Australian Rail Track Corporation

Maitland to Minimbah Third Track Project

Submissions Report including Preferred Project Report

September 2010

H8R-REP-S2G-ENV-0019-0

Appendix E
Noise and Vibration Study

Appendix E

Noise and Vibration Study

Australian Rail Track Corporation

Maitland to Minimbah Third Track

Submissions Report

Noise and Vibration Study

September 2010

H8R-REP-S2G-ENV-0021-0

GHD

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Document Status

Rev No.	Date	Revision Description	Prepared	Reviewed		Approved	
				Name	Signature	Name	Signature
0	01/09/2010	Original	V Chavand	C Evenden		S Taylor	

Contents

Table Index

Figure Index

Appendices

Glossary of Terms

Chainage	The chainage at a location along a rail line is the distance of that point in relation to Sydney (NSW only) based on 0.000 kilometres being located at the end of Central No. 1 Platform.
Construction Environmental Management Plan	A document setting out the management, control and monitoring measures to be implemented during construction of a development, to avoid or minimise the potential environmental impacts identified during an environmental impact assessment process.
Construction impact zone	The area which would be affected by construction works as part of the Project. The construction impact zone incorporates the Project's extent of works, proposed site access, construction compound locations and spoil locations.
Cut	An excavation for constructing below the natural ground level.
dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
Director-General's Requirements	Requirements for an environmental assessment issued by the Director-General of the NSW Department of Planning in accordance with the Environment Planning and Assessment Act 1979.
Down Main	Primary (main) rail line that trains traverse when they are heading away from Sydney (usually positioned on the left when your back is to Sydney).
Fill	Earth used to construct an embankment.
Groundborne Vibration	Groundborne vibration is vibration transmitted from source to receiver via the medium of the ground.
Headways	The time difference between scheduled train services.
Hunter 8 Alliance	Hunter 8 Alliance, which has been formed to deliver a new third track and ancillary infrastructure between Maitland and Minimbah.
Investigation area	The investigation area is the area assessed throughout the Environmental Assessment and comprises the construction impact zone and additional investigation areas
$L_{A90\ (Time)}$	The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. LA90 (15 min).
$L_{Aeq\ (Time)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{Aeq\ (15\ hr)}$	The LAeq noise level for the period 7:00 to 22:00 hours.
$L_{Aeq\ (9\ hr)}$	The LAeq noise level for the period 22:00 to 7:00 hours.
Level crossing	A crossing provided at grade across the railway corridor.

Mitigation	Reduction in severity.
Overbridge	Where a road or pedestrian footway is situated over the railway line.
Peak Particle Velocity	Current practice for assessments of the risk of structural damage to buildings use measurements of Peak Particle Velocity (PPV), which is the maximum vector sum of three orthogonal time-synchronized velocity components regardless of whether these component maxima occurred simultaneously.
Plant	Construction machinery, vehicles or equipment needed to carry out mechanical or construction activities.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period. This is the level used for assessment purposes. It is defined as the median value of: ◗ All the day assessment background levels over the monitoring period for the day. ◗ All the evening assessment background levels over the monitoring period for the evening. Or ◗ All the night assessment background levels over the monitoring period for the night.
Receiver	A noise modelling term used to describe a map reference point where noise is predicted. A sensitive receiver would be a home, work place, church, school or other place where people spend time.
RMS	Root Mean Square.
Short-term Vibration	Vibration that occurs so infrequently that it does not cause structural fatigue nor does it produce resonance in the structure.
Tonality	Noise containing a prominent frequency or frequencies characterised by definite pitch.
Vibration	The variation of the magnitude of a quantity which is descriptive of the motion or position of a mechanical system, when the magnitude is alternately greater and smaller than some average value or reference. Vibration can be measured in terms of its displacement, velocity or acceleration. The common units for velocity are millimetres per second (mm/s).
Underbridge	Where a road or pedestrian underpass is situated under the railway line.
Up Main	Primary (main) rail line that trains traverse when they are heading toward Sydney (usually positioned on the right when your back is to Sydney).
Up Relief Main	Secondary rail line that runs parallel with the main line(s) that trains traverse when they are heading toward Sydney and is usually positioned on the right of the main line when your back is to Sydney. Usually provides a passing facility, enabling trains to pass those traversing or stationary on the main line thus giving relief to the main line operations.
VDV	Vibration Dose Value (VDV) - As defined in BS6472 – 1992, VDV is given by the fourth root of the integral of the fourth power of the frequency weighted acceleration.

Executive Summary

This noise and vibration assessment has been prepared by the Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC) as part of the Submissions Report for the Maitland to Minimbah Third Track Project (the Project).

Construction Noise and Vibration

The following amendments affect the extent of zones potentially impacted by construction activities:

- Modifications in blasting locations as a result of earthworks design changes.
- Deferment of works between the nominated chainages.
- Relocation and addition of construction compounds.

These have been reviewed and are discussed in Section 3 of this report.

The mitigation measures and strategy remain as outlined in the Noise and Vibration Impact Assessment (Appendix K of the Environmental Assessment).

Operational Rail Noise

With regards to operational noise and vibration, the major changes pertain to deferment of construction of the third track and installation of rail turnouts at the chainages described in Section 1.2.

The operational rail noise model has been updated to include the following:

- Change in earthworks and rail alignment design since preparation of the Environmental Assessment noise model.
- Operational scenarios with and without the abovementioned works deferments.

Table E-1 and Table E-2 present the extent of receivers where the Department of Environment, Climate Change and Water (DECCW) *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (IGANRIP) is triggered (the IGANRIP L_{eq} trigger levels are predicted to be exceeded, and the existing noise levels increased by 2 dB(A) or greater). It also identifies when such exceedances of the IGANRIP trigger levels are first predicted to occur. Note that existing rail noise levels already exceed the IGANRIP trigger levels at some receivers. Also note that reported exceedances account for a + 2.5dB(A) façade correction.

Table E-1 Affected Receivers per Noise Catchment Areas – Up Side

Chainage	Noise Catchment Area ID	Affected Receivers	IGANRIP Trigger (Y or N)	IGANRIP Exceedance (2022)	Predicted Initial Year of Trigger
222.900 – 223.850	U1	All three residences in U1 (MMU-003.5, MMU-004, MMU-005).	Y	5 to 7 dB(A)	2012

Chainage	Noise Catchment Area ID	Affected Receivers	IGANRIP Trigger (Y or N)	IGANRIP Exceedance (2022)	Predicted Initial Year of Trigger
222.300 – 222.700	U2	All land located between the 60dB(A) contour and rail corridor proposed for tourist development (accommodation).	Dependant on the proposed site development and layout.		
220.350 – 222.300	U3	Six residences in U3 (MMU-012, Lot 1 and 2 Sec 7 / DP 758078, Lot 8 to Lot 10 Sec 7 / DP 758078).	Y	3 to 6 dB(A)	2012
214.100 – 215.350	U4	IGANRIP compliance predicted	N	-	-
210.000 – 210.950	U5	Nelson Street (MMU-039, MMU-040) and John Street (MMU-046) residences, Greta.	Y	5 to 8 dB(A).	2012
205.100 – 206.500	U6	Both residences in U6 (MMU-053 and Lot 6 / DP 1112171).	Y	3 dB(A) at MMU-053. 5 dB(A) at Lot 6 / DP 112171.	2022 at MMU-053 2012 at Lot 6 / DP 112171
202.050 – 202.500	U7	Single residence in U7 (MMU-057).	Y	3 dB(A).	2022
200.250 – 201.100	U8	All four residences in NCA U8 (MMU-060 to MMU-062, 510/DP 774517). MMU-061 is the most affected residence in this NCA.	Y	Up to 10dB(A) at MMU-061. Up to 7 dB(A) at MMU-060 and MMU-062. 3 dB(A) at 510/DP 774517	2010 (existing) at MMU-061 2012 at MMU-060 and MMU-062 2022 at 510/DP 774517
196.400 – 197.400	U9	All land located between the 60dB(A) contour and rail corridor if proposed for residential development.	Dependant on the proposed site development and layout.		

Chainage	Noise Catchment Area ID	Affected Receivers	IGANRIP Trigger (Y or N)	IGANRIP Exceedance (2022)	Predicted Initial Year of Trigger
195.600 – 196.200	U10	Residences on Dumont Close	Y	Up to 7dB(A)	2010 (existing) for southernmost Dumont Close residence 2012 for other Dumont Close residences (southern end)
194.500 – 194.800	U11	All houses directly exposed to the rail lines on Railway Parade and Wentworth Street, Telarah.	Y	Up to 10dB(A).	2010 (existing)

Table E-2 Affected Receivers per Noise Catchment Areas – Down Side

Chainage	Noise Catchment Area ID	Affected Receivers	IGANRIP Trigger (Y or N)	IGANRIP Exceedance (2022)	Predicted Initial Year of Trigger
222.300 – 223.300	D1	MMD-003	Y	3 dB(A)	2022
221.000 – 221.350	D2	IGANRIP compliance predicted	N	-	-
219.250 – 219.700	D3	Pothana Winery (MMD-007)	Y	5 dB(A)	2012
218.000 – 218.150	D4	Single residence in D4 (MMD-008)	Y	7 dB(A)	2012
215.650 – 217.200	D5	All land located between the 60dB(A) contour and rail corridor if proposed for residential development.	Dependant on the proposed site development and layout.		
214.850 – 215.100	D6	Existing residences in D6 have been acquired by the NSW RTA for demolition.	N	-	-

Chainage	Noise Catchment Area ID	Affected Receivers	IGANRIP Trigger (Y or N)	IGANRIP Exceedance (2022)	Predicted Initial Year of Trigger
209.850 – 210.900	D7	Lloyd Street residences (Lot 81 DP 607773, Lot 106 DP 250308, Lots 4 and 5 DP 976366). Two residences off Mansfield Street (MMD-018.3 and Lot 104 DP 250308). MMD-017, Lot 1 DP 882276, Lot 2 DP 882276.	Y	4 to 7 dB(A)	2012
209.850 – 210.900	D7	Residences west of Mansfield Street	Y	3 dB(A)	2022
206.750 – 209.850	D8	All land located between the 60dB(A) contour and rail corridor if proposed for residential development.	Dependant on the proposed site development and layout.		
205.950 – 206.300	D9	Three residences east of Lovedale Road (MMD-024, Lot 261 DP / 755211, Lot 32 / DP 846828). One residence west of Lovedale Road (Lot 1 DP 434185).	Y	13 dB(A) at MMD-024 and Lot 261 DP / 755211. 3 dB(A) at Lot 32 / DP 846828. 4dB(A) at Lot 1 DP 434185.	Existing (2010) at MMD-024 and Lot 261 DP / 755211 2022 at Lot 1 DP 434185 and Lot 32 / DP 846828
203.050 – 205.100	D10	IGANRIP compliance predicted	N	-	-
200.800 – 202.500	D11	Clifton House (MMD-029) MMD-030 to MMD-032	Y	11 dB(A) at Clifton House. 3 dB(A) at MMD-030 to MMD-032	Existing (2010) at Clifton House 2022 at MMD-030 to MMD-032
195.600 – 196.250	D12	Two residences at the eastern end of Wollombi Road (including MMD-041)	Y	9-11 dB(A)	Existing (2010)

The transition from three to two tracks will require some trains to stop in the vicinity of the following turnout locations:

- Chainage 216.320 kilometres (Branxton).
- Chainage 196.100 kilometres (Farley).

The operational noise assessment described in the Environmental Assessment assumes all trains operate at a set speed within the investigation area, and does not make provisions for stopping, idling and starting events. There is predicted to be a maximum of four per day at Branxton and one per day at Farley.

Given the large number of daily movements (see Appendix K of the Environmental Assessment), train stop/start events nominated above are unlikely to affect the operational L_{eq} rail noise levels. However, local L_{max} levels are likely to increase in the vicinity of the turnout locations as trains stop or start. Major noise sources in such events are wheel squeal and shunting as the train halts.

Table E-3 presents the extent of receivers where IGANRIP may be triggered (the IGANRIP L_{max} trigger levels are predicted to be exceeded, and the existing noise levels increased by 3 dB(A) or greater).

Table E-3 Affected Receivers per Noise Catchment Areas – L_{max} Levels

Chainage	Noise Catchment Area ID	Affected Receivers
196.400 – 197.400	U9	Depending on further investigation, land located along rail corridor if proposed for residential development.
195.600 – 196.200	U10	Residences on the southern side of Regiment Road and on Dumont Close.
215.650 – 217.200	D5	Depending on further investigation, land located along rail corridor if proposed for residential development.
195.600 – 196.250	D12	Two residences at the eastern end of Wollombi Road (including MMD-041)

Operational Rail Vibration

Findings with regards to operational vibration remain as described in the Environmental Assessment. Vibration control should be considered where dwellings are located within approximately 40 metres from the nearest rail track, which involves the following receivers (excluding those located along the proposed deferments of works):

- Two residences east of Lovedale Road (MMD-021 and Lot 261 DP / 755211) in NCA D9.
- Clifton House (MMD-029) in NCA D11.
- One residence at the end of Winders Lane, Lochinvar (MMU-061) in NCA U8.

Operation Noise and Vibration Management Plan

As described in the Environmental Assessment, the Hunter 8 Alliance strategy to mitigate operational rail noise and vibration is to develop an Operation Noise and Vibration Management Plan for the Project. Implementation of this Plan would be deferred for receivers located between chainages 209.825 kilometres and 216.320 kilometres, and chainages 194.500 kilometres and 196.100 kilometres. The proposed approach of the Plan has been updated in Section 4.2 of this report.

1. Introduction

This noise and vibration assessment has been prepared by the Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC) as part of the Submissions Report for the Maitland to Minimbah Third Track Project (the Project). This report has been prepared to assess how proposed modifications to the design, construction and operation of the Project may amend or increase the potential noise and vibration impacts identified in the Environmental Assessment, and develop any additional mitigation measures required to address such amended or increased potential impacts.

1.1 Background

The Australian Rail Track Corporation (ARTC) proposes to construct a third train track adjacent to the existing two tracks of the Main Northern Railway between Maitland and Minimbah, within the Hunter Valley, NSW (the Project).

The Project commences in Farley approximately two kilometres west of Maitland Station and continues through the local government areas of Maitland, Cessnock and Singleton for approximately 30 kilometres, concluding at Minimbah.

The Project would facilitate the more efficient movement of coal to the Port of Newcastle.

An Environmental Assessment of the Project was completed in May 2010 (Hunter 8 Alliance, 2010) in accordance with the Director General's requirements for undertaking the environmental assessment received by ARTC on 25 May 2009. The Environmental Assessment was then placed on public exhibition from 9 June 2010 to 12 July 2010 in accordance with Section 75H(3) of the *Environmental Planning and Assessment Act* 1979 (EP&A Act). During this time submissions were invited from members of the public, government agencies and stakeholders.

As a result of the community consultation process and further consideration of the project implementation, a number of modifications to the Project as described in the Environmental Assessment, are proposed.

1.2 Description of Project Modifications

Several key modifications to the Project as described in Chapter 7 of the Environmental Assessment are proposed. These modifications are summarised by the following:

- Amendments to the earthworks design required for the third track, including modification to the design of the down side access track.
- A reduction in the required property acquisition resulting from the amendments to the earthworks design.
- Additional potential spoil disposal areas and the addition of potential sources of appropriate track construction material adjacent to the rail corridor (known as borrow pits).
- Alternative and proposed new locations for construction compounds (primary and secondary) and associated changes to traffic access and management.

- The proposed phasing of construction of the Project: deferment of the construction of the third track (and associated earthworks, infrastructure and construction support facilities) between chainages 209.825 kilometres and 216.320 kilometres (Branxton to Greta), and chainages 194.500 kilometres and 196.100 kilometres (Farley to Telarah).
- To facilitate operations until construction of the final phase is completed, installation of rail turnouts would be required at the following chainages:
  - 216.320 kilometres (Branxton).
  - 209.825 kilometres (Greta).
  - 196.100 kilometres (Farley).

Further detail on the proposed modifications to the design, construction and operation of the Project are provided in Chapter 5 of the Submissions Report.

1.3 Objectives and Purposes of this Report

Under Section 75H(6) of the *Environmental Planning and Assessment Act* 1979, the Department of Planning requires the Hunter 8 Alliance to prepare and submit a response to submissions made during the public exhibition period.

The objective of the Submissions Report (to which this report forms an appendix) is to:

- Provide information about the nature of the submissions received.
- Discuss how submissions have been considered and addressed.
- Describe aspects of the Proposal that have been modified.
- Provide specialist reports that incorporate issues raised in submissions and address the modifications to the Project.
- Describe how the Statement of Commitments has been revised to reflect the recent community consultation.

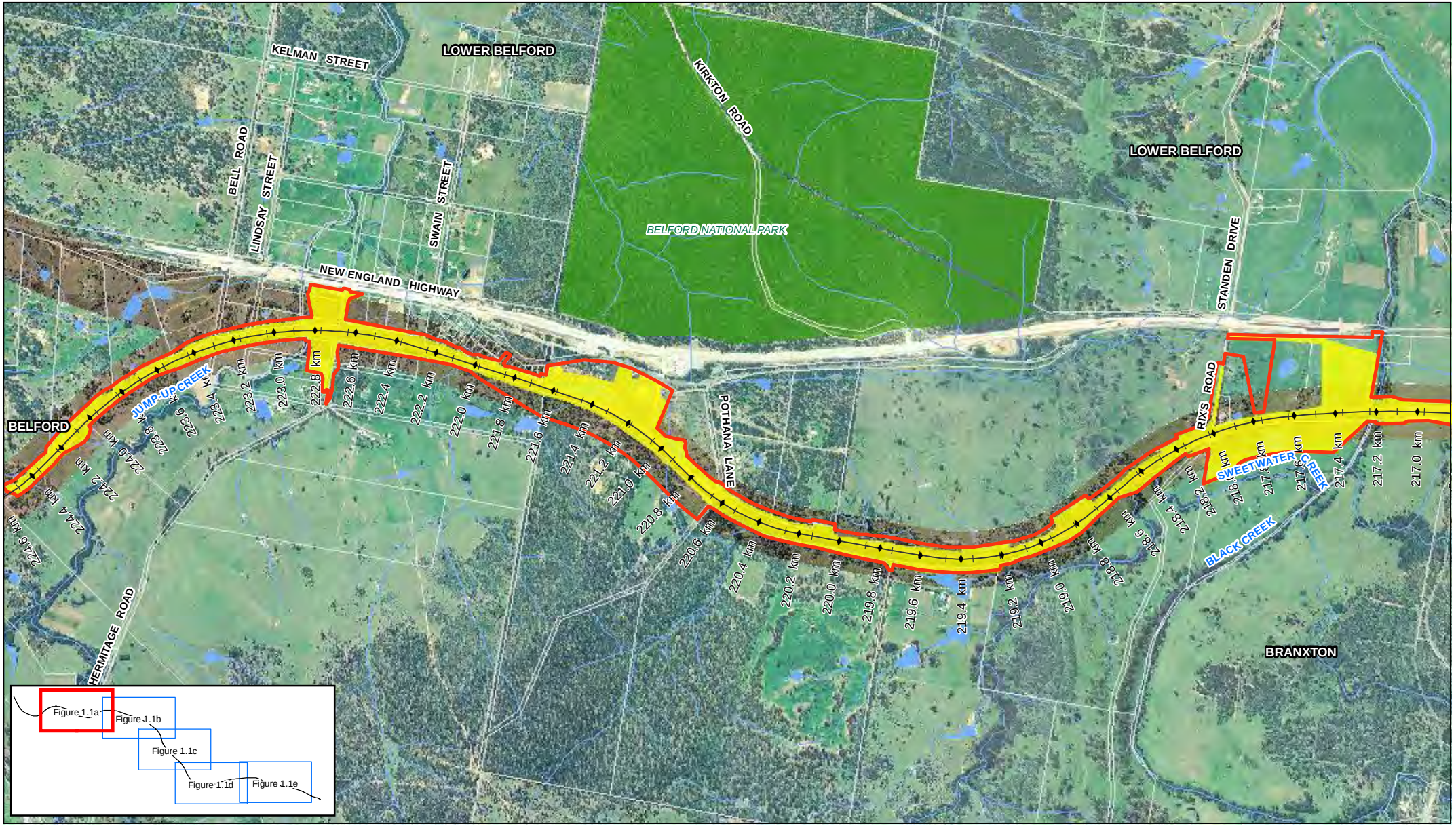
The purpose of this noise and vibration assessment report is to consider how the proposed modifications to the design, construction and operation of the Project may amend the impact assessment included in the noise and vibration assessment included in the Environmental Assessment, and whether changes or additions to the mitigation measures included in the Environmental Assessment are required.

This Noise and Vibration Impact Study also assists in informing the responses in the Submissions Report to issues relating to noise and vibration raised during the Environmental Assessment exhibition period.

1.4 Revised Construction Impact Zone

The proposed Project modifications described in Section 1.2 and detailed in Chapter 5 of the Submissions Report result in revisions to the construction impact zone described in Section 7.8 and shown in Figure 7.1 of the Environmental Assessment.

This assessment is based on the revised construction impact zone as shown in Figure 1.1.



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0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Watercourse
- Cadastre
- Revised Construction Impact Zone
- Revised Investigation Area
- Watercourse Area
- National Park

Maitland to Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Project Plan

Figure 1.1a

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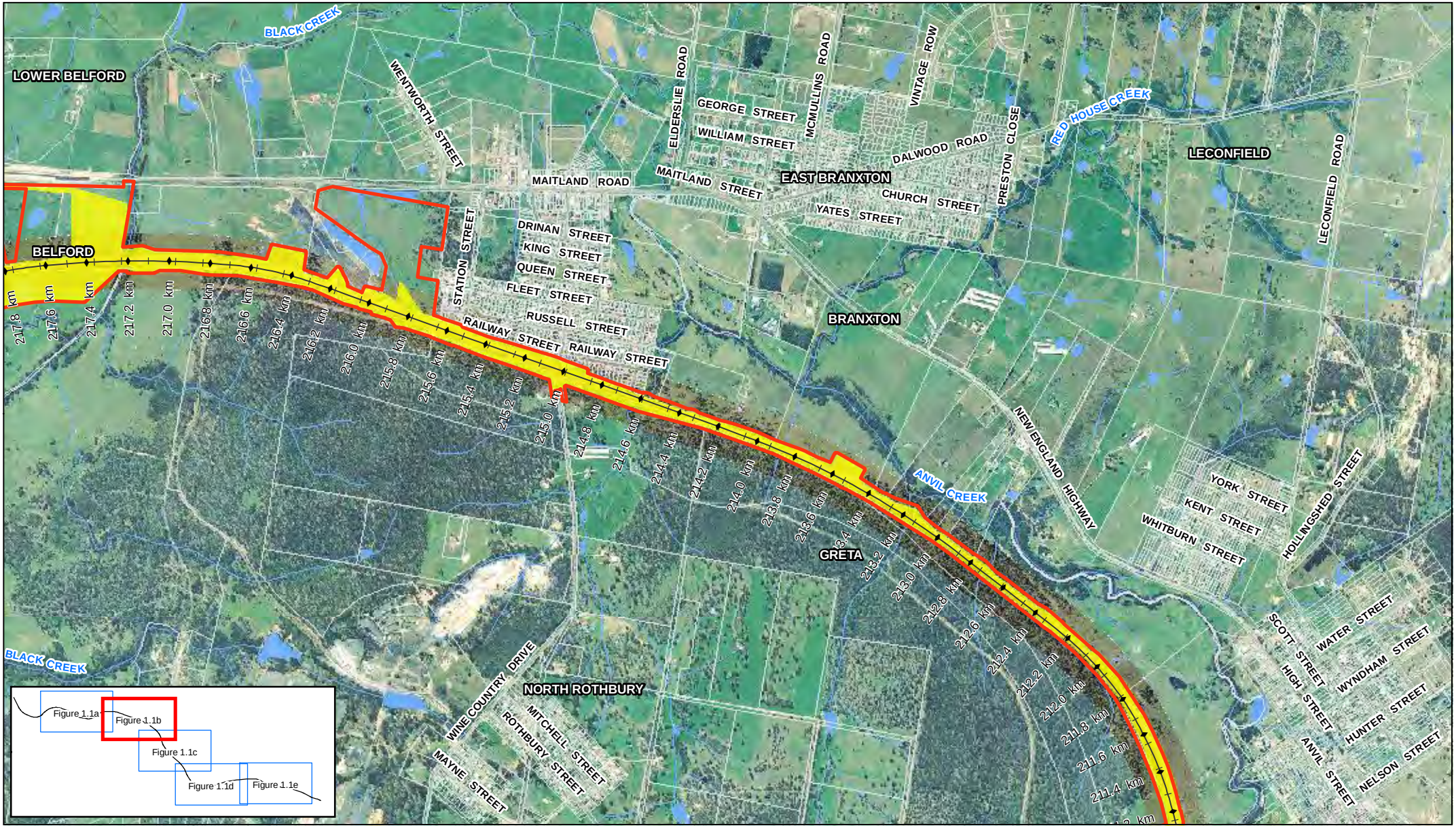

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Watercourse
- Cadastre
- Revised Construction Impact Zone
- Revised Investigation Area
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- National Park

Hunter ALLIANCE

Maitland to Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Project Plan

Figure 1.1b

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Maitland to Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Project Plan

Figure 1.1c

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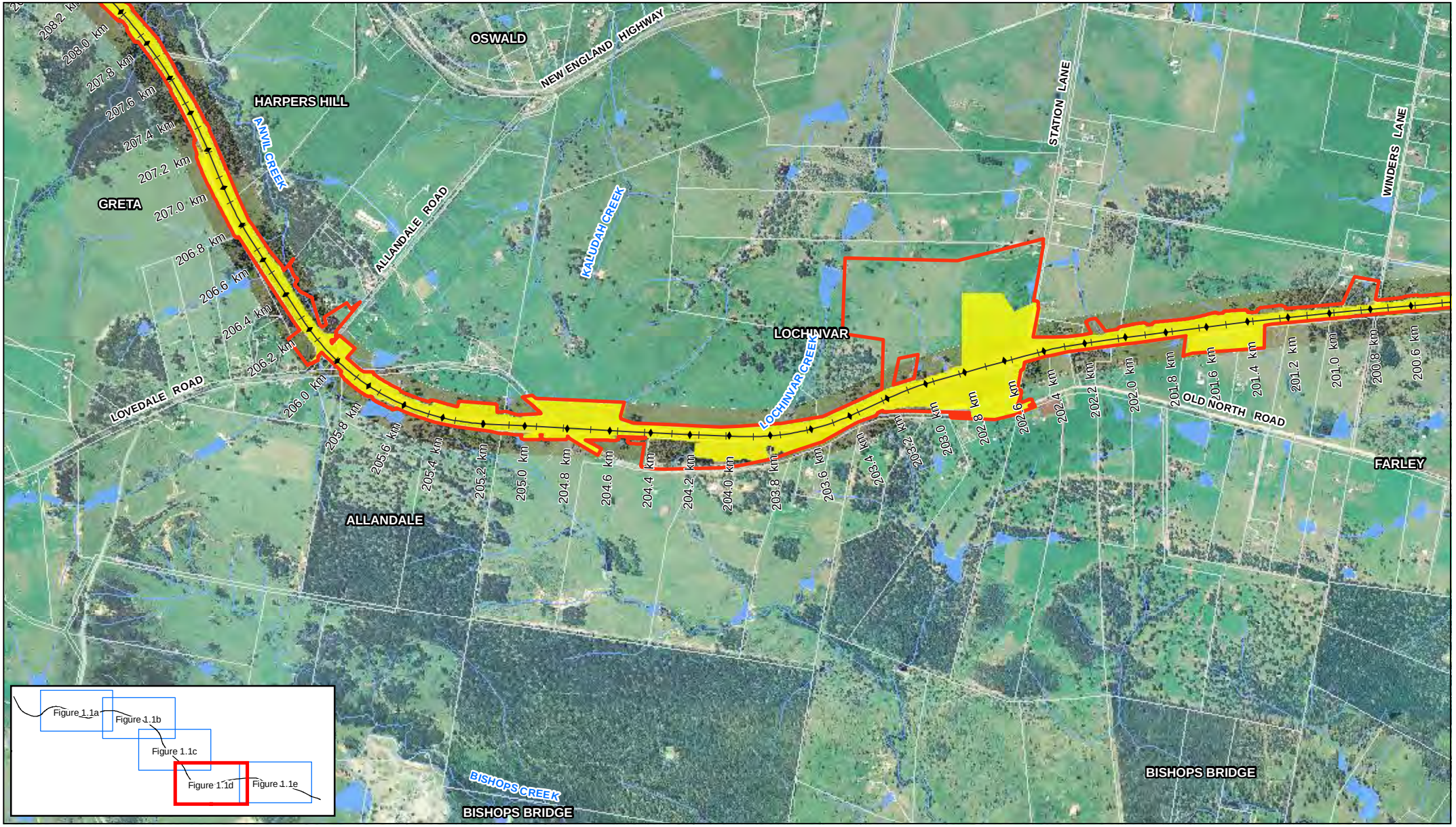

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

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- National Park

Maitland to Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Project Plan

Figure 1.1d

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- National Park

Maitland to Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Project Plan

Figure 1.1e

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2. Methodology

Noise and vibration goals remain as described in the Noise and Vibration Impact Assessment (Appendix K of the Environmental Assessment).

2.1 Construction Noise and Vibration

The project amendments do not affect the assessment methodology outlined in the Noise and Vibration Impact Assessment (Appendix K of the Environmental Assessment). However, the following amendments do affect the extent of zones potentially impacted by construction activities:

- Modifications in blasting locations as a result of earthworks design changes.
- Deferment of works between the nominated chainages.
- Relocation and addition of construction compounds.

These have therefore been reviewed and are discussed in Section 3 of this report.

2.2 Operational Noise and Vibration

With regards to operational noise and vibration, the major changes pertain to deferment of construction of the third track and installation of rail turnouts at the chainages described in Section 1.2.

The operational rail noise model has been updated to include the following:

- Change in earthworks and rail alignment design since preparation of the Environmental Assessment noise model.
- Operational scenarios with and without the abovementioned works deferments.

The modelling methodology and parameters otherwise remain as per those described in the Noise and Vibration Impact Assessment (Appendix K of the Environmental Assessment).

The deferment of the third track construction along the abovementioned chainages will also lead to trains stopping, idling and starting near the turnout locations to allow trains to cross paths. This issue has been discussed qualitatively.

3. Impact Assessment

3.1 Existing Environment

The existing environment remains identical to that described in Section 3 of the Noise and Vibration Impact Assessment (Appendix K of the Environmental Assessment).

Noise sensitive receivers along the Project route are essentially residential receivers. Table 3-1 and Table 3-2 present the noise catchment areas (NCA) identified on the up side and down side of the Project, respectively, including land which has been approved or has entered the approval process for residential development but is not developed yet (such as Heritage Green).

Table 3-1 Noise Catchment Areas – Up Side

Chainage	NCA ID	Land Description
222.900 – 223.850	U1	Three scattered residences on rural land, west of Hermitage Road, Belford.
222.300 – 222.700	U2	Proposed Service Centre and Motel (approved).
220.350 – 222.300	U3	Eight scattered residences from Pothana Lane to Hermitage Road, Belford.
214.100 – 215.350	U4	Built-up residential area between Thomas Street and Short Street, Branxton.
210.000 – 210.950	U5	Scattered residences and proposed residential subdivision off Nelson Street and Florence Street, Greta.
205.100 – 206.500	U6	Two residences on rural (grazing) land off Allandale Road, Allandale.
202.050 – 202.500	U7	One residence on rural (grazing) land off Station Lane, Lochinvar.
200.250 – 201.100	U8	Three scattered residences on rural (grazing) land off Winders Lane, Farley/Lochinvar.
196.200 – 197.600	U9	Heritage Green.
195.600 – 196.200	U10	Built-up residential subdivision between Wollombi Road and Heritage Green.
194.400 – 194.750	U11	Built-up residential area between South Street and Lismore Street, Telarah.

Table 3-2 Noise Catchment Areas – Down Side

Chainage	NCA ID	Land Description
222.300 – 223.300	D1	3 scattered residences off Hermitage Road.
221.000 – 221.350	D2	2-3 isolated residences west of Pothana Lane.
219.250 – 219.700	D3	Pothana Winery.
218.000 – 218.150	D4	One isolated residence at the end of Standen Drive.
215.650 – 217.200	D5	Huntlee Residential Development (going through approval process).
214.850 – 215.100	D6	Two residences off Wine Country Road, Branxton.
209.850 – 210.900	D7	Built-up residential area in Greta.
206.750 – 209.850	D8	Greta Estates Pty Ltd land (approved residential development masterplan).
205.750 – 206.300	D9	3 residences on rural land at intersection of Allandale Road and Lovedale Road.
203.050 – 205.100	D10	7 scattered residences on rural land off Old North Road.
200.800 – 202.500	D11	8 scattered residences off Old North Road, east of Station Lane.
195.600 – 196.250	D12	Residences off Wollombi Road.

3.2 Construction Noise and Vibration

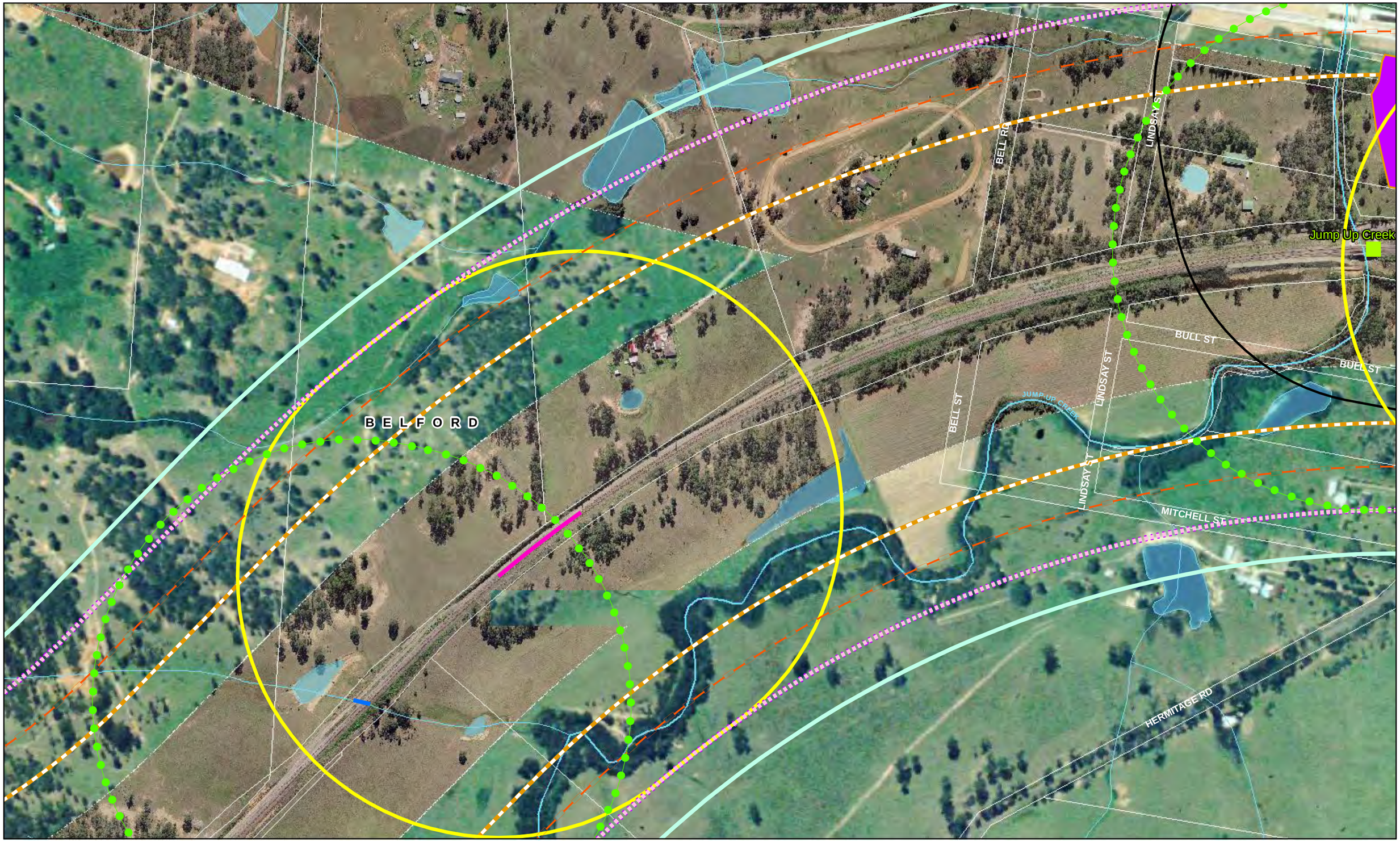
The relocation or addition of construction compounds would have some impact on the areas potentially affected by construction activities. Deferment of works also implies that construction noise and vibration impacts would be limited at receivers located along the subject chainages. Construction noise and vibration impact zones have therefore been revised to reflect the above and are shown in Figure 3.1.

Similarly, blasting impact zones are also expected to be slightly modified, as shown in Table 3-3 and Figure 3.2.

Table 3-3 Proposed Blasting Locations

Chainage (kilometres)	Cut	Up or Down Side
195.360 to 195.400	2	Up
195.960 to 195.980	3	Up
204.680 to 204.940	11	Up
205.200 to 205.680	12	Up
211.540 to 211.760	15	Up and Down
213.420 to 213.700	16	Up
214.060 to 214.180	17	Up and Down
214.900 to 215.460	18	Down
216.180 to 216.940	19	Up and Down
218.720 to 218.960	21	Up
221.000 to 221.360	23	Up
221.600 to 221.920	24	Up
222.520 to 222.600	25	Up
223.840 to 223.960	26	Up

With regards to construction noise and vibration, the findings outlined in the Environmental Assessment remain otherwise unchanged.



1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Impact Radius for Bridgeworks (Including Culverts)
- Impact Radius for Drainage and Capping
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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Construction Noise Impact Zones

Figure 3.1a

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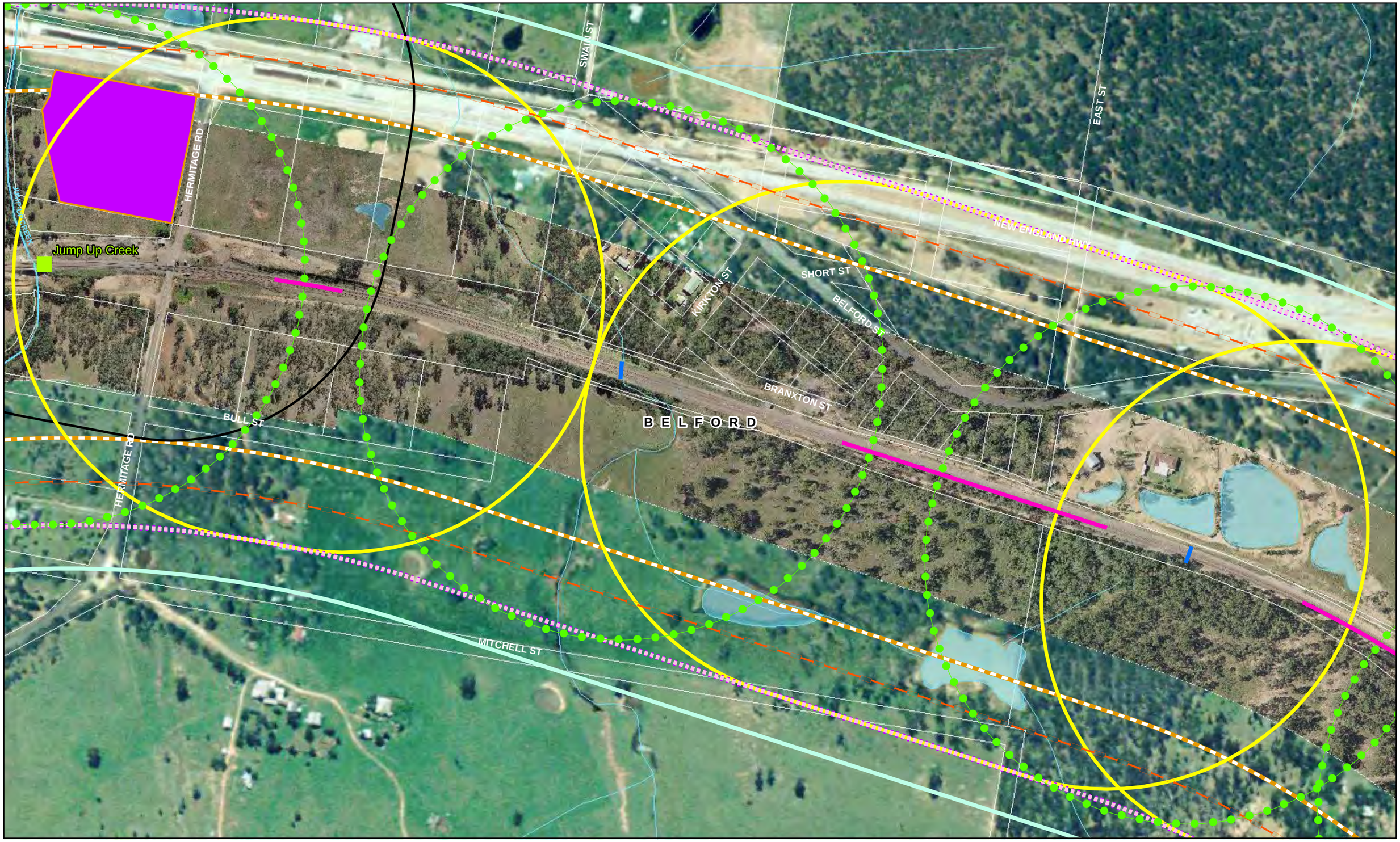

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number	22-14471
Revision	A
Date	August 2010

Revised Construction Noise Impact Zones

Figure 3.1b

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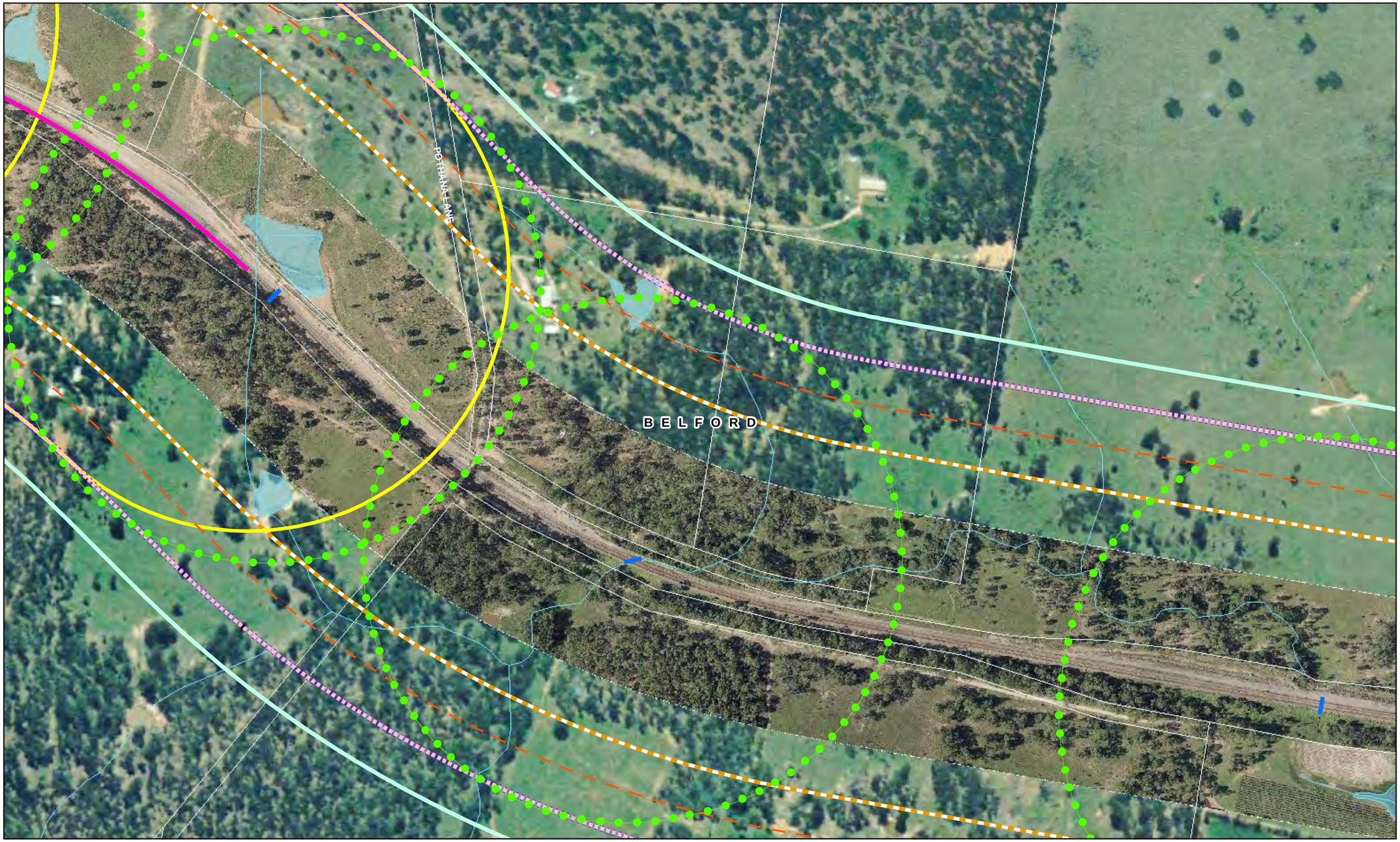

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

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- Proposed New Underbridge

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number	22-14471
Revision	A
Date	August 2010

Revised Construction Noise Impact Zones

Figure 3.1c

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BELFORD

BRANXTON

PIKES ROAD

SWEETWATER CREEK

BLACK CREEK

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Construction Noise Impact Zones

Figure 3.1d

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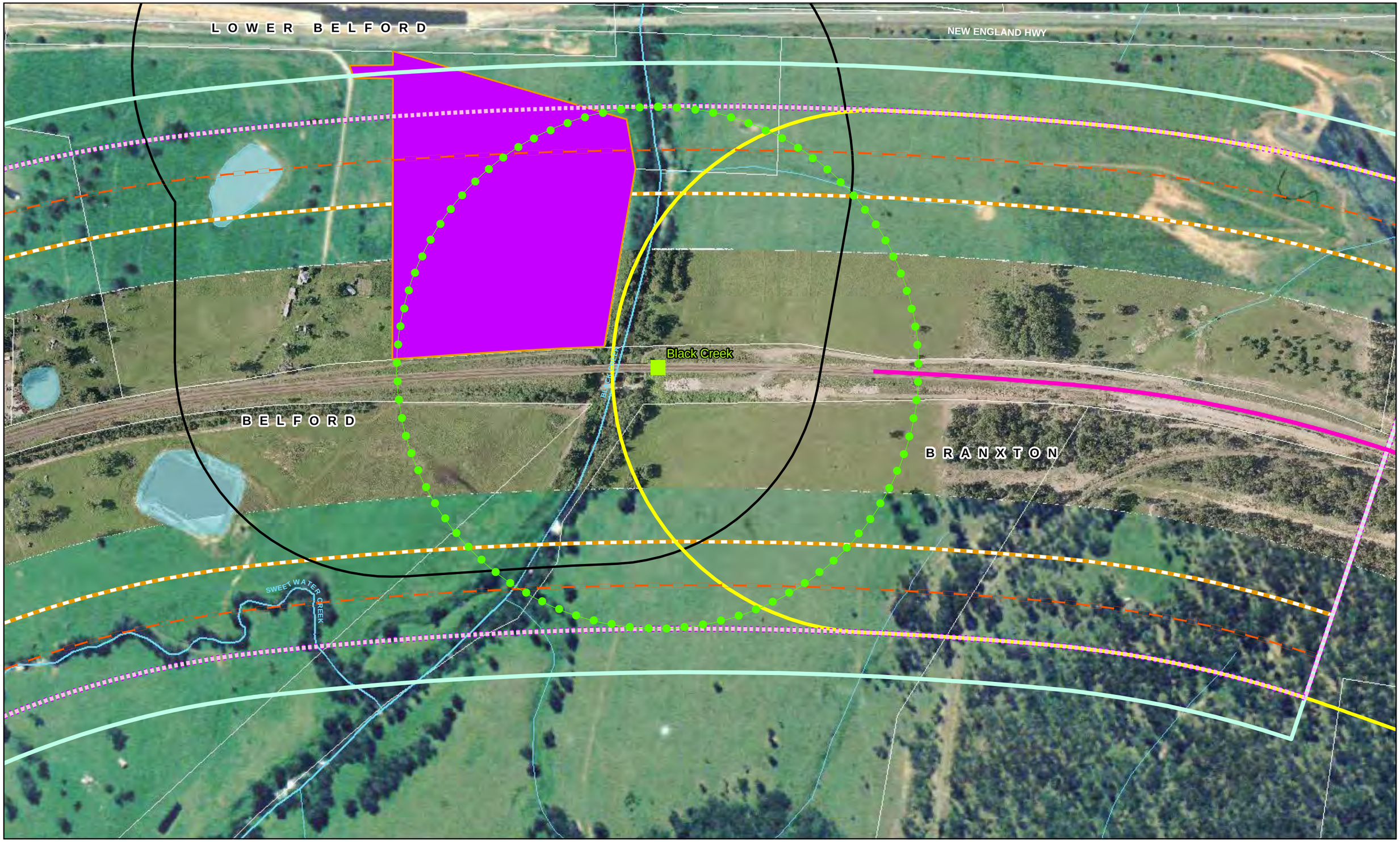

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Construction Noise Impact Zones

Figure 3.1e

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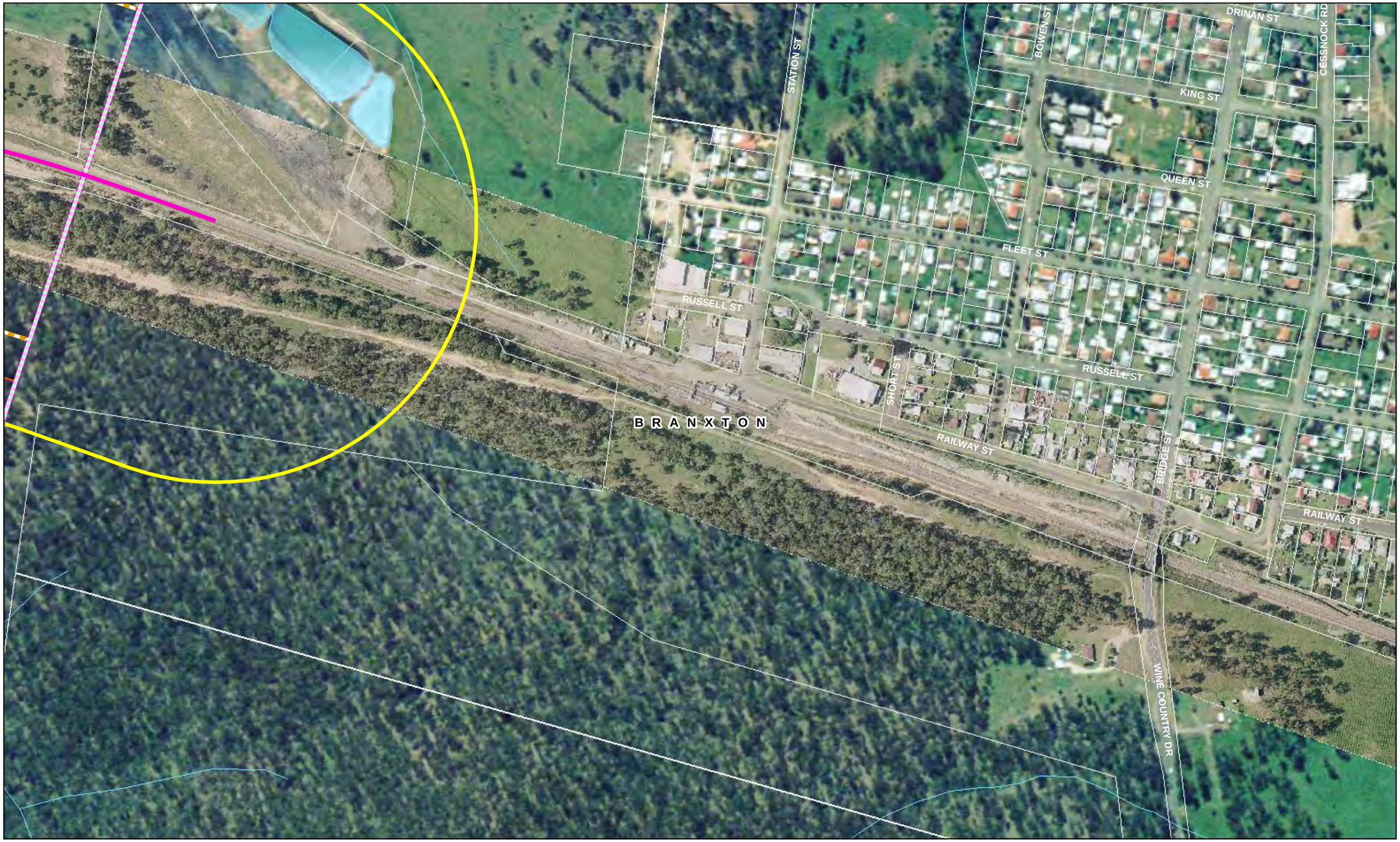

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
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N

LEGEND

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Construction Noise Impact Zones

Figure 3.1f

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1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
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N

LEGEND

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number	22-14471
Revision	A
Date	August 2010

Revised Construction Noise Impact Zones

Figure 3.1g

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BRANXTON

GRETA

NORTH ROTHBURY

NEW ENGLAND HWY

KENTISH

WHITBURN ST

OXFORD ST

ANVIL CREEK

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Construction Noise Impact Zones

Figure 3.1h

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1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

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- Proposed New Underbridge

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number	22-14471
Revision	A
Date	August 2010

Revised Construction Noise Impact Zones

Figure 3.1i

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1:4,000 (at A3)

0 20 40 80 120 160

Metres

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number	22-14471
Revision	A
Date	August 2010

Revised Construction Noise Impact Zones

Figure 3.1j

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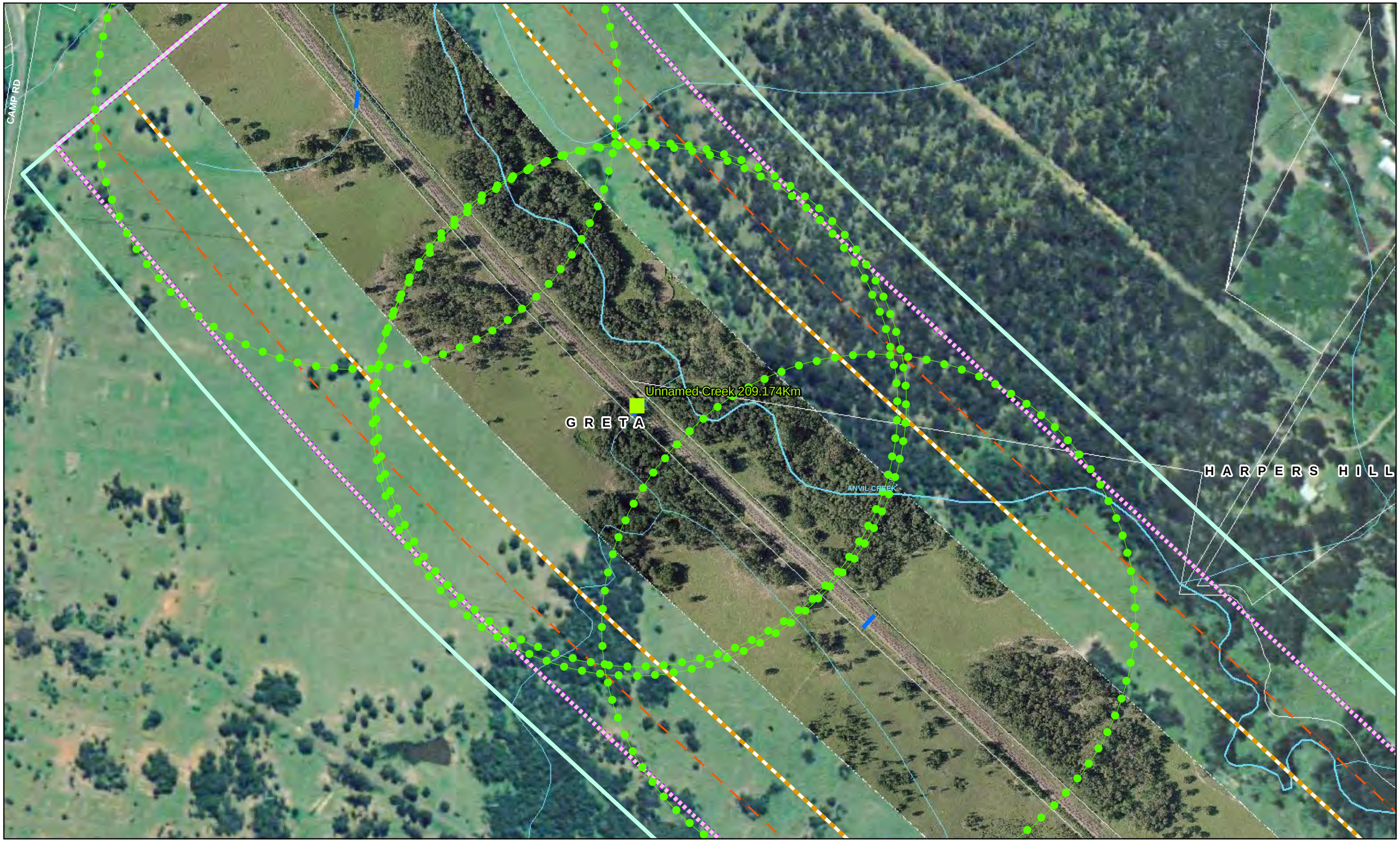

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

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- Proposed New Underbridge

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Construction Noise Impact Zones

Figure 3.1k

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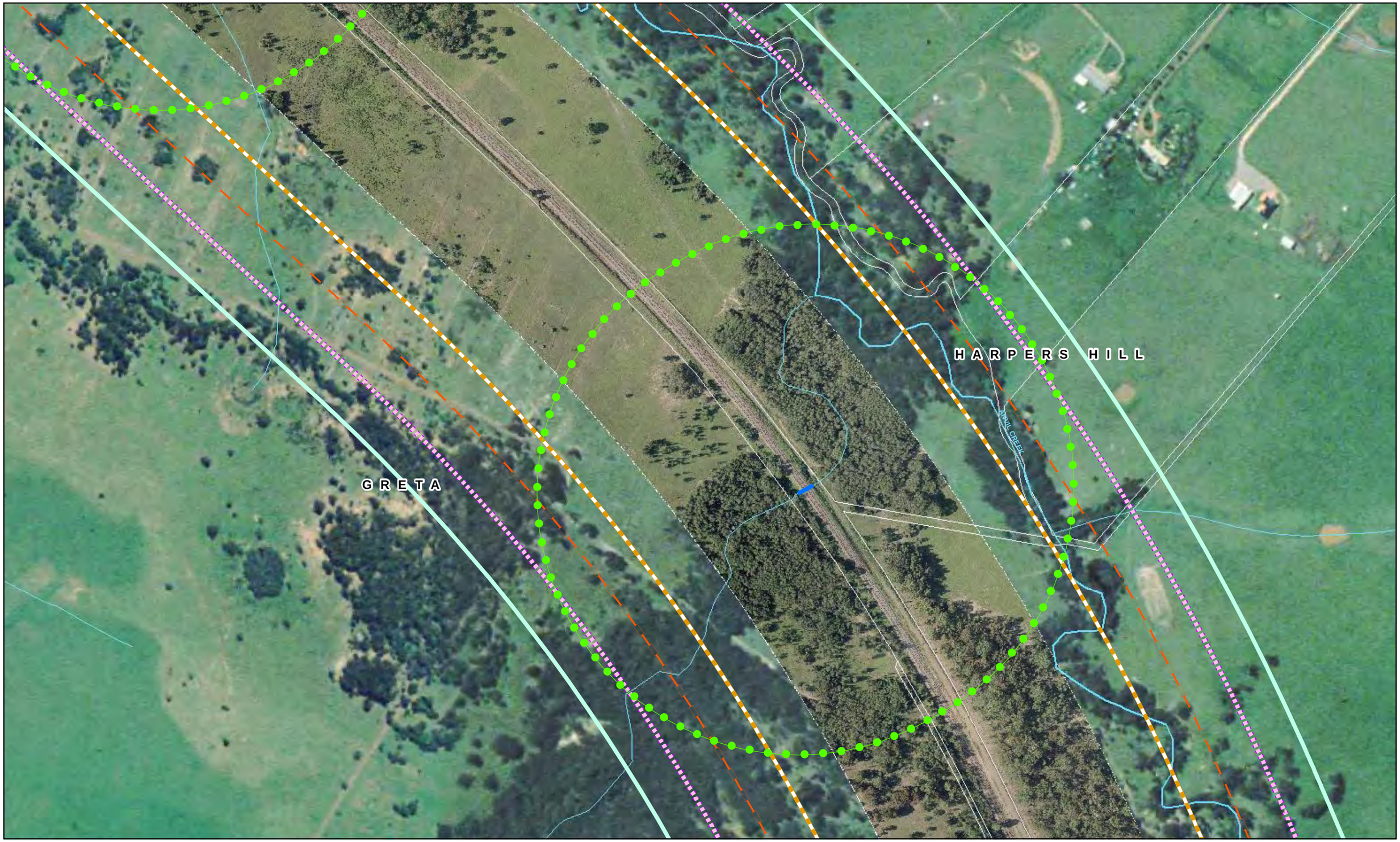

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
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N

LEGEND

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- Proposed New Underbridge

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Maitland To Minimbah Third Track
Submissions Report
Noise and Vibration Impact Assessment

Job Number 22-14471
Revision A
Date August 2010

Revised Construction Noise Impact Zones

Figure 3.1l

G:\22\14471\GIS\Maps\Deliverables\PPR\PPR_NSR_ConstructionNoise_ImpactZones_20100701_A.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by: msmiljkovski, tmorton

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Impact Radius for Bridgeworks (Including Culverts)
- Impact Radius for Drainage and Capping
- Impact Radius for Cut and Fill
- Impact Radius for Topsoiling and Landscaping
- Impact Radius for Crushing Plant
- Impact Radius for Site Compounds
- Site Compounds
- Impact Radius for Clearing and Stripping
- Watercourse Area
- Proposed Culvert Extensions
- Proposed Third Track
- Proposed Crushing Plant
- Watercourse
- Proposed New Underbridge

Hunter Alliance

Maitland To Minimbah Third Track
Submissions Report
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Figure 3.1m

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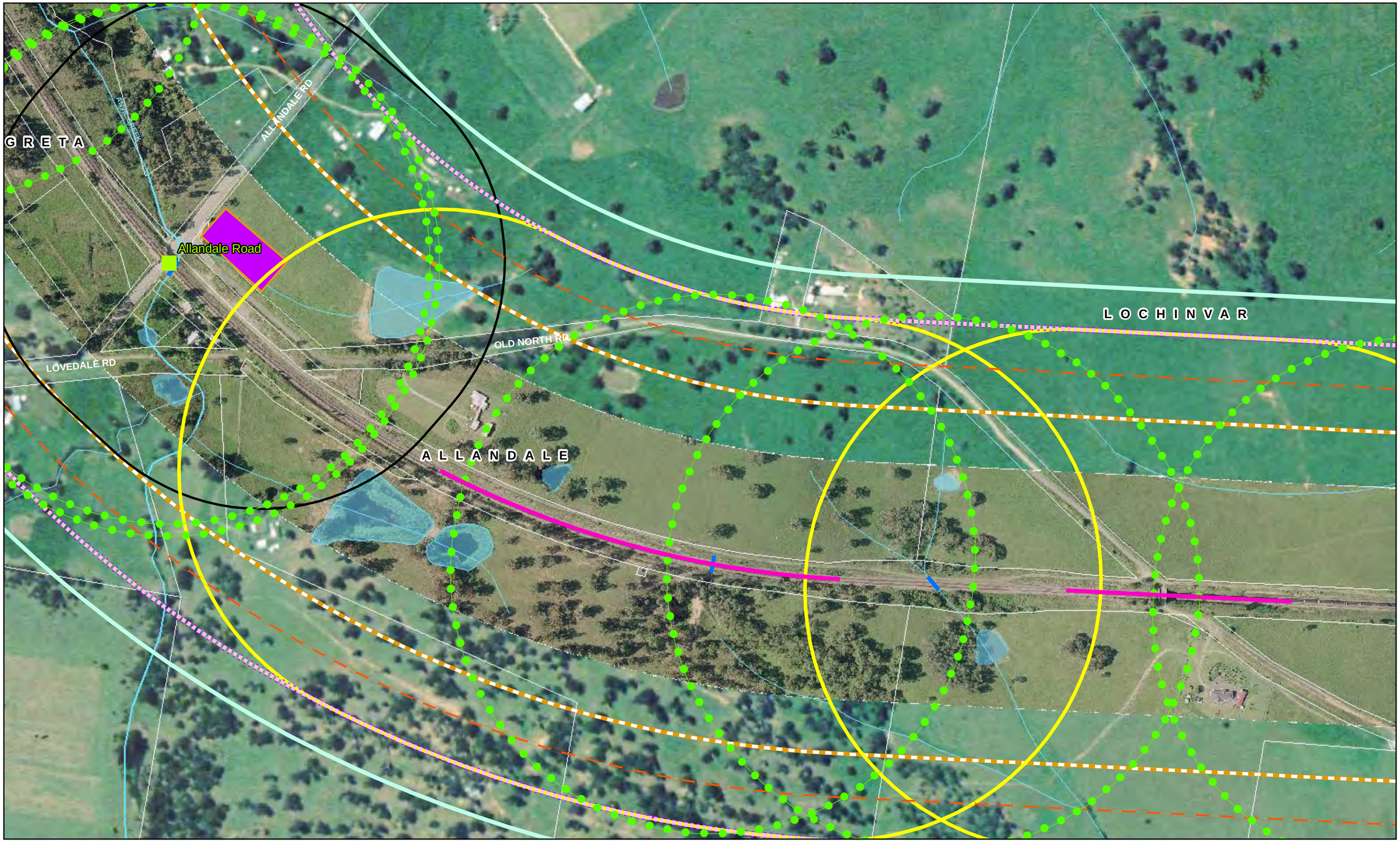

1:4,000 (at A3)

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

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Maitland To Minimbah Third Track
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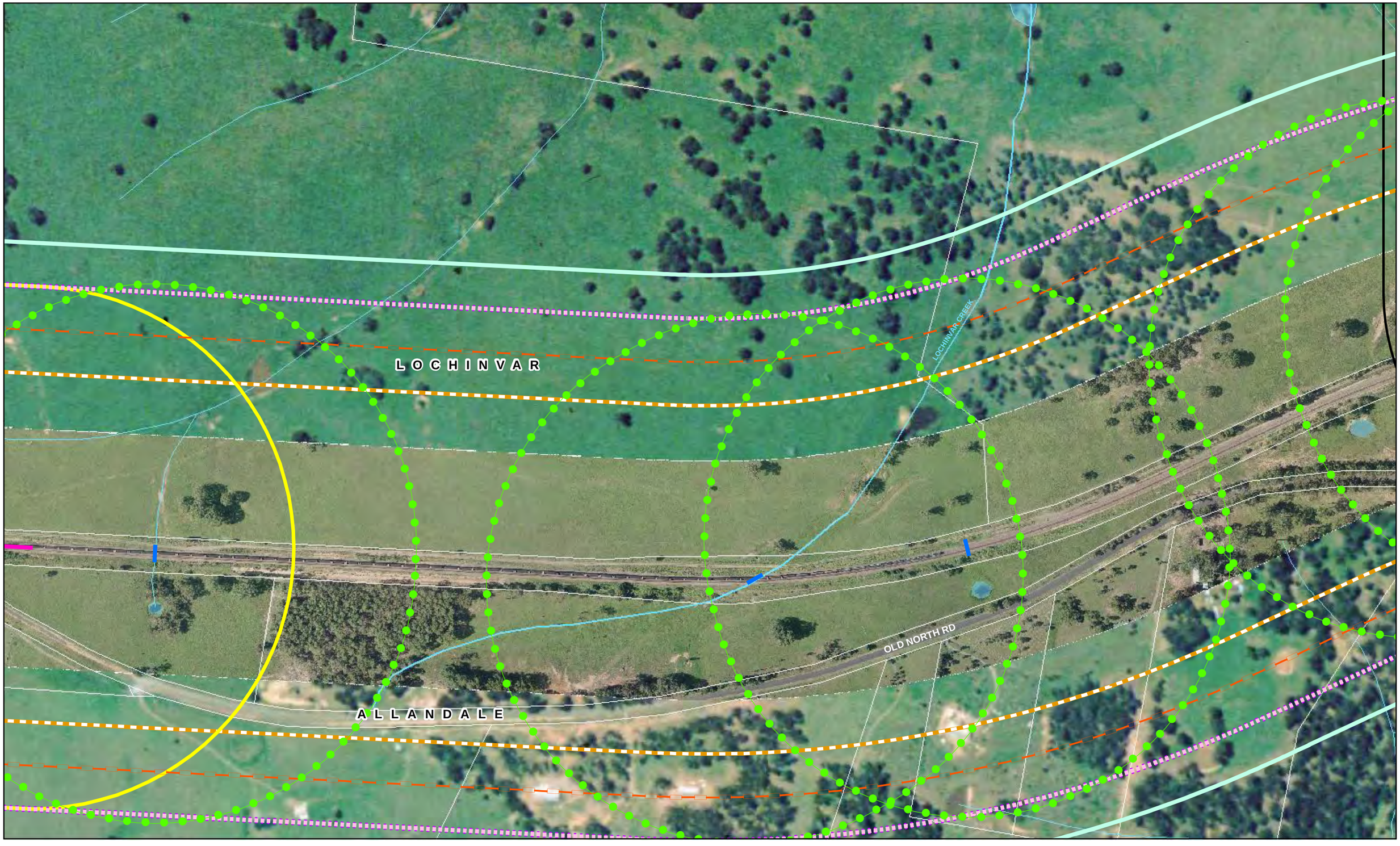

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Metres

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Hunt8r ALLIANCE

Maitland To Minimbah Third Track
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Figure 3.1o

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