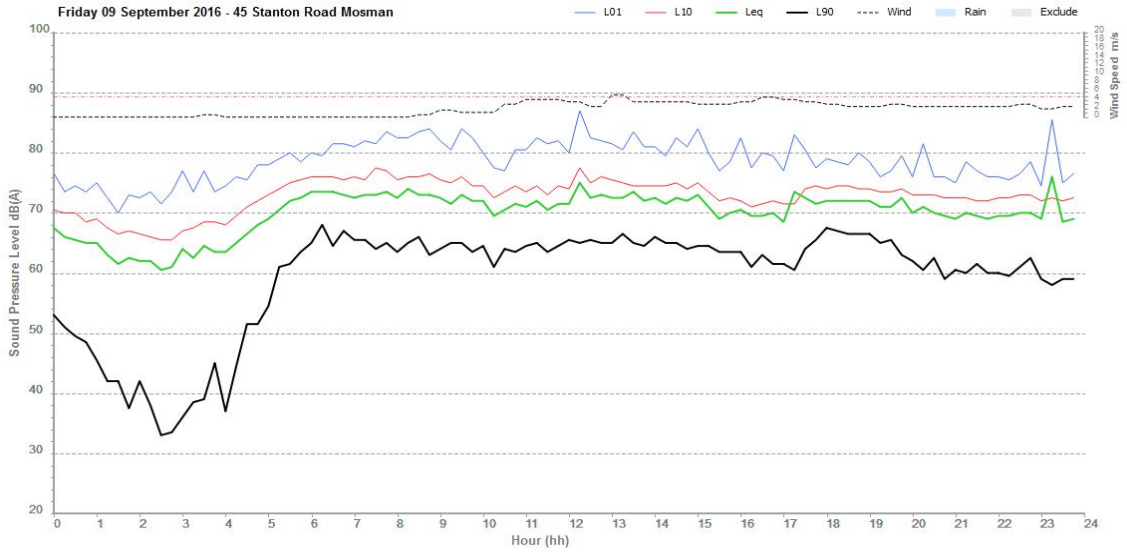


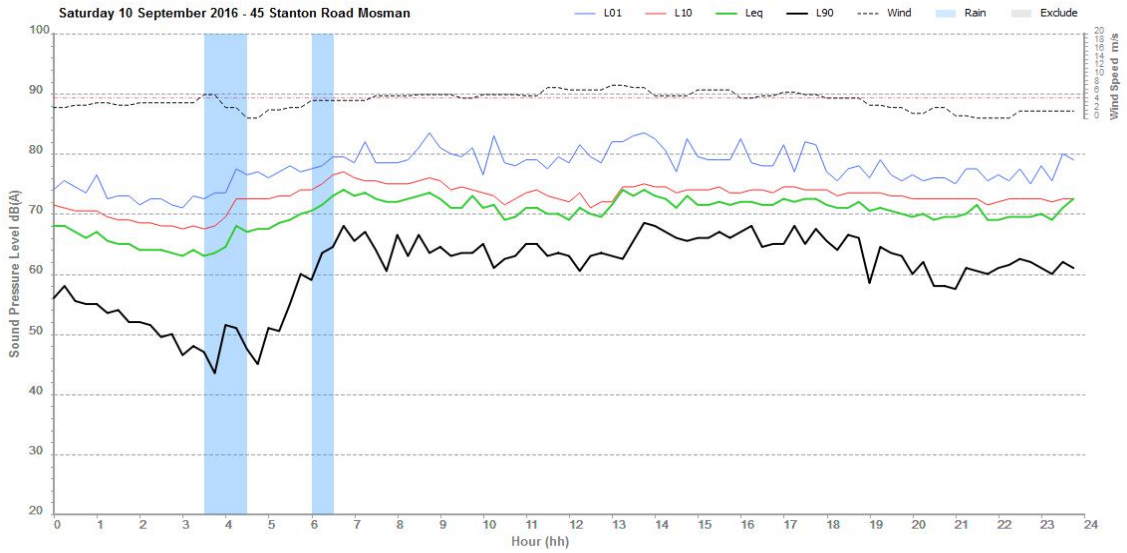




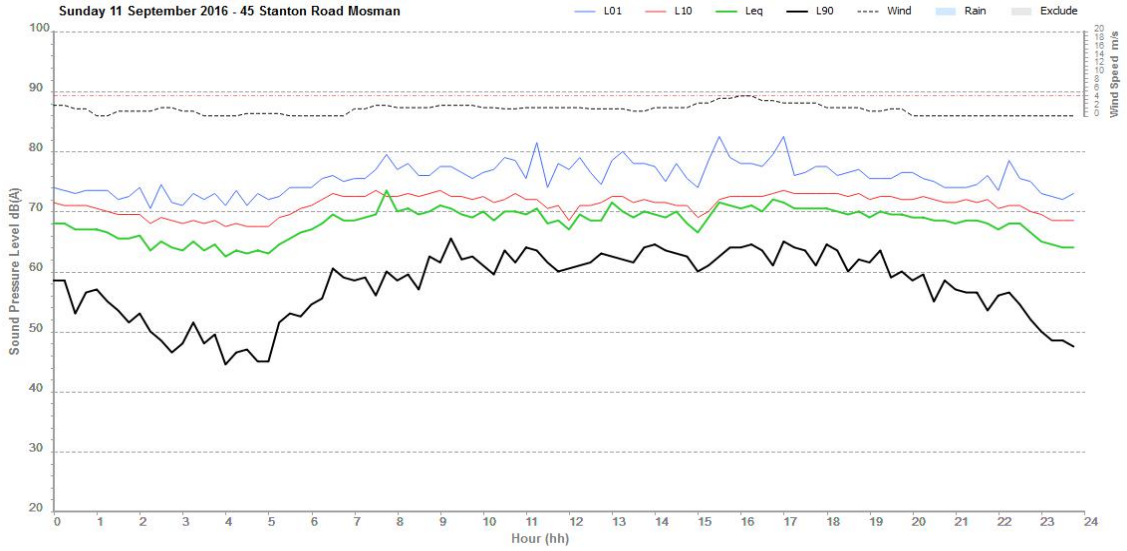
Logger Graphs

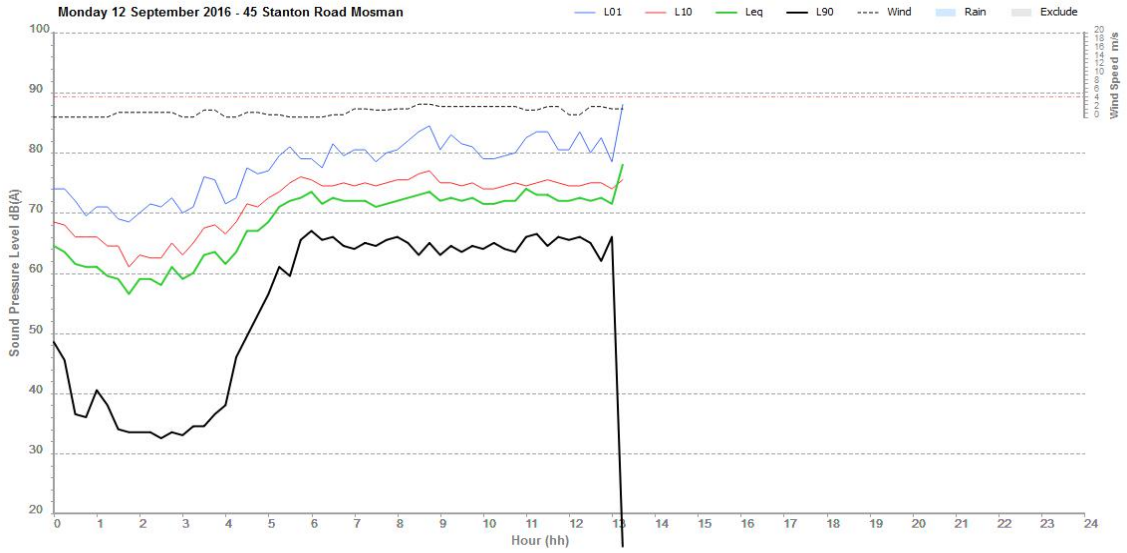






Logger Graphs





P12_9 - 162 Spit Road - 31/08/16 - 07/09/16

Logger Setup

Logger Type: ARL 315

Serial No : 16-707-006

Address: 162 Spit Road , Mosman

Location: In raised up garden, on the verge.

Facade / Free Field: Free Field

Environment: Traffic noise dominates. Logger located on corner of Spit Road, Bickell Road and Mitchell Road in raised up garden.

Logger Setup Photo

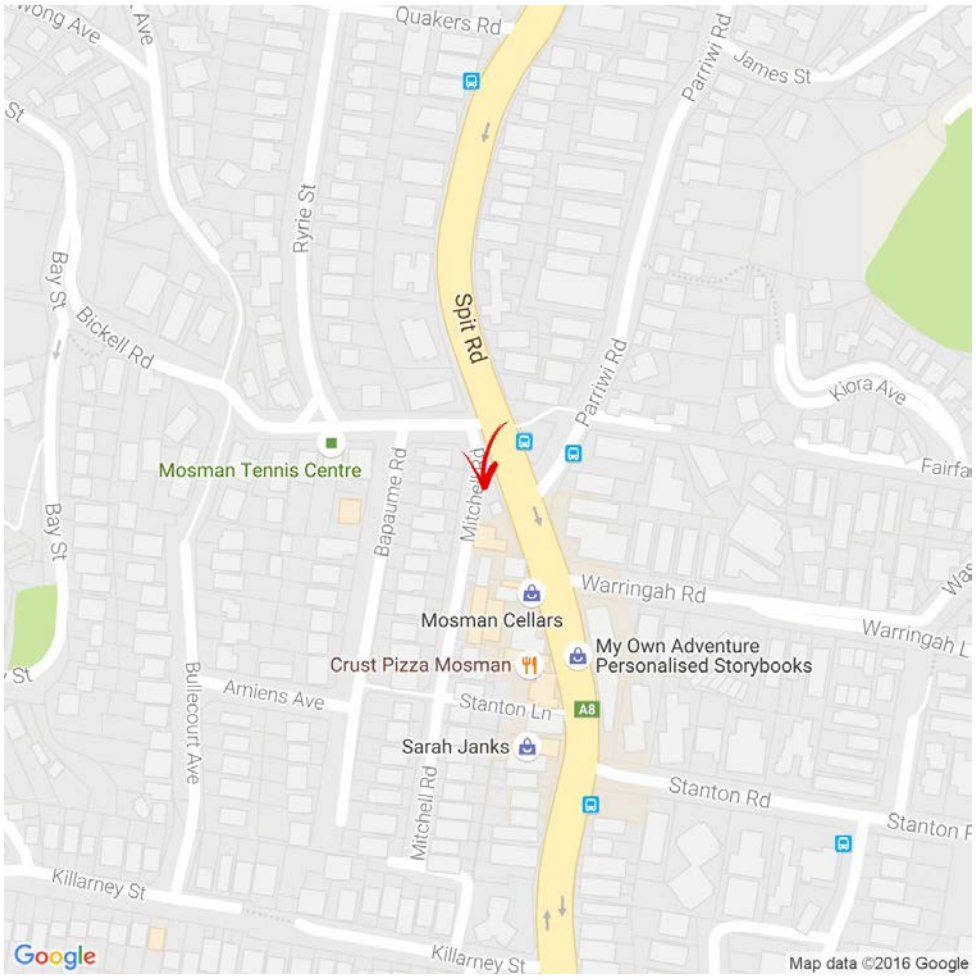
INP Noise Level, dB(A)

	Log Average	RBL
Day	73	61
Evening	72	60
Night	68	38

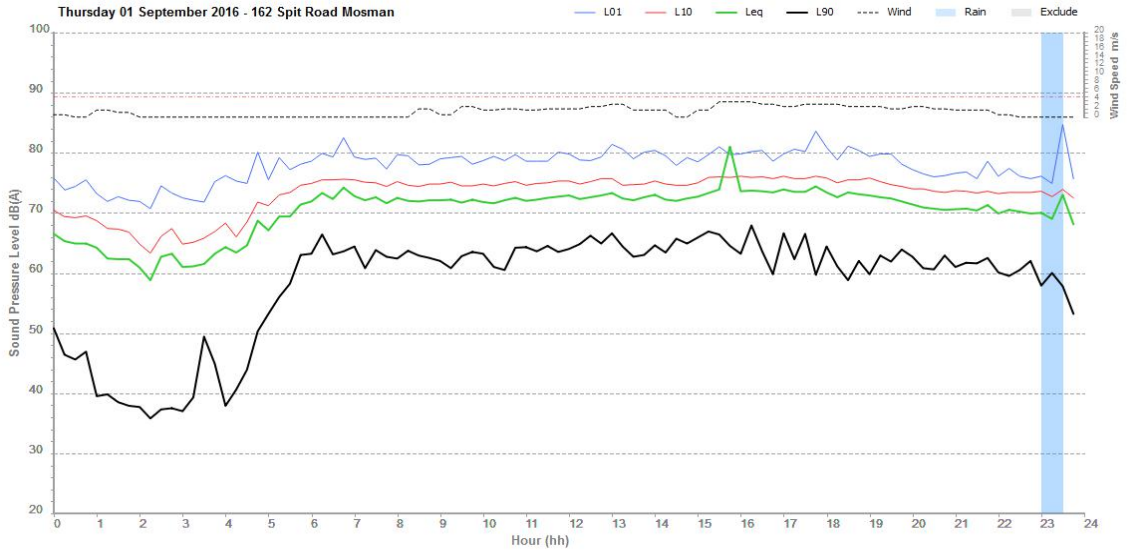
RNP Noise Level, dB(A)

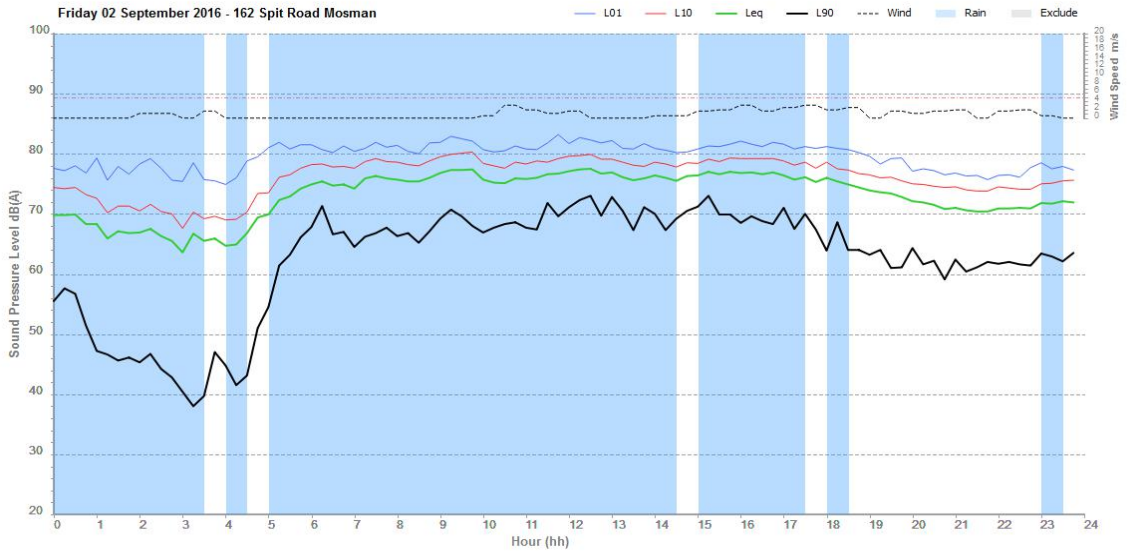
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

Logger Location Map

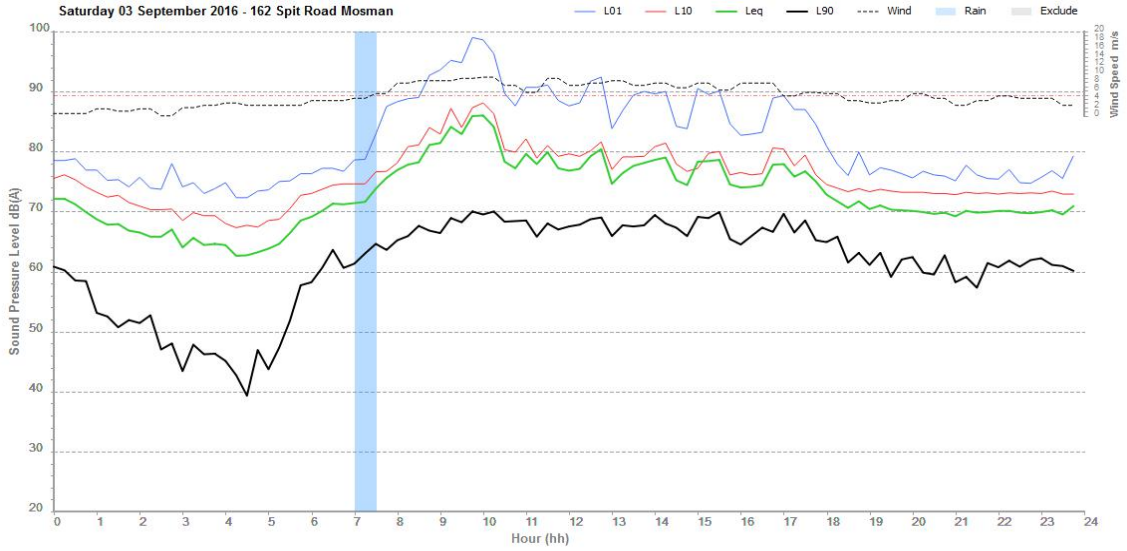


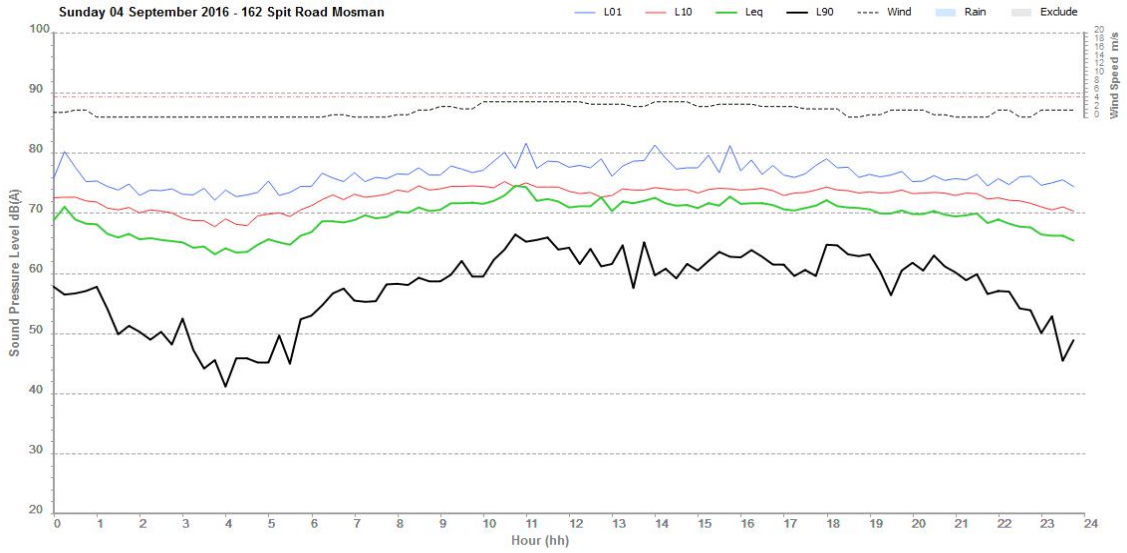
Logger Graphs

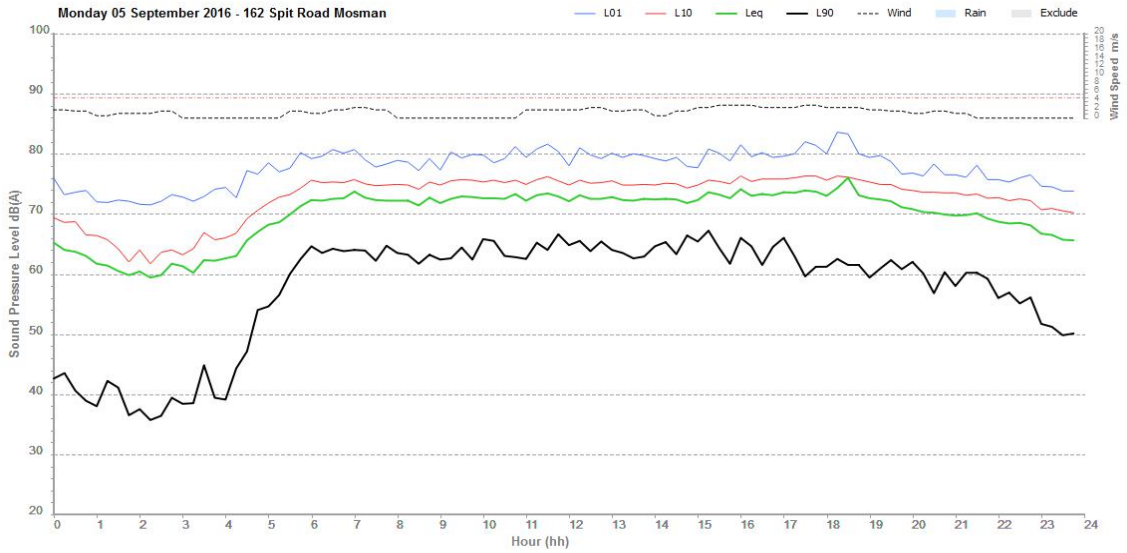




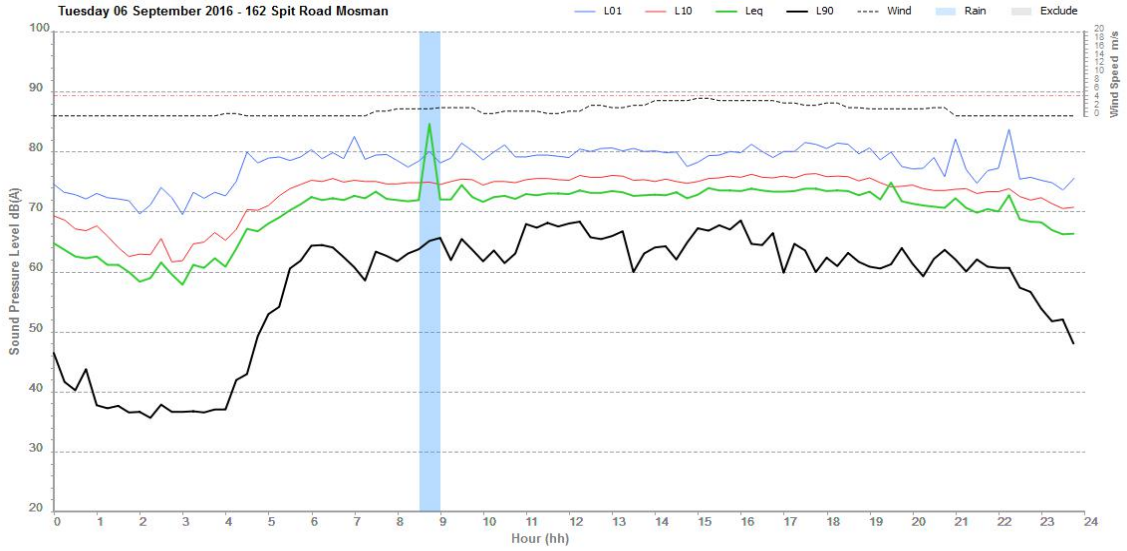
Logger Graphs

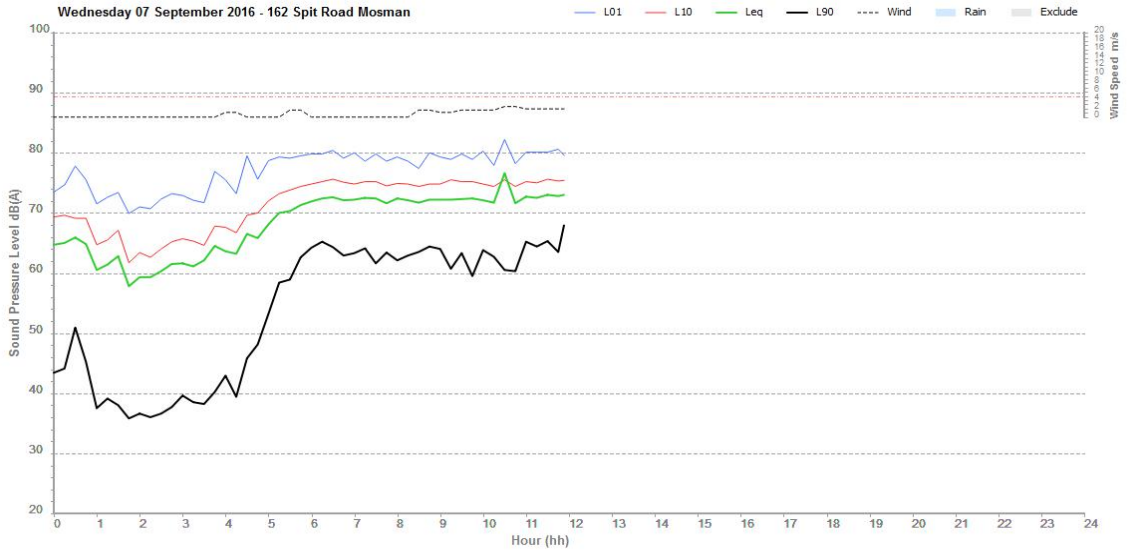






Logger Graphs





P8_1 - 727 Pittwater Road - 31/08/16 - 11/09/16

Logger Setup

Logger Type: ARL 215

Serial No : 194803

Address: 727 Pittwater Road , Dee Why

Location: On nature strip adjacent carpark, under tree.

Facade / Free Field: Free Field

Environment: Traffic noise is dominant. Logger located elevated above the alignment of Pittwater Road.

Logger Setup Photo

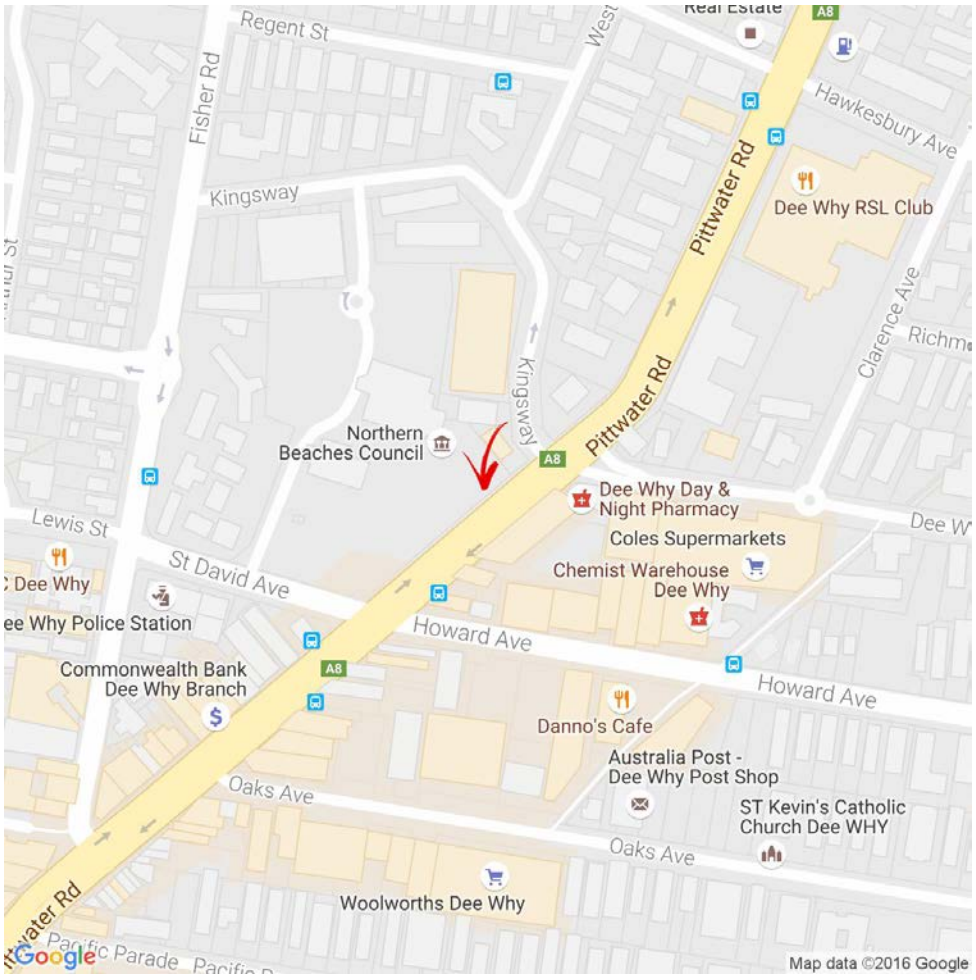
INP Noise Level, dB(A)

	Log Average	RBL
Day	71	58
Evening	70	55
Night	66	42

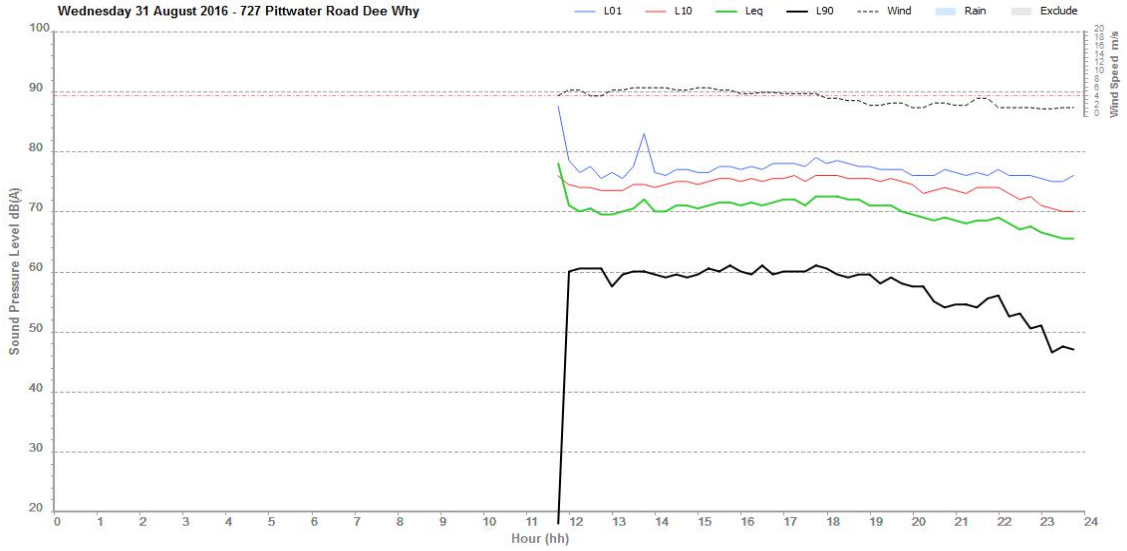
RNP Noise Level, dB(A)

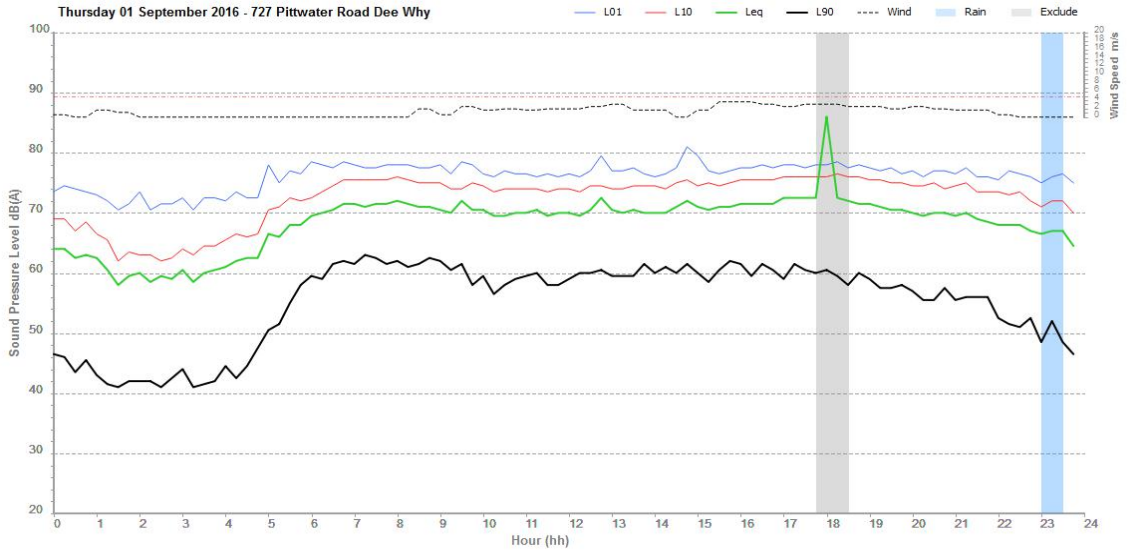
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

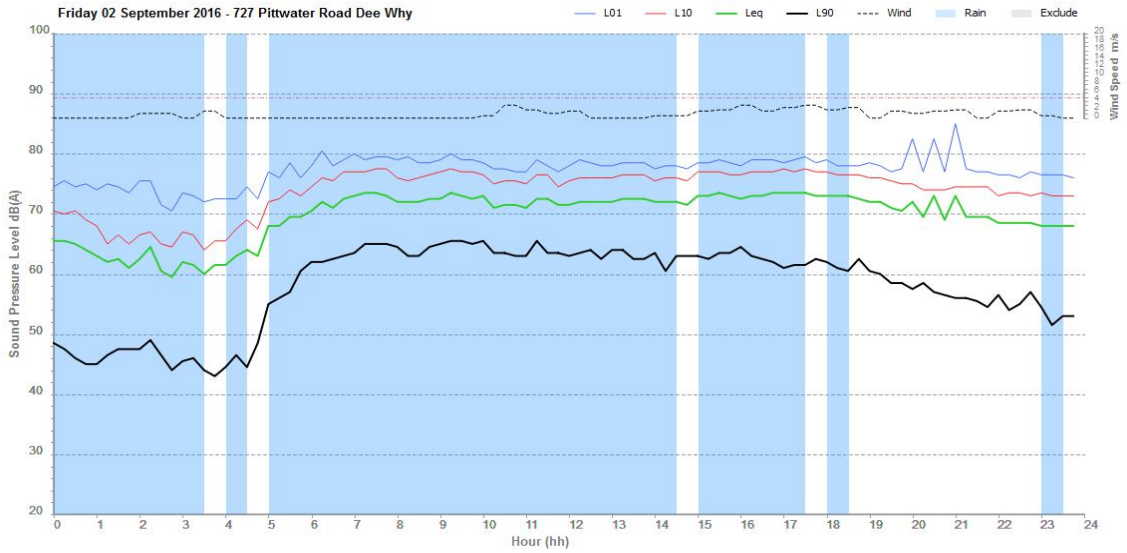
Logger Location Map



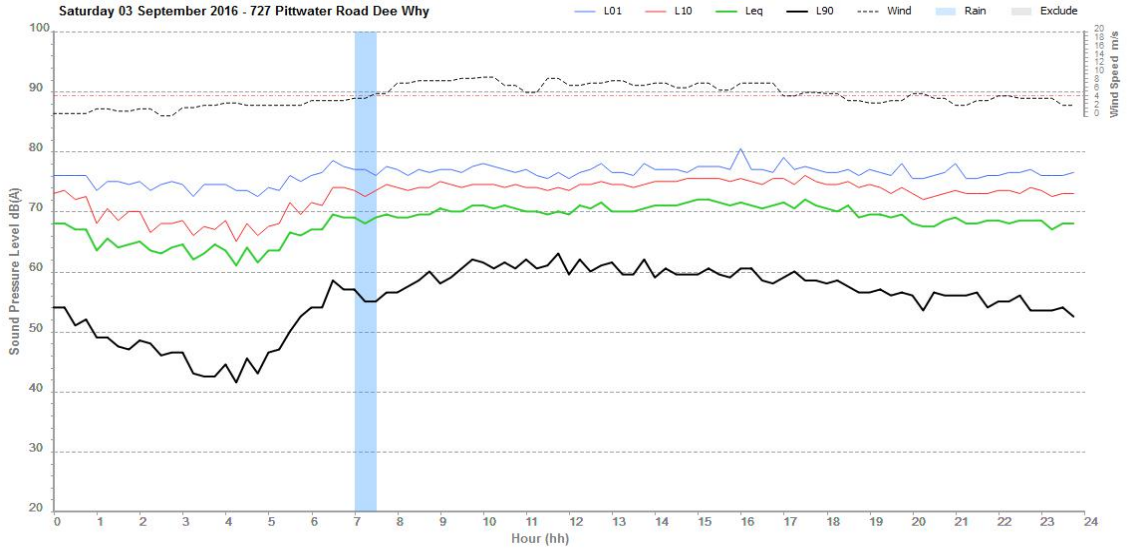
Logger Graphs

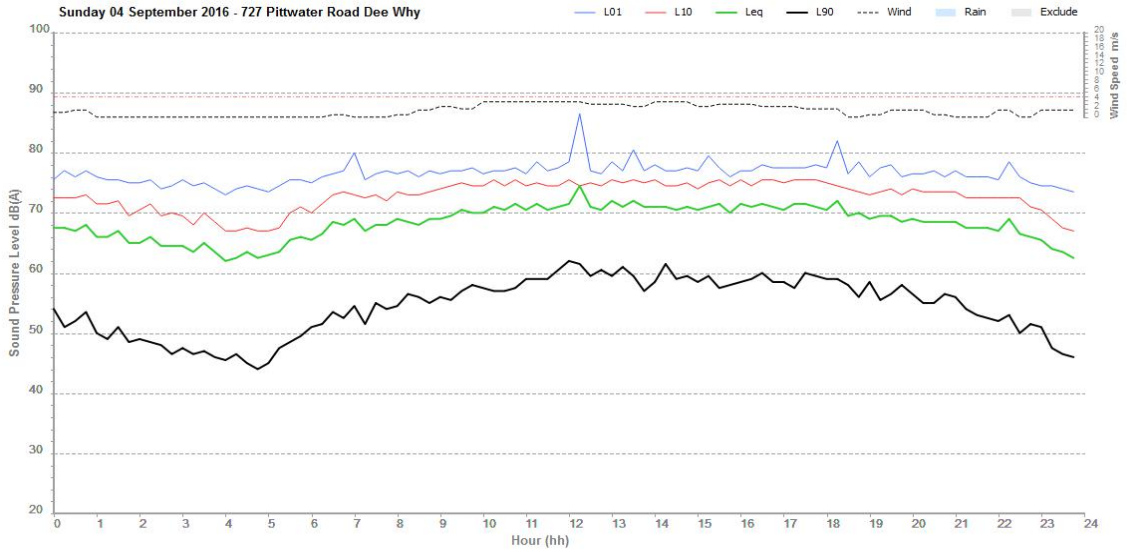


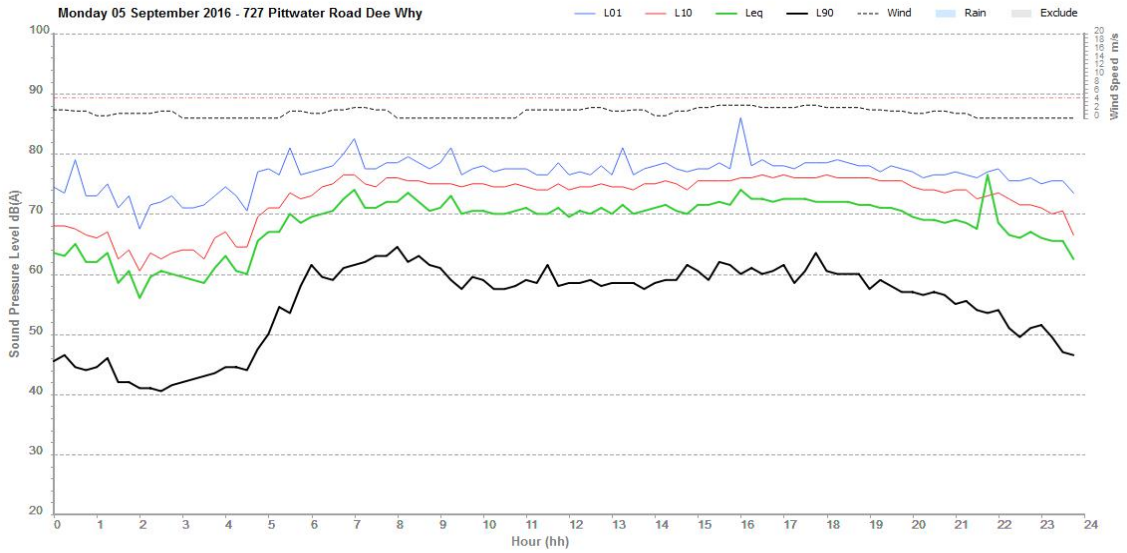




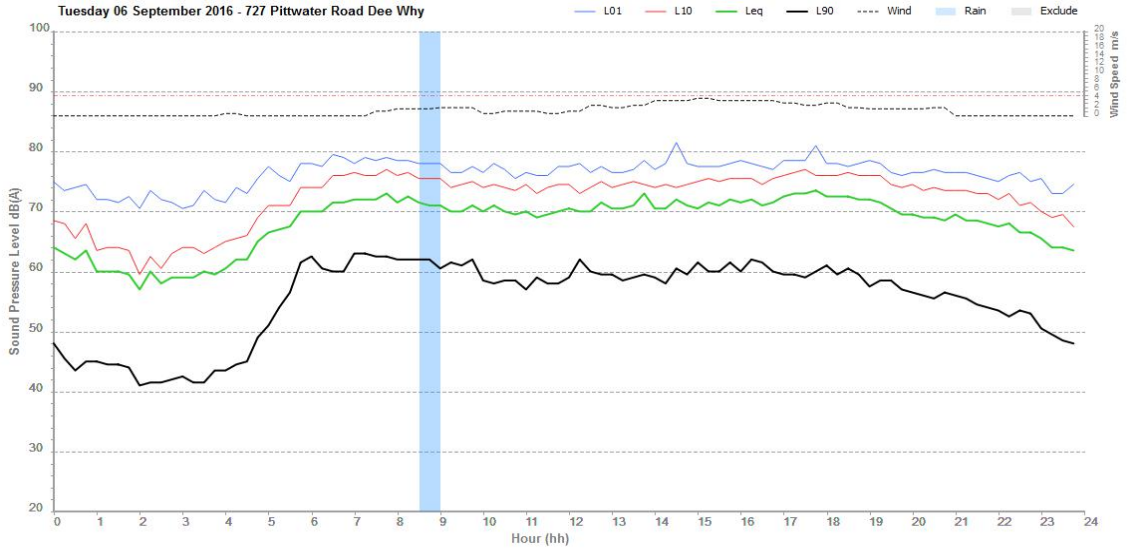
Logger Graphs

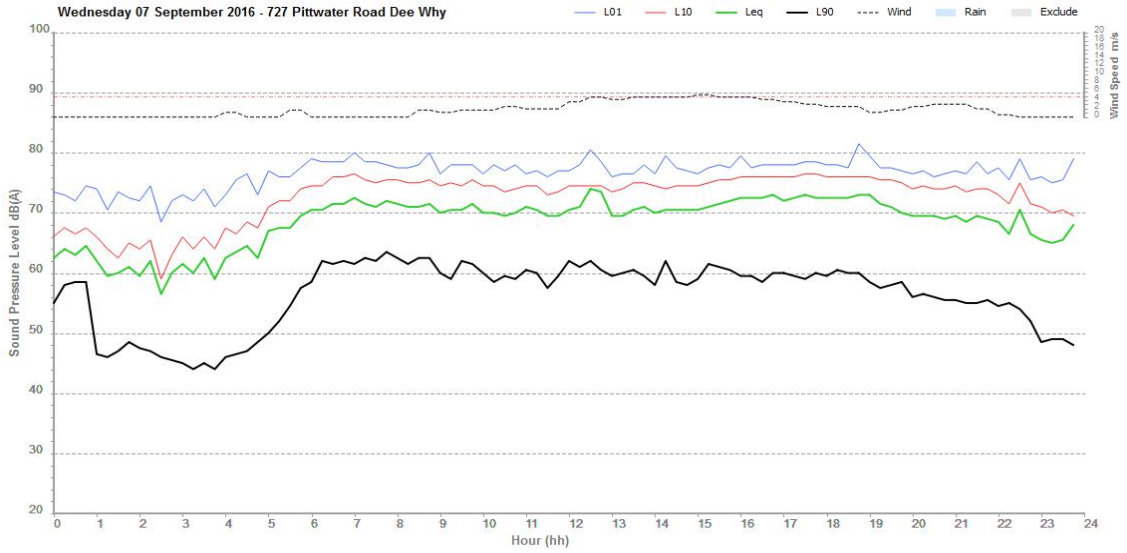


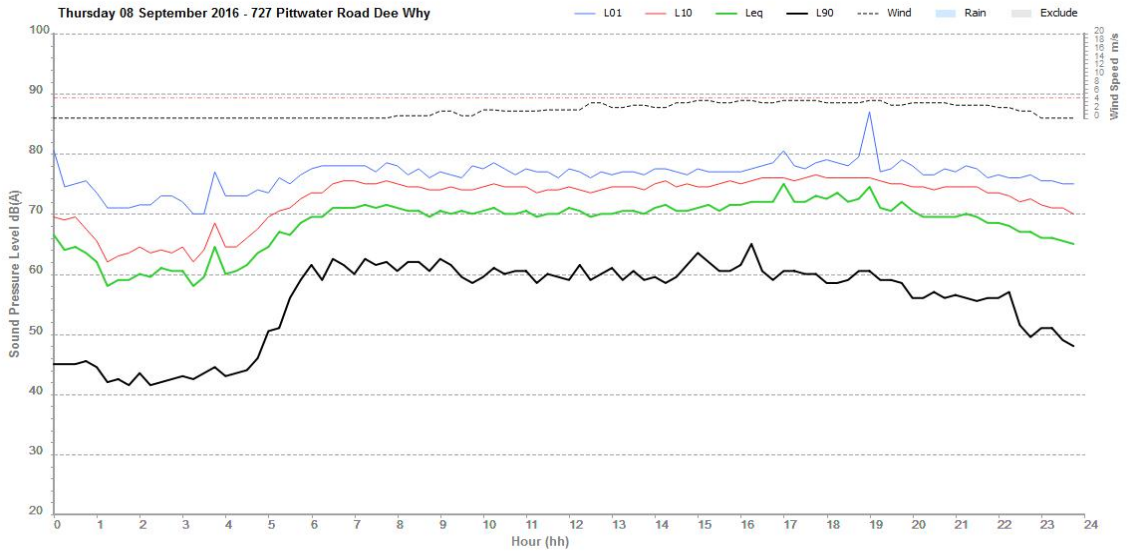




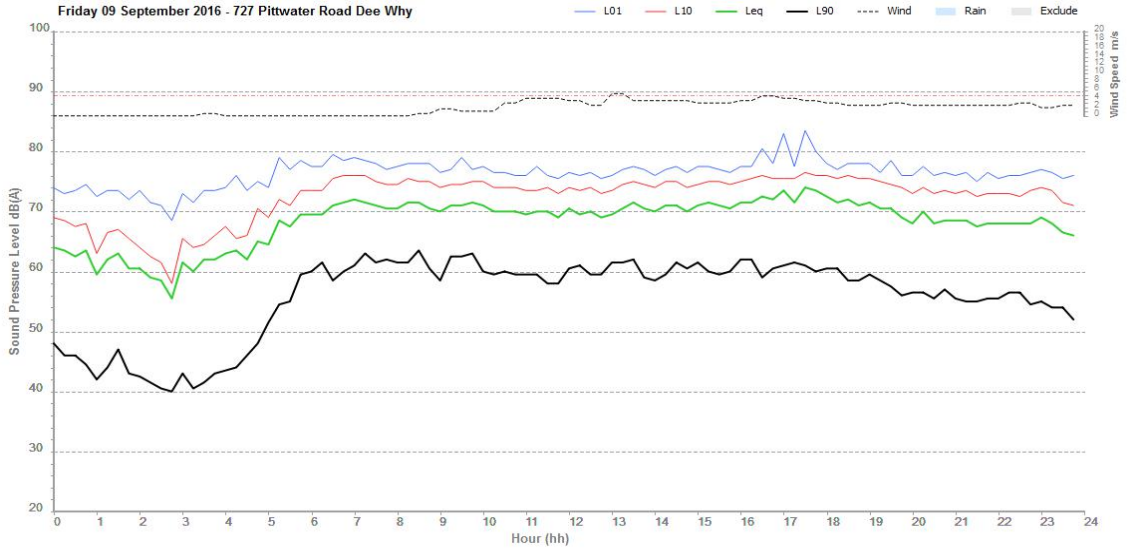
Logger Graphs

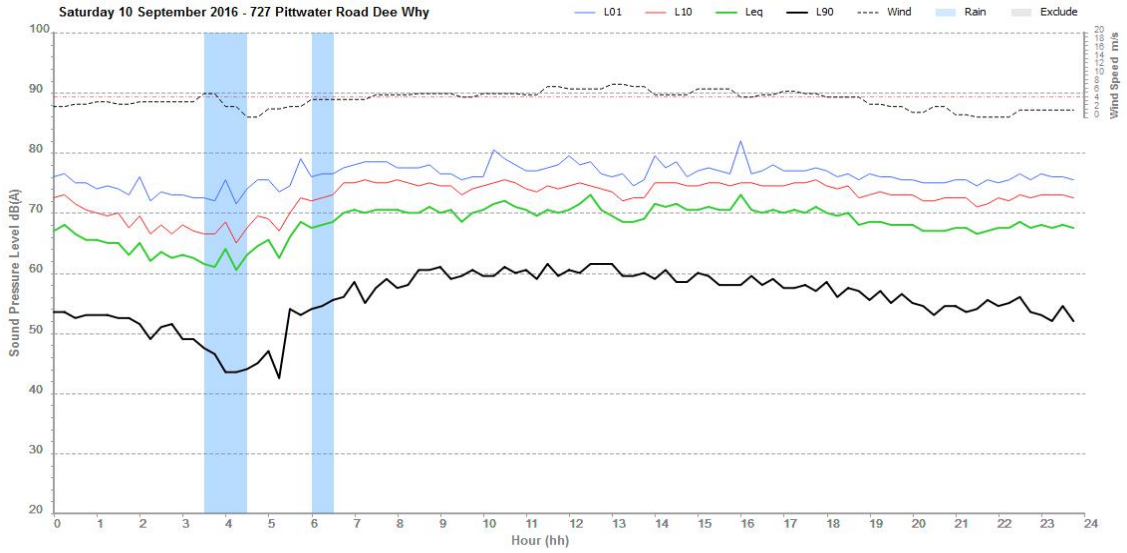


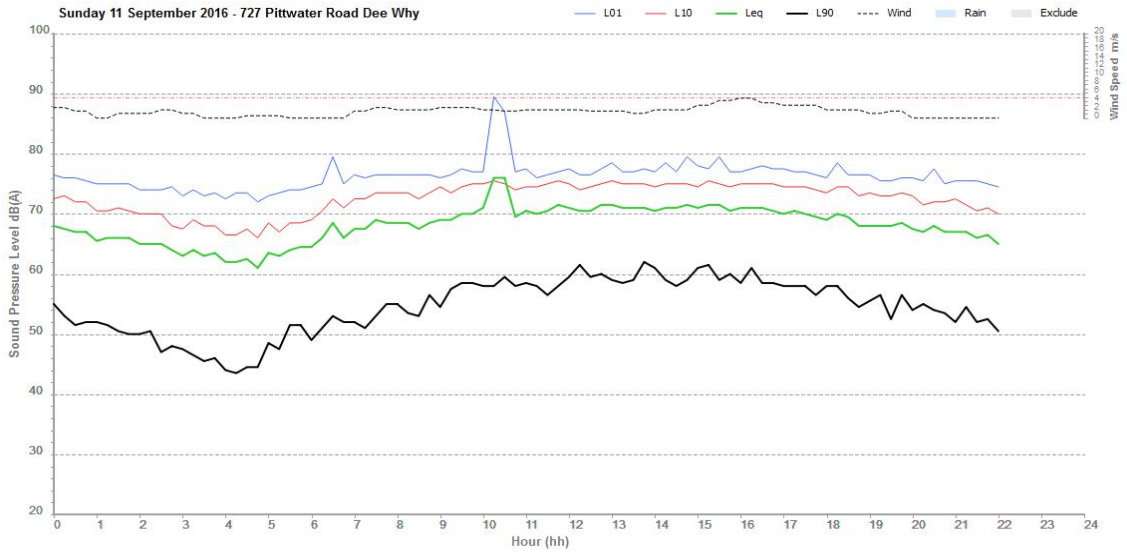




Logger Graphs







DRAFT

Appendix D

Noise catchment areas

AECOM

B-Line

Noise Catchment Area - Work Site A1

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Fig. **1**

Legend

Work Site A1

Noise Catchment Area 1

0 95 190 380 Meters

N

Legend

- Work Site A2
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 2
- Noise Catchment Area 3
- Noise Catchment Area 4

B-Line

Noise Catchment Areas - Work Site A2

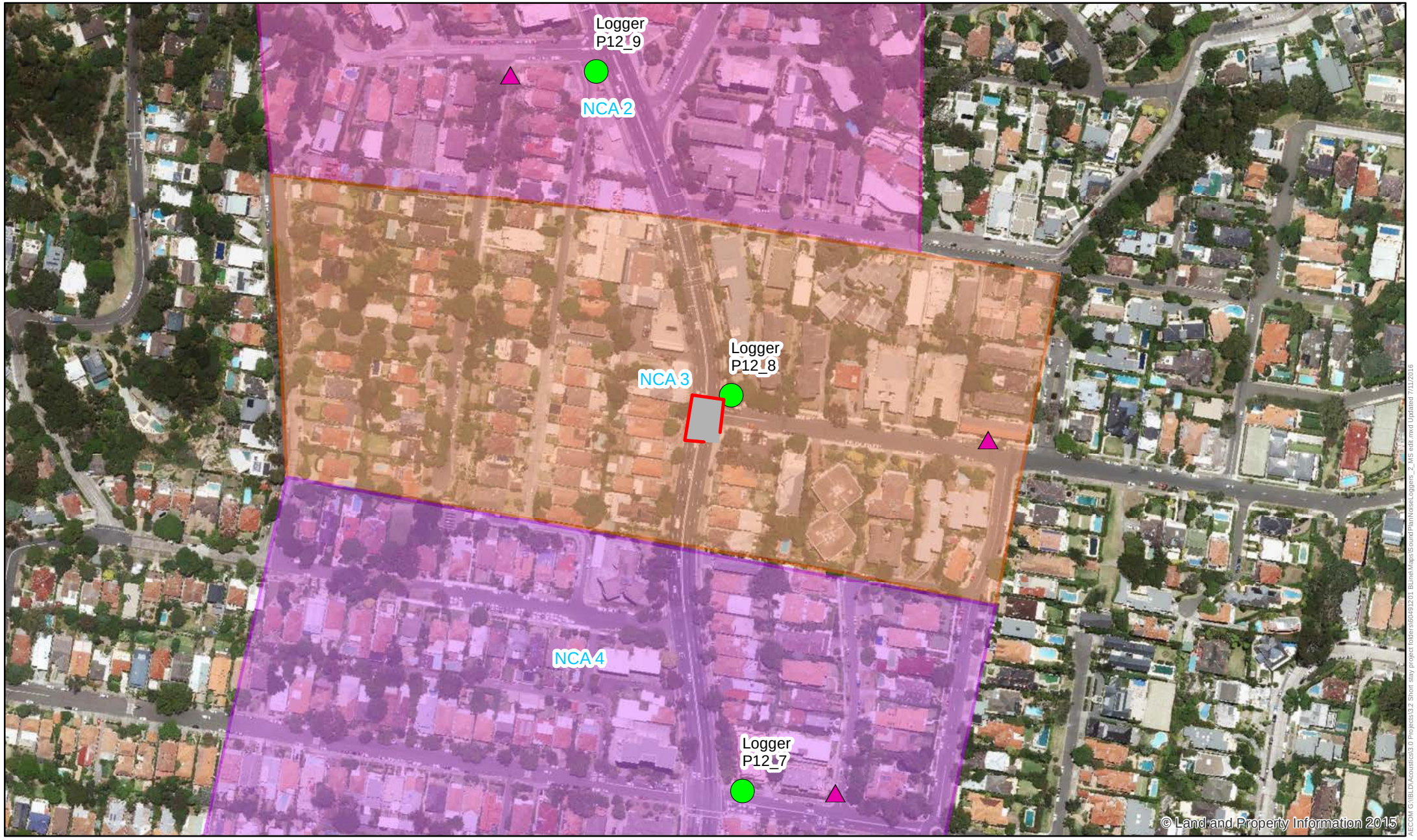
0 87.5 175 350 Meters

N

NOV 2016

60491201

Fig. **2**



Legend

- Work Site A3_1
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 2
- Noise Catchment Area 3
- Noise Catchment Area 4

B-Line

Noise Catchment Areas - Work Site A3_1

0 50 100 200 Meters

N

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Fig. **3**

Legend

- Work Site A3_2
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 2
- Noise Catchment Area 3
- Noise Catchment Area 4

B-Line

Noise Catchment Areas - Work Site A3_2

0 30 60 120 Meters

N

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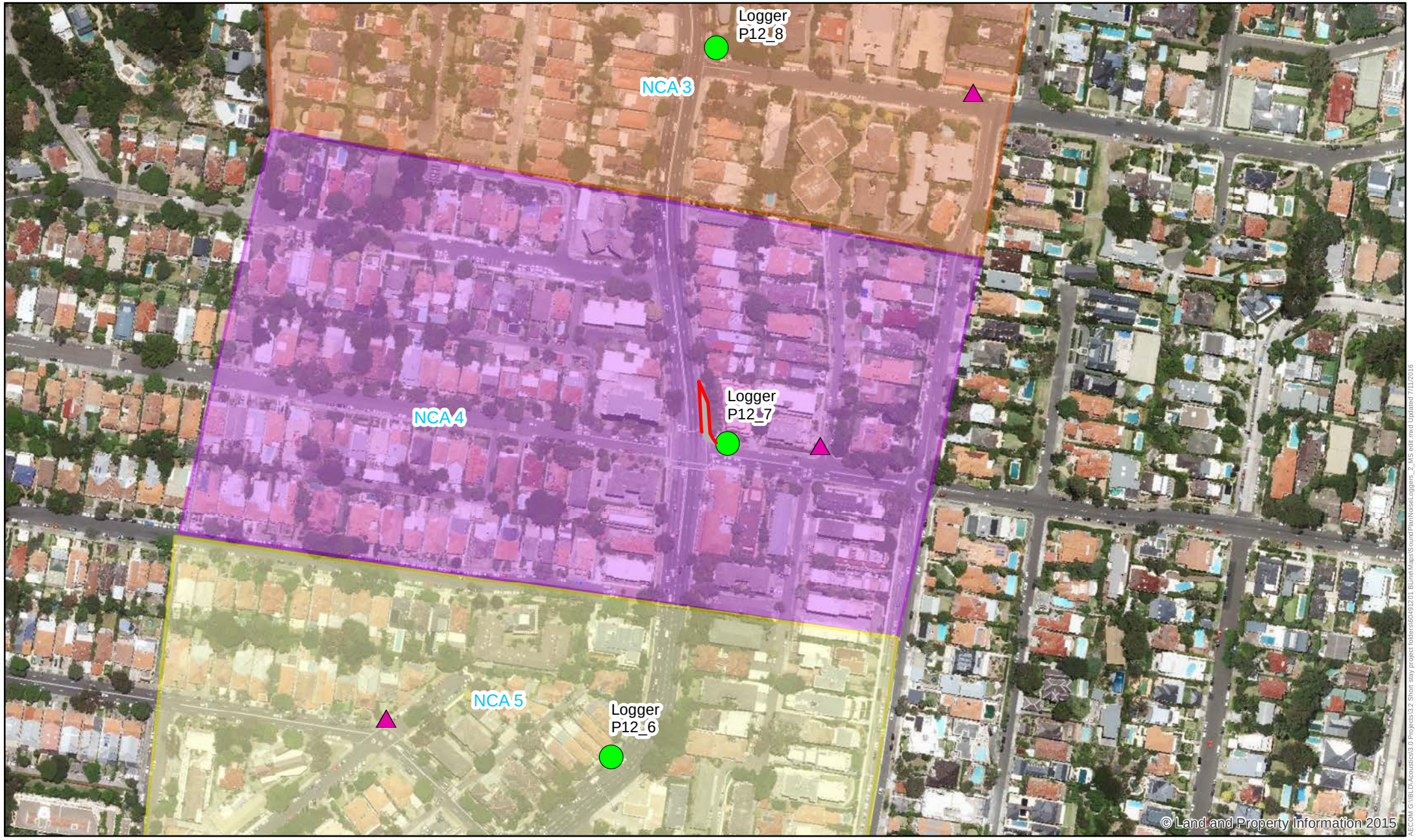
Fig. **4**



Legend

- Work Site A4
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 3
- Noise Catchment Area 4
- Noise Catchment Area 5

B-Line

Noise Catchment Areas - Work Site A4

0 50 100 200 Meters

N

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Fig. **5**

Legend

- Work Site A5
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 4
- Noise Catchment Area 5

B-Line

Noise Catchment Areas - Work Site A5

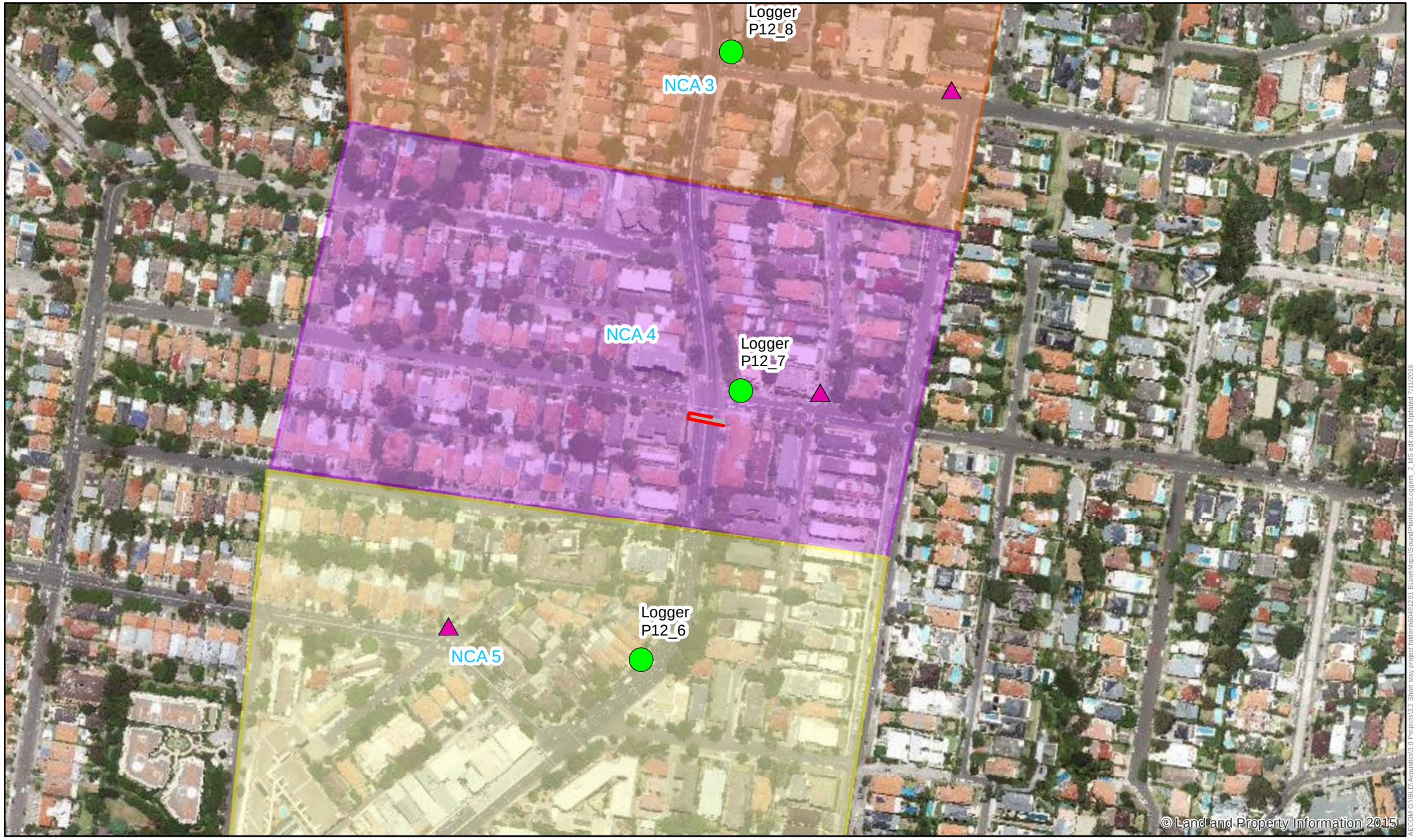
0 60 120 240 Meters

N

NOV 2016

60491201

Fig. **6**



Legend

- Work Site A6_1
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 3
- Noise Catchment Area 4
- Noise Catchment Area 5

B-Line

Noise Catchment Areas - Work Site A6_1

0 60 120 240 Meters

N

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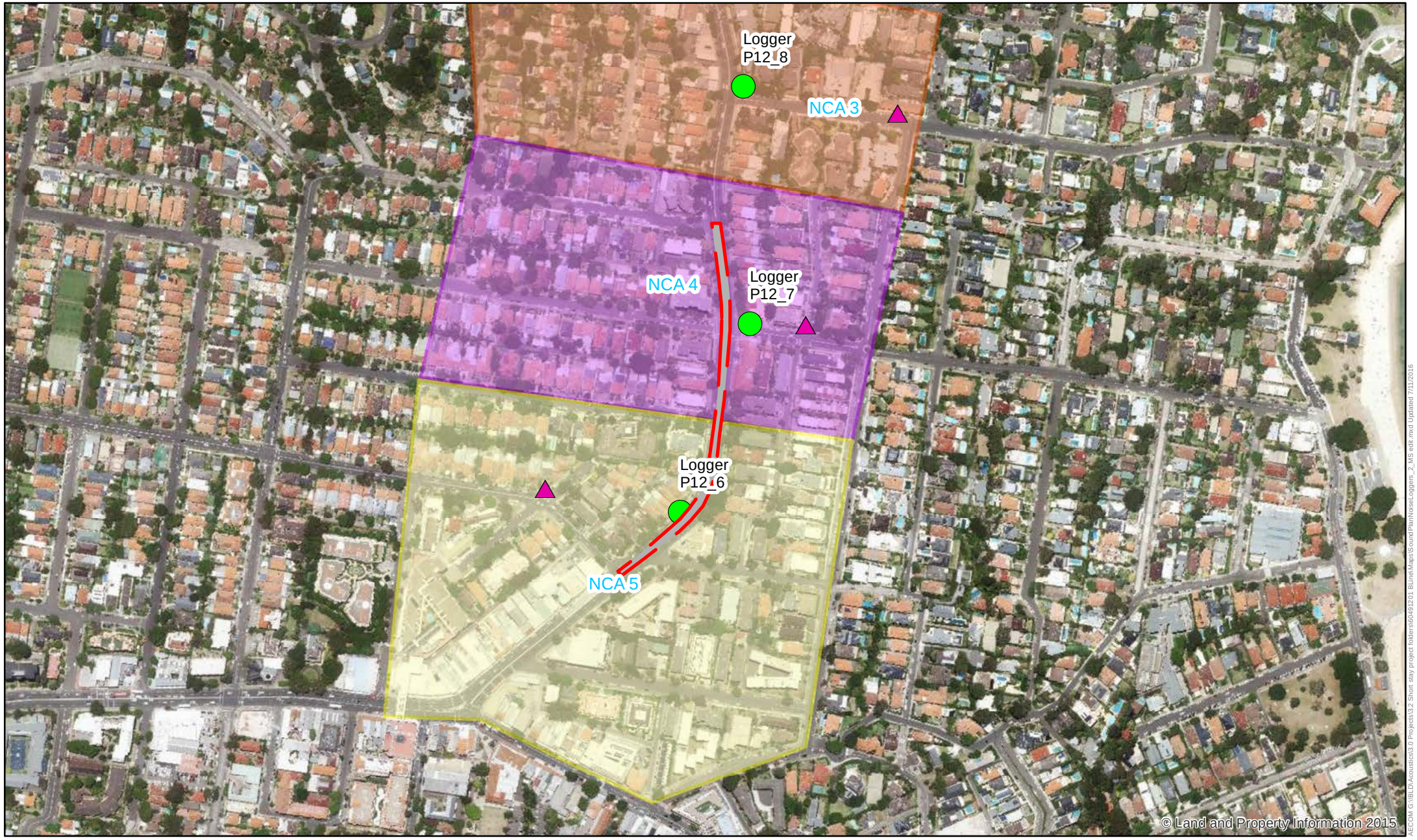
Fig. **7**



Legend

- Work Site A6_2
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 3
- Noise Catchment Area 4
- Noise Catchment Area 5

B-Line

Noise Catchment Areas - Work Site A6_2

0 87.5 175 350 Meters

N

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Fig. **8**

Legend

- Work Site B1
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 4
- Noise Catchment Area 5
- Noise Catchment Area 6

B-Line

Noise Catchment Areas - Work Site B1

0 87.5 175 350 Meters

N

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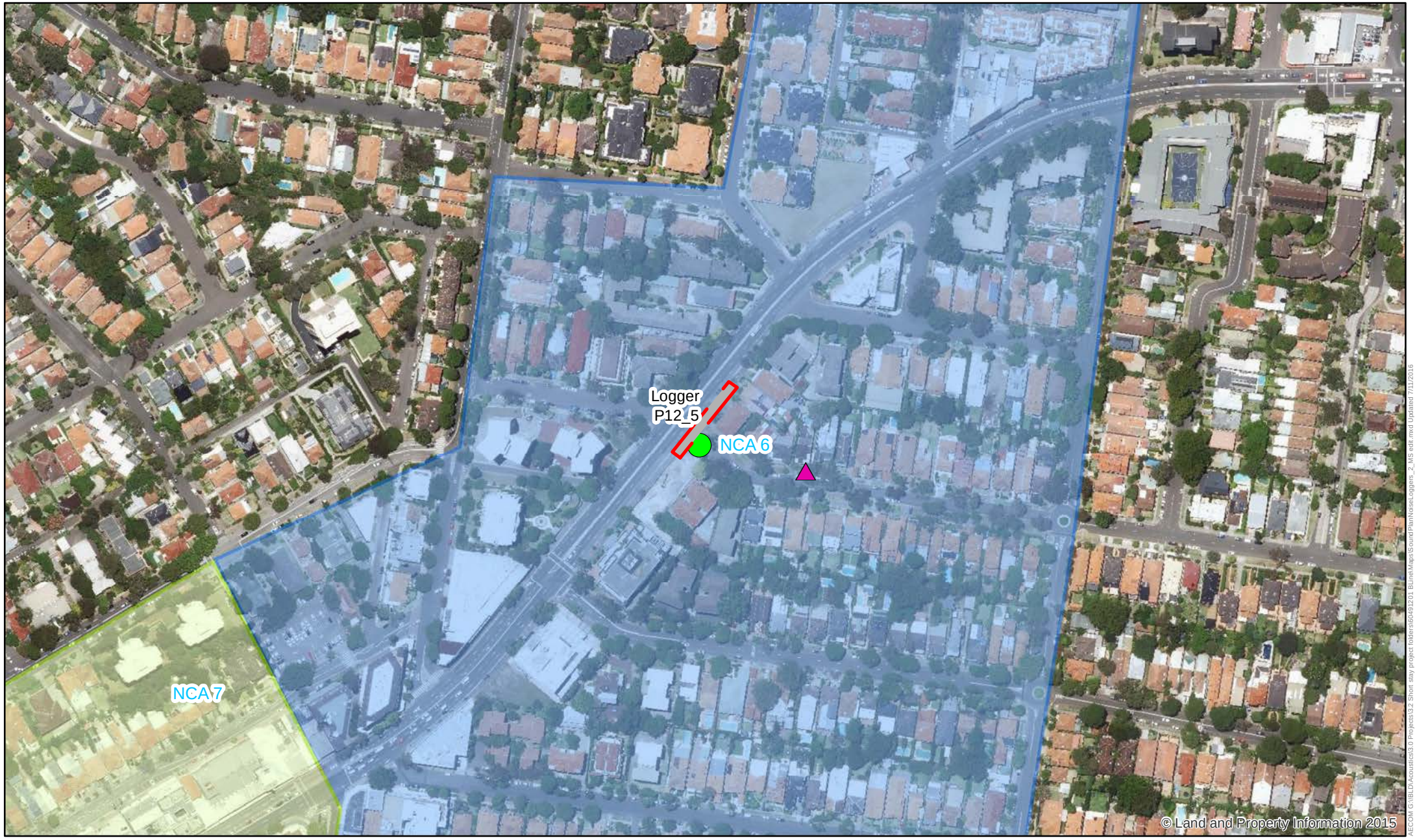
60491201

Fig. **9**



Legend

- Work Site B2
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 6
- Noise Catchment Area 6

B-Line

Noise Catchment Areas - Work Site B2

0 50 100 200 Meters

N

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Fig. **10**

Legend

- Work Site C1
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 6
- Noise Catchment Area 6
- Noise Catchment Area 8
- Noise Catchment Area 9

B-Line

Noise Catchment Areas - Work Site C1

0 50 100 200 Meters

N

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60491201

Fig. **11**

Legend

- Work Site C2
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 6
- Noise Catchment Area 6
- Noise Catchment Area 8
- Noise Catchment Area 9
- Noise Catchment Area 10

B-Line

Noise Catchment Areas - Work Site C2

0 50 100 200 Meters

N

NOV 2016

60491201

Fig. **12**

Legend

- Work Site C3
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 6
- Noise Catchment Area 6
- Noise Catchment Area 8
- Noise Catchment Area 9
- Noise Catchment Area 10

B-Line

Noise Catchment Areas - Work Site C3

0 50 100 200 Meters

N

NOV 2016

60491201

Fig. **13**

Legend

- Work Site C6_1
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 10

B-Line

Noise Catchment Areas - Work Site C6_1

0 40 80 160 Meters

N

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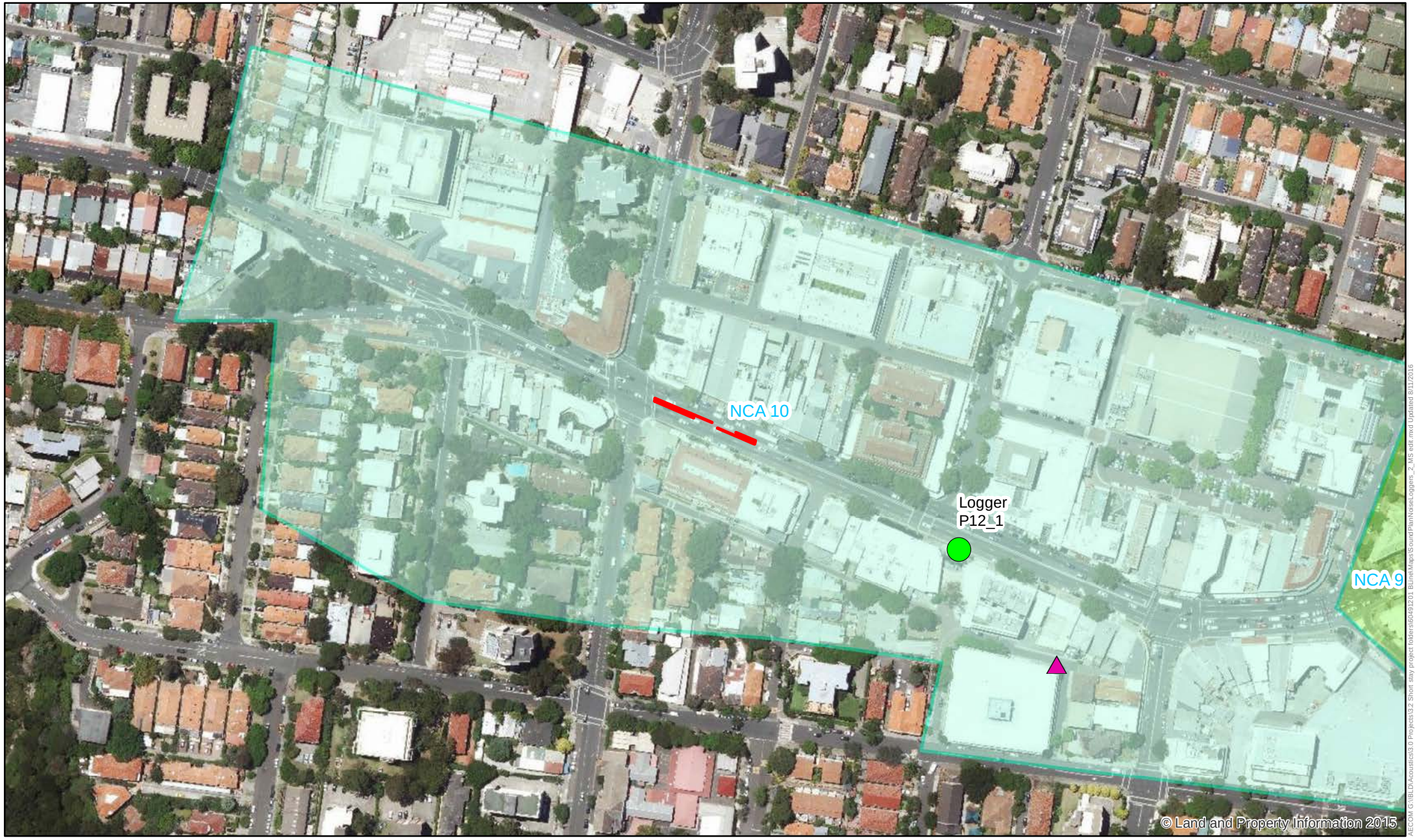
60491201

Fig. **14**



Legend

- Work Site C6_2
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 9
- Noise Catchment Area 10

B-Line

Noise Catchment Areas - Work Site C6_2

0 40 80 160 Meters

N

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60491201

Fig. **15**

Legend

- Work Site C6_3
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 9
- Noise Catchment Area 10

B-Line

Noise Catchment Areas - Work Site C6_3

0 40 80 160 Meters

N

NOV 2016

60491201

Fig. **16**

Legend

- Work Site C6_4
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 8
- Noise Catchment Area 9
- Noise Catchment Area 10

B-Line

Noise Catchment Areas - Work Site C6_4

0 40 80 160 Meters

N

NOV 2016

60491201

Fig. **17**

Legend

- Work Site C6_5
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 6
- Noise Catchment Area 6
- Noise Catchment Area 8
- Noise Catchment Area 9

B-Line

Noise Catchment Areas - Work Site C6_5

0 50 100 200 Meters

N

NOV 2016

60491201

Fig. **18**

Legend

- Work Site C6_6
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 6
- Noise Catchment Area 6
- Noise Catchment Area 8
- Noise Catchment Area 9

B-Line

Noise Catchment Areas - Work Site C6_6

0 50 100 200 Meters

N

NOV 2016

60491201

Fig. **19**

Legend

- Construction Compound
- Unattended measurement location
- Attended measruement location
- Noise Catchment Area 4
- Noise Catchment Area 5

B-Line

Noise Catchment Areas - Work Site Construction Compound

0 50 100 200 Meters

N

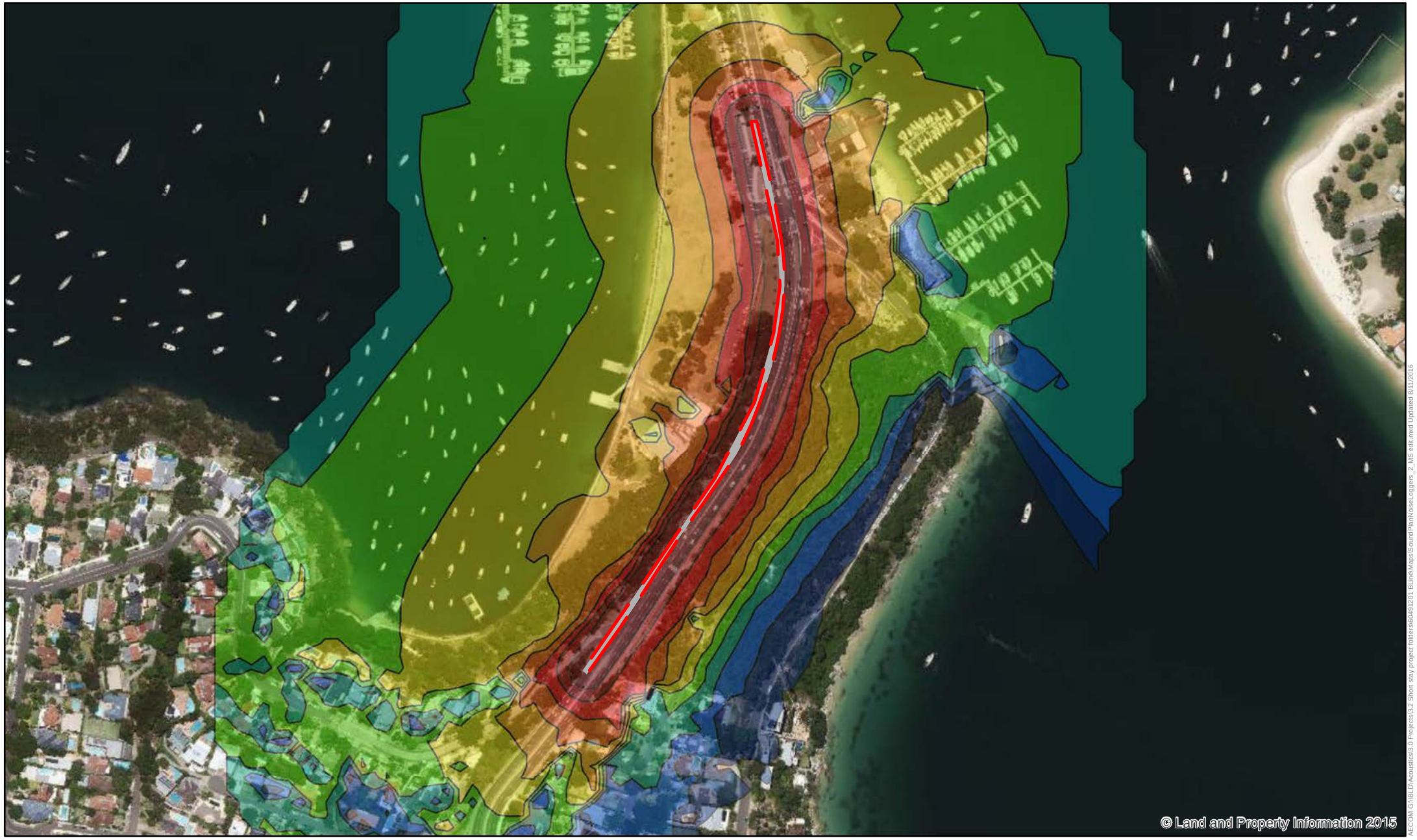
NOV 2016

60491201

Fig **20**

Appendix E

Predicted noise contours



Legend

Work Site A1

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site A1

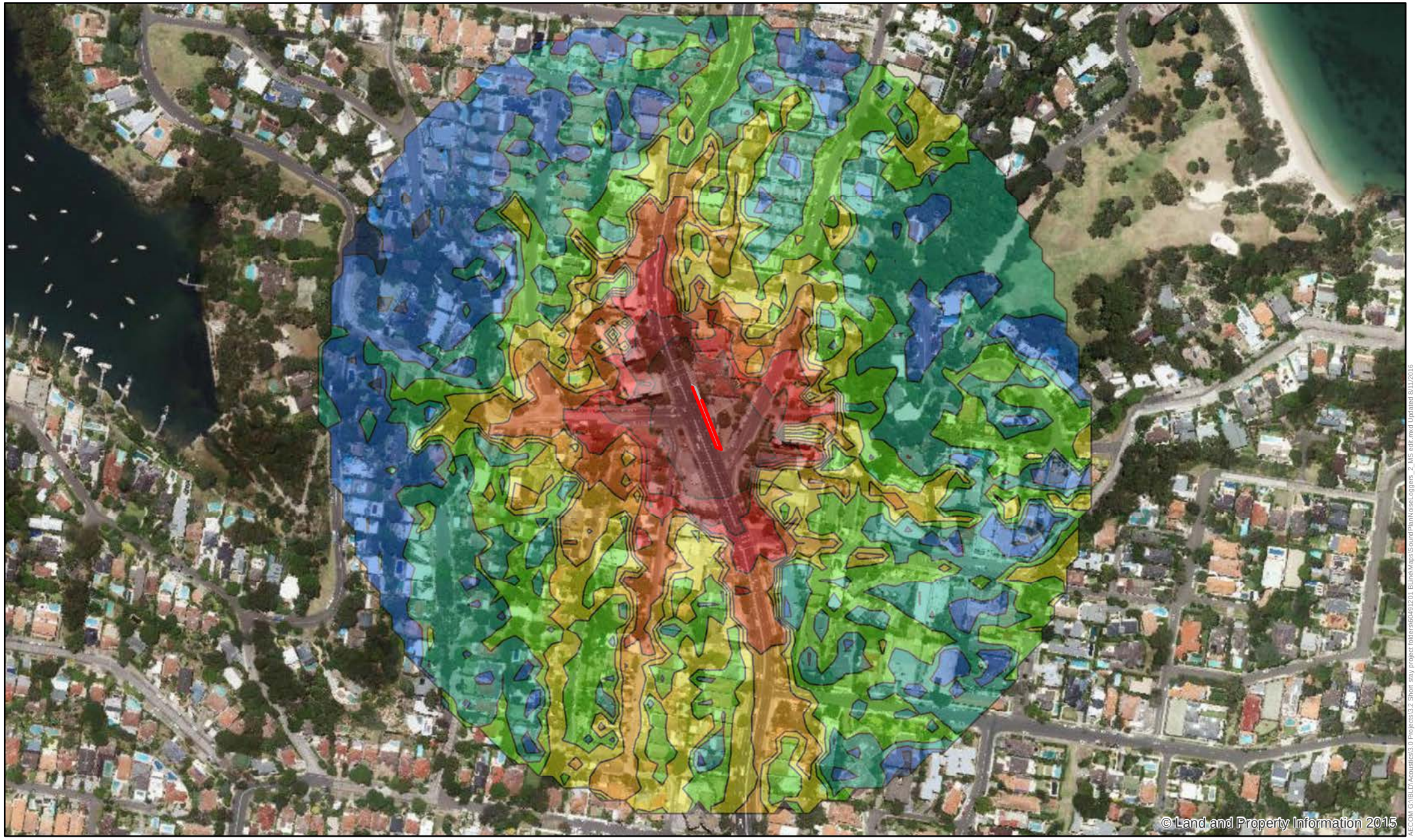
0 70 140 280 Meters

N

NOV 2016

60491201

Fig. **1**



Legend

Work Site A2

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site A2

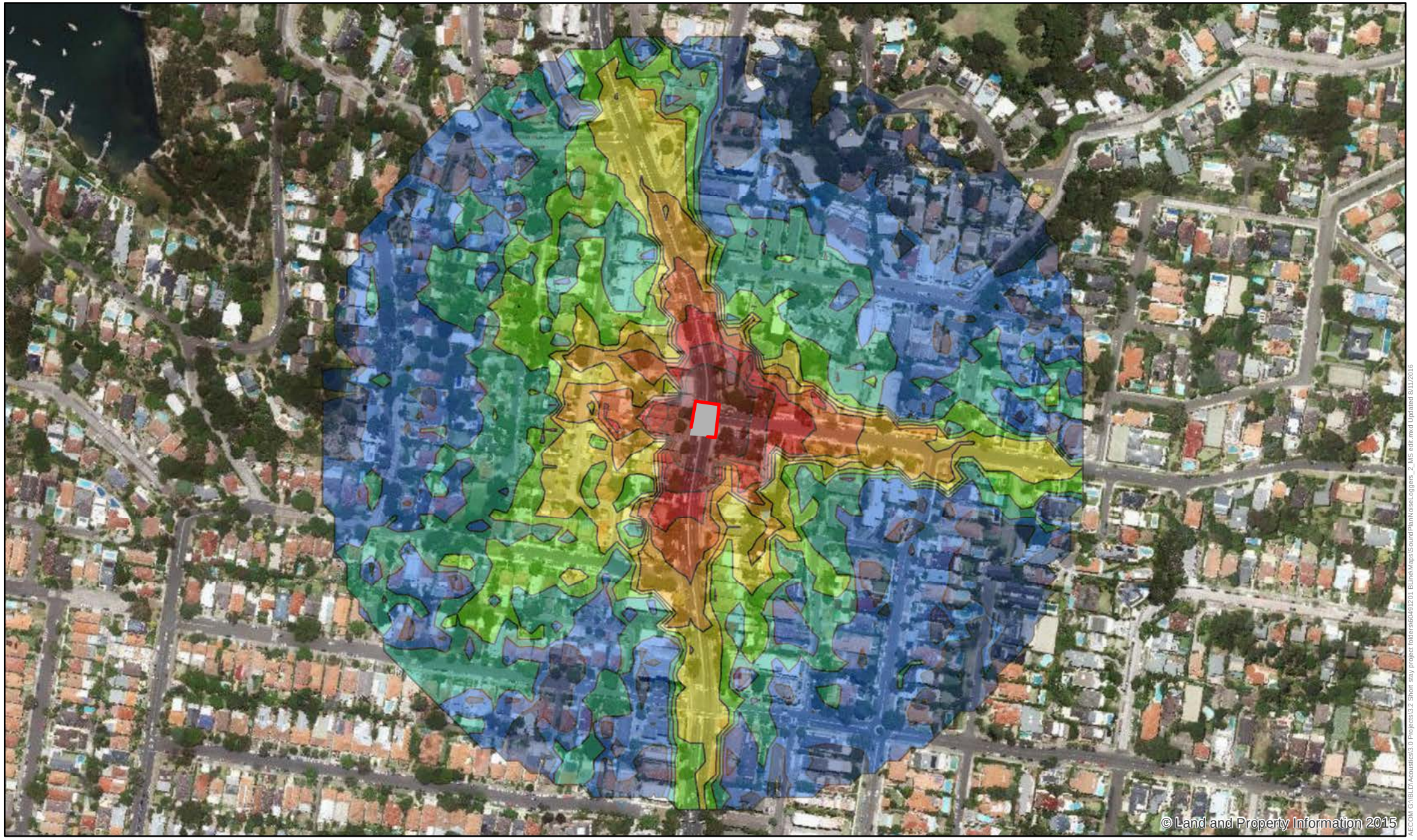
0 70 140 280 Meters

N

NOV 2016

60491201

Fig. **2**



Legend

Work Site A3_1

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site A3_1

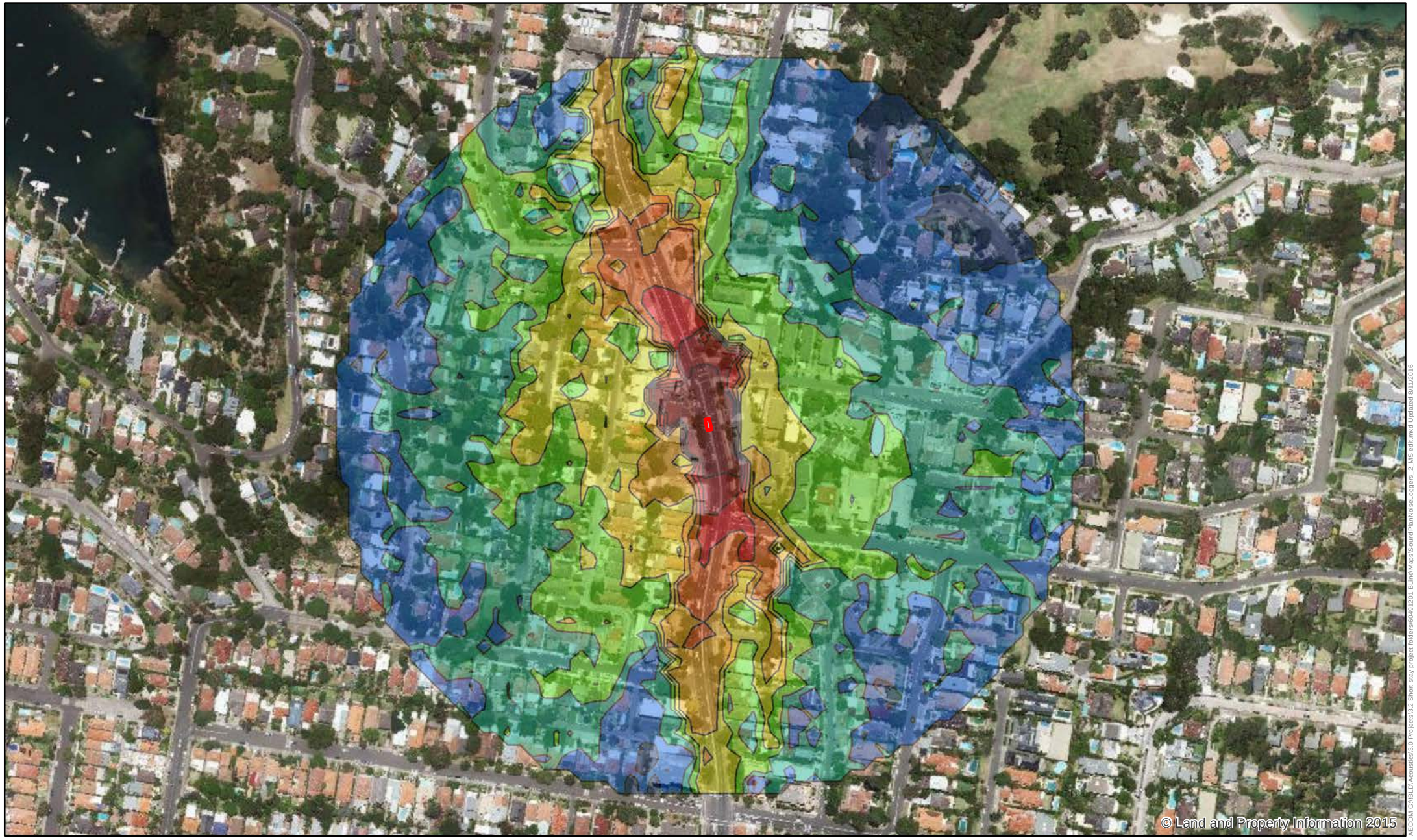
0 70 140 280 Meters

N

NOV 2016

60491201

Fig. **3**



Legend

Work Site A3_2

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site A3_2

0 70 140 280 Meters

N

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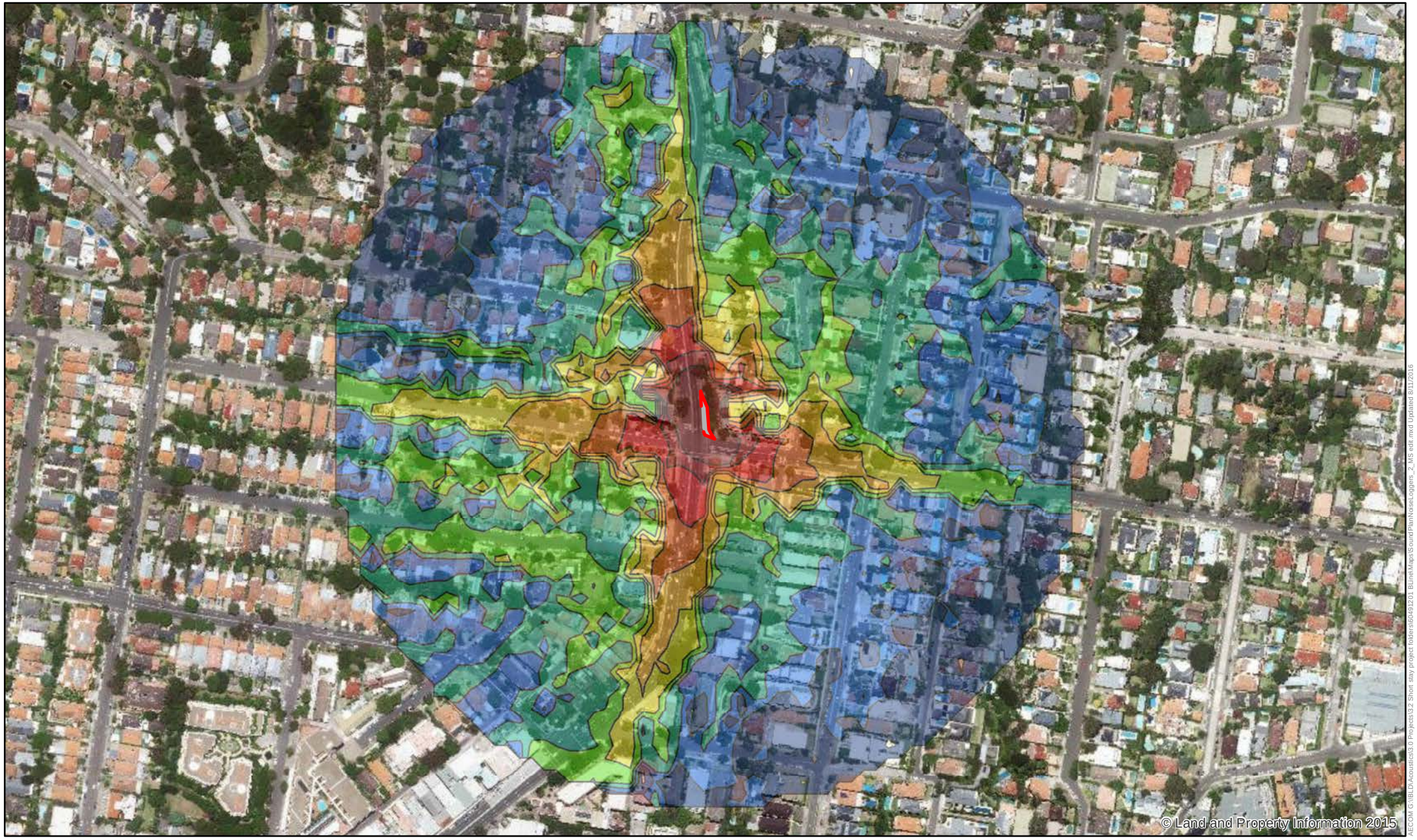
Fig. **4**



Legend

Work Site A4

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site A4

0 70 140 280 Meters

N

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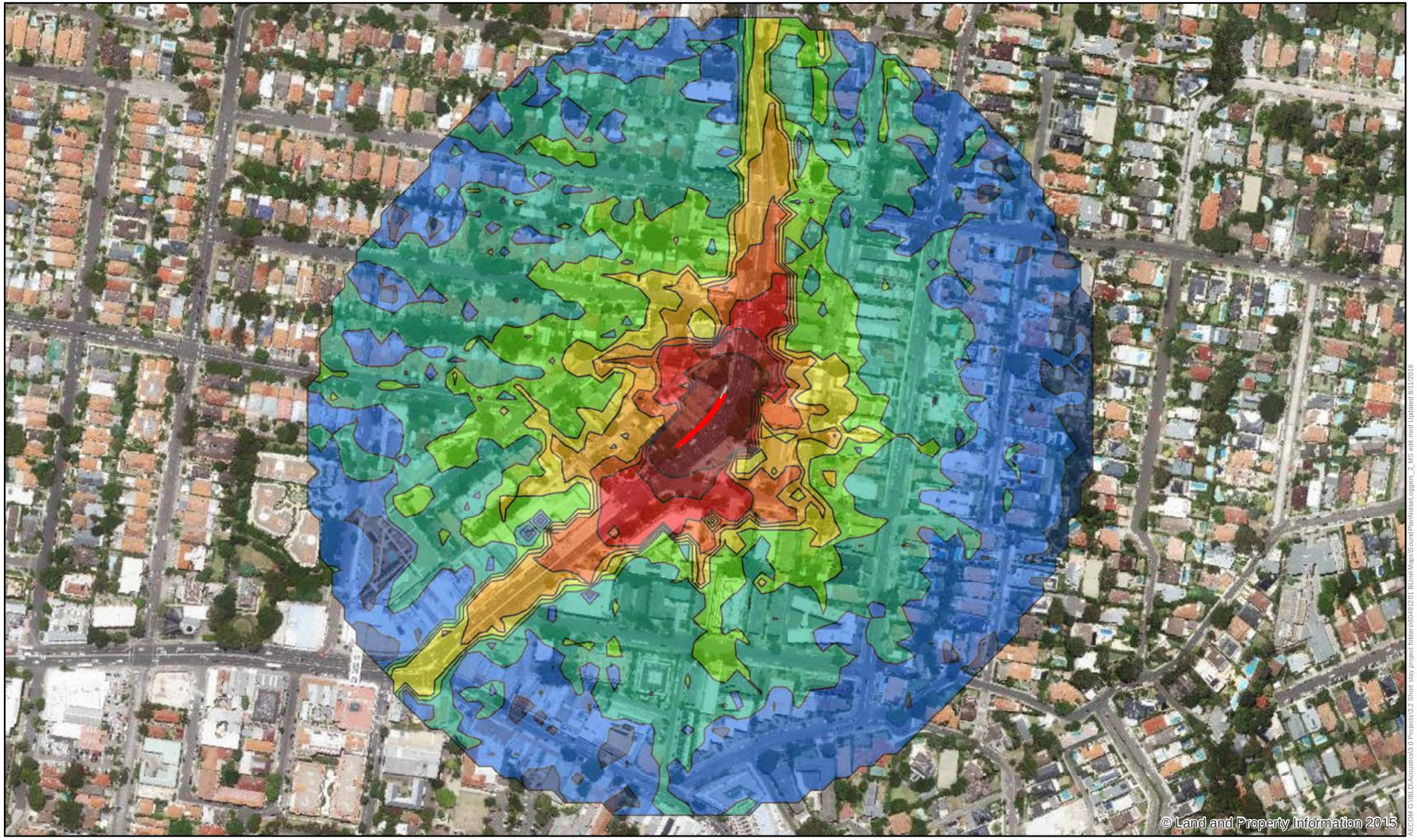
Fig. **5**



Legend

Work Site A5

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site A5

0 70 140 280 Meters

N

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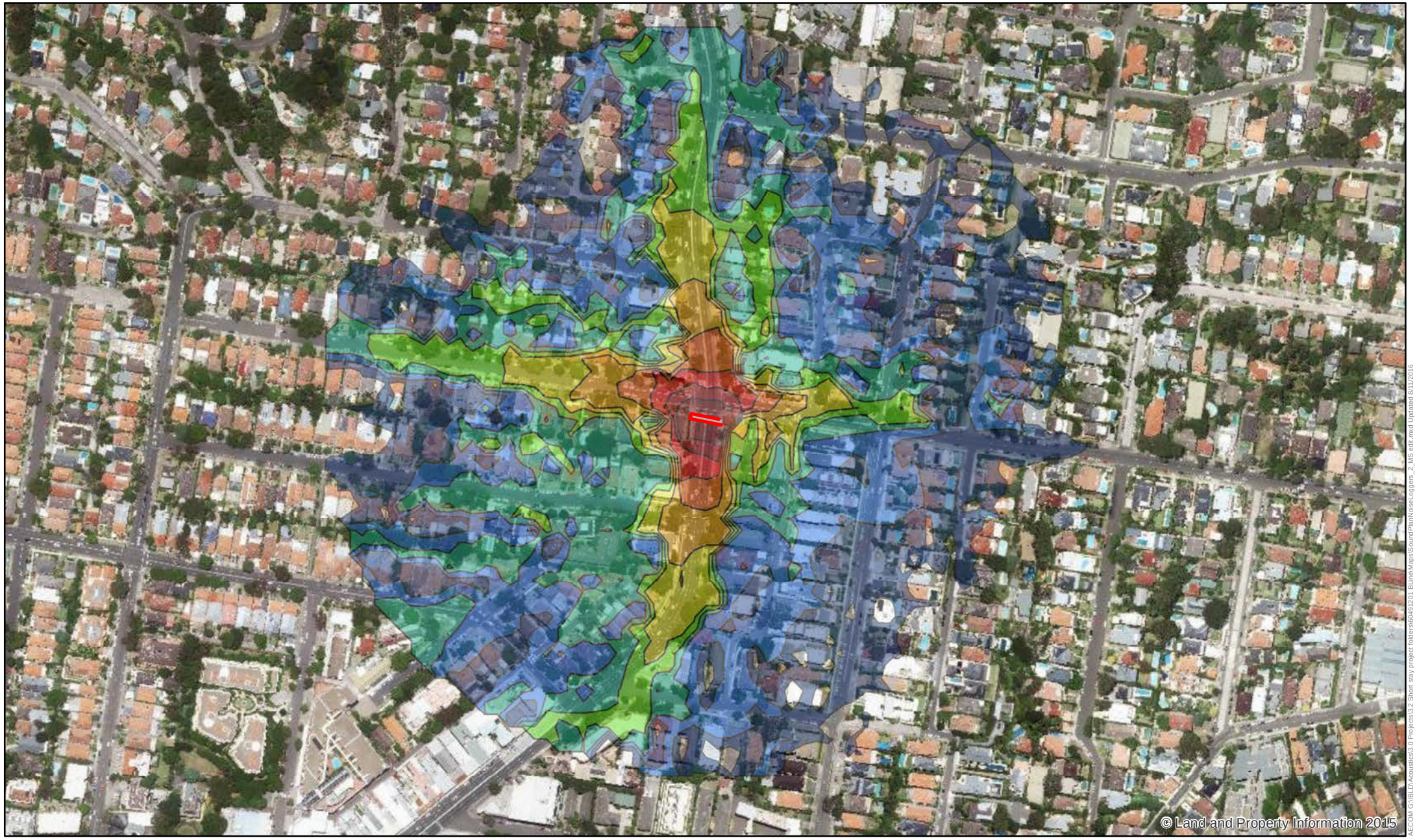
Fig. **6**



Legend

Work Site A6_1

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site A6_1

0 70 140 280 Meters

N

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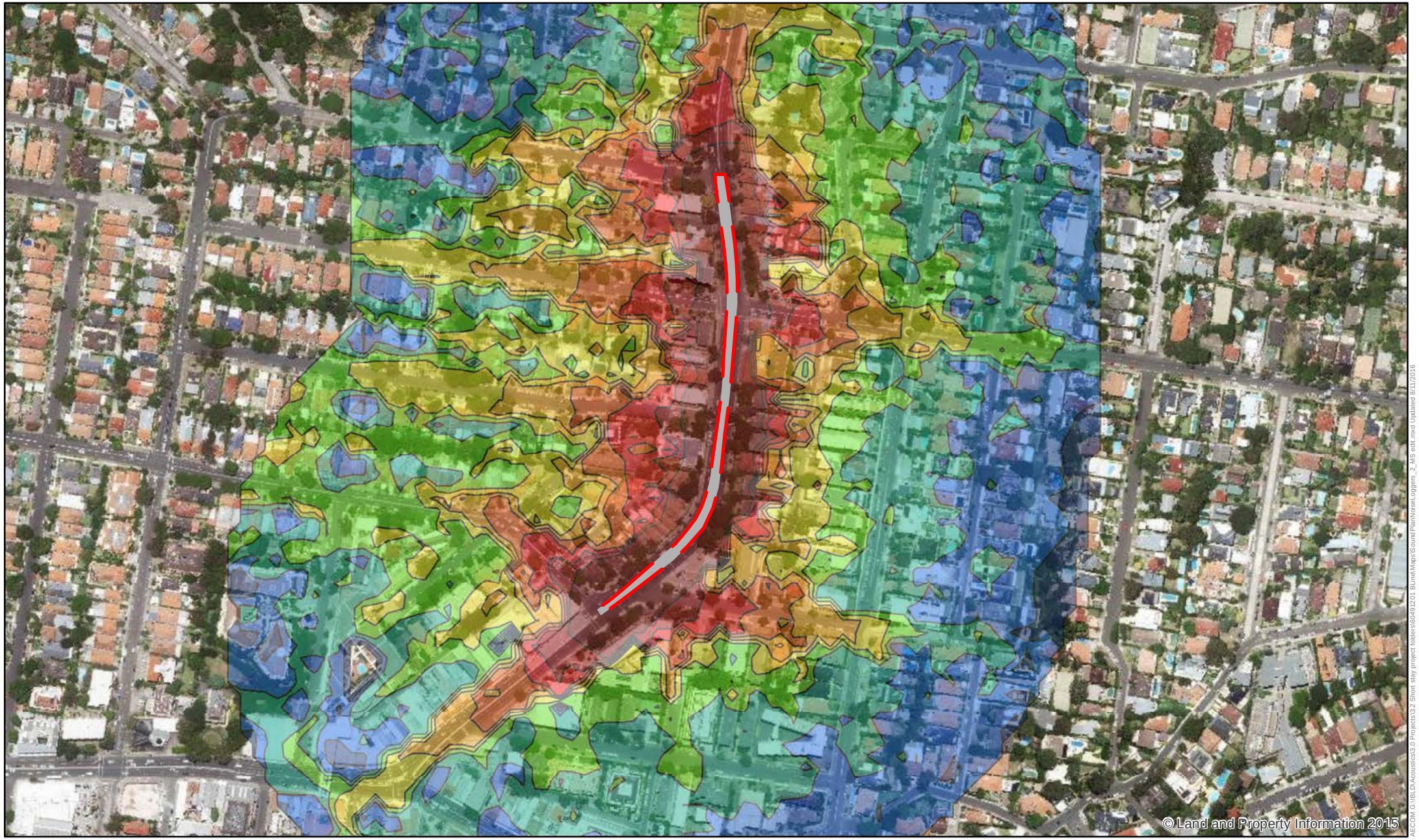
Fig. **7**



Legend

Work Site A6_2

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site A6_2

0 70 140 280 Meters

N

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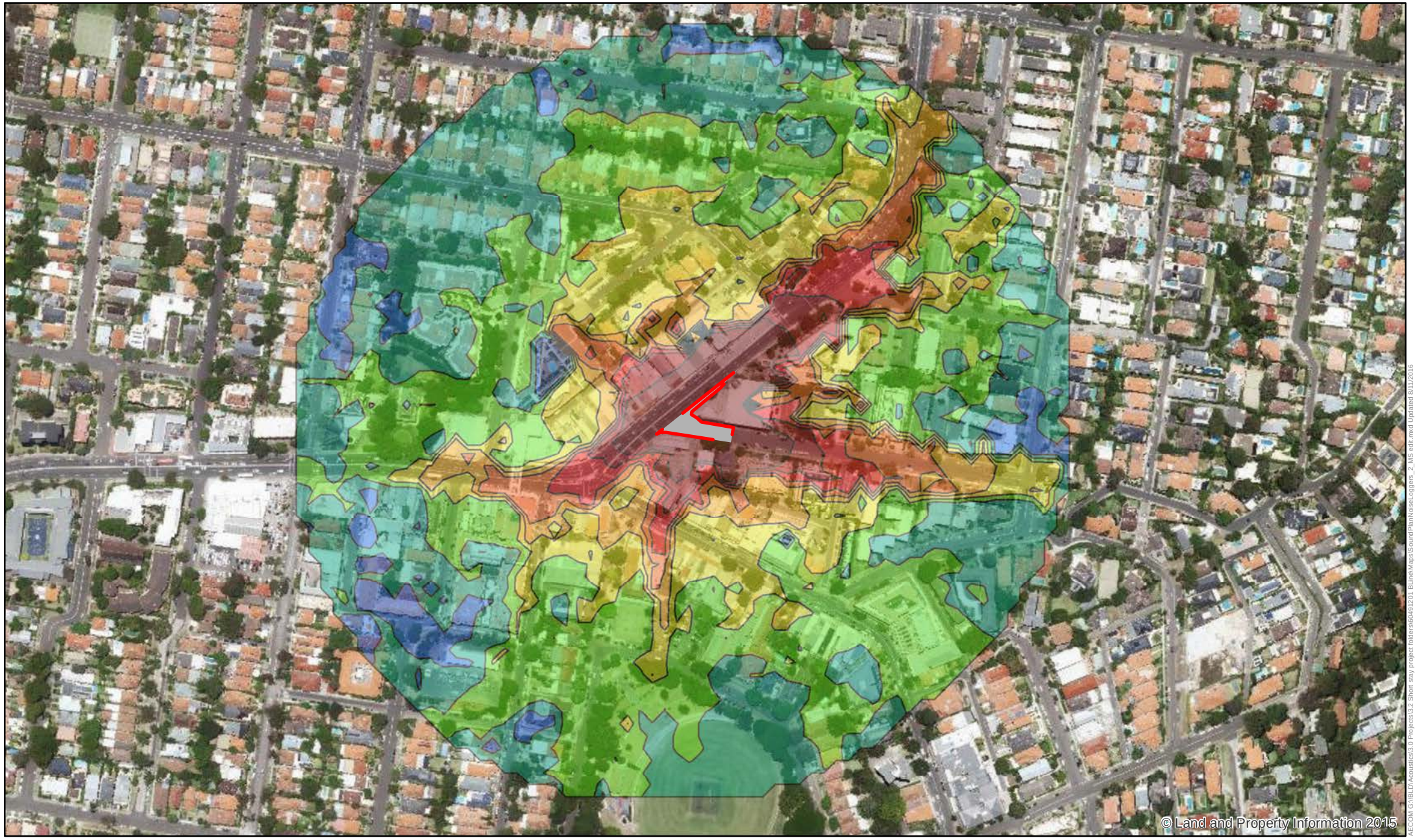
Fig. **8**



Legend

Work Site B1

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site B1

0 70 140 280 Meters

N

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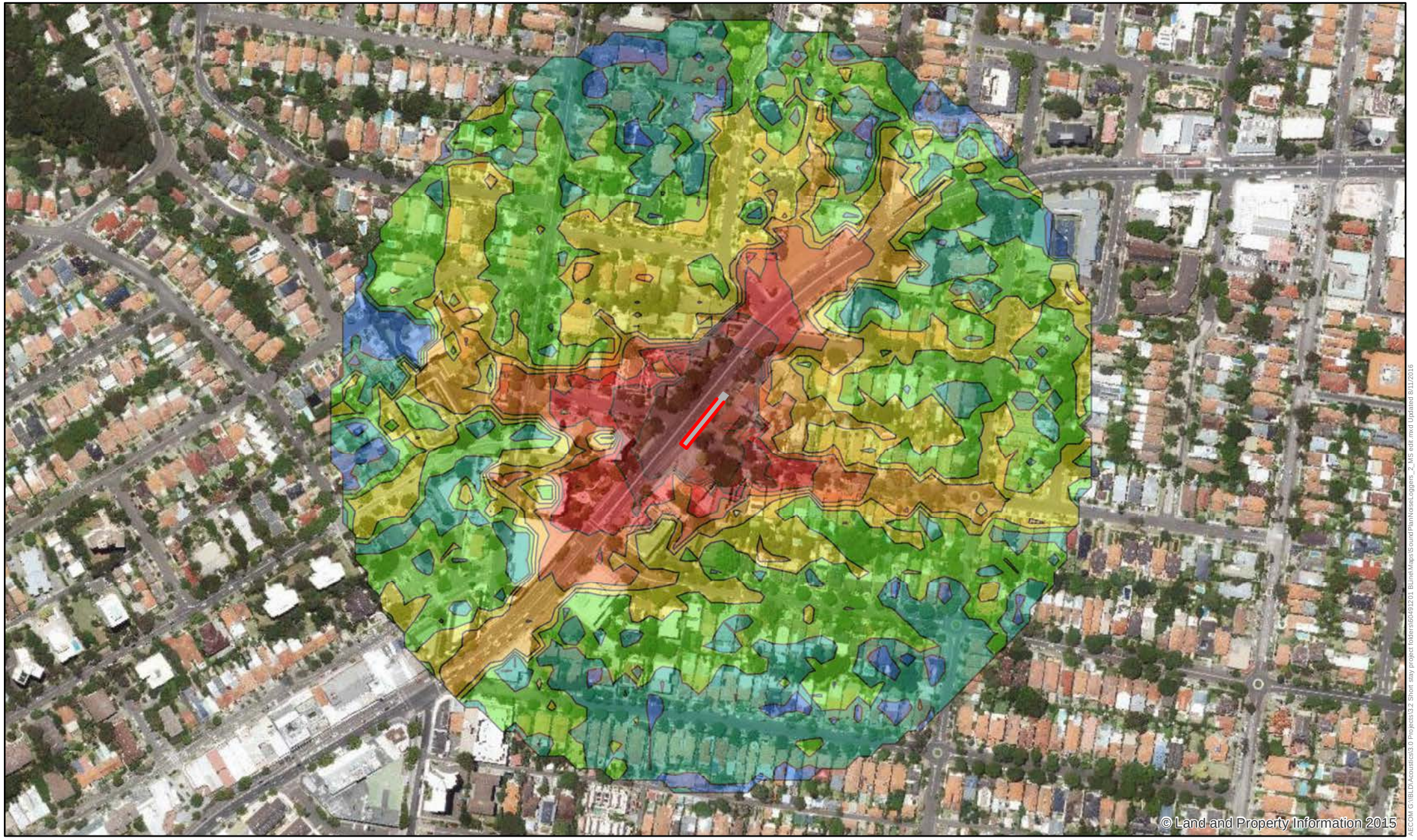
Fig. **9**



Legend

Work Site B2

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site B2

0 70 140 280 Meters

N

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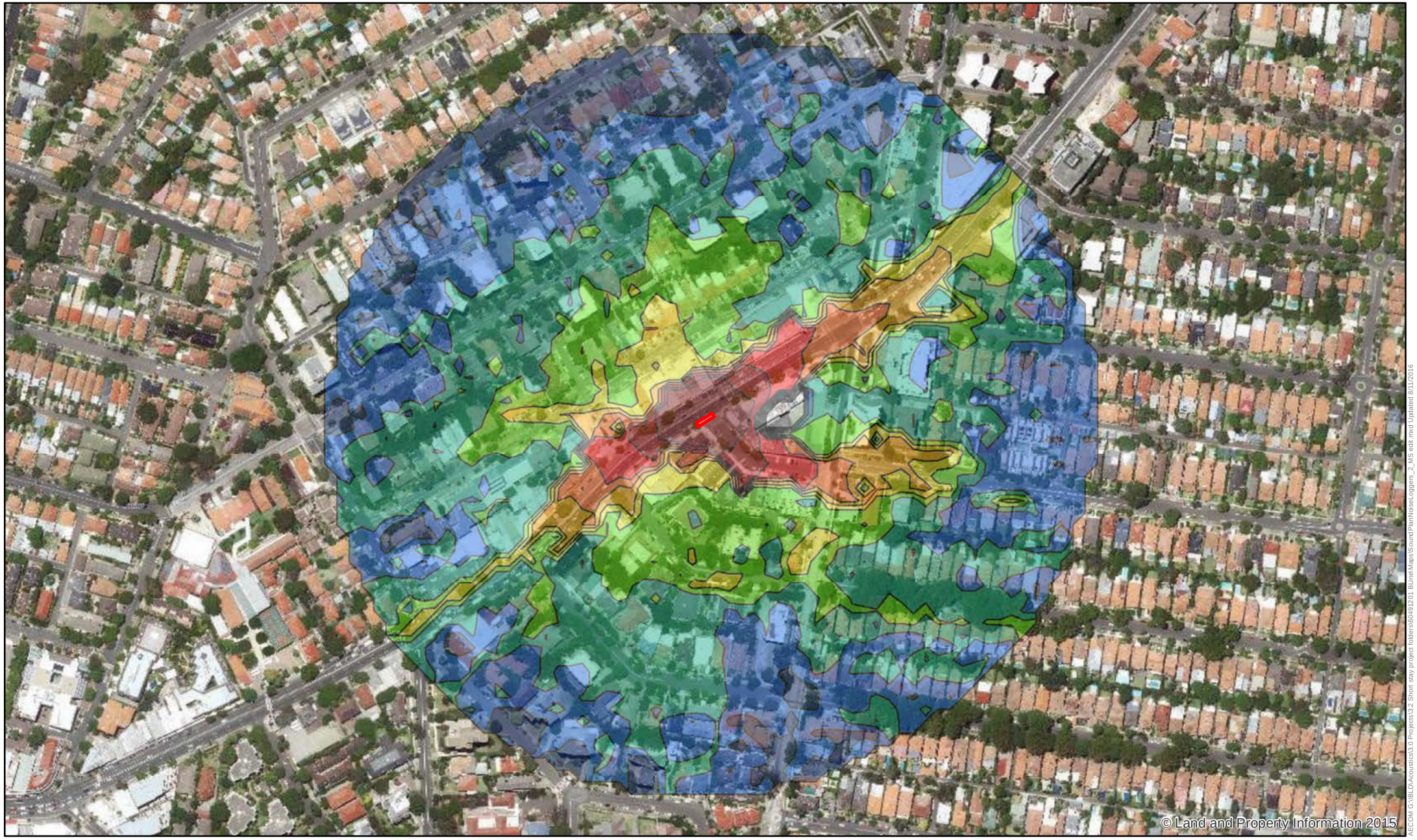
Fig. **10**



Legend

Work Site C1

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C1

0 70 140 280 Meters

N

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Fig. **11**

Legend

Work Site C2

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C2

0 70 140 280 Meters

N

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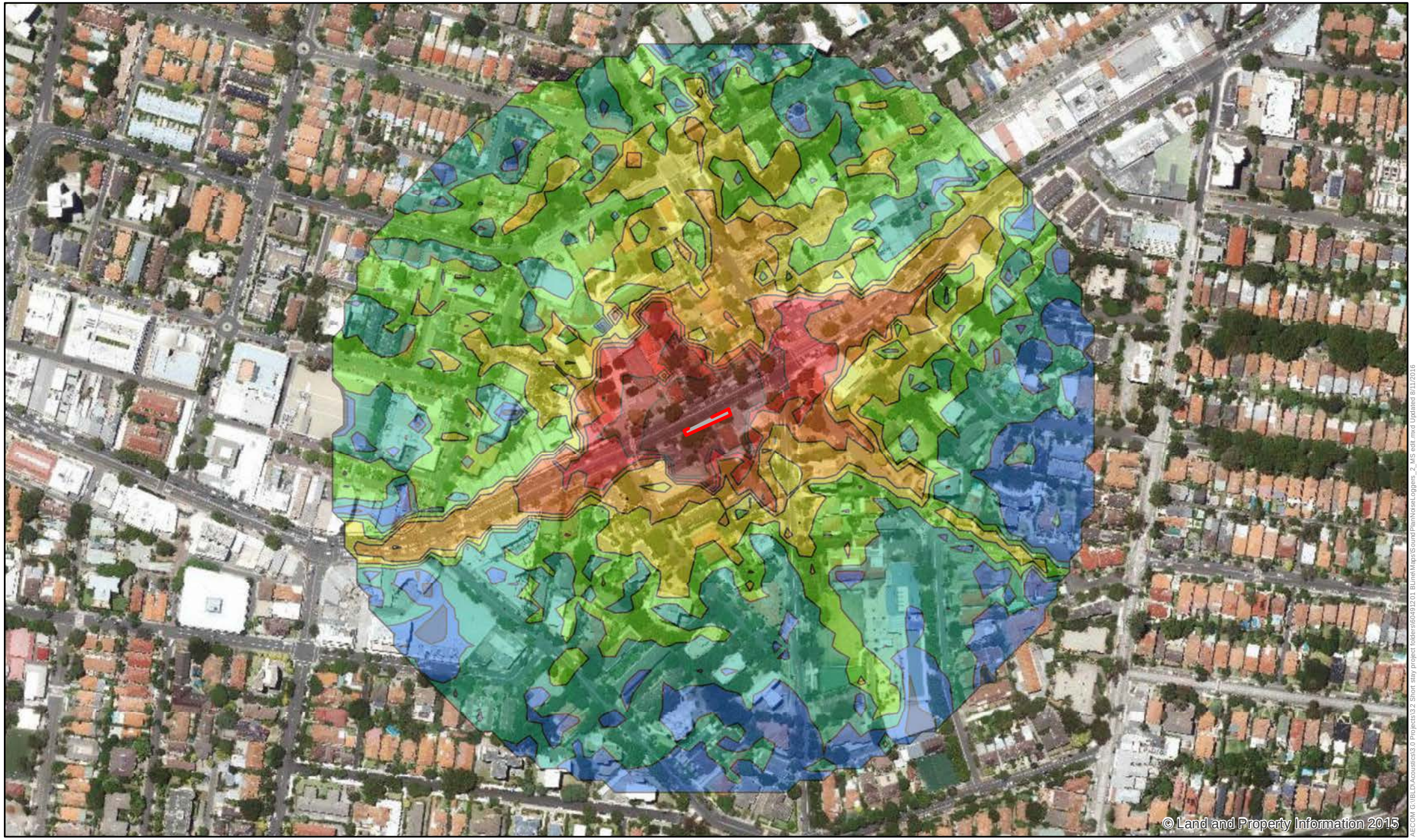
Fig. **12**



Legend

Work Site C3

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C3

0 70 140 280 Meters

N

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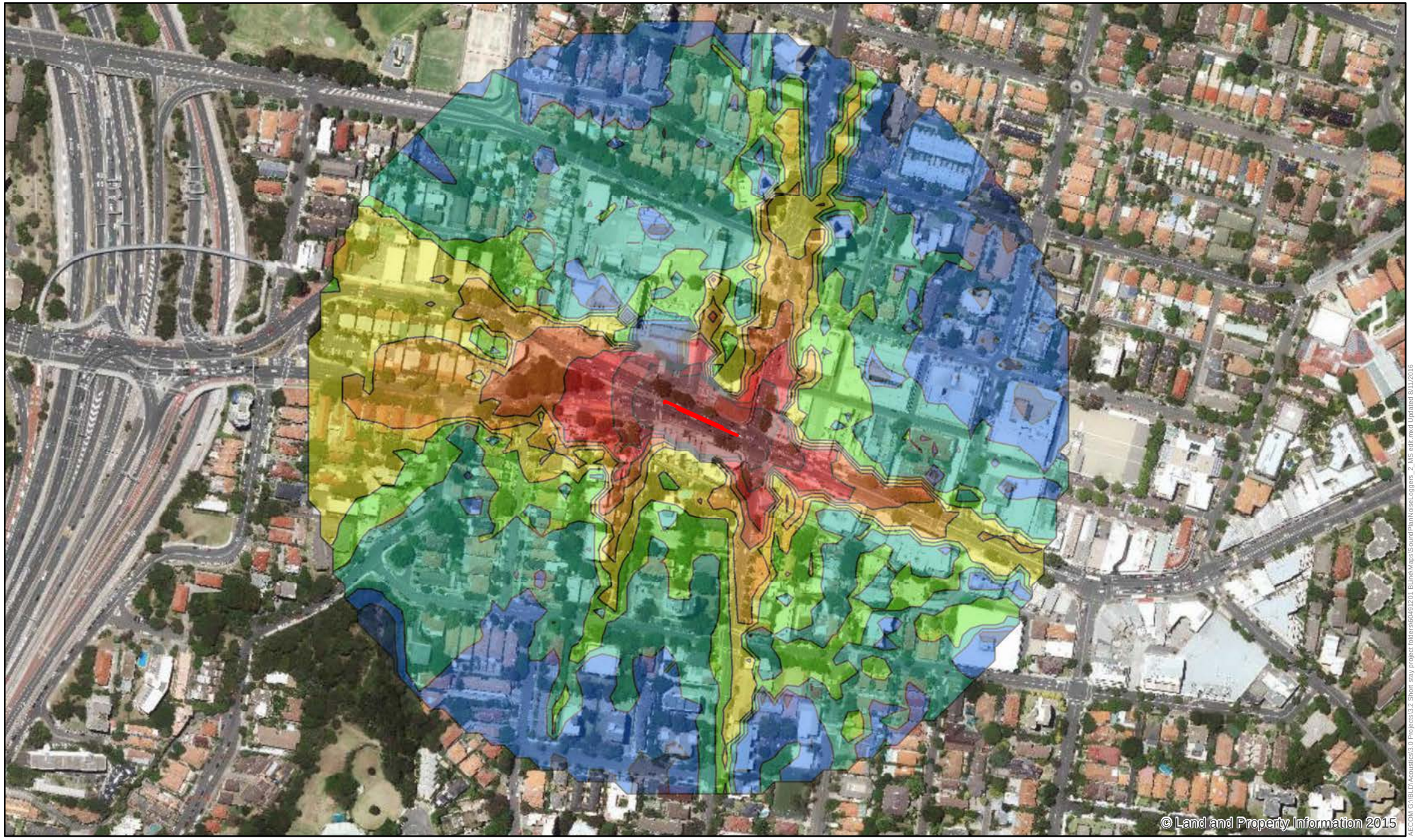
Fig. **13**



Legend

Work Site C6_1

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C6_1

0 70 140 280 Meters

N

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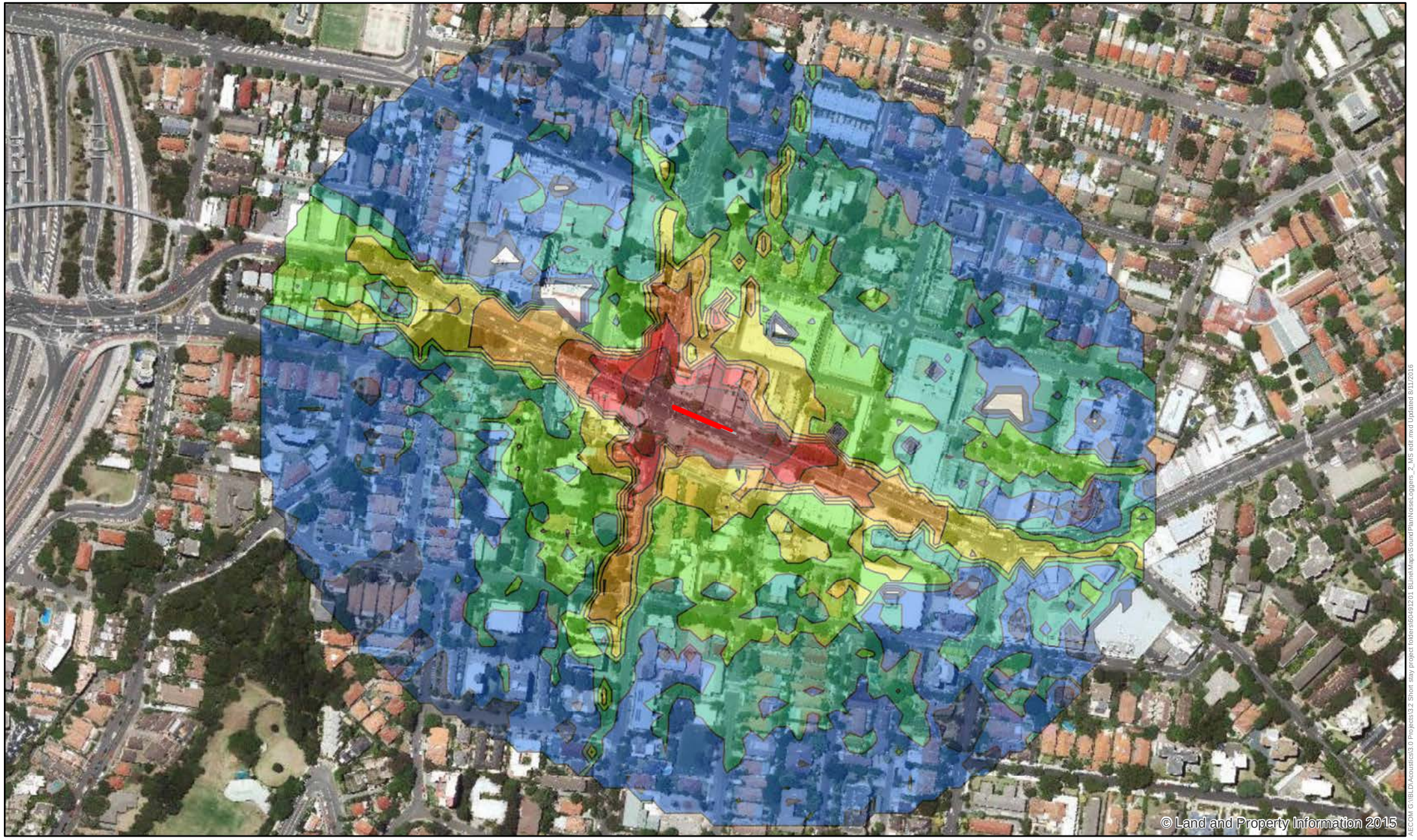
Fig. **14**



Legend

Work Site C6_2

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C6_2

0 70 140 280 Meters

N

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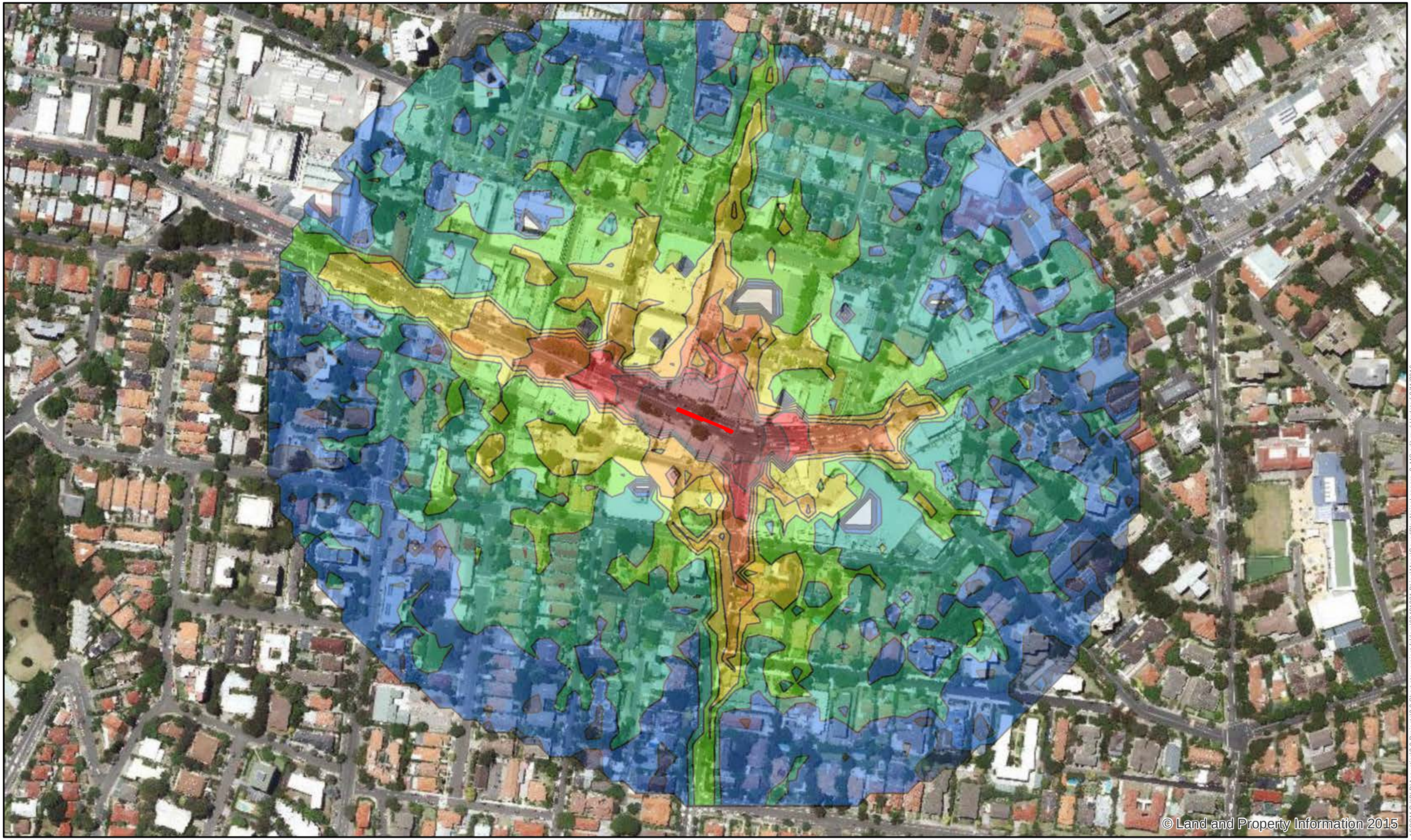
Fig. **15**

AECOM



AECOM G:\!BLD\Acoustics\3.0 Projects\3.2 Short stay project folders\60491201 BLine\Maps\SoundPlanNoiseLoggers_2_MS edit.mxd Updated 8/11/2016

Legend

Work Site C6_3

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C6_3

0 70 140 280 Meters

N

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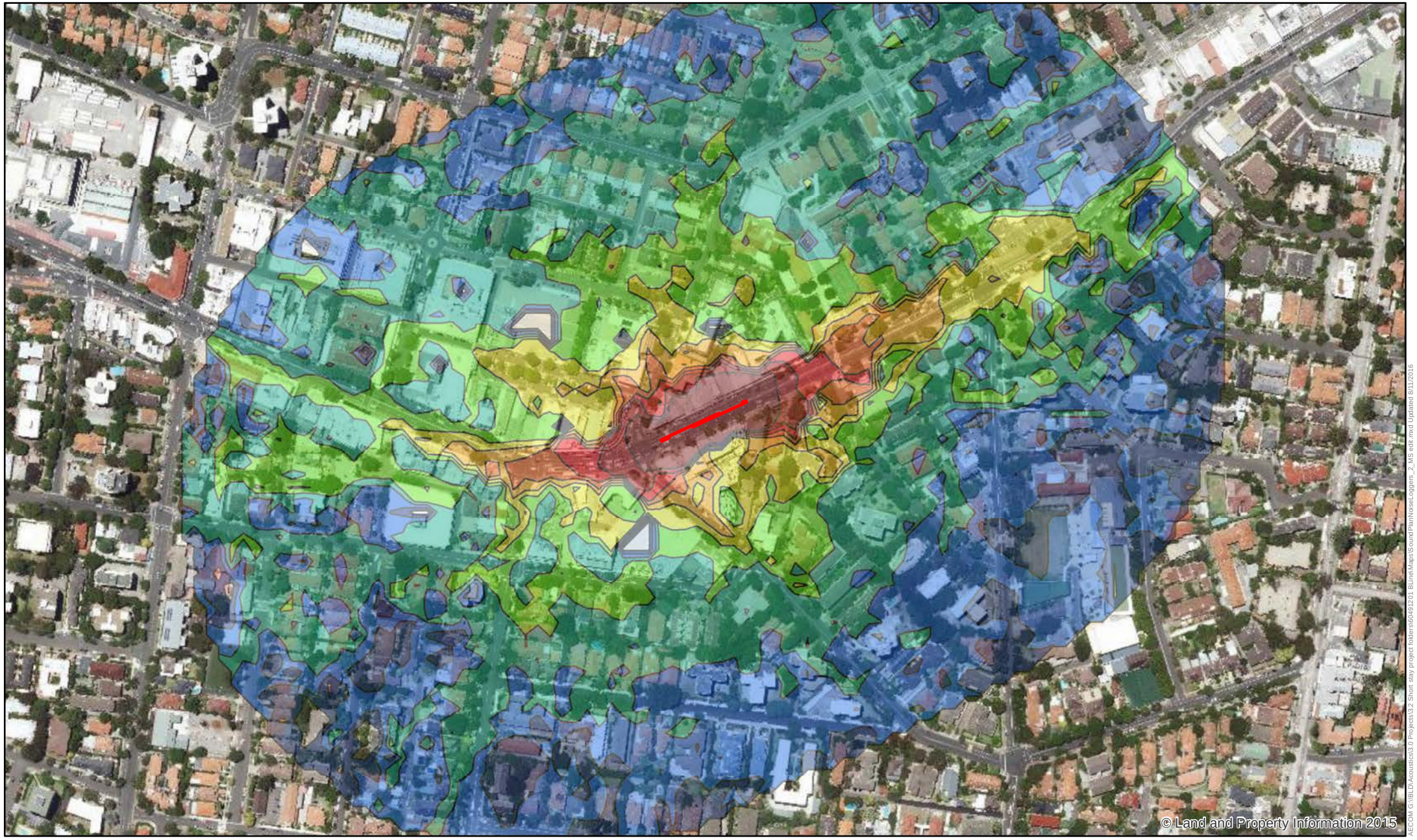
Fig. **16**



Legend

Work Site C6_4

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C6_4

0 70 140 280 Meters

N

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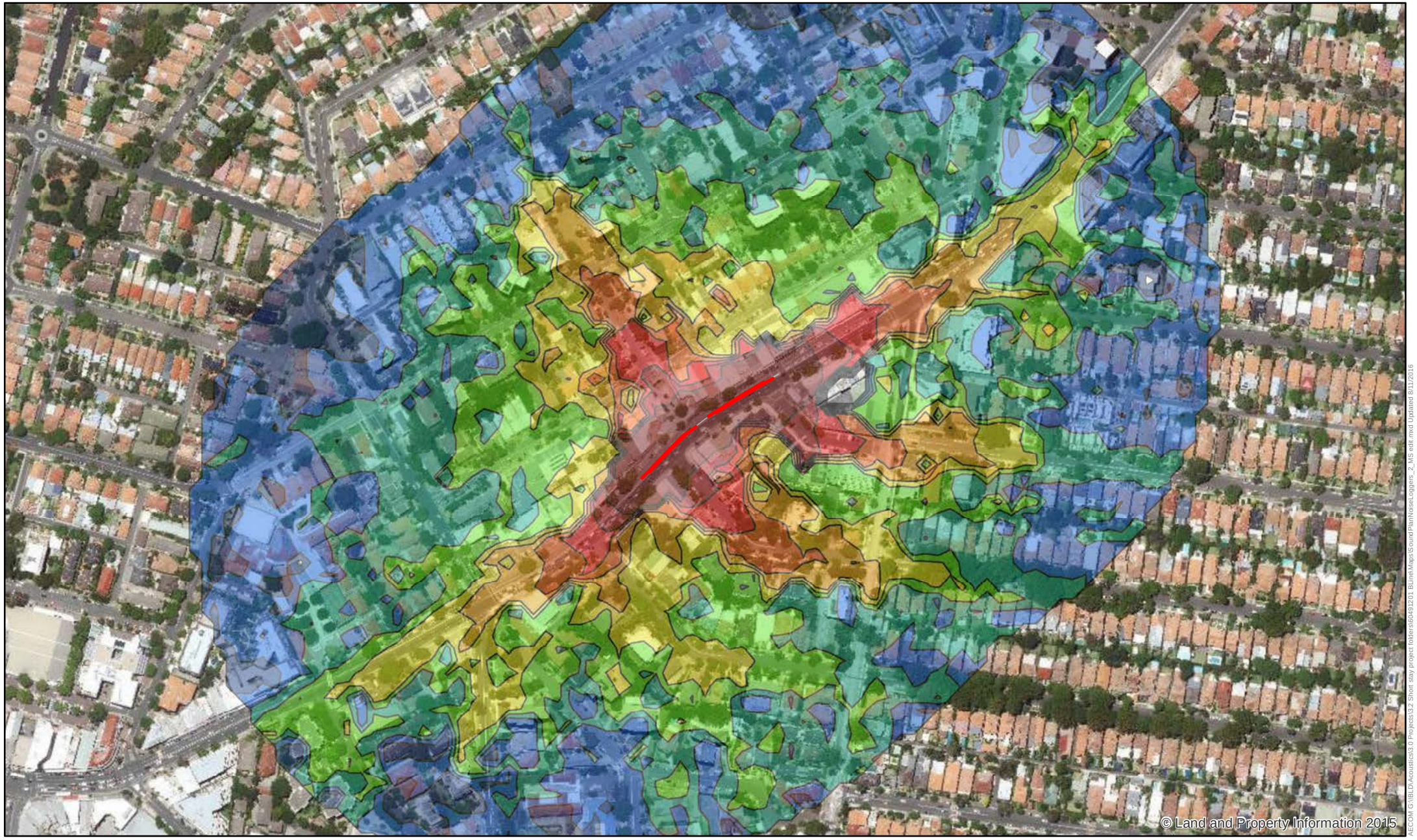
Fig. **17**



Legend

Work Site C6_5

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C6_5

0 70 140 280 Meters

N

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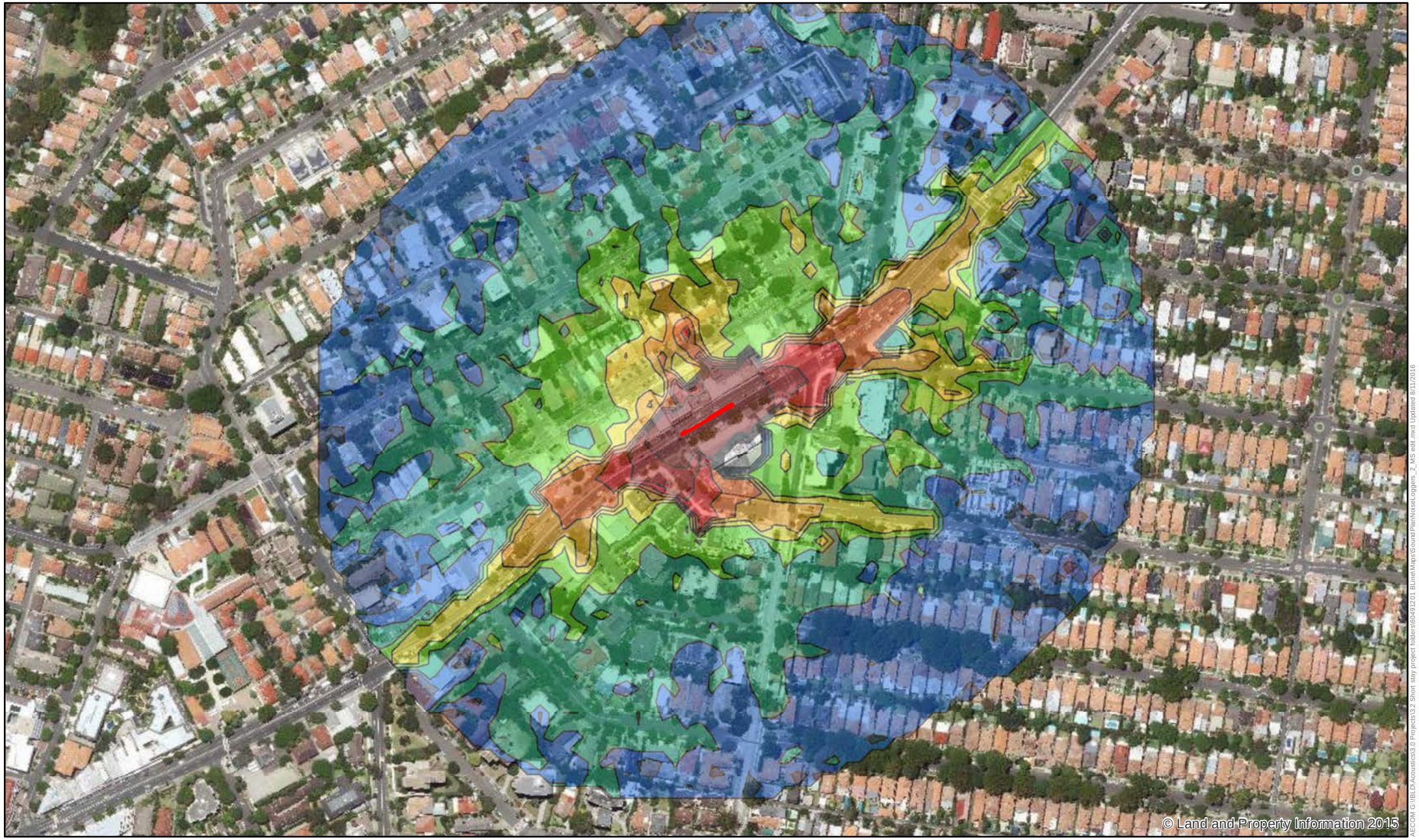
60491201

Fig. **18**



Legend

Work Site C6_6

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site C6_6

0 70 140 280 Meters

N

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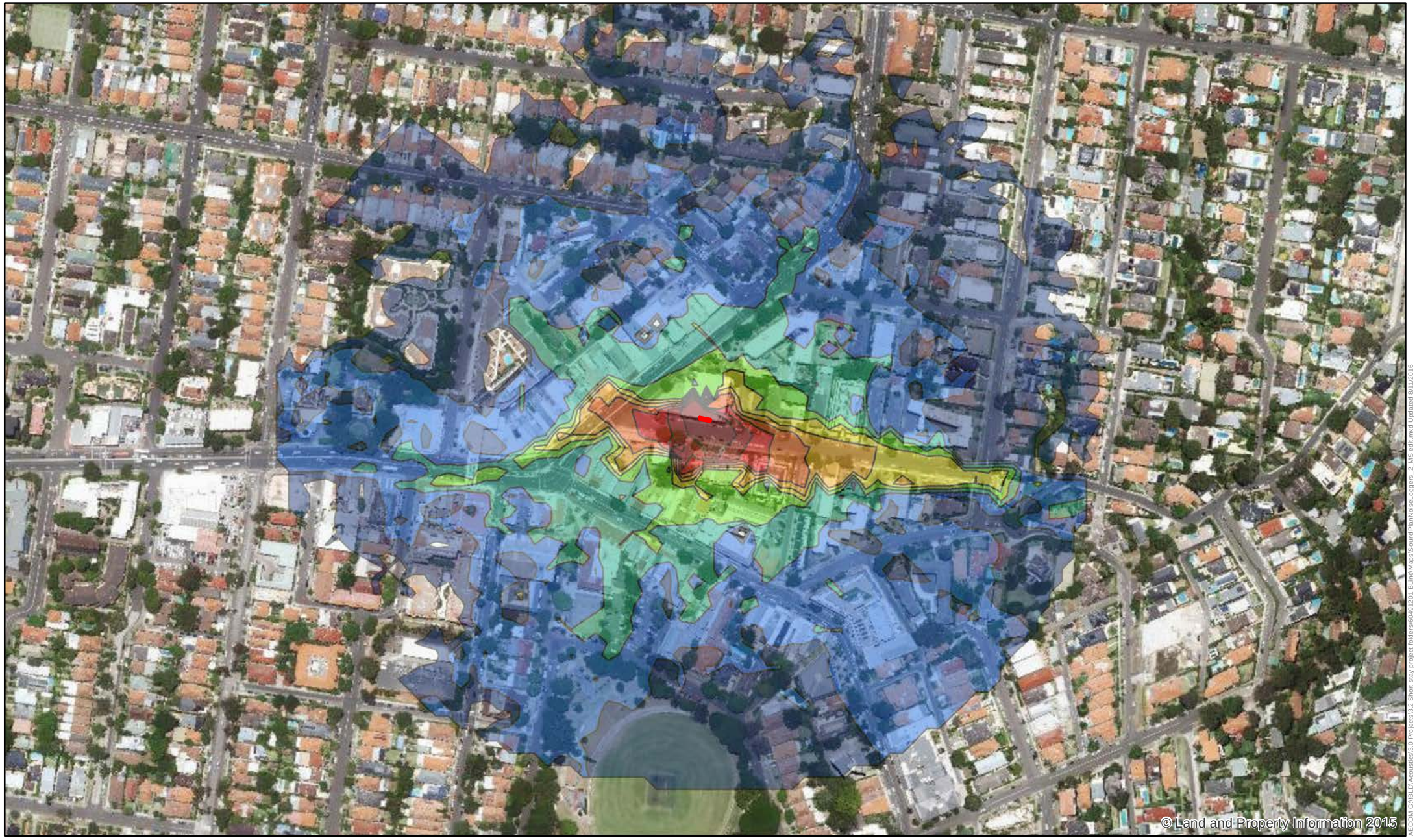
Fig. **19**



Legend

Construction Compound

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site Construction Compound - Establishment

0 70 140 280 Meters

N

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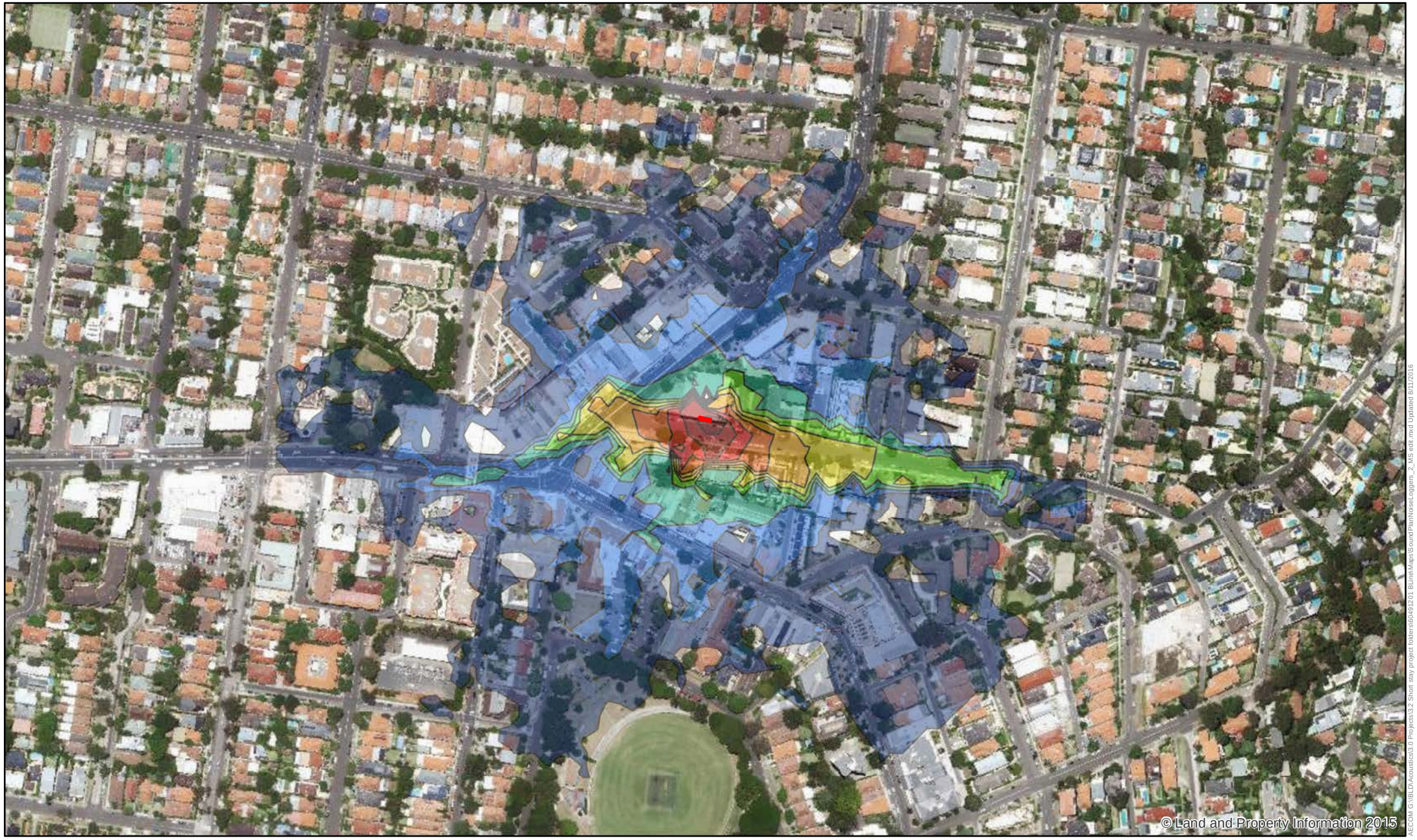
Fig. **20A**

AECOM



Legend

Construction Compound

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

35 40 45 50 55 60 65 70 75 80

B-Line

Noise Contour Map - Work Site Construction Compound - Operation

0 70 140 280 Meters

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Fig **20B**

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