Appendix G

SWRL Substations Noise Impact Assessment

HEGGIES

REPORT 10-6055-R6

Revision 0

SWRL Substations
Noise Impact Assessment

PREPARED FOR

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SWRL Substations

Noise Impact Assessment

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1 INTRODUCTION

As part of South West Rail Link (SWRL) project three new electrical substations are proposed to be constructed along the SWRL rail corridor. These substations are proposed at the following locations:

- An Integral Energy substation to the south of Cemetery Curve at approximate chainage 47.750 km, Denham Court.
- A RailCorp substation at a site west of Camden Valley Way, at approximate chainage 48.780 km, Leppington.
- A RailCorp substation within the train stabling facility (TSF) at Rossmore.

These substations are required to feed 1500 V DC traction supply for SWRL train operation. The Integral Energy substation would also provide power to future developments in the area.

The major noise sources at substations are electric transformers, which vibrate due to expansion and contraction of the transformer core. Transformers operate continually throughout the day and night. An additional noise source at substations is circuit breakers, which operate only when fault conditions cause over-current trips.

This report assesses the potential noise impact of substation operation on nearby residential receivers. It forms part of the Environmental Assessment (EA) of the project, and supersedes the noise assessment of the substations presented in Chapter 8 of the *EA Volume 2a Technical Paper 1 'Noise and Vibration'* report. This assessment incorporates recently developed design information rather than estimated substation capacities and also includes the revised location of the Integral Energy substation at Denham Court.

2 EXISTING ACOUSTIC ENVIRONMENT

2.1 Sensitive Receiver Locations

The existing land use in the vicinity of the substations is predominantly rural residential. Two substations will be constructed adjacent to the SWRL rail corridor and one substation will be constructed within the train stabling facility at Rossmore. **Figure 1**, **Figure 2** and **Figure 3** show the locations of each substation and nearby residential properties.

It can be seen from **Figure 1** that a residential area exists on the southern side of the proposed Integral Energy substation at Denham Court. The nearest existing residence is 85 Cassidy Street, located approximately 40 m from the closest substation boundary.

It can be seen from **Figure 2** that the area around the proposed RailCorp traction substation west of Camden Valley Way is largely rural with scattered residential dwellings. The nearest residence is 1701 Camden Valley Way and located on the opposite side of the rail corridor approximately 50 m from the closest substation boundary.

The location of the proposed RailCorp traction substation within the TSF is shown in **Figure 3**. An existing low density residential area lies to the south of the substation along McCann Road and Mark Road. The nearest residence to the proposed substation is 108 McCann Road, located approximately 98 m from the closest substation boundary.

Figure 1 Substation at Approximate Chainage 47.750 km (Integral Energy Substation - Denham Court)

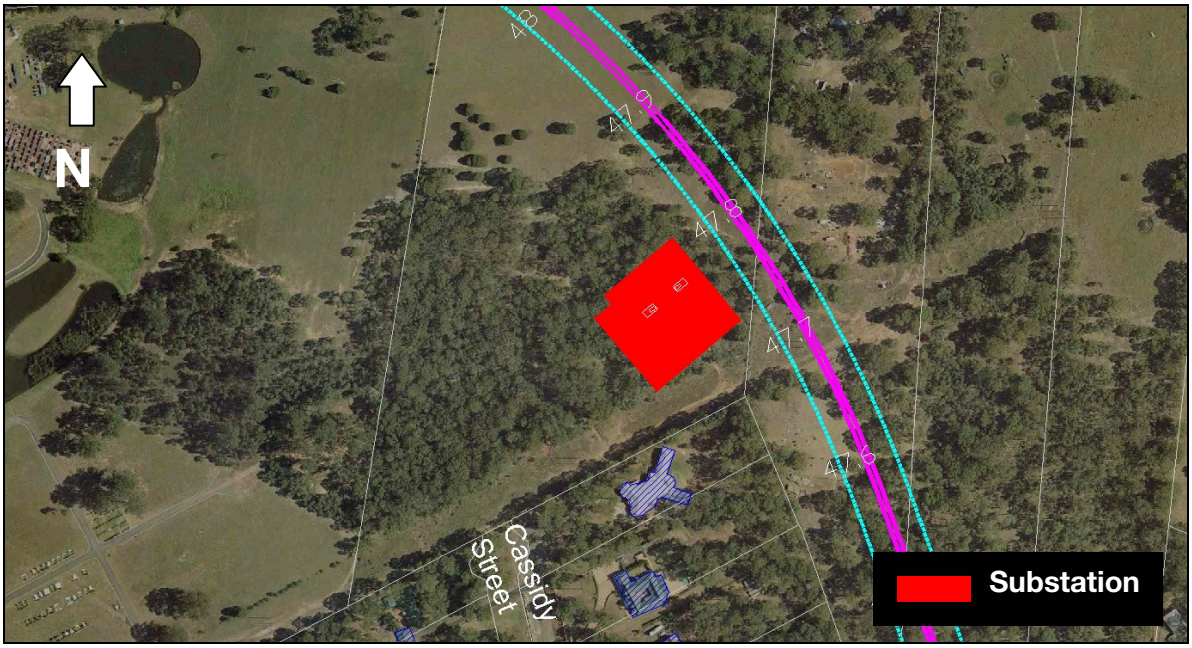


Figure 2 Substation at Approximate Chainage 48.780 km (Traction Substation - Leppington)

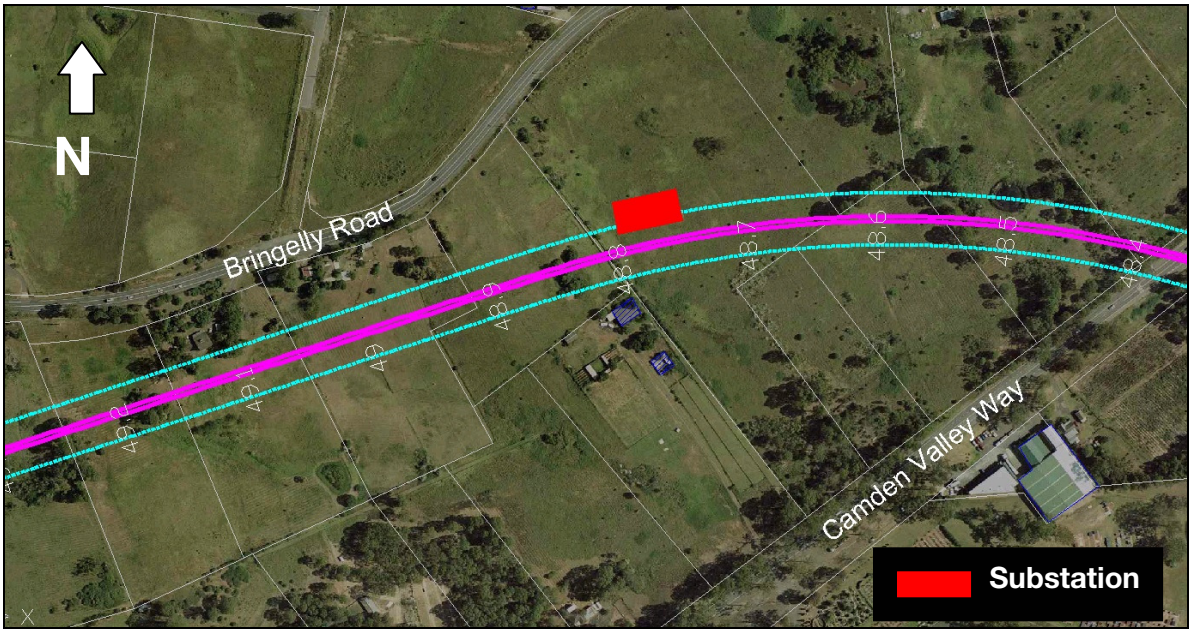
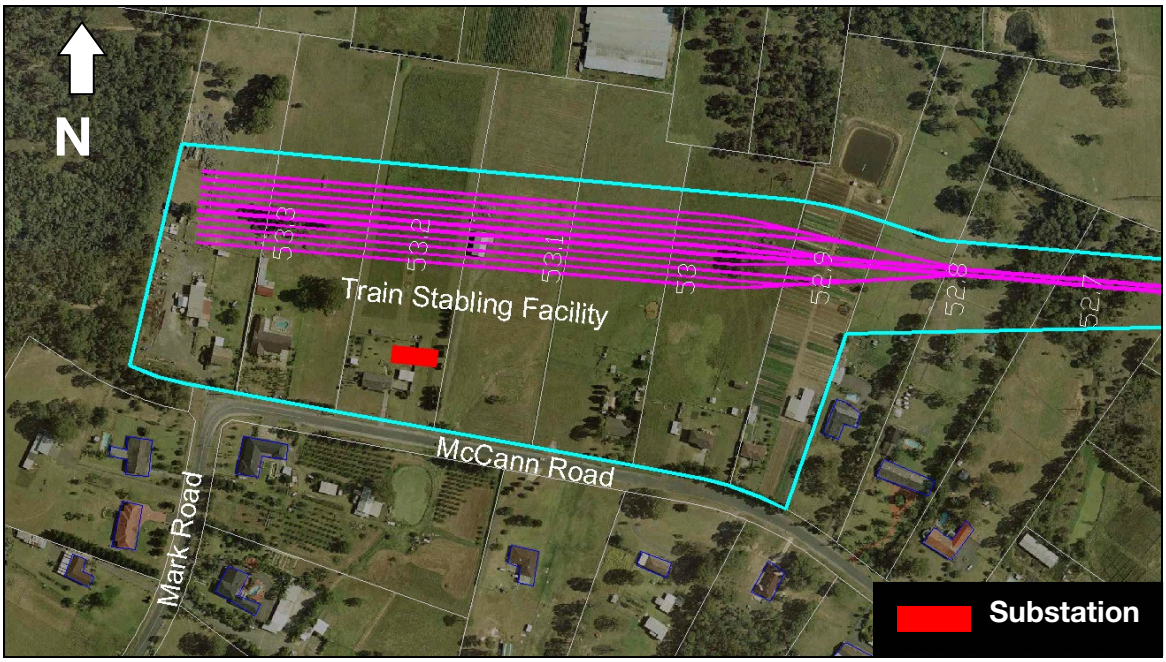


Figure 3 Substation within Train Stabling Facility (Traction Substation - Rossmore)



2.2 Unattended Ambient Noise Surveys

Surveys were undertaken by Heggies in 2006 at a number of locations between Glenfield and Leppington to determine typical existing background noise levels for the project area. These surveys are described in the SWRL *Environmental Assessment Volume 2a Technical Paper 1 'Noise and Vibration'*. A summary of the background noise levels measured at locations relevant to this substation noise assessment is presented in **Table 1**.

Table 1 Summary of Background Noise Levels at Unattended Noise Monitoring Locations

Monitoring Location	Noise Level (dBA)					
	Daytime 7.00 am - 6.00 pm		Evening 6.00 pm - 10.00 pm		Night-time 10.00 pm - 7.00 am	
	LA90	LAeq	LA90	LAeq	LA90	LAeq
198 McCann Road Rossmore	34	66	33	59	30	54
25 Cassidy Street Denham Court	36	46	37	43	33	42

3 ENVIRONMENTAL NOISE CRITERIA

DECCW's NSW Industrial Noise Policy (INP) provides criteria for the assessment of noise impact associated with industrial activities. It aims to balance the need for industrial activity with the desire for quiet within the community. As the proposed substations are fixed facilities, all operational noise emissions need to be assessed in accordance with the INP.

The INP sets two separate noise criteria: one to account for intrusive noise and the other to protect the amenity of particular land uses. These criteria are to be met at the most-affected boundary of the receiver property. In addition, the online Application Notes for the INP state that the potential for sleep disturbance should also be assessed.

3.1 INP Criteria for Intrusive Noise

To provide for protection against intrusive noise, the INP states that the L_{Aeq} noise level of the source, measured over a period of 15 minutes, should not be more than 5 dBA above the ambient (background) L_{A90} noise level, termed the Rating Background Level (RBL), measured during the daytime, evening and night-time periods at the nearest sensitive receivers. Because noise from substation transformers is continuous, the most stringent intrusive noise criteria for the project are the night-time L_{A90} noise levels from **Table 1** plus 5 dBA. At locations near the TSF substation, the intrusiveness criterion is 35 dBA, and at locations near the Integral Energy and Leppington substations the intrusiveness criterion is 38 dBA.

3.2 INP Criteria for Amenity

To provide protection against impacts on amenity, the INP specifies suitable maximum noise levels for particular land uses and activities during the daytime, evening and night-time periods. For this assessment, the existing residences in the vicinity of the substations are considered 'Rural'. The amenity criteria are presented in **Table 2**. For rural areas the recommended acceptable L_{Aeq} noise level is 50 dBA during the daytime, 45 dBA during evening, and 40 dBA at night.

Table 2 Recommended L_{Aeq} Amenity Noise Levels

Type of Receiver	Indicative Noise Amenity Area	Time of Day[1]	Recommended L_{Aeq} Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	**Rural**	**Day**	**50**	**55**
		Evening	**45**	**50**
		Night	**40**	**45**
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
Active Recreation Area	All	When in Use	55	60
Commercial Premises	All	When in Use	65	70

3.3 Modifying Factor Adjustments

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise sources at the same level. To account for this additional annoyance, the INP describes modifying factors to be applied. Substation transformer noise occurs at approximately 100 Hz (and harmonics of 100 Hz), with a humming or buzzing characteristic, which could be considered both low-frequency and tonal. The modifying factors recommended in the INP for tonal/low frequency noise are presented in **Table 3**.

Table 3 INP Modifying Factor Corrections

Factor	When to apply	Correction [1]
Tonal Noise	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: **5 dB** or more if the centre frequency of the band containing the tone is above 400 Hz **8 dB** or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive **15 dB** or more if the centre frequency of the band containing the tone is below 160 Hz	5 dB[2]
Low frequency noise	Measure/assess C- and A-weighted levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more	5 dB[2]

Note 1. Corrections to be added to the measured or predicted levels.

Note 2. Where a source emits tonal and low frequency noise, only one 5 dB correction is to be applied if the tone is in the low frequency range.

The INP states that modifying factors are to be applied to the noise from the source measured or predicted at the receiver, before comparison with the criteria. Heggies notes that measurements of substation noise carried out for other projects do not necessarily meet the INP definitions of 'tonal' or 'low-frequency' for measurements taken more than a few metres from the source. Although the transformer noise is both tonal and low-frequency at the source, background noise levels at the receiver often mean that the 'When to Apply' criteria shown in **Table 3** are not met.

For this assessment, the modifying factor is conservatively applied in all cases to account for the potentially annoying tonal and low-frequency characteristic of substation noise. As described in **Table 3**, the total penalty applied is 5 dB.

3.4 Sleep Disturbance

The DECCW's current approach to assessing potential sleep disturbance is to apply an initial screening criterion of background plus 15 dBA (as described in the Application Notes to the INP), and to undertake further detailed analysis if the screening criterion cannot be achieved. The sleep disturbance screening criterion applies outside bedroom windows during the night-time period.

Where the screening criterion cannot be met, the additional analysis should consider the number of potential sleep disturbance events during the night, the level of exceedance and noise from other events. It may also be appropriate to consider other guidelines including the DECCW's ECRTN which contains additional guidance relating to the potential sleep disturbance impacts.

A review of research on sleep disturbance in the ECRTN indicates that in some circumstances, higher noise levels may occur without significant sleep disturbance. Based on studies into sleep disturbance, the ECRTN concludes that:

- "Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions."

- "One or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA, are not likely to affect health and wellbeing significantly."

It is generally accepted that internal noise levels in a dwelling, with the windows open, are 10 dBA lower than external noise levels. Based on a worst case minimum attenuation, with windows open, of 10 dBA, the first conclusion above suggests that short term external noises of 60 dBA to 65 dBA are unlikely to cause awakening reactions. The second conclusion suggests that one or two noise events per night with maximum external noise levels of 75 dBA to 80 dBA are not likely to affect health and wellbeing significantly.

3.5 Noise Goals for the Substations

A summary of the operational noise goals for the substations is provided in **Table 4**.

Table 4 Summary of Operational Noise Goals for the Substations

Location	Period	Existing Noise Levels (dBA)		Operational Noise Goals (dBA)		
		RBL	LAeq(Period)	LAeq(15min) Intrusive	LAeq(Period) Amenity	LA1(60sec) Sleep Disturbance
Residential Receivers near TSF Substation	Daytime	34	66	**39**	50	-
	Evening	33	59	**38**	45	-
	Night	30	54	**35**	40	**45 – 65**
Residential Receivers near Denham Court and Leppington Substations	Daytime	36	46	**41**	50	-
	Evening	37	43	**42**	45	-
	Night	33	42	**38**	40	**48 - 65**

Since the transformer noise emissions associated with the operation of substations are considered to be continuous, the $L_{Aeq(15minute)}$ and the $L_{Aeq(period)}$ noise criteria are directly comparable parameters and the more stringent of the intrusiveness or the amenity criteria sets the noise goals. For this project, the night-time intrusiveness criterion sets the noise goals.

As the land around the stabling facility is developed, the background noise levels in the area will increase. It is anticipated that the future background noise levels in the area surrounding the stabling facility are likely to be in the order of 45 dBA to 50 dBA during the daytime period and 35 dBA to 40 dBA during the night-time period (as discussed in Section 7.2.1 of the EA *Volume 2a Technical Paper 1 'Noise and Vibration'* report).

For the purposes of this assessment, a conservative approach has been adopted using the measured RBLs as shown in **Table 4**.

4 OPERATIONAL NOISE ASSESSMENT

Modelling of substation noise has been carried out using the CONCAWE algorithm in SoundPLAN V6.5, assuming neutral meteorological conditions and 3D topographical information for the project area. The noise model includes source noise emissions and ground absorption resulting from the topography, acoustic shielding from site buildings and the location and height of the potentially most affected and/or representative noise-sensitive receivers.

4.1 Transformer Noise Modelling Inputs

4.1.1 Integral Energy Substation at Denham Court

Based on the information provided by the Transport Construction Authority (TCA) it is understood that the substation at Denham Court would be equipped with one 60 MVA transformer. There are three variants of 60 MVA transformers that could be used at this substation. Two of the 60 MVA variants (Option 1 and Option 2) are specified with the same sound power level, the third variant (Option 3) is specified with a slightly lower sound power level.

The transformer will be capable of operating at a reduced capacity of 30 MVA. An additional noise assessment would be undertaken in the event that the substation was to be upgraded (i.e. if an additional transformer were to be installed).

This leads to four potential assessment scenarios for the Integral Energy substation. These scenarios with corresponding transformer source sound power levels as supplied by TCA are presented in **Table 5**.

Table 5 Integral Energy Substation Noise Modelling Scenarios and Source Levels

Scenario No.	Scenario	Source L_{Aeq} Sound Power Level (dBA re 10^{-12} W)
1	Option 1&2 Type Operating at half capacity (30 MVA)	70
2	Option 1&2 Type Operating at full capacity (60 MVA)	75
3	Option 3 Type Operating at half capacity (30 MVA)	67
4	Option 3 Type Operating at full capacity (60 MVA)	72

For the purpose of noise modelling it has been assumed that the substation would be constructed in open space without any enclosures or safety blast walls, as this would be considered a worst case scenario from a noise assessment perspective.

4.1.2 Traction Substations at Leppington and Rossmore

It is understood that each traction substation (located at Leppington and Rossmore) would have two 5 MW rectifier transformers (only one would be operating at any one time) and a 5/6.25 MVA power transformer equipped with a cooling fan. Therefore two transformers would be continuously operating at any one time at each traction substation. The source sound power levels for these transformers as supplied by TCA are presented in **Table 6**.

Table 6 Traction Substations Noise Modelling Scenarios and Source Levels

Scenario	Source L_{Aeq} Sound Power Level (dBA re 10^{-12} W)
Transformer with Fans Off[1]	68
Transformer with Fans On[2]	77

Note 1: Applicable for both 5MW Rectifier Transformer and 5/6.25MVA Power Transformer.

Note 2: Applicable for 5/6.25MVA Power Transformer only.

For the purpose of noise modelling it has been assumed that the substations would be constructed in open space without any enclosures or safety blast walls, as this would be considered a worst case scenario for noise.

4.2 Circuit Breaker Noise Modelling Inputs

4.2.1 Integral Energy Substation

Circuit breakers can emit an impulsive "bang" when a fault causes a breaker to trip. It is understood that a number of 132 kV (unenclosed) and 33 kV (enclosed) circuit breakers will be installed at the Integral Energy substation at Denham Court. Integral Energy has advised that the unenclosed 133 kV circuit breakers have a typical sound pressure level of 92 dBA at a distance of 8 m.

Heggies has been advised by Integral Energy that circuit breaker noise events would be highly infrequent and would only occur if there was a fault.

4.2.2 Traction Substations at Leppington and Rossmore

For a previous Heggies project, the Rail Corporation of NSW provided data indicating that the circuit breakers at a section hut on the North Shore Line emitted sound pressure levels ranging between 100 dBA and 120 dBA at a distance of 6 m. It is understood that this level of noise is dependant on the electrical load at the time of a fault and is representative of an unenclosed circuit breaker. These source levels have been used as the basis for the modelling of the DC circuit breakers in the traction substations at Leppington and Rossmore.

As the noise emissions from the circuit breakers are intermittent in nature and can occur at any time of the day (only if a fault occurs), it is appropriate to assess the potential noise emissions against the night-time sleep disturbance goals presented in **Table 4**.

Heggies has been advised by RailCorp that circuit breaker noise events would be highly infrequent and would only occur if there was a fault.

4.3 Predicted Noise Levels

4.3.1 Transformer Noise

The predicted noise levels from the transformers are presented in the form of L_{Aeq} noise contour plots in **Appendix A**. The noise contours are calculated at a height of 2 m above local ground level representative of ground floor receivers.

The $L_{Aeq(15minute)}$ noise levels predicted at the nearest residences are presented in **Table 7**. As discussed in **Section 3.3**, a 5 dBA correction factor for tonal/low frequency noise has been added to the predicted levels in accordance with the INP.

Table 7 Predicted Transformer $L_{Aeq(15minute)}$ Noise Levels

Receivers	Night-time Intrusive $L_{Aeq(15min)}$ Criterion	Predicted $L_{Aeq(15minute)}$ Noise Level (dBA)			
		Scenario 1	Scenario 2	Scenario 3	Scenario 4
85 Cassidy Street Denham Court **(Integral Energy)**	38	28	33	26	30
1701 Camden Valley Way Leppington **(Traction)**	38	38 with Fans On 34 with Fans Off			
108 McCann Road Rossmore **(Traction)**	35	36 with Fans On 32 with Fans Off			

4.3.2 Circuit Breaker Noise

The predicted L_{Amax} noise levels from the circuit breakers at the nearest residences are presented in **Table 8**.

Table 8 Predicted Circuit Breaker L_{Amax} Noise Levels

Receivers	Sleep Disturbance Upper Noise Goal L_{Amax} Noise Level (dBA)	Predicted L_{Amax} Noise Level (dBA)
85 Cassidy Street Denham Court **(Integral Energy)**	65	72
1701 Camden Valley Way Leppington **(Traction)**		81-101
108 McCann Road Rossmore **(Traction)**		75-95

4.4 Discussion

4.4.1 Integral Energy Substation

Table 7 indicates that the predicted $L_{Aeq(15minute)}$ noise levels generated by the transformer in the Integral Energy substation would comply with the night-time INP intrusiveness criterion of 38 dBA at the nearest residential receiver (85 Cassidy Street Denham Court). Therefore the $L_{Aeq(15minute)}$ noise level would comply at all existing residential receivers in the vicinity of the Integral Energy substation.

Table 8 indicates that the predicted external maximum L_{Amax} noise level generated by the circuit breaker at 85 Cassidy Street residence would be approximately 72 dBA. This noise level exceeds the upper sleep disturbance noise goal of 65 dBA by 7 dBA.

However, the circuit breakers only operate when fault conditions cause over-current trips and it has been advised that these events are highly infrequent. The review of sleep disturbance presented in the ECTRN (see **Section 3.4**) suggests that one or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA (75 dBA to 80 dBA external noise levels assuming a 10 dBA reduction from outside to inside with the windows open), are not likely to affect health and wellbeing significantly.

Heggies has been advised by Integral Energy that circuit breaker noise events would be highly infrequent and would only occur if there was a fault. It is on this basis that consideration of noise mitigation measures for circuit breaker noise is not required at this site.

4.4.2 Leppington Traction Substation

Table 7 indicates that the predicted $L_{Aeq(15minute)}$ noise levels generated by the traction substation at Leppington would comply with the night-time INP intrusiveness criterion of 38 dBA at the nearest residential receiver (1701 Camden Valley Way Leppington). Therefore the $L_{Aeq(15minute)}$ noise level would comply at all existing residential receivers in the vicinity of the Leppington traction substation.

Table 8 indicates that the predicted external L_{Amax} noise levels generated by the circuit breakers would typically range from 81 dBA to 101 dBA at 1701 Camden Valley Way residence. This noise level exceeds the upper sleep disturbance noise goal of 65 dBA by between 16 dBA and 36 dBA.

However, the circuit breakers only operate when fault conditions cause over-current trips and it has been advised that these events are highly infrequent. The review of sleep disturbance presented in the ECTRN (see **Section 3.4**) suggests that one or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA (75 dBA to 80 dBA external noise levels assuming a 10 dBA reduction from outside to inside with the windows open), are not likely to affect health and wellbeing significantly.

Heggies has been advised by RailCorp that circuit breaker noise events would be highly infrequent and would only occur if there was a fault. It is on this basis that consideration of noise mitigation measures for circuit breaker noise is not required at these sites.

4.4.3 Rossmore TSF Traction Substation

Table 7 indicates that the predicted $L_{Aeq(15minute)}$ noise levels at the traction substation within the TSF would comply with the night-time INP intrusiveness criterion of 35 dBA at all existing residential receiver locations, except for 108 McCann Road. At this location, the predicted $L_{Aeq(15minute)}$ noise level from the transformer with fans on exceeds the night-time intrusiveness criterion by a small margin (up to 1 dBA). It is anticipated that buildings associated with the TSF may provide some acoustic shielding which may eliminate the marginal exceedance of the INP criterion at this location. As the detailed design of the TSF is not yet available, the TSF buildings have not been included in the noise model for this assessment.

Table 8 indicates that the predicted external L_{Amax} noise levels generated by the circuit breakers would typically range from 75 dBA to 95 dBA at 108 McCann Road residence. This noise level exceeds the upper sleep disturbance noise goal of 65 dBA by between 10 dBA and 30 dBA.

However, the circuit breakers only operate when fault conditions cause over-current trips and it has been advised that these events are highly infrequent. The review of sleep disturbance presented in the ECTRN (see **Section 3.4**) suggests that one or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA (75 dBA to 80 dBA external noise levels assuming a 10 dBA reduction from outside to inside with the windows open), are not likely to affect health and wellbeing significantly.

Heggies has been advised by RailCorp that circuit breaker noise events would be highly infrequent and would only occur if there was a fault. It is on this basis that consideration of noise mitigation measures for circuit breaker noise is not required at these sites.

5 CONCLUSION AND RECOMMENDATIONS

The main noise emissions associated with substations are continuous low level humming from the transformers and impulsive noise from the infrequent operation of circuit breakers. On the basis of the noise modelling results presented in **Table 7**, the $L_{Aeq(15minute)}$ noise levels resulting from the operation of the project substations would comply with the INP amenity and intrusiveness noise criteria at all existing residential receivers, except 108 McCann Road (which is adjacent to the proposed traction substation at the TSF). At this location, the predicted $L_{Aeq(15minute)}$ noise level is marginally higher than the night-time intrusiveness criterion when the transformer fans are operating. As discussed in **Section 3.5**, at the time of opening of the SWRL in 2016, the background noise levels at this location would be somewhat higher and therefore exceedance of the background plus 5 dB intrusiveness criterion is not expected.

It is on this basis that mitigation of the substation transformer noise is not required at any of the substation locations in order to comply with the INP criteria. It is recommended that monitoring of the substation noise be carried out at the three locations listed in **Table 7** once they are operational in order to confirm the predicted compliance with the INP criteria.

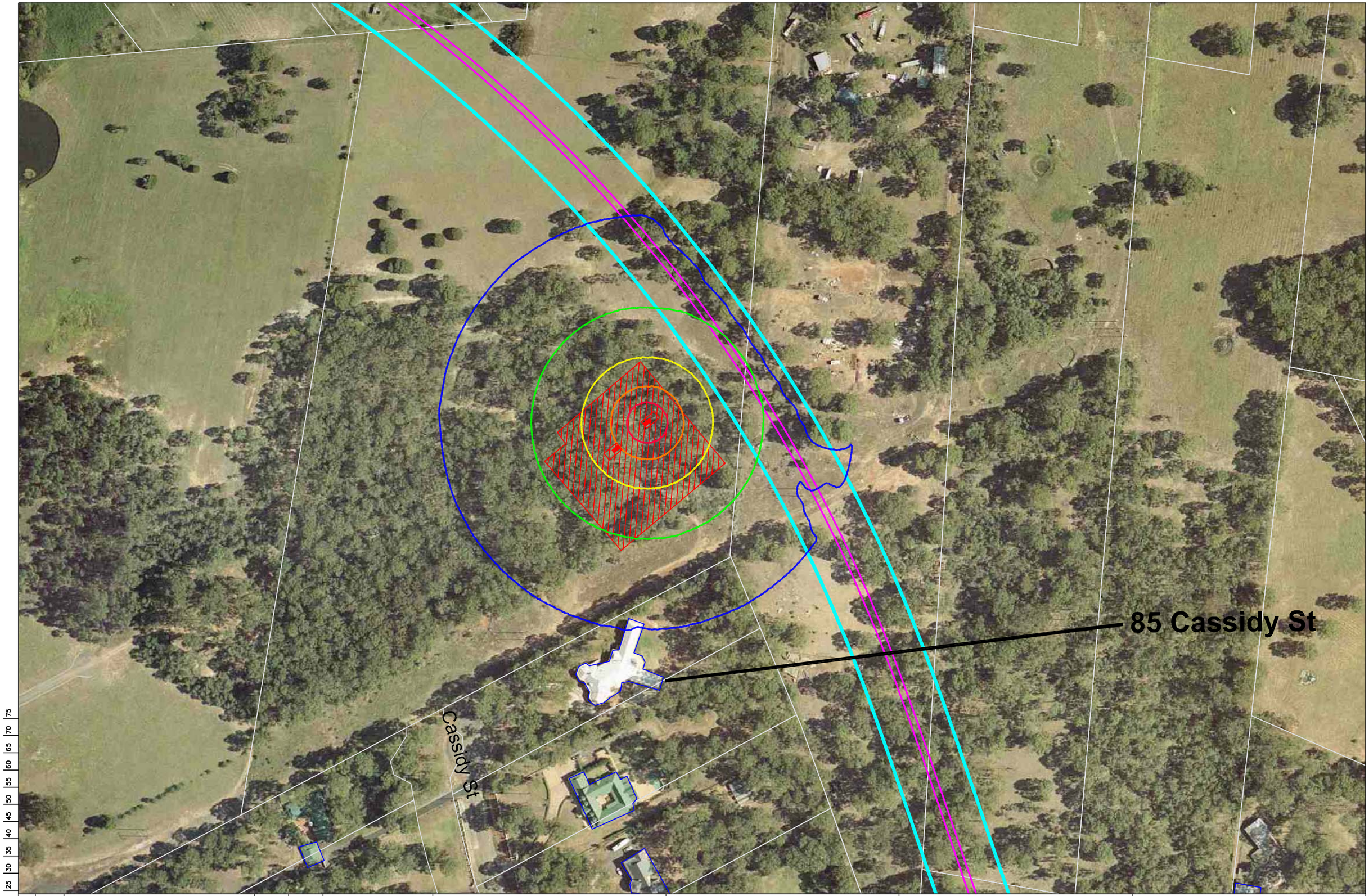
The predicted noise levels from the operation of circuit breakers would exceed the sleep disturbance noise goals at the nearest residences. However, the circuit breakers only operate when fault conditions cause over-current trips and it has been advised that these events are highly infrequent. The review of sleep disturbance presented in the ECTRN (see **Section 3.4**) suggests that one or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA (75 dBA to 80 dBA external noise levels assuming a 10 dBA reduction from outside to inside with the windows open), are not likely to affect health and wellbeing significantly.

It has been advised by RailCorp and Integral Energy that circuit breaker noise events would be highly infrequent and would only occur if there was a fault. It is on this basis that consideration of noise mitigation measures for circuit breaker noise is not required at these sites.

Appendix A

Report 10-6055R6

SWRL Substation LAeq Noise Contour Plot



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Legend
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- 40 dBA Noise Contour
- 35 dBA Noise Contour
- 30 dBA Noise Contour
- 25 dBA Noise Contour

- South West Rail Link Alignment
- South West Rail Rail Corridor
- South West Rail Substation

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Appendix A - South West Rail Link Substation LAeq Noise Contour Scenario 1

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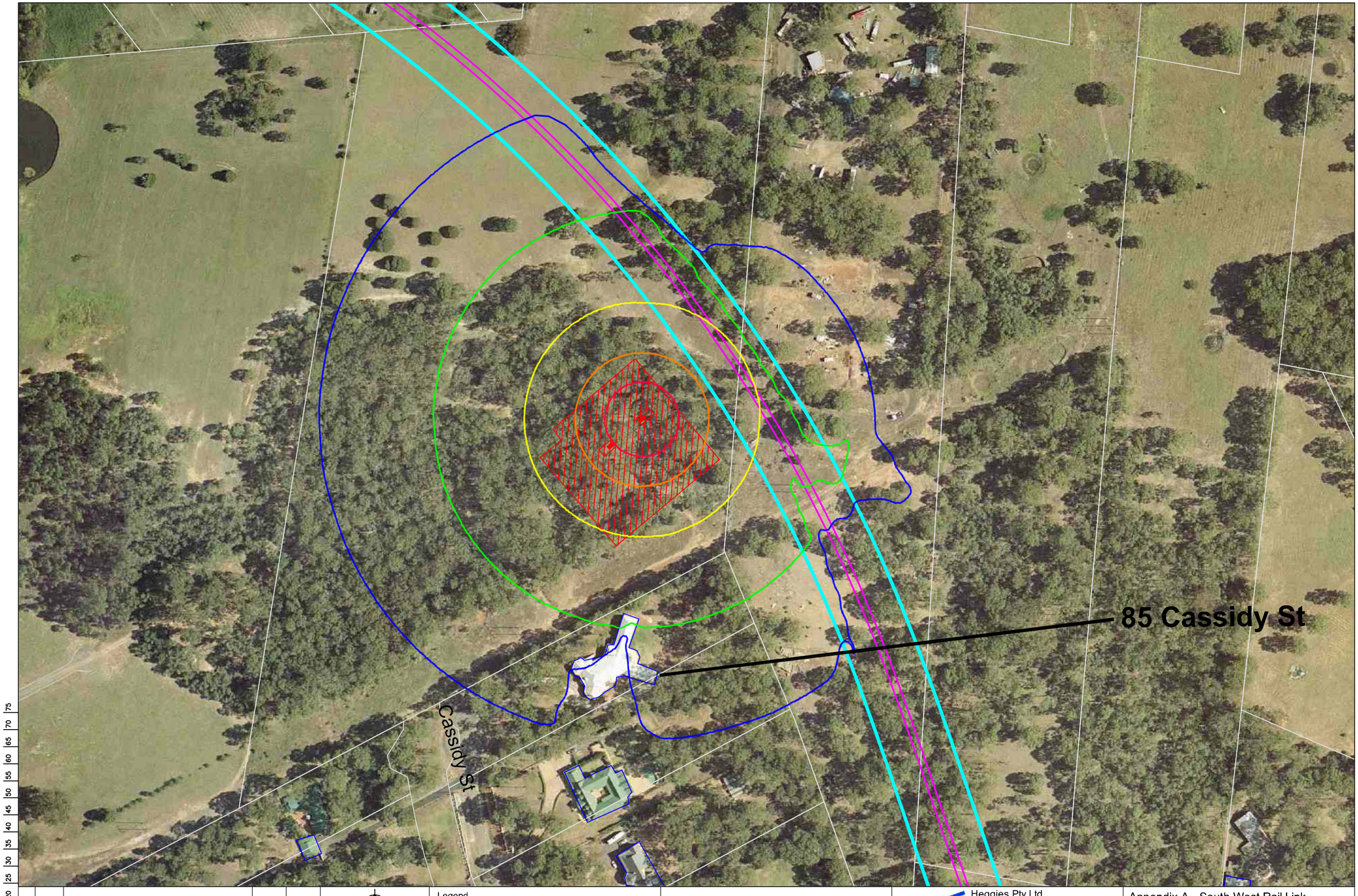

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Appendix A - South West Rail Link
Substation LAeq Noise Contour
Scenario 2

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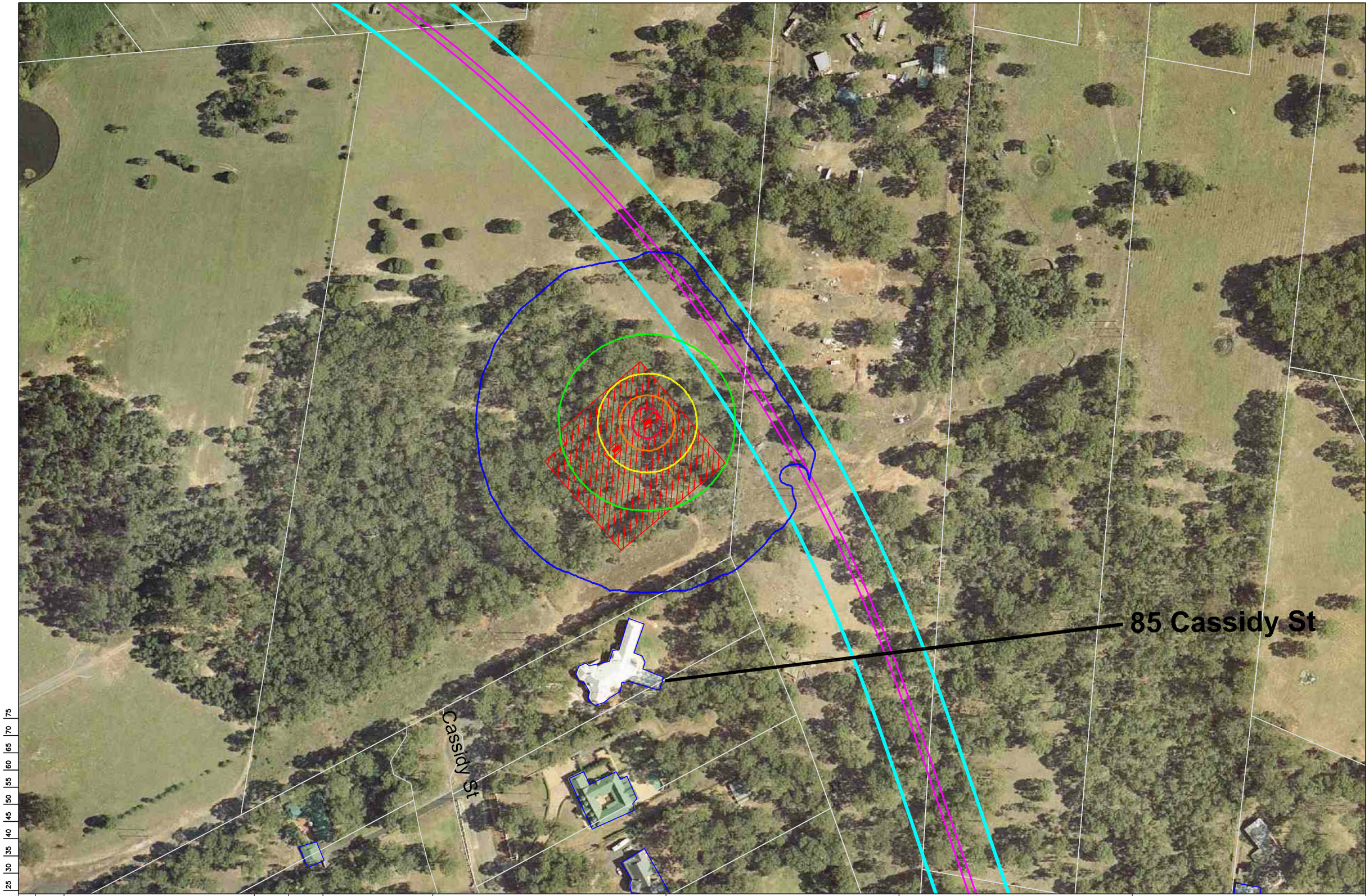

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Appendix A - South West Rail Link Substation LAeq Noise Contour Scenario 3

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10-6055 A1 Denham Sc3

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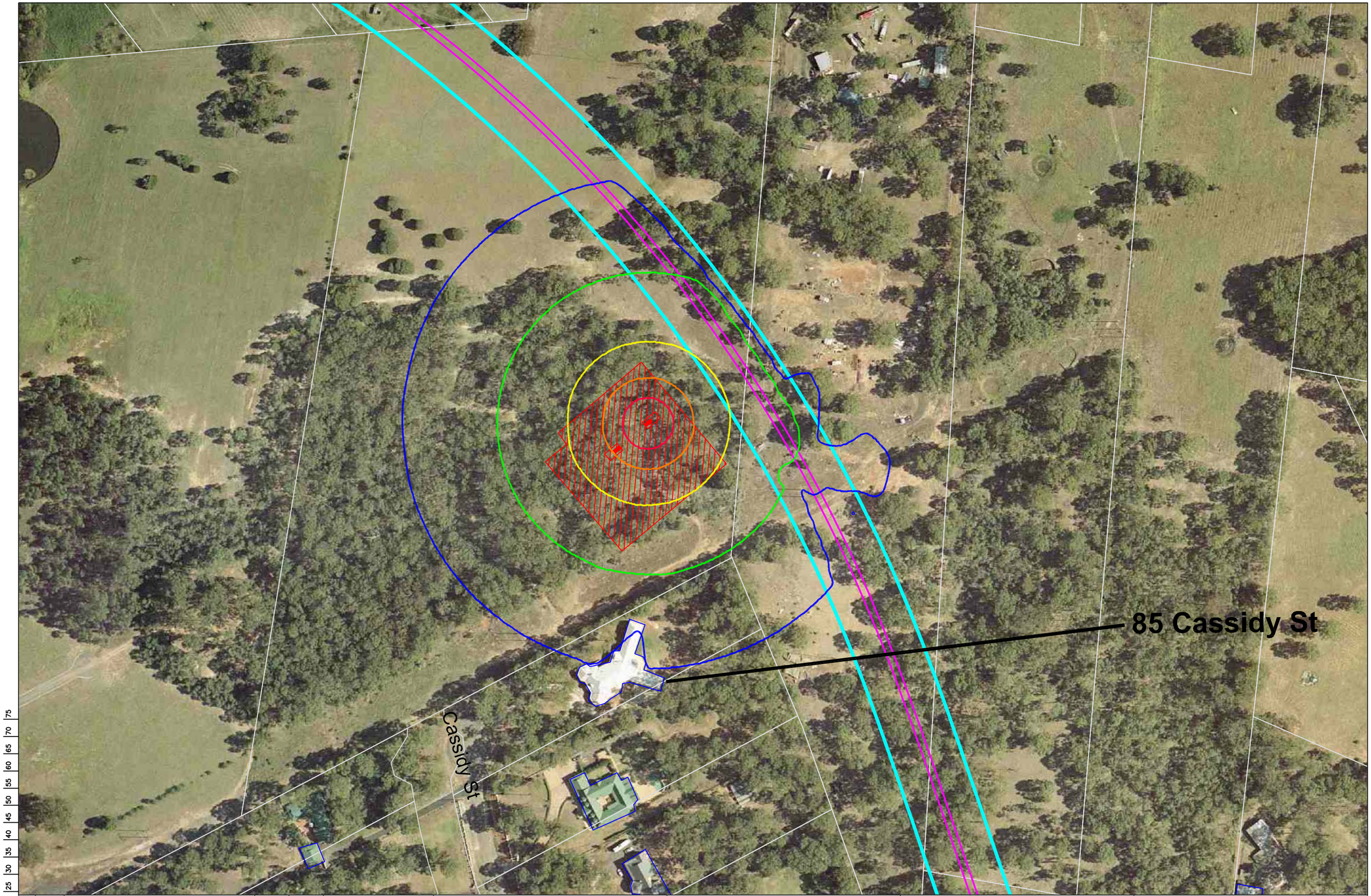

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- South West Rail Rail Corridor
- South West Rail Substation

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Appendix A - South West Rail Link
Substation LAeq Noise Contour
Scenario 4

FILE NAME
10-6055R6 Appendix A.dwg

DRAWING No.
10-6055 A1 Denham Sc4

REVISION
0

Bringelly Rd

1701 Camden Valley Way

Camden Valley Way

75 mm ON ORIGINAL

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

REV.	DATE	AMENDMENT / ISSUE DESCRIPTION	PREPARED	CHECKED
0	05/07/10		JH	BC

0 20 40

Scale = 1:2000

Legend

- 45 dBA Noise Contour
- 40 dBA Noise Contour
- 35 dBA Noise Contour
- 30 dBA Noise Contour
- 25 dBA Noise Contour

- South West Rail Link Alignment
- South West Rail Rail Corridor
- South West Rail Substation

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Appendix A - South West Rail Link Substation LAeq Noise Contour Transformer Fan On

FILE NAME: 10-6055R6 Appendix A.dwg

DRAWING No.: 10-6055 A1 Leppington Fan On

REVISION: 0

Bringelly Rd

1701 Camden Valley Way

Camden Valley Way

75 mm ON ORIGINAL

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REV.	DATE	AMENDMENT / ISSUE DESCRIPTION	PREPARED	CHECKED
0	05/07/10		JH	BC

0 20 40

Scale = 1:2000

Legend

- 45 dBA Noise Contour
- 40 dBA Noise Contour
- 35 dBA Noise Contour
- 30 dBA Noise Contour
- 25 dBA Noise Contour
- South West Rail Link Alignment
- South West Rail Rail Corridor
- South West Rail Substation

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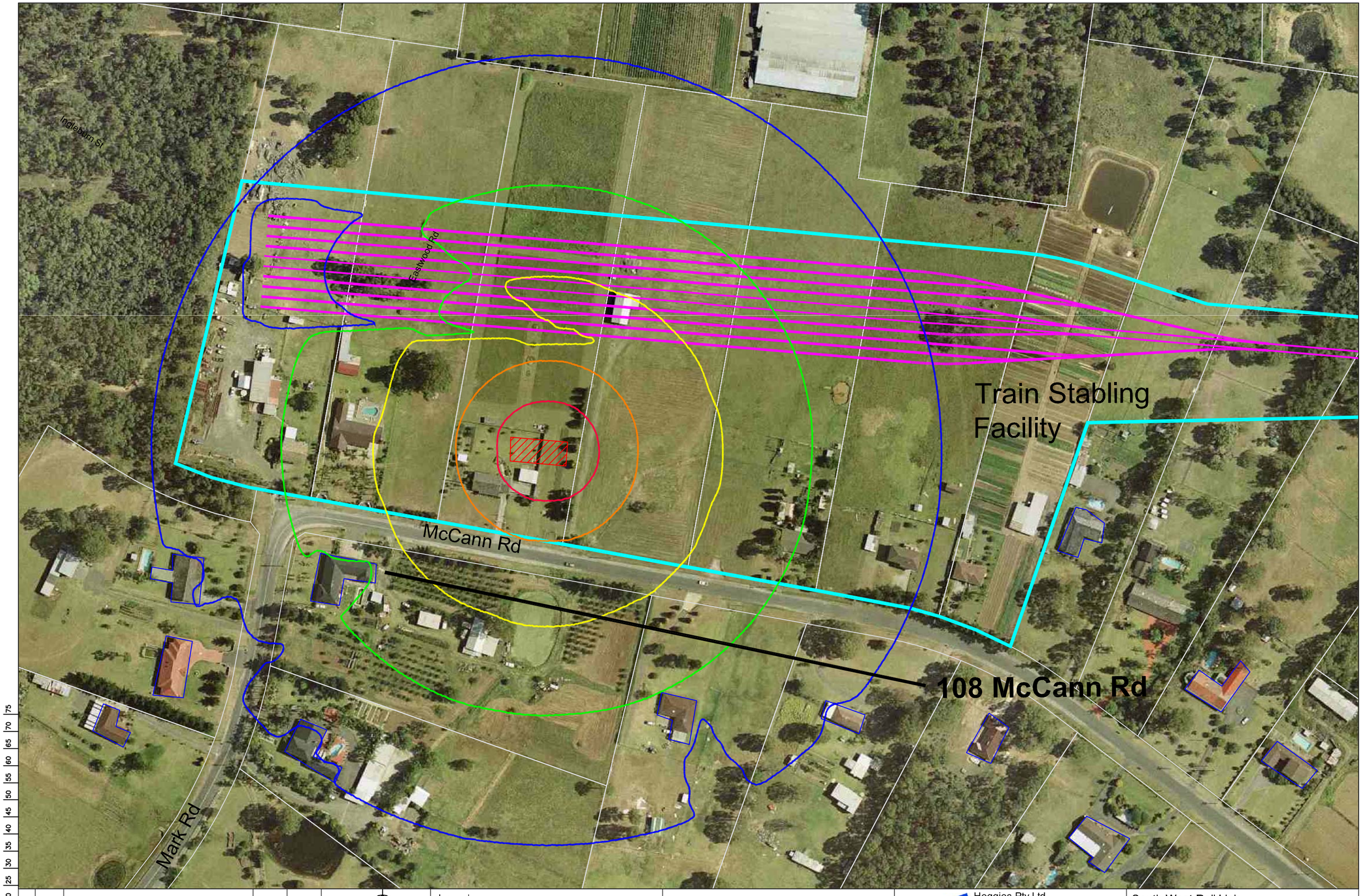
Appendix A - South West Rail Link Substation LAeq Noise Contour Transformer Fan Off

FILE NAME: 10-6055R6 Appendix A.dwg

DRAWING No.: 10-6055 A1 Leppington Fan Off

REVISION: 0



75 mm ON ORIGINAL

REV.	DATE	AMENDMENT / ISSUE DESCRIPTION	PREPARED	CHECKED
0	05/07/10		JH	BC

Scale = 1:2000 (0, 20, 40)

Legend

- 45 dBA Noise Contour
- 40 dBA Noise Contour
- 35 dBA Noise Contour
- 30 dBA Noise Contour
- 25 dBA Noise Contour
- South West Rail Link Alignment
- South West Rail Rail Corridor
- South West Rail Substation

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FILE NAME: 10-6055R6 Appendix A.dwg

South West Rail Link
LAeq 9hr Night-time Noise Contour
Transformer Fan On

DRAWING No.: 10-6055 A1 Rossmore Fan On

REVISION: 0

75 mm ON ORIGINAL

REV.	DATE	AMENDMENT / ISSUE DESCRIPTION	PREPARED	CHECKED
B	05/07/10		JH	BC

0 20 40
Scale = 1:2000

Legend
- 45 dBA Noise Contour
- 40 dBA Noise Contour
- 35 dBA Noise Contour
- 30 dBA Noise Contour
- 25 dBA Noise Contour

- South West Rail Link Alignment
- South West Rail Rail Corridor
- South West Rail Substation

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FILE NAME
10-6055R6 Appendix A.dwg

South West Rail Link
LAeq 9hr Night-time Noise Contour
Transformer Fan Off

DRAWING No.
10-6055 A1 Rossmore Fan Off

REVISION
0

Appendix H

Options assessment for the Integral Energy substation

Options assessment for the Integral Energy substation

Date	**30 July 2010**
Revision	**2**
Status	**Final**
Document reference no.:	1123186_3.DOC

Commercial in Confidence

Table of Contents

1. Introduction

1.1. Background

The South West Rail Link (SWRL) Concept Plan and Environmental Assessment (November 2006) identified the need for railway-related ancillary infrastructure such as traction substations and bulk supply substations to be constructed as part of the project. At that early stage of design, it was noted that at least one bulk supply substation would be required to provide the power supply for the proposed rail line.

Following preparation of the concept plan, the design and location requirements for the rail line power supply were further investigated and developed. In consultation with Integral Energy, the electricity provider in the region, investigations led to the identification of an indicative location for an Integral Energy substation (IES). This indicative location was included in the SWRL Glenfield to Leppington rail line Environmental Assessment (EA May 2010). Section 1.2.2 of the EA May 2010 recommended further site planning and design of the proposed IES at Denham Court. As part of the ongoing design investigations, an options assessment has been undertaken to determine the preferred location of the Integral Energy substation.

1.2. Purpose of this report

The purpose of this report is to document the assessment of the potential options for the location of the IES and identify the preferred location. The report provides environmental impact assessment of the preferred location and measures to mitigate the potential impacts of the substation on the surrounding area. The environmental impact assessment includes assessment of the key issues:

- Noise
- Visual
- Ecology
- Heritage
- Hydrology
- traffic
- electric and magnetic fields

This report provides information that is relevant to the submissions received during public exhibition of the SWRL EA (May 2010) on the location, need for, and potential impacts of the Integral Energy substation. As such, this report is intended to inform the Submissions Report for the SWRL Glenfield to Leppington rail line.

2. Need for the substation

Substations are a critical ancillary infrastructure needed to provide the operational electricity needs for the SWRL Glenfield to Leppington rail line. Without the inclusion of substations along the rail alignment, the proposed rail line would not be able to operate.

The substations required for the SWRL need to be located where they can maintain the required voltage along the rail corridor and supply the required power. Typically, rail substations are required every four to five kilometres of double track length. A traction substation at Railway Parade, Glenfield is currently being delivered as part of the Glenfield Transport Interchange which was approved by TCA in April 2009.

An additional three substations are therefore needed along the Glenfield to Leppington rail line which involves the following bulk power supply strategy:

- Construction of a new bulk supply substation to an existing 132 kV transmission line.
- Construction of a new traction substation west Camden Valley Way (off Bringelly Road).
- Construction of a new traction substation at Leppington at the proposed train stabling facility.

The substation proposed at the 132kV transmission line network will provide the primary bulk supply power for the SWRL. Due to capacity constraints, upgrades of existing substations in the network would not be sufficient to provide the primary bulk power supply for the SWRL. It is proposed that the bulk supply substation would be operated by *Integral Energy*.

The two proposed traction substations would provide the boost of power necessary for maintaining the voltage along the rail line.

Integral Energy, TCA and RailCorp are continuing to develop the power strategy for the SWRL which may provide an alternative delivery method for electricity to service the SWRL.

The proposed bulk supply substation at Denham Court must therefore form part of the SWRL project to ensure that trains can operate on day 1 (2016).

3. Options assessment

This section provides an options assessment of the proposed potential locations for the bulk supply substation.

3.1. Regional level options

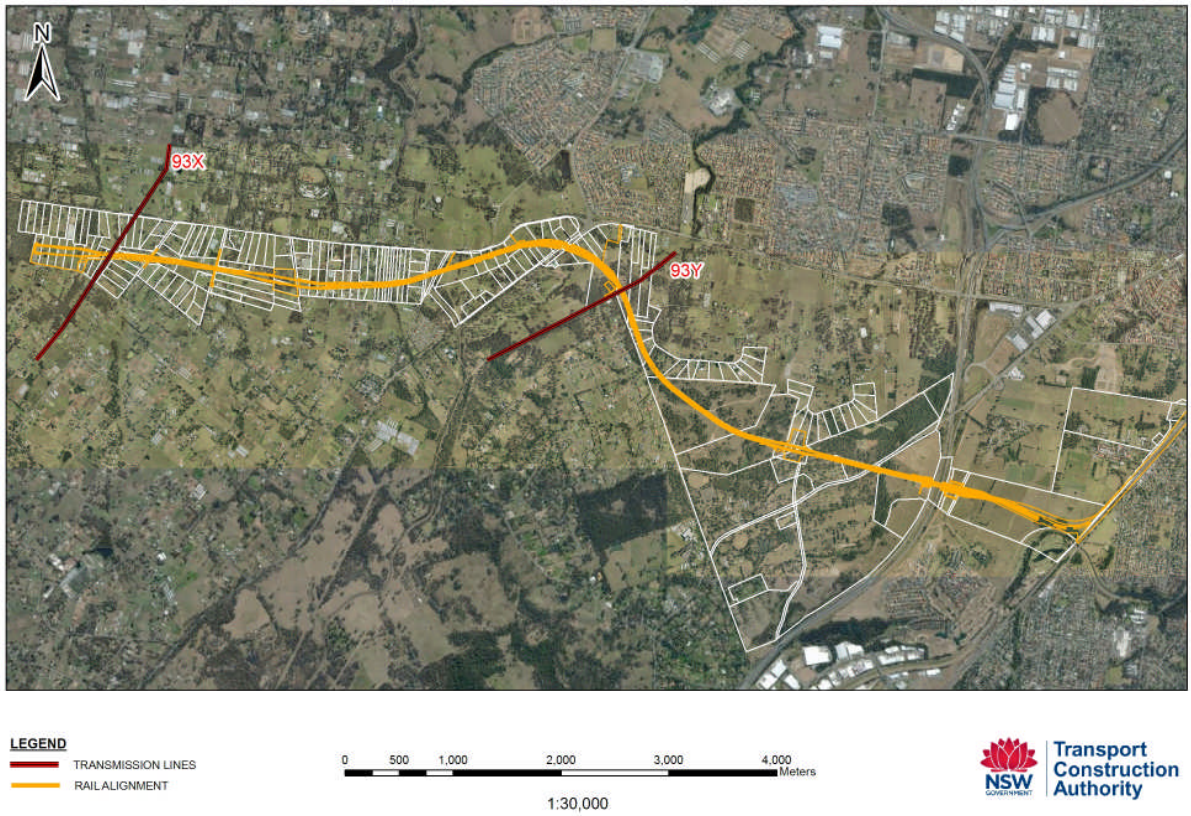
A number of site planning criteria were applied to determine the preferred location of the Integral Energy substation within the project area. These included:

- Accessibility to the electricity network.
- Accessibility to the road network.
- Proximity to the rail line.
- Availability of suitable land.
- Service and maintenance access.

There are two 132kV transmission lines within the regional electricity network that were identified as having the potential to provide the power requirements for the SWRL. The 93X transmission line which traverses the SWRL corridor near the train stabling facility and the 93Y transmission line which is located west of Denham Court (Refer to Figure 1).

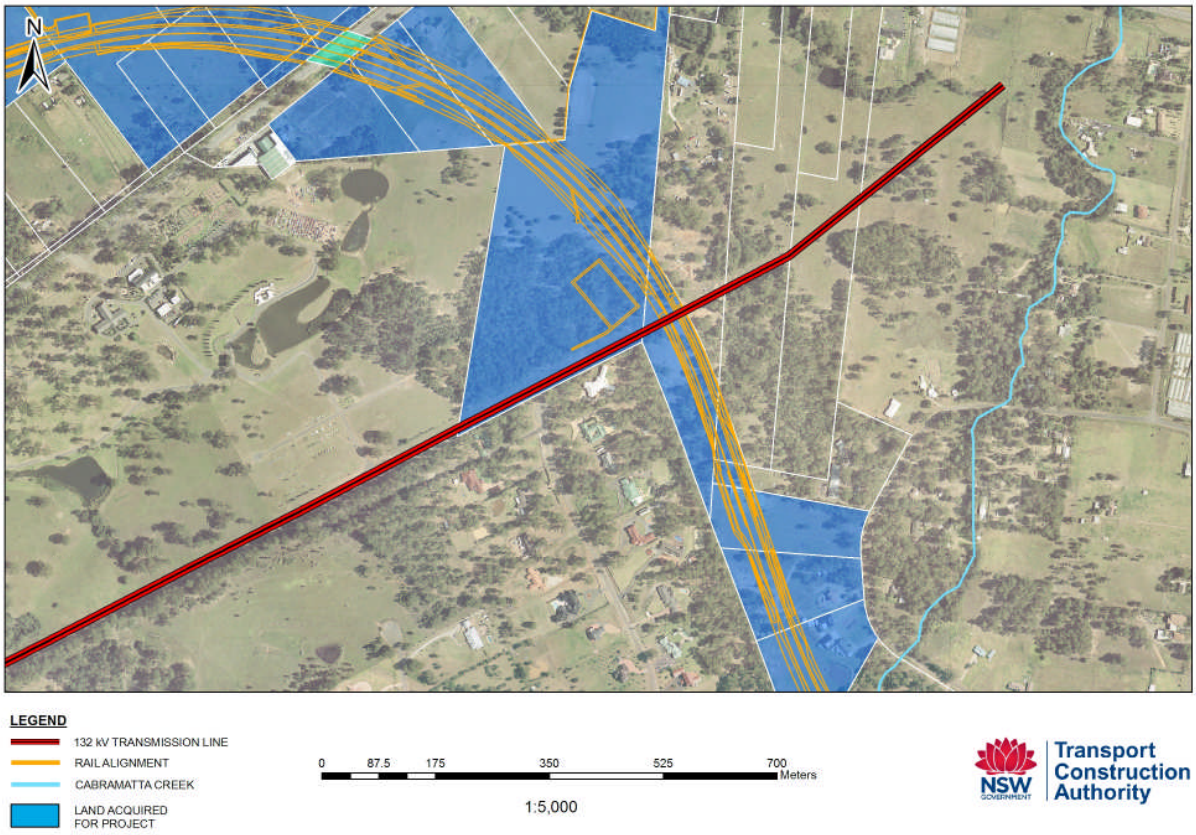
In early 2010, Integral Energy advised TCA that the 93X transmission line does not have sufficient capacity to provide the electricity requirements of the rail line as it is designated for supplying the future needs of the South West Growth Centre. As such, the proposed substation would need to connect to the 93Y transmission line.

Figure 1: Location of transmission lines within the rail corridor



To allow for the efficient operation of the rail line, the proposed substation would need to be located close to the 93Y transmission line at the point where it crosses the rail line. TCA therefore investigated land for the proposed Integral Energy substation near this junction (refer to Figure 2) to meet the above site planning criteria...

Figure 2: Substation site options



Alternative locations along the SWRL

A number of submission received during the public exhibition of the EA recommended alternative sites such as Edmondson Park for the proposed substation. TCA investigated land at Edmondson Park for a bulk supply substation and concluded that land is not suitable to provide the bulk power supply for the SWRL. It would also require the purchase of additional land within a 2 km corridor easement to connect with the existing 132kV transmission line to the proposed site via overhead transmission lines.

Furthermore, the existing land availability at Edmondson Park Station is also subject to space constraints and can only accommodate the proposed sectioning hut (which would be used to maintain voltage along the line). There is not sufficient land available to accommodate a substation as required by Integral Energy.

3.2. Local level options

The options assessment involved the analysis of the potential substation location options to the north and south of the rail line, where the 93Y transmission line crosses the rail line, against a range of environmental, social, economic and technical criteria, including:

- Land availability and property impacts.
- Construction, service and maintenance considerations.

- Hydrology.
- Visual amenity and landscape character.
- Ecology.

Table 1 provides a summary of the key factors that were considered in determining if the IES should be located on the northern or southern side of the rail line.

Table 1: Substation location options assessment

Key criteria	Sites north of the rail line	Sites south of the rail line
Land availability and property impacts	Land adjacent to the transmission line is not available for the project. The closest land available would be over 100 metres away and connections to the substation would require new easements across private property, fragmenting this land and potential future uses.	There is a large site adjacent to the rail line and transmission line that is part of the current property acquisition plan for the SWRL. The connections from the substation would not fragment private property.
Construction, service and maintenance considerations	Integral Energy has identified concerns with the length of access road required for the site, which would impact service and maintenance access. The topography to the north of the rail line is not suitable for construction and maintenance access, including delivery of large component substation infrastructure.	Access could be provided from Cassidy Street, which would not require any further upgrade. Integral Energy has confirmed that Cassidy Street would provide good maintenance and emergency access.
Hydrology	Available locations to the north of the rail line are within a flood zone. Where the flood zone is encountered, the substation would need to be elevated, resulting in greater visual impacts.	Some areas to the south of the rail line are subject to flooding, although these areas can be avoided within the proposed site off Cassidy Street.
Visual amenity and landscape character	The connections to the substation on the northern side of the rail line would be relatively longer. The need for additional towers to provide these connections would affect the visual amenity of the area.	The proximity of a substation to Cassidy Street has the potential to affect the visual amenity of rural residential properties, adding to the visual impacts of the existing transmission line. Subject to the final location of the substation, visual screening would be provided protect adjacent residences or the Forest Lawn Memorial Gardens.
Ecology	Construction of the substation on the northern side of the rail line would require removal of some native vegetation, which could include some areas of Cumberland Plain Woodland, a critically endangered ecological community. The amount of clearing required would depend on final site selection.	Construction of the substation on the southern side of the rail line would also require vegetation removal, including areas of Cumberland Plain Woodland, a critically endangered ecological community. Impacts on Cumberland Plain Woodland would be difficult to avoid completely. TCA is proposing to offset all vegetation loss due to the SWRL project.

The options assessment concluded that the available sites to the north of the rail line are not preferred for the following reasons:

- The connections between the potential substation sites and the existing 132kV transmission line would fragment rural residential property and create additional visual impacts.
- The topography to the north of the rail line is not suitable for construction access.
- The flooding constraint is more detrimental on the northern side.
- Integral Energy has expressed concerns on the maintenance requirements for a substation to the north of the rail line, in particular on the length of access road required.

As such, it was concluded that the preferred location for the proposed substation would be south of the rail line. To avoid direct impacts on rural residential land, the preferred site for the proposed substation is to the south of the rail line and to the west of the existing 132kV transmission line. This property is currently owned by the NSW Department of Planning for the purposes of the SWRL.

3.3. Site level options

The location of the substation within the preferred site was also subject to a number of considerations and constraints during the options assessment, including:

- **Hydrology**: The north-west corner of the site is subject to flooding and would require the substation to be elevated. This would have implications on the visual impacts of the substation.
- **Flora and fauna**: The site comprises Cumberland Plain Woodland, which is identified as a critically endangered ecological community under both Commonwealth and state legislation. Vegetation clearing would be required for the substation site, the connections between the substation and the existing transmission line, and the access road. The length of the access road and the connections between the substation and the existing transmission line would therefore have implications on the extent of vegetation clearing.
- **Visual amenity**: The site is adjacent to rural residential development to the south-east and the Forest Lawn Memorial Gardens to the west. The presence of a substation at this site may affect the visual amenity of these land uses.

Based on the review of the above considerations, the preferred location and design of the Integral Energy substation has been developed, as discussed in Chapter 4.

4. Preferred option

This section assesses the preferred option for the proposed bulk supply power substation.

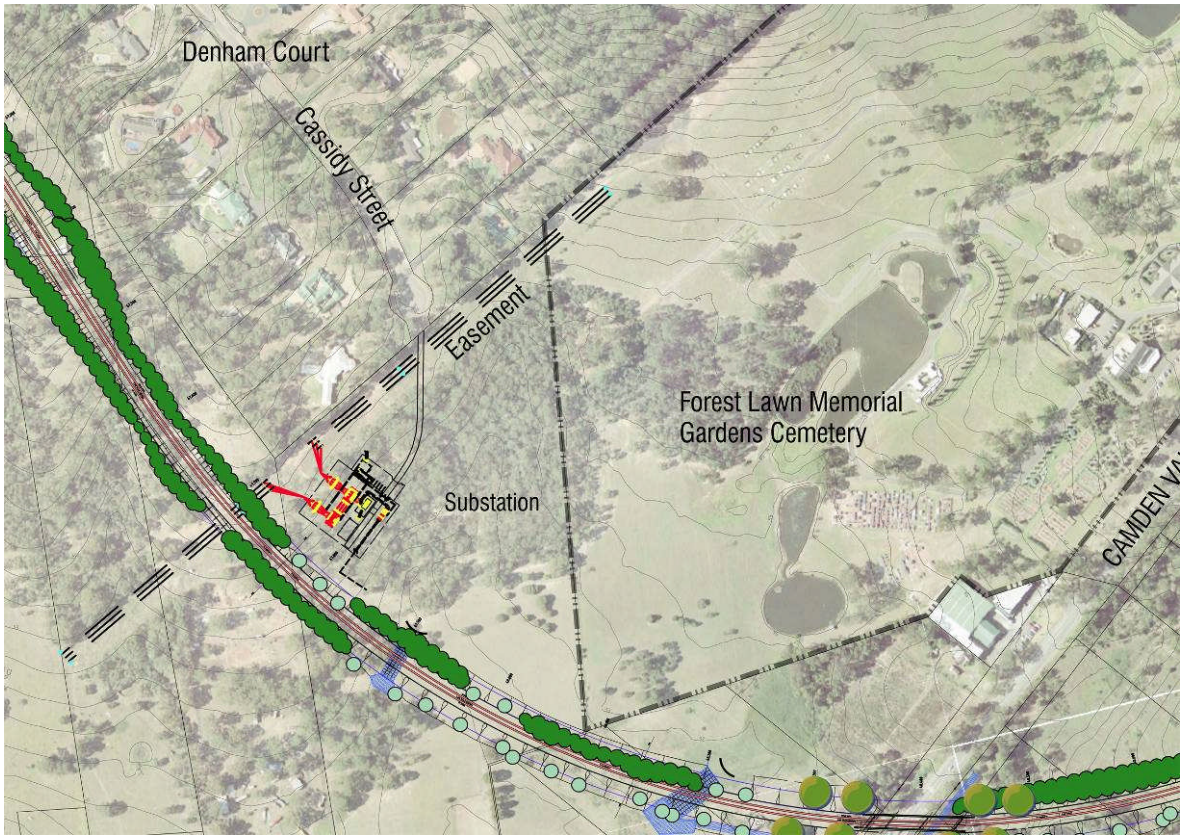
4.1. Overview of the preferred option

The preferred design and location of the Integral Energy substation is shown in Figure 3 includes the following components:

- A substation area about 69 metres long and 77 metres wide.
- One transformer with a maximum capacity of about 60MVA.
- Space for a second transformer, and appropriate connections, for *Integral Energy* requirements.
- A 132kV and 33kV control and protection room.
- Space for a future 33kV switchroom.
- Staff parking and amenities.
- A perimeter fence.
- A driveway around the perimeter fence.
- A driveway from Cassidy Street.

The substation would be initially built to provide power to the rail line, although allowance has been made for Integral Energy to upgrade the substation in the future, which would be subject to a separate environmental planning approval process. Future upgrades of the substation would not require extension to the substation footprint.

Figure 3: Preferred location of the Integral Energy substation



4.2. Benefits of the preferred option

The options assessment concluded that the location and design of the substation provided in Figure 3 provides, on balance, the best outcome from an environmental, social, economic and technical perspective. In comparison to other locations within this property, the preferred location of the substation would have the following benefits:

- The substation is now located outside the flood zone and would not require elevation, thereby minimising the height of the substation reducing potential visual impacts.
- The close proximity of the substation to the rail line and transmission line would minimise the land take required by the connections.
- The substation is now located to minimise vegetation clearance and fragmentation.
- The potential noise and visual impacts have been minimised as much as practically possible.
- The offset distance provided between the substation and the transmission line, along with the provision of a landscaped wall, would minimise visual impacts on adjacent residences.
- Construction, maintenance and emergency access to the substation meets *Integral Energy* requirements.
- A simple access gate with sign would be provided at the end of Cassidy Street but no other feature would be noticeable from along Cassidy Street, minimising the potential visual impacts on Cassidy Street residents. The need to screen the substation has been balanced against the need for sightlines to provide security.

5. Impacts of the preferred option

The preferred location option for the proposed IES is approximately 40m further north of the location presented in the SWRL EA (May 2010). This new proposed location increases the separation between the substation and residences, with the nearest Denham Court residence being approximately 40m from the substation site boundary.

Additional environmental impact assessment has been undertaken to address the revised substation location, as well as additional design details that have become available since the completion of the SWRL EA. The results of this additional assessment are provided below. These results supersede those presented in the SWRL EA.

5.1. Noise impacts

5.1.1. Additional noise assessment

In July 2010, TCA commissioned *Heggies Pty Ltd* (Heggies) to undertake an additional assessment of the potential noise impacts of the proposed substation. This assessment incorporated recently developed design information, rather than estimated substation capacities, and addressed the revised substation location.

5.1.2. Noise impact assessment results

The main noise emissions associated with substations are continuous low level humming from transformers and impulsive noise from the infrequent operation of circuit breakers.

Transformer noise

The results of the additional noise assessment indicate that the transformer noise generated by the proposed IES would comply with the *NSW Industrial Noise Policy* 1999 (INP) land use amenity and intrusiveness criteria at all existing residential receivers. That is, impact mitigation measures for transformer noise would not be required to achieve INP compliance.

Circuit breaker noise

The predicted noise levels generated by the operation of circuit breakers would exceed levels considered to have the potential to cause sleep disturbance at the nearest residences. The circuit breakers would only operate, however, when faults result in over-current trips. These events are expected to be very infrequent and are therefore unlikely to cause significant sleep disturbance or result in adverse health effects.

5.2. Visual impacts

5.2.1. Additional visual impact assessment

In July 2010A commissioned *Hassell* to undertake the additional assessment of the potential visual impacts of the proposed IES. This assessment incorporated updated design details and addressed the revised substation location. It is important to note, that the levels of the substation have not yet been finalised. The visual assessment undertaken to date has therefore been based on an assumption of substation levels, using typical substation designs. Further assessment would be undertaken, as required, once the levels have been confirmed.

5.2.2. Visual impact assessment results

Substation site

The proposed IES site is located adjacent to the northeastern side of the existing transmission line easement that runs along the northern edge of Denham Court, at the termination of Cassidy

Street, approximately 40m from the nearest residence. The existing transmission line easement accommodates 132kV lines and creates a border to Denham Court. There are restrictions on land use and planting for this easement. Vegetation within the easement is height restricted and is maintained at regular intervals by Integral Energy.

The proposed substation would be located within a dense stand of existing vegetation that would provide visual screening between the substation site and Denham Court. Sufficient land is also available for additional vegetation plantings to provide further visual screening, if required. With the existing vegetation and potential for additional plantings, the proposed substation is not expected to have an adverse visual impact on Denham Court.

Substation access route

The access road to the substation would be a continuation of Cassidy Street and would cross the easement and approach the substation from the southwest. The location of the access road to the north of the easement would mean that a substantial portion of woodland would remain between the easement and the road. This would provide a vegetation buffer that screens the view of the substation from both the road and the nearest residence (Refer to Figure 3).

Cassidy Street currently terminates at the transmission line easement with an assortment of fencing and gates. The existing streetscape at this location was assessed as having little aesthetic or scenic value. The volume of traffic required to service the substation would be very low and is unlikely to further detract from the visual quality of the streetscape. The opportunity exists to improve the aesthetics of the streetscape at the end of Cassidy Street as a result of the substation works.

5.3. Ecology impacts

The preferred option for the substation would include the removal of 0.58 hectares of Shale Plains Woodland, which is listed as part of Cumberland Plain Woodland as a critically endangered ecological community under the *NSW Threatened Species Conservation Act 1995*. The vegetation in this area is classed as “Other Remnant Vegetation” with >10% canopy cover and would provide habitat values for a range of fauna. The clearing required would incrementally add to the clearing already proposed for the SWRL including the loss of habitat for threat-listed microchiropteran bats and the Grey-headed Flying-fox.

The area is classified as non-certified under the Growth Centres biodiversity certification order.

Some of this vegetation is commensurate with Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest listed as critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The clearing for the preferred option will add 0.07 hectares of clearing of Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest (Critically Endangered under the EPBC Act) outside of the Edmondson Park Conservation Agreement area. The additional clearing is all category C vegetation (Patches with connectivity to other large native vegetation).

This additional clearing required is not likely to constitute a significant impact. Offsets would be used to address this loss as part of the overall Offset Strategy for the SWRL.

5.4. Heritage impacts

Aboriginal heritage surveys undertaken by AMBS as part of the SWRL EA (May 2010) identified a number of previously unknown sites in the vicinity of the SWRL corridor. SWRL Site 10 was identified near the proposed location of the substation. The site comprises 14 stone artefacts scattered along the existing 132kV transmission line easement. The site has been assessed as having low research potential and low archaeological significance.

The SWRL EA also identified that the construction of the SWRL would directly impact on parts of SWRL Site 10. The changed location of the substation still impacts on this Aboriginal heritage site. Activities impacting the site would include excavation, leveling and filling, which would destroy part of the site and any associated sub-surface archaeological deposit. Given the assessed low significance of this Aboriginal heritage site, its destruction represents a minor cumulative impact upon the overall heritage significance and archaeology of the region.

5.5. Hydrology impacts

Hydrology and flooding issues were assessed by *WMA Water* as part of the SWRL EA 2010 and also in response to concerns raised by the community. The preferred site has therefore been selected based on hydrology and flooding issues.

The preferred site for the substation is located within the same catchment as the site identified in the EA. The Integral Energy substation drains to Crossing 8 and is not anticipated to change the impacts of the proposed substation on hydrology or change the flooding issues.

Flood levels during the 1% AEP (1 in 100 year) event vary across the western edge of the preferred substation site from 50.3 mAHD in the north east corner to 53.3 mAHD in the south west corner. The final detailed design of the substation would need to address the potential for site flooding on the western side of the site. Additional impact mitigation measures, to update those provided in the EA, are provided in Section 6.5.

5.6. Traffic impacts

Construction and operational traffic issues were assessed by *Parsons Brinckerhoff* in the SWRL EA 2010. The nearest access road to the IES is Cassidy Street, which is a local road that provides access to 11 rural residential properties. There is no kerb and guttering and a cul-de-sac is located at its western end. Cassidy Street links with Culverston Avenue.

Construction of the Integral Energy substation would result in some increase in traffic movements along Cassidy Street and the broader area, primarily related to the delivery of the substation components. A construction compound (compound 5) and stockpile area is proposed in close proximity to Cassidy Street; however this site would be accessed from the north via Jardine Drive, and as such there would be minimal construction traffic impact on Cassidy Street. Installing and commissioning of the substation would be undertaken over four to six months. The additional construction traffic is unlikely to have a significant impact on traffic in the area and impacts would be minimised through the implementation of a Construction Traffic Management Plan.

Once operational, inspections of the Integral Energy substation would typically be conducted every eight weeks by a maintenance crew with a light commercial vehicle. Replacing or rebuilding of major equipment, such as circuit breakers, switchgear or transformers, would occur every five to six years. This would involve a heavy-duty tabletop truck up to 22 tonnes GWM. Maintenance works would generally occur during normal weekday business hours.

Fault and emergency maintenance would be undertaken in response to unpredicted or impending failure, or incidents or events that have the potential to impact safety, the environment or supply. This would require an immediate response and may occur at any time.

Overall, the substation would generate very few traffic movements and local traffic impacts would be minimal.

5.7. Electric and magnetic fields

Electric and magnetic fields (EMF) are produced wherever electricity or electrical equipment is in use. Both substations and high voltage transmission lines produce EMF. The typical magnetic

field strength for a transmission line is in the range of 10-200 milligauss (mG), whilst substations have a typical measurement of 1-6mG. These measurements are taken directly underneath a transmission line and at the fence of a substation, with a reduction in EMF recorded with increased distance from this infrastructure.

For comparison, the typical magnetic field strength for common household sources of EMF is as follows:

- Personal computer: 2-30mG.
- Television: 0.2-2.0mG.
- Hair dryer: 10-70mG.
- Fridge: 2-5mG.
- Toaster: 2-10mG.

The proposed Integral Energy substation would have a negligible effect on EMF at nearby residences due to the distance between the substation and property and the presence of an existing transmission line. In addition, the anticipated EMF levels are well below the guideline from the International Commission on Non-Ionizing Radiation Protection of 1000mG for general exposure for up to 24 hours per day.

6. Impact mitigation measures

This section provides the specific mitigation measures that would be applied to manage the potential environmental impacts due to the construction and operation of the proposed substation.

6.1. Noise

The results of the noise assessment for the proposed Integral Energy substation indicate that impact mitigation measures are not required to achieve compliance with the relevant INP criteria or reduce the risks of sleep disturbance.

Monitoring would be carried out once the substation is operational to:

- Confirm the predicted compliance of transformer noise with INP criteria.
- Provide further information on the potential for circuit breaker and transformer noise to cause sleep disturbance.

6.2. Visual impacts

The location of the substation within a dense stand of vegetation would provide initial screening and reduce the impact of the substation. The following additional impact mitigation measures would be implemented as part of the project:

- An additional visual buffer would be established along the southern boundary of the substation via a planting program.
- In conjunction with the establishment of the substation access road, landscaping measures would be implemented to improve the amenity of the streetscape at the end of Cassidy Street.
- To minimise light spillage on adjacent properties, the detailed design and construction of the substation would be carried out in accordance with Australian Standard 4282-1997 *Control of the obtrusive effects of outdoor lighting*. Security lighting would be directed towards the substation and not in the direction of adjacent properties.

6.3. Ecology

The mitigation measures for the proposed substation would be the same as those proposed for the overall SWRL in the SWRL EA. In order for the project as a whole to meet the requirements to improve or maintain biodiversity values a comprehensive offset strategy would be required. This would need to address the clearing and associated habitat loss at the proposed Integral Energy substation site.

6.4. Heritage

As outlined in the SWRL EA, Site 10 has been assessed as having low research potential and low archaeological significance. Results from archaeological excavations undertaken in the local area on similar landforms by *Navin Officer* (2007) indicate that it is unlikely that subsurface archaeological deposits are present at this site, and that archaeological material is limited to a surface scatter of stone artefacts. As such, further archaeological investigation of this site, including archaeological excavation, is unlikely to increase the current scientific knowledge of the region. Because part of the site would be directly impacted by the Integral Energy substation the

Aboriginal community should be offered the opportunity to relocate artefacts outside of the construction area prior to commencement of works.

6.5. Hydrology

The following mitigation measures would be implemented in addition to those proposed in the May 2010 EA:

- Substation construction and operation would be carried out in a manner that does not result in obstruction or fill of the creek adjacent to the site.
- Site drainage needs to be provided so that flows through the site are not impeded.

6.6. Traffic

A Construction Traffic Management Plan would be prepared to manage the potential traffic impacts associated with Integral Energy substation construction.

7. Conclusion

In accordance with Section 1.2.2 of the SWRL EA (2010) TCA has now completed an options assessment which has investigated and assessed potential alternative sites available to provide a bulk supply substation to service the SWRL Glenfield to Leppington Rail Line. The options assessment also involved the environmental impact assessment of key engineering, environmental and planning issues.

The proposed bulk supply substation is critical to the operation of the SWRL which forms an essential part of the power strategy to provide the electricity to power trains between Leppington and Glenfield. The substation must therefore form part of the SWRL project to ensure that trains can operate on day 1 (2016).

The assessment involved the consideration of various site planning criteria concluded that the current proposed site provides the most appropriate location for a bulk supply substation to power the SWRL. Alternative sites are either unavailable for such a use or require a greater infrastructure input to service a new site located away from the 132 kV transmission line. The proposed site also meets the operational and siting requirements of *Integral Energy* who are proposed to be the owner and operator the proposed bulk supply substation.

Since the EA was on public exhibition, the proposed substation site has now been relocated 40 m away from the nearest residential property and is therefore unlikely to generate significant noise, traffic or visual impacts on residential amenity. The site has also been chosen to minimise hydrology and flooding issues and vegetation loss.

The implementation of mitigation measures such as a landscape plan, vegetation offsets and traffic access mitigation measures would ensure that the proposed construction and operation of the substation would occur with minimal environmental impact.

Further design development of the substation would also occur as part of the construction phase once the final power strategy is completed by Integral Energy, TCA and RailCorp.

The proposed site for the Integral Energy bulk supply substation should therefore be approved as part of the Project Approval that is being sought by TCA for the proposed SWRL Glenfield to Leppington Rail Line.