During preparation of this environmental assessment, the Director-General of the Department of Planning issued a clarification relating to the construction noise assessment DGRs. The Director-General advised that, since the *Draft New South Wales Construction Noise Guideline* (DECC 2008c) has not been finalised, the construction noise assessment is to take into account chapter 171 of the *Environmental Noise Control Manual* (ENCM) (EPA 1994). This is addressed in Sections 9.3.3 and 9.3.5.

9.3.1 Assessment approach

Technical Paper 3 (Volume 2) details the approach taken for the noise and vibration assessment. This involved noise monitoring (refer Figure 9-4) and noise modelling. For the purposes of the assessment, receivers have been identified within 10 noise catchment areas (NCAs). These NCAs are identified in Table 9-12 (refer Figure 9-4). Refer to Appendix G of Technical Paper 3 for receiver locations.

Table 9-12 Noise catchment areas

Noise catchment area	Receiver type	Location	Total number of receivers	Receiver numbers	Non-residential receivers
1	Isolated	South-western side of the project.	7	1 to 7	
2	Isolated	North-western side of the project.	4	8 to 11	
3	Isolated	Eastern side of the project and the existing highway, north of Holbrook.	13	291 to 298, 580 to 583, 587	
4	Isolated	Between the project and the existing highway, north of Holbrook.	2	256, 257	
5	Town	Holbrook town, eastern side of the existing highway.	279	299 to 447, 449 to 579	Holbrook Hospital, Knox Uniting Church, Golf Course, Holbrook Public School
6	Town	Holbrook town between the project and the existing highway.	178	42, 43, 77 to 99, 101 to 112, 117 to 145, 147 to 251, 255, 276 to 281	St Patrick's School, Our Lady of Sorrows Church, Anglican Church (Young Street)
7	Town	Rear of Holbrook town between the project and the existing highway, west of NCA 6.	70	12 to 41, 44 to 49, 100, 113 to 116, 146, 252 to 254, 258 to 275, 282 to 288	

Noise catchment area	Receiver type	Location	Total number of receivers	Receiver numbers	Non-residential receivers
8	Town	Between the project and the existing highway, south of Holbrook.	27	50 to 76	
9	Isolated	Eastern side of the existing highway, east of NCA 5.	12	448, 584 to 586, 588, 589, 594, 596 to 600	
10	Isolated	Eastern side of the existing highway, south of Holbrook.	2	289 to 290	

The predicted noise levels are based on the high diversion scenario traffic predictions cited in Section 9.5 and *Technical Paper 4 — Traffic and Transport* (Volume 2). For the high diversion scenario, about 54 per cent of light vehicles and 64 per cent of heavy vehicles would use the project.

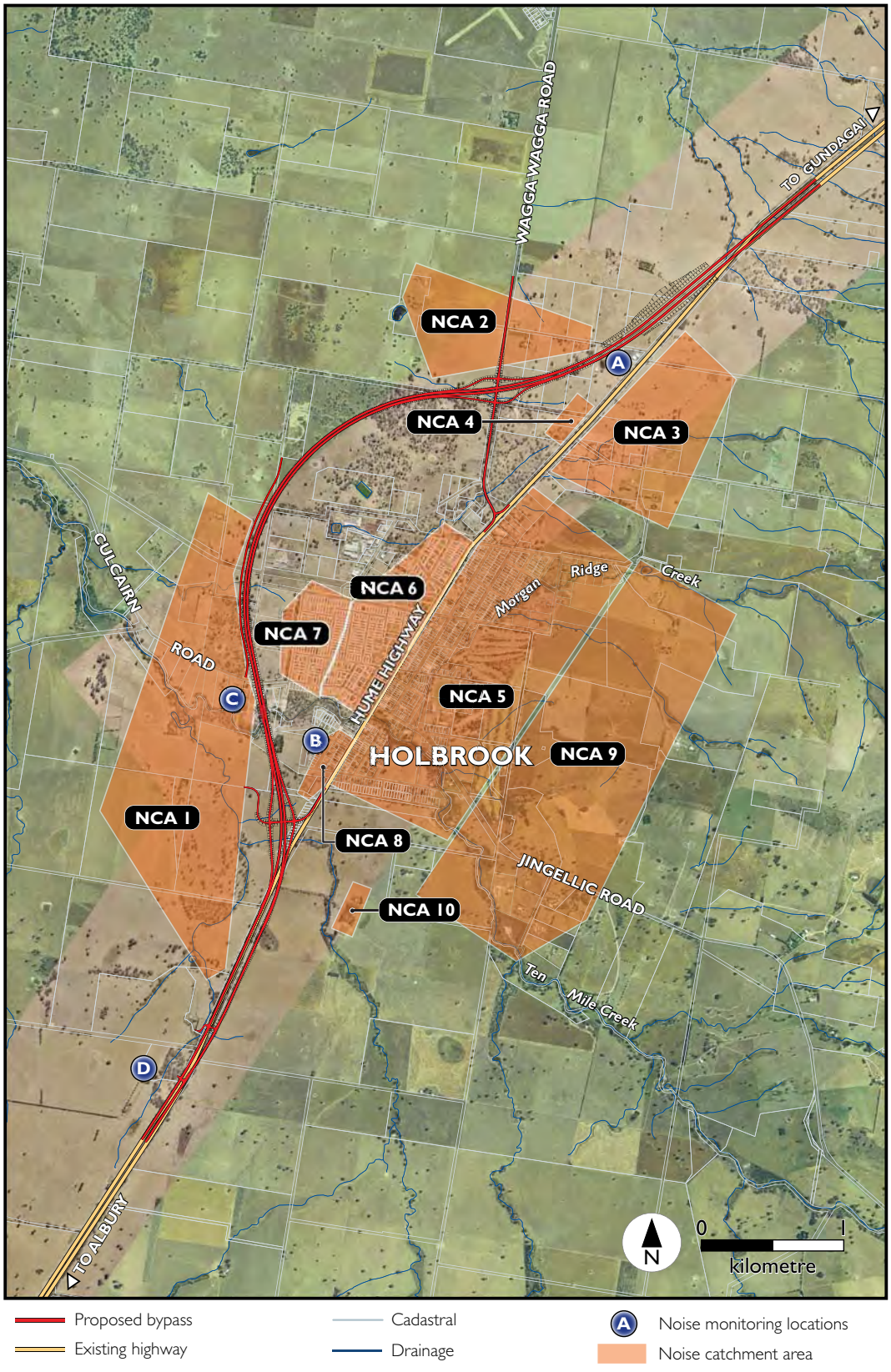

Figure 9-4 **Noise monitoring locations and noise catchment areas**

9.3.2 Existing noise environment

Noise monitoring was conducted to provide background noise levels to set appropriate criteria for the construction noise assessment, and to allow validation of the noise model used to determine existing traffic noise levels at receivers. See Figure 9-4 for noise monitoring locations.

The long-term background noise levels, in terms of rating background level, are provided in Table 9-13. The time periods are as defined in the *NSW Industrial Noise Policy* (EPA 2000).

Table 9-13 Measured background noise levels

Monitoring location	Rating background level (L_{A90} dBA)		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night-time (10pm to 7am)
A	43	44	37
B	38	41	32
C	38	34	33
D	40	41	35

The *NSW Industrial Noise Policy* recommends that, unless there is a specific cause for evening and night-time levels to be higher than daytime, the lowest rating background level measured throughout a 24 hour period should be used. In this case, the traffic counts in Holbrook show a marked increase in heavy vehicle traffic during the evening period (see Section 9.5), and the evening rating background levels are higher than those for the daytime and night-time periods. Accordingly, the rating background levels as measured have been used to set construction noise criteria.

L_{Aeq} is the standard descriptor of traffic noise. The measured L_{Aeq} levels over the periods used for assessing traffic noise are given in Table 9-14. Location C was too distant from the highway for traffic noise to be dominant, with other noise sources dominating background noise.

Table 9-14 Measured L_{Aeq} traffic noise levels

Location	L_{Aeq} (dBA)	
	Daytime (7am to 10pm)	Night (10pm to 7am)
A	62	64
B	51	49
D	57	59

9.3.3 Assessment criteria

Construction noise and vibration

The ENCM provides construction noise objectives. It is considered that for construction periods longer than 26 weeks, as for this project, the L_{A10} noise level should not exceed the background (L_{A90}) level by more than 5 dBA.

In addition, the ENCM recommends the following time restrictions for the construction activities where noise is audible at residential premises:

- 7am to 6pm Monday to Friday.
- 8am to 1pm if audible on residential premises, otherwise 7am to 1pm Saturday.
- No work on Sundays and public holidays.

If night-time construction is required for a project, it is recommended that the L_{A10} level should not exceed the existing night-time background (L_{A90}) level by more than 5 dBA.

In addition to those criteria, where any work is conducted during the night-time period 10pm to 7am, the ENCM recommends that, to protect against sleep disturbance, the L_{A1} noise levels should not exceed the background level by more than 15 dBA at any sensitive receiver. While there are no specific criteria relating to sleep disturbance in the NSW Government's *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA 1999), the document advises that maximum internal noise levels below 50 to 55 dBA are unlikely to cause awakening reactions.

Section 6.5 identifies that the majority of construction activities would take place between 6am and 7pm Monday to Friday and 7am and 4pm Saturday. The proposed working hours between 6am and 7am, and 6pm and 7pm are outside the standard construction hours in the ENCM. The hour from 6am to 7am is normally considered night-time so has been considered separately and is denoted as 'early morning'. The hour from 6pm to 7pm is normally considered evening, but as the background noise levels for this period were similar to the daytime background levels (see Appendix B in Technical Paper 3 (Volume 2)), the criterion for L_{A10} construction in this period has been included with the daytime criterion. Sleep disturbance criteria have been determined for the early morning and night-time periods. Table 9-15 shows the project-specific construction noise criteria for sensitive receivers in Holbrook and isolated receivers. For the town, the criteria are based on the levels measured in Holbrook (Monitoring location B). For isolated receivers, the criteria have been based on the lowest levels measured at any property (Monitoring location C).

Table 9-15 Project-specific construction noise criteria

Receiver location	L_{Aeq} construction noise criteria (dBA)				Sleep disturbance (L_{A1} (dBA))	
	Early morning (6am to 7am)	Daytime (7am to 7pm)[1]	Evening (7pm to 10pm)	Night-time (10pm to 6am)	Early morning (6am to 7am)	Night-time (10pm to 6am)
Town[2]	44	43	46	37	54	47
Isolated receivers[3]	45	43	39	38	55	48

Notes: 1. Includes early evening (6pm to 7pm).

2. Includes NCAs 5, 6, 7, 8.

3. Includes NCAs 1, 2, 3, 4, 9, 10.

Blasting

For assessment of annoyance due to blasting, the *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZECC 1990) sets out the following criteria for any sensitive receiver:

- The maximum overpressure due to blasting should not exceed 115 dB for more than five per cent of blasts in any year and should not exceed 120 dB for any blast.
- The maximum peak particle ground velocity should not exceed five millimetres per second for more than five per cent of blasts in any year and should not exceed 10 millimetres per second for any blast.

At sufficiently high levels, blasting may in itself cause structural damage to some building elements such as windows. However, this occurs at peak overpressure levels of about 133 dB and above, which is well in excess of the criteria for annoyance.

Vibration

Chapter 14 of Technical Paper 3 (Volume 2) identifies the vibration criteria for blasting activities, which are established in accordance with Australian Standard *AS2187.2-1993 Explosives — Storage, Transport and Use*. Section 14.1 of Technical Paper 3 (Volume 2) identifies the vibration criteria for other construction activities, which are established in accordance with DECCW's *Assessing Vibration: A Technical Guideline* (DEC 2006).

In regard to potential building damage, the recommended vibration level for sensitive heritage buildings ranges from 3.0 to 10.0 millimetres per second and 5.0 to 20.0 millimetres per second for dwellings.

Operational traffic noise

Criteria for assessment of road traffic noise are set out in the ECRTN. The RTA has also published the *Environmental Noise Management Manual* (ENMM) to assist in implementing the ECRTN.

The ECRTN classifies various road developments depending on the type of road and nature of the development. Practice note (i) of the ENMM describes when each of these classifications applies. The project is considered a 'new freeway or arterial road corridor' ('new road') for the majority of its alignment, except for three receivers (receivers 1, 289 and 290) that are located south of where the project rejoins the existing highway. For these receivers, the project is considered a 'redevelopment of existing freeway/arterial road' ('redevelopment'). Table 9-16 lists the relevant ECRTN daytime and night-time criteria for different receiver types.

Table 9-16 Daytime and night-time criteria for receivers

Receiver type	Daytime criterion	Night-time criterion	Where criteria are already exceeded
Residential receivers			
'New road'	55($L_{Aeq,15hr}$)	50 ($L_{Aeq,9hr}$)	The new road should be designed so as not to increase existing noise levels by more than 0.5 dB.
'Redevelopment of an existing road' (receivers 1, 289 and 290)	60 ($L_{Aeq,15hr}$)	55 ($L_{Aeq,9hr}$)	In all cases, the redevelopment should be designed so as to not increase existing noise levels by more than 2 dB. Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances, this may be achievable only through long term strategies.
Non-residential receivers			
School	45 ($L_{Aeq,1hr}$) — Internal during school hours 55 ($L_{Aeq,15hr}$) — External	-	-
Place of worship	40 ($L_{Aeq,1hr}$) — Internal while place is in use	40 ($L_{Aeq,1hr}$) — Internal while place is in use	-
Hospital	35 ($L_{Aeq,1hr}$) — Internal at any time	35 ($L_{Aeq,1hr}$) — Internal at any time	-
Active recreation (eg golf course)	60 ($L_{Aeq,15hr}$)		-

The traffic assessment for the project (see Section 9.5 and Technical Paper 4 (Volume 2)) predicts that many vehicles would continue to use the existing highway through Holbrook. Even with some traffic removed by the proposed bypass, noise from the existing highway alone could still be above the noise criterion for a new road at many receivers in Holbrook.

The ECRTN guidelines require consideration of combined noise (from the existing highway and project) against the base criteria. Where these criteria cannot be met, reasonable and feasible mitigation should be considered. Practice Note (iv) of the ENMM provides discussion of where additional controls would be 'reasonable and feasible'.

For road upgrades, the ECRTN and ENMM provide guidance on the likelihood of sleep disturbance. This is discussed in Section 12.1 of Technical Paper 3 (Volume 2). The ENMM suggests that the nominated noise levels and guidelines should be taken into consideration when determining noise mitigation measures to address general road traffic noise.

The quoted noise levels (of 50 to 55 dBA internal noise) are not intended as specific criteria for the purpose of implementing mitigation measures, but to highlight the potential for awakening reactions and the consideration of this in the design of noise mitigation, where this is considered to be necessary to reduce overall noise levels.

Acute noise levels

Noise levels above $L_{Aeq,9hr}$ 60 dBA or $L_{Aeq,15hr}$ 65 dBA are considered 'acute' and would be considered for noise mitigation as part of the project.

9.3.4 Operational road traffic noise impacts

Predicted operational road traffic noise

A total of 594 receivers in 10 catchment areas have been identified and noise levels (without mitigation) predicted at each location 10 years after the adopted opening date for the proposed highway upgrade in accordance with guidelines set out in the ENMM.

Detailed noise predictions at individual receivers (without mitigation) are given in Appendix D of Technical Paper 3 (Volume 2).

NCA 1 is adjacent to the project on the south-western side. It consists of seven isolated receivers. Exceedances of the noise criterion are predicted at five receivers. Two receivers in this catchment are predicted to experience acute noise levels.

NCA 2 is adjacent to the project on the north-western side. It consists of four isolated receivers. Exceedances of the noise criterion are predicted at three receivers. One receiver in this catchment is predicted to experience acute noise levels.

NCA 3 is east of the existing Hume Highway north of Holbrook. It consists of 13 isolated receivers. No exceedances of the noise criterion are predicted at these receivers. These receivers currently experience noise from the existing Hume Highway. As traffic would be reduced on the Hume Highway the noise levels are predicted to reduce after opening of the project.

NCA 4 is west of the existing Hume Highway north of Holbrook. It consists of two isolated receivers. Receivers are between the Hume Highway and the proposed bypass, so noise was assessed at both eastern and western facades. No exceedances of the noise criterion are predicted at the western façade of these receivers (ie from the proposed bypass). These receivers currently experience noise from the existing Hume Highway on their eastern facades. As traffic would be reduced on the Hume Highway the noise levels are predicted to be reduced after opening of the project.

NCA 5 is east of the existing Hume Highway. It consists of 279 receivers. While traffic noise would decrease due to the reduction of traffic on the Hume Highway, acute noise levels are predicted at 13 receivers close to the existing highway. The noise contribution from the proposed bypass is insignificant at these receivers.

NCA 6 is west of the existing Hume Highway north of Young Street. It consists of 70 receivers. Receivers are between the Hume Highway and the proposed bypass, so noise was assessed at both eastern and western facades. While traffic noise would decrease due to the reduction of traffic on the existing highway, acute noise levels are predicted at the eastern façade of 16 receivers close to the existing highway. Exceedances of the noise criterion are predicted at the western façade of three receivers (ie from the proposed bypass).

NCA 7 is west of NCA6 and north of Young Street. It consists of 178 receivers. Receivers are between the Hume Highway and the proposed bypass, so noise was assessed at both eastern and western facades. NCA 7 is more significantly impacted from the proposed bypass than NCA 6. Exceedances of the noise criterion are predicted at the western façade of 40 receivers (ie from the proposed bypass). Exceedances of the noise criterion are predicted at the eastern façade of two receivers (ie from the existing highway).

NCA 8 is west of the existing Hume Highway and south of Young Street. It consists of 27 receivers. Receivers are between the Hume Highway and the proposed bypass, so noise was assessed at both eastern and western facades of these houses. NCA 8 includes the caravan park at the south of Holbrook. Exceedances of the noise criterion are predicted at the western façade of nine receivers (ie from the proposed bypass). Acute noise is predicted at the western façade of one receiver, despite the fact that noise would decrease to this façade due to the project. Acute noise levels are predicted at the eastern façade of two receivers close to the existing highway.

NCA 9 is east of Holbrook. It consists of 12 receivers. No exceedances of the noise criterion are predicted at these receivers.

NCA 10 is southeast of Holbrook. It consists of two receivers. No exceedances of the noise criterion are predicted at these receivers.

Table 9-17 Operational noise impacts 2022

NCA	Impact	Number of receivers exceeding criterion (receiver numbers)	Number of receivers exposed to acute levels (receiver numbers)
1	Five receivers would require consideration of mitigation.	5 (3, 4, 5, 6, 7)	2 (4, 5)
2	Three receivers would require consideration of mitigation, one of which with acute noise levels.	3 (9, 10, 11)	1 (11)
3	Noise levels in this catchment are found to decrease and are not predicted to be acute.	0	0
4	No receivers would require consideration of mitigation as noise levels are within the allowance criteria and do not generate acute levels.	0	0
5	Noise levels in this catchment are found to decrease, however 13 receivers would be exposed to acute noise levels from the existing highway.	0	13 (411, 419, 420, 451, 452, 453, 458, 459, 460, 461, 462, 463 & 464)
6	Three receivers would require consideration of mitigation due to noise from the proposed bypass on their western façade. At the eastern façade, noise levels in this catchment are found generally to decrease, however 16 receivers would be exposed to acute noise levels from the existing highway.	3 (42, 43, 99)	16 (95, 96, 138, 139, 140, 141, 194, 195, 197, 198, 199, 200, 201, 202, 203 & 204)
7	Forty receivers would require consideration of mitigation due to noise from the proposed bypass on their western façade. Noise levels exceed the criteria at the eastern façade at two receivers.	Western façade 40(12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 44, 45, 46, 47, 100, 146, 285, 286, 287, 288) Eastern façade 2 (15,16)	0

NCA	Impact	Number of receivers exceeding criterion (receiver numbers)	Number of receivers exposed to acute levels (receiver numbers)
8	Nine receivers would require consideration of mitigation due to noise from the proposed bypass on their western façades. One receiver would be exposed to acute noise at the western façade, despite the fact that noise decreases at this façade due to the project. Two receivers would be exposed to acute noise levels from the existing highway.	9 (51, 52, 53, 54, 55, 56, 57, 59, 61)	Western façade 1 (64) Eastern facade 2 (73, 75)
9	Noise levels in this catchment are found to decrease and are not predicted to be acute.	0	0
10	No receivers would require consideration of mitigation as noise levels are within the allowance criteria and do not generate acute levels.	0	0

Non-residential receivers

Noise levels at non-residential receivers are given in Table 9-18. The noise level is the $L_{Aeq,\ 1hr}$ during the busiest hour of use. For some receivers, the criterion is based on internal noise. For most buildings, if the windows are open, then the internal noise level is approximately 10 dBA less than the external noise level. Hence, for the buildings with predicted external noise levels more than 10 dBA above the internal noise criterion, a possible exceedance is noted.

Table 9-18 Predicted noise levels at non-residential receivers

Receiver[1]	External noise levels $L_{Aeq,\ 1hr}$ (dBA)		Estimated internal noise level with windows open $L_{Aeq,\ 1hr}$ (dBA)	Criterion $L_{Aeq,\ 1hr}$ (dBA)	Comment (combined noise)	Change from existing
	Hume Highway 2012 (no project)	Combined project and existing highway 2022				
508 Holbrook Public School	59	57	47	45 (internal)	Exceeds	-2
	65 (15 hour in playground)	63	-	55 (playground)	Exceeds	-2
149 St Patrick's School	59	57	47	45 (internal)	Exceeds	-2
	65 (15 hour in playground)	63	-	55 (playground)	Exceeds	-2
150 Our Lady of Sorrows Church	61	59	49	40 (internal)	Exceeds	-2
606 Holbrook Hospital	50	48	38	35 (internal)	Exceeds	-2

Receiver[1]	External noise levels $L_{Aeq, 1hr}$ (dBA)		Estimated internal noise level	Criterion $L_{Aeq, 1hr}$ (dBA)	Comment (combined noise)	Change from existing
605 Golf Course	50 (15 hour)	48 (15 hour)	-	60 (15 hour)	Complies	-2
255 Anglican Church (Young Street)	54	54	44	40 (internal)	Exceeds	0
607 Knox Uniting Church	60	58	48	40 (internal)	Exceeds	-2

Note: 1. Refer to Appendix G of Technical Paper 3 (Volume 2) for receiver locations.

Impact on maximum noise levels

Section 12.2 of Technical Paper 3 (Volume 2) estimates maximum noise levels from the existing highway at receivers located between 20 and 500 metres from the existing highway. As the existing Hume Highway will continue to be used after opening of the project, the analysis would change only by the number of vehicles using the existing highway. This means there could still be up to 60 events per hour with maximum noise levels above the threshold. Predicted internal maximum levels at receivers beyond 50 metres from the road would be below 50 to 55 dBA and are, therefore, unlikely to cause awakening reactions according to the ECRTN. For houses located closer to the road, awakening reactions may occur with open bedroom windows. However, awakening reactions are not expected with windows closed.

Maximum noise levels have been estimated at receivers located between 50 and 500 metres from the project. In general, the maximum noise levels from the project would be much less in Holbrook, but would increase for some isolated residential receivers. Predicted internal maximum levels at receivers beyond 300 metres from the project are unlikely to cause awakening reactions according to the ECRTN. For houses located closer to the project, awakening reactions may occur with open bedroom windows. At the closest receivers (within 100 metres), awakening reactions may occur with the windows closed.

Meteorological effects

Neither the ECRTN nor the ENMM discuss assessment of traffic noise under changing meteorological conditions. Following advice from DECCW, the *NSW Industrial Noise Policy* has been used undertake a qualitative assessment of meteorological effects.

The *NSW Industrial Noise Policy* discusses the effect of temperature inversions and wind; both can enhance noise propagation from a source to a receiver. The *NSW Industrial Noise Policy* discusses that, for the best confidence in an assessment of meteorological effects on noise, meteorological data for the assessment area is required. In this case, meteorological data for Holbrook was unavailable. In such cases, the default conditions are the temperature inversions of three degrees per 100 metres in combination with a drainage wind of two metres per second from source to receiver, where the receiver is below the noise source. In this case, the receivers are typically at the same height as the proposed bypass or higher, hence the drainage wind has not been considered.

In the absence of meteorological data, the following procedure was used to estimate the effect of these conditions for the project.

Noise propagation from the project was predicted using the RTA environmental noise model. A line source (to simulate the flow of traffic) representing the project was used and noise was predicted at all receivers under various meteorological conditions. The model resulted in the prediction of the noise level at any receiver from the project under isothermal still conditions and under a temperature inversion of three degrees per 100 metres. The difference in these two levels is typically 1 to 4 dBA, depending on the location of the receiver with respect to the highway. This difference was then added to the predicted traffic noise level.

The analysis shows that the temperature inversion increases noise level by up to 3 dBA at any receiver. This increase in noise level exists only for the time of the temperature inversion. The *NSW Industrial Noise Policy* suggests that temperature inversions are most likely to occur during the hour immediately before and after sunrise. So while there may be a significant increase in noise level during those times, the effect over the entire nine hour period of night-time is an increase in $L_{Aeq,9hr}$ of only 1 dBA at most receivers. Temperature inversion is, therefore, not likely to be a significant contributor of increased operational noise from the project.

With respect to wind, there would be a similar increase in noise level at many receivers if there was a continuous low velocity wind blowing towards a receiver. There is no evidence to suggest that this would be the case in Holbrook. Wind, therefore, is not likely to be a significant contributor of increased operational noise from the project.

9.3.5 *Construction noise and vibration impacts*

Construction noise and vibration sources

Section 6.5.2 proposes construction working hours of 6am to 7pm, Monday to Friday and 7am to 4pm Saturday, with no work on Sundays or public holidays. Table 6-3 identifies the construction activities that are likely to occur during the proposed construction working hours while Table 6-4 identifies the construction activities that are likely to occur during the evening and night-time periods. Sources of construction noise and vibration used during these activities would comprise a range of heavy plant and equipment and hand tools. These sources, and their typical sound power levels, are listed in Table 13-3 of Technical Paper 3 (Volume 2).

Based on the typical sound power levels, noise level predictions have been undertaken for the construction activities outlined in Table 6-3. These predictions are provided in Table 9-19.

Table 9-19 Predicted sound power level of construction activities

Activity	Typical equipment used	Total L_{Aeq} sound power level (dBA)[1]
Milling and repaving	Road trucks, compactor, multi-tyred and vibratory rollers, asphalt paving plant, backhoe, profiler, sweeper, compressors, generators.	113
Site establishment	Excavators, chainsaws, mulching plant and chipper, cranes, generators.	111
Removal of vegetation	25-tonne excavator, mulcher, chainsaw, trucks, grader, combination backhoe FEL.	111
Earthworks	Road trucks, compactor, grader, steel, multi-tyred and vibratory rollers, concrete pour, including trucks and concrete vibrator, asphalt paving plant, backhoe, sweeper, compressors, generators, (excavator with hammer).	114 (120)

Activity	Typical equipment used	Total L_{Aeq} sound power level (dBA)[1]
Piling	Bored or driven piling rigs.	115 (bored) to 120 (driven)
Bridge works	Piling rigs, cranes.	115 to 120 (possible when piling)
Paving	Road trucks, compactor, (jackhammers), steel, multi-tyred and vibratory rollers, concrete pour, including trucks and concrete vibrator, asphalt paving plant, backhoe, (concrete saw), profiler, sweeper, compressors, generators.	113 (116)
Landscaping of exposed areas	Excavator/bobcat, powered hand tools, air compressor, spoil, material or concrete truck, jackhammer (for concrete embedded parts).	111

Note: 1. The sound power levels in brackets ( ) are for the occasional use of rock breakers, jackhammers and concrete saws.

Table 9-20 provides estimated vibration levels at a range of distances from various construction activities.

Table 9-20 Typical vibration emission levels from construction plant

Activity	PPV vibration level (millimetres per second)		
	10 metres	20 metres	30 metres
Concrete sawing	0.5	0.3	0.2
Four-tonne vibratory roller (high)	2.0 to 4.0	0.4 to 1.2	0.2 to 0.8
Hydraulic hammer (30 tonne)	3	1.5	1.0

Concrete batch plant

Section 6.6 identifies that at least one concrete batch plant is likely to be required for construction of the project. Noise generating plant and activities associated with the concrete batch plant would include:

- Conveyor drive.
- Front-end loader.
- Concrete batching, including concrete trucks.
- Trucks unloading into hopper.
- Cement bulk tanker unloading.

The typical overall sound power level of a concrete batch plant during full operation would be approximately $L_{A10,15min}$ 117 dBA. For the possibility of deliveries outside daytime working hours, the estimated source level is $L_{A10,15min}$ 115 dBA — the equivalent of one truck and one front-end loader. For the sleep disturbance assessment, a maximum level of L_{A1} 120 dBA is assumed. A temperature inversion of 3°C per 100 metres was included for the evening and night-time and periods. This would account for the potential worst-case impacts of temperature inversion.

Construction noise impacts

The noise level experienced at any receiver along the project would depend on many factors, such as distance to the construction site, shielding between the site and receivers, and the activity occurring at the construction site. The quietest activities, such as site preparation, would be up to 20 dBA quieter than the noisiest activities, such as earthworks using rockbreakers. Furthermore, noise levels would be quieter whenever the construction takes place in a cut compared with that undertaken on fill. The length of the project and the transient nature of the construction activities could also alter noise levels experienced at individual receivers.

As mentioned in Section 9.3.3, because the background noise levels between 6am and 7am is normally considered night-time so has been considered separately and is denoted as 'early morning'. The hour from 6pm and 7pm are similar to those experienced between 7am and 6pm. Therefore, the daytime period includes two criteria, one for 'early morning' 6am to 7am and one for 7am to 7pm.

Table 9-21, Table 9-22 and Table 9-23 show the predicted noise levels of construction activities (excluding compound/batch plant operation and deliveries) at sensitive receivers located within the noise study area during the daytime (6am to 7pm), evening (7pm to 10pm) and night-time (10pm to 6am).

Impacts at town receivers (NCAs 5, 6, 7 and 8)

Most daytime construction activities are predicted to exceed the criterion within 500 metres of the activity. This includes the two westernmost rows of receivers in NCA 7 (receivers 15 to 45) and the caravan park in NCA 8 (receivers 50 to 63).

The closest receivers would be exposed to exceedances of up to 16 dBA.

For noisier works involving piling and rock hammering, exceedances are predicted at all receivers located within one kilometre of the project. This includes receivers located in NCA 7 and NCA 8 and the receivers located at the southern end of NCA 6 (receivers 42, 43, 77 to 106). Noise at many receivers beyond around 600 metres would be shielded to some extent by other houses and impact would be reduced.

The closest receivers would be exposed to exceedances of up to 20 dBA. Construction activities during the evening are predicted to exceed the criterion within 500 metres of the activity. This includes the two westernmost rows of houses in NCA 7 (receivers 15 to 45) and the caravan park in NCA 8 (receiver 50 to 63). Exceedances would typically be up to 10 dBA, depending on the work location and the activity.

Construction activities during the night-time are predicted to exceed the criterion within one kilometre of the activity (ie concrete paving and sawcutting). This includes receivers located in NCA 6, 7 and 8 as well as all NCA 5 receivers located south of Young Street (receiver 42, 43, 81 to 84 and 147). The closest receivers would be exposed to exceedances of up to 20 dBA.

The early morning sleep disturbance criterion is predicted to be exceeded at receivers within 300 metres of the activity. This includes the two westernmost rows of houses in NCA 7 (receivers 15 to 45) and the caravan park in NCA 8 (receiver 50 to 63). Exceedances of the night-time sleep disturbance criterion are predicted at receivers within 500 metres of the activity. This includes most receivers in NCA 7 and 8. The closest receivers would be exposed to exceedances up to approximately 20 dBA over the relevant sleep disturbance criterion.

Impacts at isolated receivers (NCAs 1, 2, 3, 4, 9 and 10)

Most daytime construction activities are predicted to impact receivers within 500 metres of the project. This includes receivers located in NCA 1 (receiver 1, 4, 5, 6 and 7), NCA 2 (receiver 9, 10 and 11) and NCA 4 (receiver 256 and 257). The closest receivers would be exposed to exceedances of up to 30 dBA.

Construction activities during the evening and night are predicted to exceed the criterion within one kilometre of the activity. This includes all receivers located in NCA 2, 3, 4 and 10 as well as most receivers in NCA 1 (receivers 1, 4, 5, 6 and 7). The closest receivers would be exposed to exceedances of up to 35 dBA. The early morning sleep disturbance criterion is predicted to be exceeded at receivers within 300 metres of the activity. This includes receivers located in NCA 1 (receivers 1, 4, 5, 6 and 7) and NCA 2 (receiver 9 and 11). The night-time sleep disturbance criterion is predicted to be exceeded at receivers within 500 metres of the activity. This includes receivers located in NCA 1 (receivers 1, 4, 5, 6 and 7), NCA 2 (receiver 9 and 11), NCA 3 (receiver 291) and all NCA 4 receivers. The closest receivers would be exposed to exceedances of up to 28 dBA.

Table 9-21 Predicted daytime construction noise at NCAs

NCA	Nearest receiver	Criterion, $L_{A10,\ 15\ min}$ dBA		Noise levels, $L_{A10,\ 15\ min}$ dBA									
		6am-7am	7am-7pm	Site preparation		Earthworks		Piling		Bridge structures		Paving	
				Typical	Max	Typical	Max	Typical	Max	Typical	Max	Typical	Max
1	4	45	43	**53**	**69**	**56**	**72**	43	**49**	38	**44**	**55**	**71**
2	10	45	43	**53**	**71**	**56**	**74**	41	**47**	36	42	**55**	**73**
3	291	45	43	37	41	40	**44**	38	**44**	33	39	39	43
4	257	45	43	**49**	**53**	**52**	**56**	**50**	**53**	**45**	**48**	**51**	**55**
5	577	44	43	**47**	**54**	**50**	**57**	19	25	14	20	**49**	**56**
6	42	44	43	**48**	**57**	**51**	**60**	**55**	**57**	**50**	**52**	**50**	**59**
7	15	44	43	**57**	**79**	**60**	**82**	**63**	**64**	**58**	**59**	**59**	**81**
8	64	44	43	**57**	**71**	**60**	**74**	**50**	**52**	**45**	**47**	**59**	**73**
9	448	45	43	30	31	33	34	**53**	**54**	**48**	**49**	32	33
10	289	45	43	**45**	**49**	**48**	**52**	**53**	**54**	**48**	**49**	**47**	**51**

Note: **Bold** text indicates an exceedance of criteria

Table 9-22 Predicted evening construction noise at NCAs

NCA	Nearest receiver	Criterion, $L_{A10,\ 15\ min}$ dBA	Predicted noise levels, $L_{A10,\ 15\ min}$			
			Paving		Sawcutting	
			Typical	Max	Typical	Max
1	4	39	**55**	**71**	**58**	**74**
2	10	39	**55**	**73**	**58**	**76**
3	291	39	**49**	**53**	**52**	**56**
4	257	39	**51**	**55**	**54**	**58**
5	577	46	**56**	**63**	**59**	**66**
6	42	46	**50**	**59**	**53**	**62**
7	15	46	**54**	**76**	**57**	**49**
8	64	46	**49**	**63**	**52**	**66**
9	448	39	39	**40**	**42**	**43**
10	289	39	37	**41**	**40**	**44**

Note: **Bold** text indicates an exceedance of criteria

Table 9-23 Predicted night-time construction noise at NCAs

NCA	Nearest receiver	Criteria $L_{A10, 15\ min}$ dBA	Predicted noise levels, $L_{A10, 15\ min}$ dBA				Criteria $L_{A10, 15\ min}$ dBA		Predicted noise levels (sleep disturbance), $L_{A1, 1\ min}$ dBA	
		10pm-7am	Paving		Sawcutting		10pm-6am	6am-7am	Noise level maximum event	
			Typical	Max	Typical	Max			Typical	Max
1	4	38	**55**	**71**	**58**	**74**	48	55	**60**	**76**
2	10	38	**55**	**73**	**58**	**76**	48	55	**60**	**78**
3	291	38	**49**	**53**	**52**	**56**	48	55	**54**	**58**
4	257	38	**51**	**55**	**54**	**58**	48	55	**56**	**60**
5	577	37	**56**	**63**	**59**	**66**	47	54	**61**	**68**
6	42	37	**50**	**59**	**53**	**62**	47	54	**55**	**64**
7	15	37	**54**	**76**	**57**	**79**	47	54	**59**	**81**
8	64	37	**49**	**63**	**52**	**66**	47	54	**54**	**68**
9	448	38	**39**	**40**	**42**	**43**	48	55	44	45
10	289	38	37	**41**	**40**	**44**	48	55	42	45

Note: **Bold** text indicated an exceedance of criteria

Batch plant operation and delivery impacts

As identified in Section 6.6.1, no specific locations for site compound(s) and batch plant(s) have been identified. An assessment was carried out to determine the noise catchments of these facilities, and the impacts they would have on sensitive receivers.

Exceedances of the daytime and evening criteria are likely where a receiver is located within one kilometre of the facility. Exceedance of the night-time criterion is likely where a receiver is located within 1.5 kilometres of the facility. Exceedances of the early morning and night sleep disturbance criteria are likely where a receiver is located within one kilometre of the facility.

Impacts on receivers could vary depending on the location of the facility relative to any receiver, as some noise reduction may result from localised shielding through topography or other buildings.

Site compound impacts

Exceedances of the daytime, evening, night-time and sleep disturbance criteria are likely where a receiver is located within one kilometre of the facility. Exceedances would be reduced (less than 3 dBA at receivers within 100 metres of the site compound) when only light vehicles are accessing the site compound.

Construction vibration impacts

Vibration levels are not predicted to exceed the damage criterion at any receiver, as receivers are more than 65 metres from construction activities. At this distance, vibration is predicted to be below the criteria for damage and human comfort.

Three heritage structures have been identified in the noise study area. The criterion for building damage depends on frequency of vibration. Vibration levels less than three millimetres per second would generally comply. Levels of one millimetre per second and above would indicate a requirement for a more detailed study of the building and its relationship to the works. The structures, and the assessment of vibration, is summarised in Table 9-24.

Table 9-24 Construction vibration at heritage buildings

Buiding	Approximate distance to work site	Vibration level of hydraulic breaker	Complies?
Montpellier shearers quarters (HHI-1[1])	220	<1mm/s	Yes
Hereford stud homestead (HHI-3[1])	40-50	0.8-1mm/s	Probable. Further assessment recommended.
Historic dairy and well (HHI-4[1])	250	<1mm/s	Yes

Note: 1. See Section 10.2 for description and location.

Blasting impacts

Blasting may be required in one area at the northern end of the project to a cut depth of approximately 10 metres. The closest receivers are located in NCAs 2, 3 and 4. The need for blasting would be determined following completion of geotechnical studies.

Table 9-25 summarises the predicted results for the allowable maximum instantaneous charge (MIC) to meet the overpressure ANZECC guidelines at the closest receiver to the blast site. The predictions assume no shielding from local topography.

Table 9-25 Allowable MICs to meet overpressure goals

Receiver number	Approximate distance to closest blast (metres)[1]	MIC (kg)	
		For any blasts	For more than 5% of blasts in any year
NCA 2			
8	1600	605.3	129.5
9	940	122.8	26.3
10	900	107.7	23.1
11	430	11.8	2.5
NCA 3			
291	530	22.0	4.7
292	940	122.8	26.3
293	720	55.2	11.8
294	950	126.7	27.1
295	920	115.1	24.6
296	900	107.7	23.1
297	1080	186.2	39.8
298	1130	213.2	45.6
580	1130	213.2	45.6
581	760	64.9	13.9
582	900	107.7	23.1
583	1200	255.4	54.6
587	560	26.0	5.6
NCA 4			
256	890	104.2	22.3
257	830	84.5	18.1

Note: 1. Distance to closest receiver is measured from the closest point of the proposed blasting area to the receiver in question.

Table 9-26 summarises the predicted results for the allowable MIC to meet the ground vibration ANZECC guidelines at the closest receiver to the blast site.

Table 9-26 Allowable MICs to meet ground vibration goals

Receiver number	Approximate distance to closest blast (metres) 1	MIC (kg)	
		For any blasts	For more than 5% of blasts in any year
NCA 2			
8	1600	1086.6	456.9
9	940	428.4	180.1
10	900	397.0	166.9
11	430	109.0	45.8
NCA 3			
291	530	157.2	66.1
292	940	428.4	180.1
293	720	268.7	113.0
294	950	436.4	183.5
295	920	412.6	173.5
296	900	397.0	166.9
297	1080	546.2	229.7
298	1130	591.2	248.6
580	1130	591.2	248.6
581	760	295.3	124.2
582	900	397.0	166.9
583	1200	656.8	276.2
587	560	173.1	72.8
NCA 4			
256	890	389.3	163.7
257	830	344.6	144.9

Note: 1. Distance to closest receiver is measured from the closest point of the proposed blasting area to the receiver in question.

Site tests would be necessary to establish the characteristics of the rock and allow more accurate determination of the MIC values shown in the table.

Criteria for overpressure and vibration can be achieved using correct blast design and by MIC not exceeding those given in the tables. Test blasts could show site specific characteristics that allow higher values for MIC.

9.3.6 Management of impacts

Construction

Best practice mitigation and management measures will be implemented to minimise construction noise and vibration at noise sensitive receivers and will be described in the CEMP. Further discussion on standard construction noise mitigation is provided in Table 9-28 and Chapter 14 of Technical Paper 3 (Volume 2).

Operation

Most receivers in Holbrook currently experience noise from the existing highway above the ECRTN 'base' criteria (refer to Table 9-16). The project would reduce noise levels for most receivers in Holbrook due to the reduction of traffic on the existing highway. While noise at some receivers would be above the base criterion and/or acute, where the project would reduce noise levels it would not be considered reasonable and feasible to provide further mitigation. Acute noise levels from traffic on the existing highway do not fall within the noise catchment for the project. Accordingly, this project would not consider treatment for acute noise resulting from traffic on the existing highway.

For operational noise impacts resulting from the project, where the 'base' criteria are already exceeded, the project should seek to not increase the existing noise levels by more than 0.5 dB for a 'new road' and 2 dB for a 'redevelopment' (receivers 1, 289 and 290).

Where the project cannot achieve the above objective, reasonable and feasible mitigation would be considered in accordance with the ENMM.

In the assessment of the provision of mitigation for operational traffic noise, the ENMM gives guidance as to whether it is reasonable and feasible to offer noise mitigation.

For 'new roads', it is generally not considered reasonable and feasible to offer mitigation if the predicted design year noise levels are:

- Within 2 dBA of 'future existing' noise levels (ie the predicted noise level 'existing highway no project 2012).
- Not more than 2 dBA above the target noise levels.

The ECRTN also indicates that if the existing noise level is below the criterion but within 2 dB of the criterion, then the 2 dB allowance may also be applied. Hence, the exclusion above is also taken to apply to cases where an existing noise level below the 'base' criterion is predicted to increase by 2 dBA or less.

Table 9-27 identifies the 60 receivers that are to be considered for operational noise mitigation.

Table 9-27 Summary of receivers to be considered for operational noise mitigation

NCA[1]	Receiver[2]	Treatment type
1	3, 4, 5, 6, 7	Architectural
2	9, 10, 11	Architectural
6	42, 43, 99	At-road
7	12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 44, 45, 46, 47, 100, 146, 285, 286, 287, 288	At-road
8	51, 52, 53, 54, 55, 56, 57, 59, 61	At-road

Notes: 1. Refer to Figure 9-4.

2. Refer to Appendix G in Technical Paper 4 (Volume 2) for receiver locations.

At road mitigation

Noise barriers and low noise pavements are considered 'at road' noise mitigation for groups of receivers (eg generally more than three receivers).

In NCA 7 and NCA 8 receivers are grouped in a way that makes consideration of at-road noise mitigation reasonable. Section 9.5 of Technical Paper 4 (Volume 2) provides indicative operational noise treatments, presented in Figure 9-5. Final noise mitigation measures would be further investigated during detailed design to reduce levels to compliance.

For NCA 7 an indicative operational noise treatment includes the combination of a southbound barrier at a height of 3.5 metres and length of 1700 metres along the project (as shown in Figure 9-5) and open graded asphalt (low noise) pavement on both carriageways. At-road operational noise treatment for NCA 7 would also mitigate exceedances of noise criteria at three receivers in NCA 6.

For NCA 8 an indicative operational noise treatment includes the combination of a 3.5 metre high split ramp barrier (running the entire ramp length, partly on the outside of the ramp and partly between the ramp and the main carriageways) and low noise pavement extending (as shown in Figure 9-5). This treatment assumes the use of low noise pavement for NCA 7 as described above.

Architectural treatment

For small groups of receivers, generally less than three receivers, at road noise mitigation is not considered to be reasonable and feasible. If mitigation is required at isolated receivers or small groups of receivers, architectural treatment of residences may be considered. This can include provision of ventilation or air conditioning, or upgrading the glazing and doors of the building. Architectural treatment is considered for each building individually.

Architectural treatment would be considered where noise levels from the project are predicted to exceed criteria for receivers in NCA 1, 2 and 6.

Mitigation and management measures for noise and vibration impacts are presented in Table 9-28. These measures have been incorporated into the draft statement of commitments in Chapter 11.

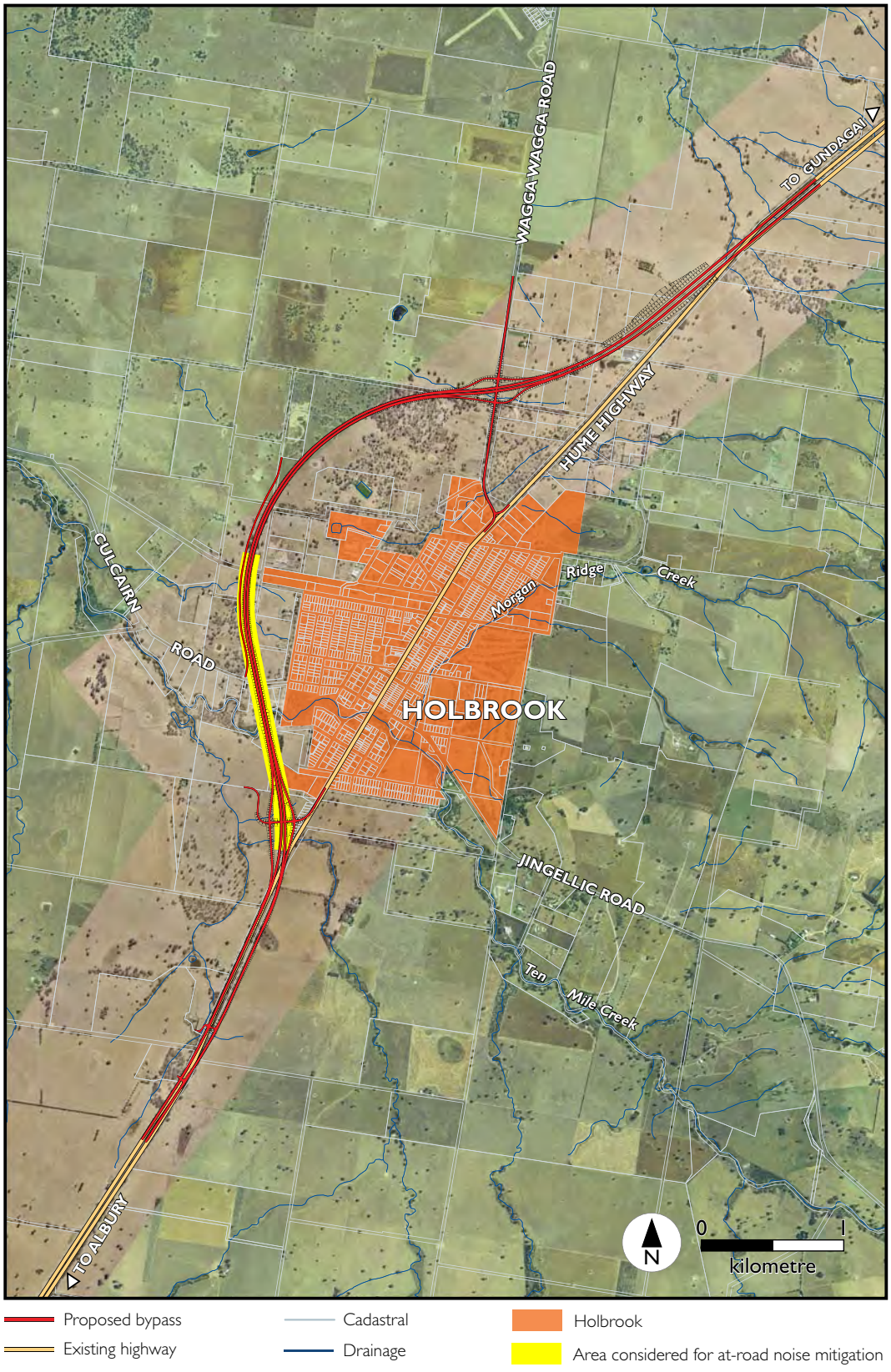

Figure 9-5 **Indicative area of at-road operational noise mitigation - NCA7 and NCA8**

Table 9-28 Noise and vibration mitigation and management measures

Potential impact	Mitigation and management measure
Construction	
Noise impacts to sensitive receivers during construction activities	▪ Prior to the commencement of construction, prepare and implement a construction noise and vibration management plan as part of the CEMP. Typical construction noise mitigation measures that would be considered, and their anticipated noise reduction (dBA), are listed in Table 9-29. ▪ Undertake monitoring to determine the effectiveness of mitigation measures. Implement additional mitigation measures where required if construction noise generates complaints and the monitoring confirms unreasonable noise impacts. ▪ Implement a notification and negotiation procedure where noise impacts from evening and night construction activities are above criteria. This would involve consultation with sensitive receivers to develop appropriate management measures. ▪ Develop a procedure for dealing with and responding to complaints.
Operation	
Noise levels from traffic exceeding criteria at sensitive receivers	▪ Develop and implement all reasonable and feasible mitigation measures to meet the noise criteria applicable to the project in consultation with the sensitive receiver. ▪ Measure operational noise along the project between six months and one year after opening. Should the monitoring indicate that traffic noise impacts exceed the levels predicted, implement further reasonable and feasible mitigation measures in consultation with the sensitive receiver.

Table 9-29 Typical construction noise mitigation measures and anticipated noise reduction

Typical construction noise mitigation measures	Anticipated noise reduction (dBA)
Operating during approved hours	N/A
Monitoring of construction noise to determine impact of plant on sensitive receivers	N/A
Training staff	N/A
Responding to noise complaints	N/A
Turning off machinery when not in use	0-5
Respite periods for pile drivers	N/A
Portable temporary screens	5-10
Screen or enclosure for stationary equipment	10-15
Maximising offset distance between noisy plant items and sensitive receivers	3-6
Avoiding using noisy plant simultaneously and/or close together, adjacent to sensitive receivers	2-3
Orienting equipment away from sensitive receivers	3-5
Carrying out loading and unloading away from sensitive receivers	3-5
Using dampened tips on rock breakers	3-6
Using noise source controls, such as residential class mufflers, to	5-10

Typical construction noise mitigation measures	Anticipated noise reduction (dBA)
reduce noise from all plant and equipment including bulldozers, cranes, graders, excavators and trucks	

9.4 Social and economic

A social and economic assessment for the project has been undertaken as presented below.

DGRs	Where addressed
Social and economic (including but not limited to)	
The agricultural sector taking into account the fragmentation and potential loss of agricultural and farm viability, stock diseases and the impact of a revised road network on quarantined properties and travelling stock reserves/route.	Sections 9.4.2, 9.5.4
Local community socio-economic impacts associated with land use, property and amenity related changes.	Section 9.4.2
Business (including agribusinesses) impacts including the overall viability, profitability, productivity and sustainability of businesses.	Section 9.4.2

9.4.1 Existing social and economic environment

An assessment of the social and economic impacts is presented below. The assessment is informed by surveys and interviews. These surveys and interviews were undertaken to understand the social and economic environment and to identify the potential impacts of the project on the local community and businesses, from a community perspective. The following surveys and interviews were carried out:

- Highway related business survey, which identified and profiled highway dependent businesses in Holbrook.
- Stopping motorist survey, which identified reasons for travel, origin and destination, previous stop locations, length of stop and expenditure patterns.
- Overnight stayers survey, which identified origin and destination, purpose and mode of travel, length and frequency of stay, and expenditure patterns.
- Interviews with property owners directly affected by the project, which identified commercial and non-commercial properties, established profiles for each commercial property and considered impacts of the project on agribusiness operations.
- Consultation with the community.

The assessment was supported and informed by baseline socio-economic data comprising Australian Bureau of Statistics (ABS) Census Data (2001 and 2006) and planning documents to understand the demographic profile and socio-economic context of Holbrook. It was also informed by observations made during site visits, discussions held during consultation activities, the key findings of other technical investigations for the project and previous economic assessments of bypassed towns.

Social profile

Holbrook is the largest town in the Greater Hume Shire, with a population of over 1300 people. The town's economy has been traditionally agriculture based due to the vast surrounding farming and grazing region. However, the retail and service industries have grown due to a number of factors, including:

- Holbrook's strategic location on the Hume Highway close to the midpoint between Sydney and Melbourne, as well as being the largest town between Wagga Wagga and Albury.
- Holbrook's prominence as the largest town in the Greater Hume Shire.
- Recent ongoing duplication works on the Hume Highway.

Holbrook's location on the Hume Highway has resulted in several businesses providing services to traffic travelling between Melbourne and Sydney. Holbrook provides a convenient and attractive rest stop due to its strategic location between Sydney and Melbourne as well as providing good facilities for stoppers, such as the submarine precinct equipped with easy access parking, toilets and a café. Holbrook also has a number of features enhancing the amenity and desirability of the town including: heritage buildings and tourist attractions, such as the National Museum of Australian Pottery, Holbrook airfield, Holbrook Miniature Railway, Ian Geddes Walk, the Woolpack Museum, and the park containing the iconic submarine HMAS Otway.

Holbrook serves as a service centre for local residents as well as for residents from the surrounding villages, such as Henty, Culcairn and Woomargama. The town is well serviced with local businesses providing supermarkets, a bakery, cafés, hotel/motels, service stations, and automobile repair centres. Recreational facilities include a golf course, tennis courts, and skate park. Holbrook also offers a number of social services and facilities, which cater not only for the local community of Holbrook, but the surrounding smaller towns and villages. These include a hospital, general practitioners, pharmacy, day care centres, early childhood centres, primary schools, aged care facilities, bank and supermarket retail outlets, fire station, library, Returned Services League club, post office, recreational and sporting facilities as well as transport facilities. The location of these services and facilities are shown in Figure 9-6.

The town's social cohesion and community spirit is demonstrated by the presence of a number of community organisations, including the Country Women's Association, Holbrook Lions Club, Holbrook Community and Business Forum, a Youth Club, and others.

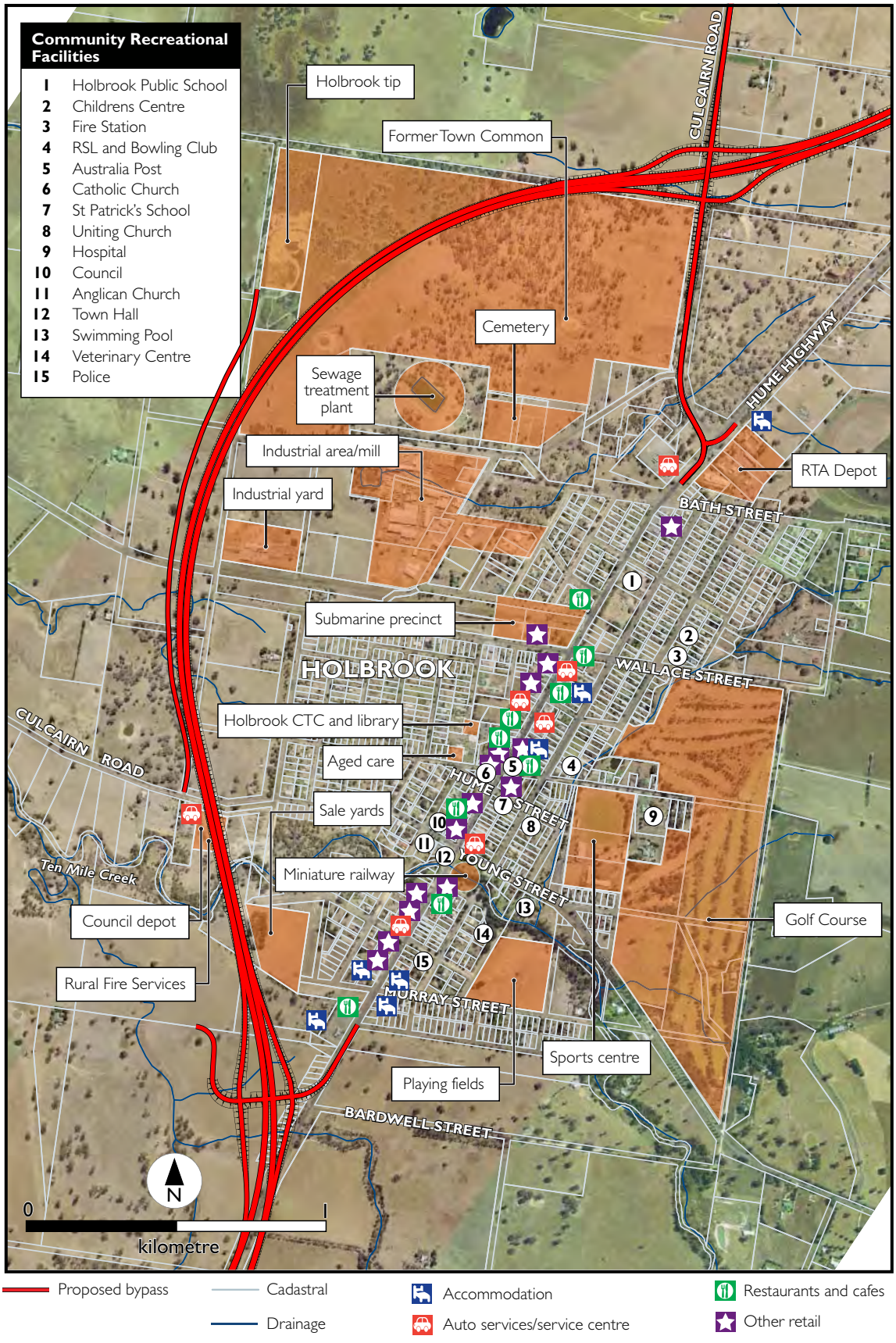

Figure 9-6 **Highway dependent businesses and community and recreation facilities in Holbrook, 2009**

Geographically, the Holbrook Urban Centre and Locality (UCL) is located within the Greater Hume Shire local government area, which forms part of the Murray Statistical Division (SD). The demographic data captured in the 2001 and 2006 Australian Bureau of Statistics (ABS) census from these geographical areas, including NSW, have been examined to compare and contrast the demographic baseline for the Holbrook UCL. Statistics are presented in Table 9-30 and are discussed further below.

Table 9-30 Demographic characteristics (2001 and 2006 ABS Census)

Attribute	Holbrook UCL	Greater Hume Shire LGA	Murray SD	NSW
Demographics				
Total population (2006)	1336	9731	110523	6549178
Total population (2001)	1276	n/a	108701	6371745
Population change (2001-2006)	4.5%	n/a	1.7%	2.7%
Under 25 years (%)	30.0%	33.1%	32.8%	33.1%
Over 65 years (%)	23.7%	15.6%	16.4%	13.8%
Median age (years)	44	41	40	37
Income				
Median household income ($/week)	$645	$840	$831	$1,036
Labour force				
Unemployment level	4.3%	3.7%	5.1%	5.9%
Not in the labour force	43.8%	33.2%	34.3%	34.3%
Total labour force	555	4763	53045	3092603
Employment				
Major industry	Retail trade (15.2%)	Agriculture, forestry and fishing (25.6%)	Agriculture, forestry and fishing (14.4%)	Retail (11.1%)
Major occupation	Labourers (19.9%)	Managers (27.3%)	Managers (19.4%)	Professionals (21.2%)
Household type				
Couple with children	37.4%	42.6%	41.2%	60.5%
Couple without children	48.2%	43.6%	42.7%	24.1%
One parent family	14.3%	12.7%	14.6%	14.2%
Other type	0.0%	1.1%	1.4%	1.2%
Average household size[1]	2.2	2.5	2.4	2.6
Education				
Year 12 or equivalent	21.5%	27.7%	29.9%	42.4%
Year 10 or equivalent	34.5%	33.7%	28.3%	25.9%

Attribute	Holbrook UCL	Greater Hume Shire LGA	Murray SD	NSW
Dwellings				
Number of dwellings	539	3575	41959	2328218
Main dwelling type	Separate house (89.8%)	Separate house (96.1%)	Separate house (84.3%)	Separate house (71.4%)
Tenure type				
Fully owned	43.1%	43.8%	37.1%	34.8%
Being purchased	26.1%	33.6%	32.1%	31.9%
Rented	26.1%	18.5%	26.5%	29.5%
Median housing loan repayment ($/month)	$867	$953	$1039	$1517
Median rent ($/week)	$120	$100	$130	$210

Source: 2006 Census (ABS 2006) and 2001 Census (ABS 2001)

1 Persons per household

The population of the Holbrook UCL in 2006 comprised 1336 persons (632 male and 704 female). The population of the Holbrook UCL has increased over the last few years, with a growth of 4.5 per cent between the 2001 and 2006 Census years, nearly double the growth of population in NSW (2.7 per cent).

Overall, the population of the Holbrook UCL is generally older than the other comparative areas. The median age of the population in the Holbrook UCL was 44 years of age, seven years older than the NSW median, and three years older than the Greater Hume Shire median. Thirty per cent of Holbrook's population was aged less than 25 years, lower than but comparable to the Greater Hume Shire (33.1 per cent) and the Murray SD (32.8 per cent).

The median weekly household income in the Holbrook UCL was $645, lower compared to the Greater Hume Shire with $840 per week, the Murray SD with $831 per week and NSW with $1036 per week.

The rate of unemployment in the Holbrook UCL was 4.3 per cent at the time of the 2006 Census. This was higher than the Greater Hume Shire with 3.7 per cent, however, lower than both the Murray SD and NSW. There is a significant difference in the level of the Holbrook population who are not in the labour force (43.8 per cent), 10 per cent greater than the Greater Hume Shire (33.2 per cent), the Murray SD (34.3 per cent) and NSW (34.3 per cent,) which are all very similar. This also ties in with the population's higher age as young people move out of the area for further education and often for work.

Of the 539 total dwellings in Holbrook, almost 69.27 per cent were identified as being fully owned or in the process of being fully owned, with repayments at nearly half the monthly amount ($867) of the whole state ($1517/month).

Compared to the state as a whole, Holbrook has a relatively low proportion of high school educated population (21.5 per cent of the population compared with 42.4 per cent in NSW). The local government area is serviced by a central public high school located in Culcairn.

Amenity and character

Holbrook has a rich local history, demonstrated by iconic features and historical buildings. The buildings lining the Hume Highway are representative of a history with strong agricultural roots, including a number of country hotels, church buildings and speciality shops. Holbrook is host to the HMAS Otway, and is widely known as the 'submarine town', demonstrating the importance of this icon in the town. The town was named Holbrook in 1914 in honour of Lieutenant N.D. Holbrook of the Royal Navy who was the first submariner to receive the Victoria Cross in World War I and had skippered the original HMAS Otway during that war (Greater Hume Shire Council, 2009).

Holbrook also acts as a service centre to the Great Hume Shire local government area and has a diverse rural economy that produces wool, wheat and other grains, lucerne, fat cattle and sheep (Greater Hume Shire Council, 2009).

Currently, the amenity of Holbrook is characterised by the Hume Highway, which passes through the centre of town. Holbrook is a favoured stopping point along the highway, and is serviced by many local businesses and the tourism precinct near the HMAS Otway. The town is traditionally known as an agricultural town, with its population living in both the township and in the rural hinterland. However, the amenity for some local residents is adversely affected by noise and traffic.

The commercial precinct of the town is also built around the Hume Highway. As such, the amenity for locals and passing trade is one that is characterised by a constant stream of traffic through town.

Community cohesion is promoted through various community organisations, local groups and Council, who provide funds or volunteers to keep some of the local historical museums, such as the Woolpack Inn, the National Museum of Australian Pottery and the submarine HMAS Otway open to the broader community and highway stoppers.

Land use

Holbrook is currently zoned under the Holbrook Interim Development Order 1970 (Holbrook IDO). The Greater Hume Shire Council was formed in 2004 by the amalgamation of the former Culcairn Shire, Holbrook Shire and part of the former Hume Shire. Council is currently preparing a revised LEP, known as the 'draft Greater Hume Shire Local Environmental Plan 2009', which includes Holbrook. This draft LEP proposes an 'RU5 Village Zone' for the majority of the Holbrook town centre surrounded by 'RU1 Primary Production'. Council has advised that this draft LEP will be gazetted in early 2010. The existing zoning and land use for Holbrook is discussed below and illustrated in Figures 9-6 and 9-7.

Holbrook consists of a consolidated town centre located along the eastern and western side of the existing Hume Highway. The town centre includes of a mix of retail, generally comprising ground floor shops, which are predominantly single storey detached buildings fronting the Hume Highway. Land included in this retail strip is zoned '3(a) General Business' under the Holbrook IDO.

Also included in this retail strip are a number of sites located on the western side of the Hume Highway, to the south of Ten Mile Creek that are zoned 3(b) Service Centre under the Holbrook IDO. Areas zoned 3(b) Service Centre are also located around the Holbrook town centre including to the south (Holbrook Caravan Park) and to the north (RTA depot and an adjacent vacant parcel of land).

The town centre is surrounded by residential development that is located on local streets. These residential areas are zoned '2(a) Residential A', '2(b) Residential B Village' and '2 (c) Residential C' comprising single to two storey detached dwellings of varying ages. These residential areas are low density with individual dwellings sometimes separated by vacant (un-developed) land also zoned for residential development.

An industrial area is located in the north-western corner of the town centre, this area is zoned '4(a) Industrial' under the Holbrook IDO. This area consists of low density one to two storey warehousing and factory structures separated by large areas of vacant land.

The Holbrook town centre is surrounded by a number of community sporting and recreational facilities, the majority of which are located on the eastern side of the Hume Highway. These recreational facilities include the Holbrook racecourse, Holbrook oval, golf course, playing fields and sports ground and the Ten Mile Creek area, all of which are zoned '6(a) Open Space' under the Holbrook IDO. A number of other community facilities are also located throughout the commercial town centre of Holbrook including Anglican and Uniting churches, Holbrook Public School and the Holbrook District Hospital all of which are zoned '5(a) Special Uses A'.

The Holbrook town centre is traversed by the non-operational Culcairn to Holbrook rail line. This rail line is located on land zoned '5(b) Special uses B Railway'.

The Holbrook town centre and residential area is surrounded by rural lots that increase in size and production as their distance increases from the centre. These lots are zoned a mix of rural uses including zone '1(a) Non-urban A' and '1(b) Non-urban B', '1(d) Non-Urban D Rural Small Holdings. The outer lying areas of Holbrook are used for primary production and farming.

The former Town Common is currently zoned for agricultural purposes. Council has recently purchased this land with the aim of rezoning and developing it for industrial purposes.