MODIFICATION REQUEST:
Pacific Highway Upgrade
Tintenbar to Ewingsdale

Modification to the Minister's Conditions of Approval 2.14, 2.17 and 2.18, seeking an increase to approved blasting criteria and blasting hours at St Helena Hill. (07_0051 MOD5)

Director-General's
Environmental Assessment Report
Section 75W of the
Environmental Planning and Assessment Act 1979
March 2013

Cover Photo – Artist's impression of the completed St Helena Hill tunnel southern portal [RMS January 2013]

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EXECUTIVE SUMMARY

The Pacific Highway Upgrade – Tintenbar to Ewingsdale Project (07_0051) was approved by the then Minister for Planning in January 2010 under Part 3A of the *Environmental Planning and Assessment Act 1979* (the Act). The approved project, referred to as the Tintenbar to Ewingsdale section of the Pacific Highway upgrade, is approximately 16.3 kilometres in length, starting at the northern end of the Ballina bypass at Ross Lane and extending to the Ewingsdale interchange.

Construction of the project commenced in September 2012 and is expected to be completed in the second half of 2014 (weather permitting).

The Roads and Maritime Services (RMS) has submitted a modification request (07_0051 MOD 5) under section 75W of the Act to modify the approval to permit an increase in the blasting criteria and blasting hours at the St Helena hill tunnel.

The department placed the modification request on its website and consulted with the Environment Protection Authority (EPA) and Byron Shire Council, who raised no objection to the proposal.

The Department has undertaken a comprehensive assessment of the modification request and considers the modification to be acceptable. The Department is satisfied that the modification request is justified and therefore has recommended its approval.

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1. BACKGROUND

The Pacific Highway Upgrade – Tintenbar to Ewingsdale Project (07_0051) was approved by the then Minister for Planning in January 2010 under Part 3A of the *Environmental Planning and Assessment Act 1979* (the Act). The approved project, referred to as the Tintenbar to Ewingsdale section of the Pacific Highway upgrade is approximately 16.3 kilometres in length, starting at the northern end of the Ballina bypass at Ross Lane and extending to the Ewingsdale interchange.

Construction of the project commenced in September 2012 and is expected to be completed in the second half of 2014 (weather permitting).

The project location and layout is shown in **Figure 1**.

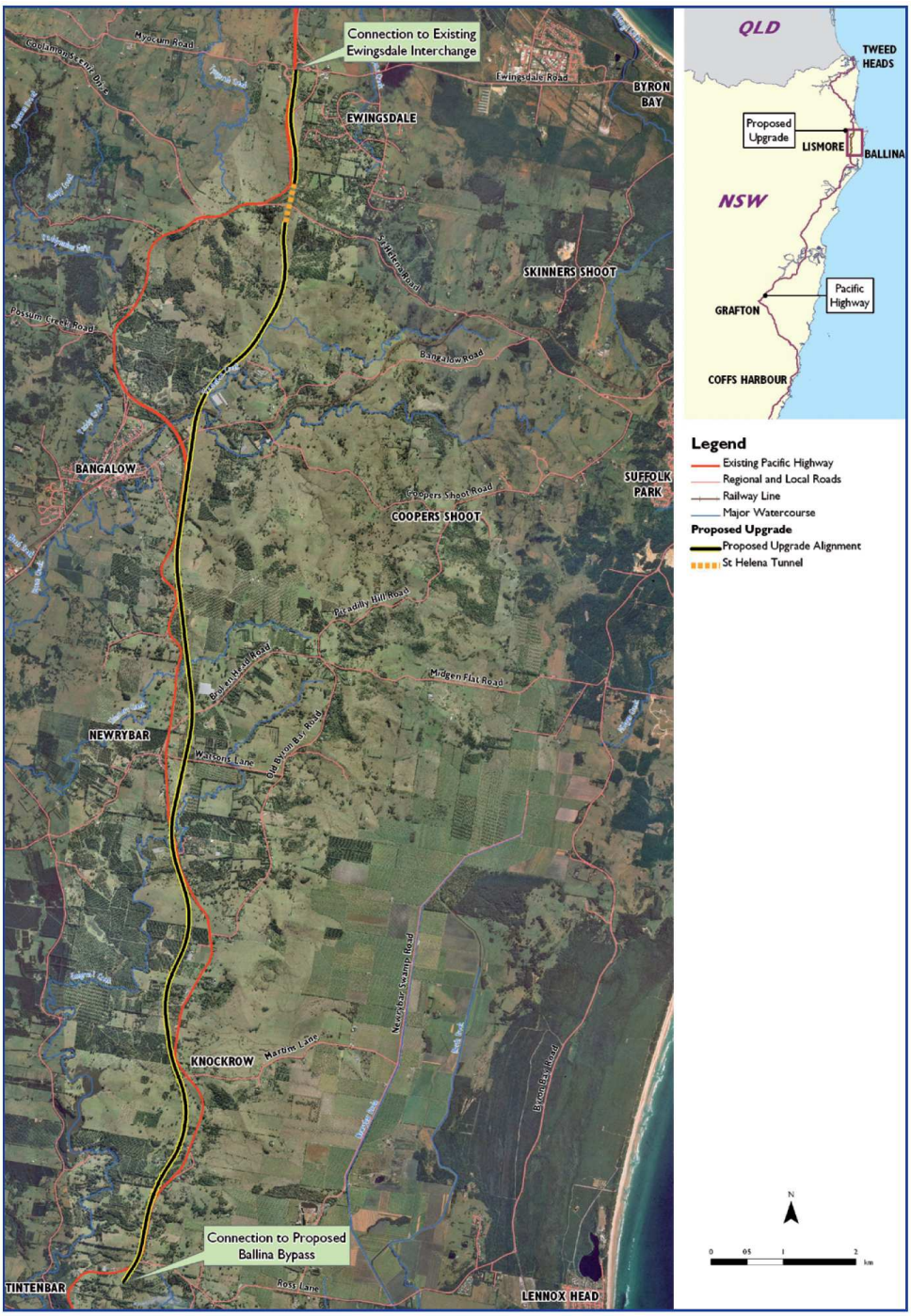

Figure 1 Project location (Source: EA — Arup 2008)

The project traverses mostly rural land uses between Tintenbar and Ewingsdale. The Project is designed to separate local traffic and highway traffic by providing a continuous alternative local road link. However the project runs in close proximity to Bangalow and Ewingsdale townships.

The project has been modified four times:

- MOD 1 (July 2010) to extend the hours in which construction of the tie-in with the Ballina bypass can take place
- MOD 2 (November 2010) to modify the definition of construction to permit certain pre-construction activities
- MOD 3 (November 2012) to modify the definition of an ancillary facility and the approval process for minor ancillary facilities
- MOD 4 (November 2012) to make changes to condition 2.22 in regards to heritage site H29 and H39.

2. PROPOSED MODIFICATION

2.1 Modification Description

The RMS (the Proponent) has submitted a request (07_0051 MOD 5) under section 75W of the Act to modify conditions of approval 2.14, 2.17 and 2.18, seeking an increase to approved blasting hours and criteria at St Helena Hill.

Condition 2.14 specifies the hours during which blasting may occur. The RMS is proposing that the blasting hours at the St Helena hill tunnel be aligned with the project's standard construction hours of 7:00am to 6:00pm on Mondays to Fridays (as specified in condition 2.12). This would provide the construction project team with the ability, as a contingency, to undertake blasting between 7:00 am to 9:00am and 5.00pm to 6:00pm on Mondays to Fridays inclusive (an extension to the existing approved blasting hours of 9:00am to 5:00pm) in the event that environmental conditions are not optimal for blasting during the existing approved blasting hours.

Conditions 2.17 and 2.18 specify the airblast overpressure and ground vibration (peak particle velocity) criteria, respectively, for blasting associated with the project. RMS is proposing an increase in the specified blasting limits that would facilitate a significant reduction in the total number of blasts required, while complying with minimum predicted vibration levels for cosmetic building damage. Further, the RMS has requested that the application of increased blasting criteria apply only to those affected landholders who have entered into a private agreement with the RMS consenting to the increased limits.

The department notes that the environmental assessment for the proposed blasting modification includes the assessment of blasting for the establishment of a 'tunnel control centre', located on St Helena hill. The RMS has withdrawn the proposed tunnel control centre from this modification request, and advised that the tunnel control centre will be subject to a separate modification request. Therefore, the department has excluded blasting for the purposes of establishment of the tunnel control centre from its assessment of this proposed modification.

3. STATUTORY CONTEXT

3.1 Modification of the Minister's Approval

In accordance with clause 3 of schedule 6A of the Act, section 75W of the Act as in force immediately before its repeal on 1 October 2011 and as modified by schedule 6A, continues to apply to transitional Part 3A projects.

Section 75W of the Act provides that a proponent may request the Minister to modify the approval of a transitional Part 3A project. The Minister's approval is not required if the project, as modified, will be consistent with the original approval. The subject modification is not consistent with the approval, but would not result in a radical transformation and therefore a modification in accordance with section 75W of the Act is considered appropriate.

3.2 Delegated Authority

An application to modify a transitional Part 3A project approval may be determined by the A/Director, Infrastructure Projects of the Department of Planning and Infrastructure under delegation from the Minister for Planning and Infrastructure, dated 14 September 2011, where the local council does not object, a political disclosure statement has not been made in relation to the application, and less than 10 objections are received. This proposed modification meets the terms of this delegation, and may be determined by the A/Director, Infrastructure Projects.

4. CONSULTATION AND SUBMISSIONS

Under Section 75X(2)(f) of the Act, the Director General is required to make the modification request publicly available. Accordingly, the Department placed a copy of the modification request on its website.

The Department also consulted with the NSW EPA and Byron Shire Council. The EPA and Council indicated their support for the proposal.

5. ASSESSMENT

Blasting criteria

Existing blasting criteria
The relevant noise and vibration criteria for blasting at the St Helena hill tunnel works are specified in Conditions 2.17 and 2.18 of the project approval:

- Condition 2.17 specifies the airblast overpressure limits to protect human comfort and annoyance due to blasting. The criteria are based on guidelines prepared by the Australian and New Zealand Environment and Conservation Council for the assessment of blasting impacts.
- Condition 2.18 specifies the peak particle velocity (PPV) ground vibration level for the assessment of damage to structures. The criteria are based on ground vibration levels recommended by *AS 2187.2-2006 Explosives — Storage and use* (AS 2187.2-2006) for assessment of damage to buildings.

The blasting criteria set by conditions 2.17 and 2.18 are presented in **Table 1**.

Table 1 Approved blasting criteria for St Helena tunnel works (conditions 2.17 and 2.18)

Condition 2.17 Airblast Overpressure (dBL)	Condition 2.18 Ground Vibration—Peak particle velocity (mms^{-1})	Conditions 2.17 and 2.18 Allowable Exceedence
115	5	5% of a total number of blasts over a 12 month period
120	10	Never

The proponent has undertaken an analysis of the anticipated blasting schedule for the St Helena hill tunnel works, based on the approved blasting criteria. The anticipated blasting period, including the predicted total number of blasts required, is presented in **Table 2**.

Table 2 Blasting schedule under approved blasting criteria

Tunnel	Required blasts	Blasting period
Northbound (western)	235	207 days
Southbound (eastern)	232	206 days

The RMS has identified that a substantial reduction in the blasting program could be achieved through fewer, larger blasts. Blasting is required for box cuts at the tunnel portals, and in the excavation of the two tunnels. Box cuts would be undertaken in a series of benches using mechanical techniques and controlled blasting. Drill and blast techniques would be used for the excavation of the St Helena hill twin tunnels. Heading blasts (blasts undertaken using horizontal drill holes) would be undertaken to excavate the top (heading) section of the proposed tunnel alignments, and bench blasts (blasts undertaken using vertical drill holes) would be undertaken to excavate the remaining lower (bench) section. RMS notes that the efficiency of excavation (that is, volume of material (m^3) removed per minute) increases substantially with larger explosive charges.

Proposed blasting criteria
The RMS asserts that the existing blasting criteria are relatively conservative and relate to human comfort levels rather than damage to buildings. The RMS seeks to increase the blasting limits to levels that would avoid cosmetic building damage but may impact upon human comfort, with agreement from all affected landowners.

To facilitate the reduction in the blasting schedule, the RMS seeks to increase the blasting criteria in conditions 2.17 and 2.18. The proposed limits for airblast overpressure and ground vibration have been determined in consideration of the need to minimise offsite impacts and maximise efficiency of blasting.

A literature review conducted for the proposal indicates that cosmetic damage can occur in the event that airblast overpressure reaches or exceeds 136 dBL, and recommends committing to a level of energy 100 percent less than this (that is, a maximum airblast overpressure level of 133 dBL). Accordingly, the RMS has proposed an airblast overpressure limit of 125 dBL for 95 percent of blasts, with 5 percent of total yearly blasts permitted to a maximum limit of 130 dBL. For comparison, the RMS notes that strong winds may exceed overpressure levels of 130 dBL without causing cosmetic building damage. RMS considers that the proposed limits would minimise the risk of cosmetic building damage while facilitating a reduction in the blasting schedule.

The RMS notes that AS 2187.2-2006 provides guidance on ground vibration impacts to buildings. This Australian Standard indicates that cosmetic building damage would occur in the event that ground vibration levels exceed 50 mms^{-1}. Accordingly, the RMS has adopted a ground vibration limit of 15 mms^{-1} for 95 percent of blasts, with 5 percent of total yearly blasts permitted to a maximum limit of 20 mms^{-1}. The RMS considers that these limits would facilitate increased efficiency in blasting, reduce the need for mechanical excavation works such as rock hammering at the tunnel portals, and protect nearby buildings from risk of façade damage.

The proposed criteria, and how these differ from the existing criteria, are shown in **Table 3**.

Table 3 Proposed blasting criteria for works at the St Helena tunnel works

	Condition 2.17 Airblast Overpressure (dBL)	**Condition 2.18 Ground Vibration—Peak particle velocity (mms^{-1})**	**Allowable Exceedence**
Existing	115	5	5% of a total number of blasts over a 12 month period
Proposed	125	15	5% of a total number of blasts over a 12 month period
Existing	120	10	Never
Proposed	130	20	Never

The RMS indicates that allowing the proposed increase in blasting criteria would facilitate a five week reduction in the time required for excavation of the twin tunnels. The predicted number of blasts and blasting days possible under the proposed criteria is presented in **Table 4**.

Table 4 Anticipated changes to blasting schedule pending approval of increased blasting criteria

Tunnel	**Required blasts**	**Blasting period**
Northbound (western)	141 (*94 fewer blasts*)	178 days (*29 fewer days*)
Southbound (eastern)	140 (*94 fewer blasts*)	176 days (*28 fewer days*)

An assessment was conducted to determine the number of receivers that would experience vibration impacts over the approved ground vibration criteria as a result of the larger blasts. The ground vibration contour for the proposed larger blasts is shown in **Figure 2**.

The RMS acknowledges that five residences on St Helena Road would experience airblast overpressure or ground vibration impacts in exceedence of the existing approved criteria, but within the proposed increased blasting limits, should the larger blasts be approved. Residents of these properties would experience impacts to amenity when blasts occur, but buildings on these properties would not be damaged by the increased vibration impacts. Furthermore, the RMS notes that the duration of noise and vibration impacts from each blasts is only a few seconds, depending on wind speed and other environmental factors, and residents indoor would experience limited ground vibration effects.

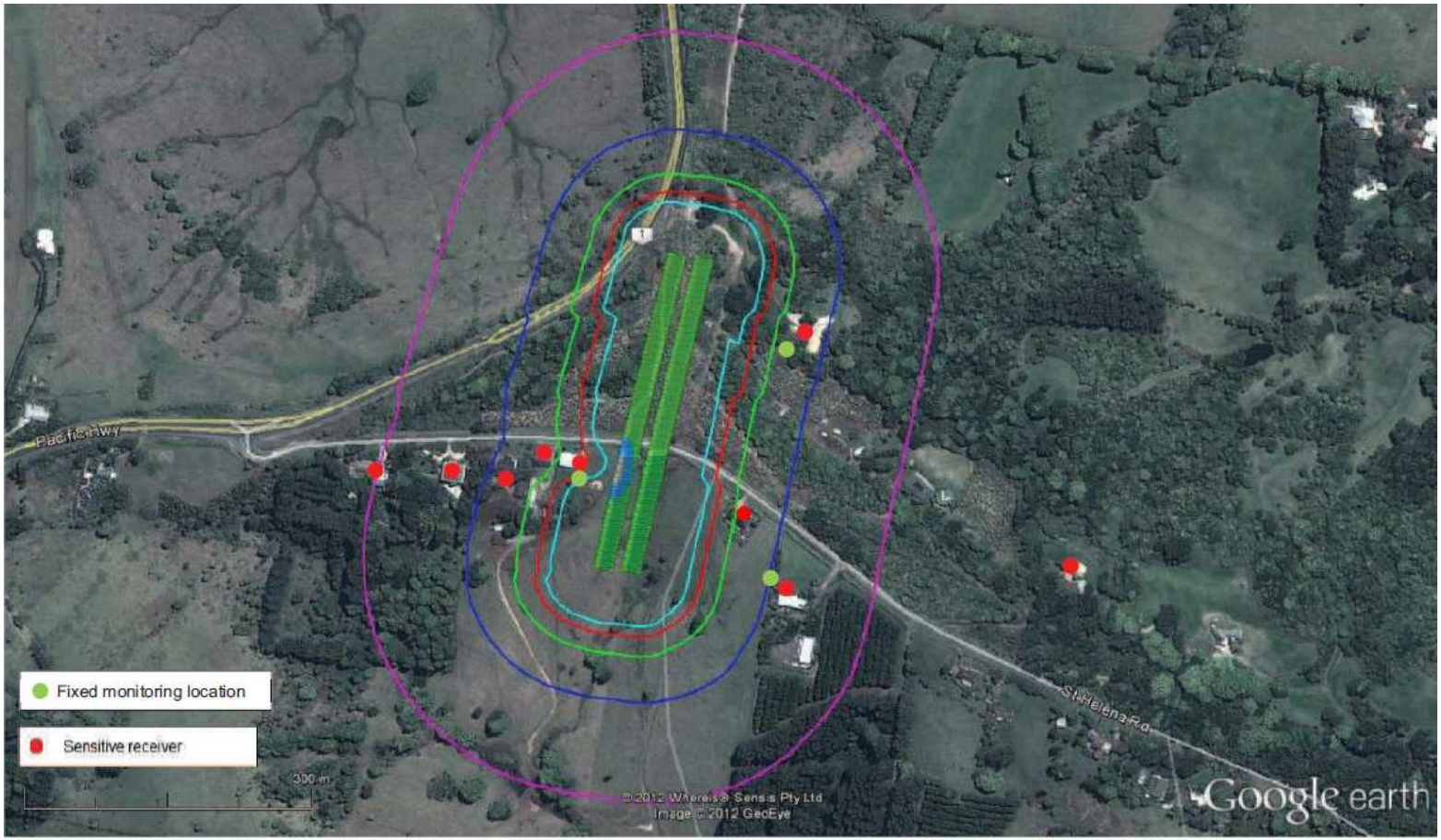

Figure 2 Increased blasting limits - ground vibration impacts (Source: Modification request — Baulderstone 2013)

As shown in **Figure 2**, five residences would experience impacts over 5 mms^{-1} as a result of the use of larger blasts for the project. The RMS proposes that increased blasting limits would only be implemented with the written agreement of all five affected landowners. Under the terms of the agreement, the landowners would retain the ability to terminate the agreement at any time. Should a landowner terminate the agreement, then the existing approved blasting criteria (conditions 2.17 and 2.18) would apply at that property. The department has sighted copies of the signed agreements.

To address the impacts of the proposed modification, the RMS conducted an extensive consultation program to engage with all affected residents in accordance with a controlled blasting communications plan. One on one meetings were conducted with all residents within a 500 metre radius during April and May 2012, to discuss the impacts of the proposed changes to blasting criteria and working hours. A street meeting was conducted on 21 May 2012 to enable residents to view a presentation on the proposal, and ask questions about potential impacts. A number of follow up meetings were then conducted to discuss outstanding issues. Following this consultation, all five affected landowners entered into an agreement with the RMS regarding the proposed increase in the blasting criteria.

The RMS has committed to a range of mitigation measures, including the continued implementation of existing controls. These mitigation measures would include implementation of a blast management plan in accordance with AS 2187.2-2006; notification of landowners prior to blasts that may impact on livestock; avoidance of blasting during strong winds; use of electronic detonators to ensure accurate blasting in sensitive areas; continued monitoring of airblast overpressure and vibration levels, including use of flashing warning lights to identify exceedences in real time; post-blast review to assess consistency of blasting impacts, and implementation of additional mitigation measures including use of additional fill or blast mats where necessary.

The RMS has committed to addressing any complaints received. Residents have been notified of a dedicated contact line for all project related inquiries and complaints. All complaints would be dealt with in accordance with a blasting complaints management procedure, which requires the RMS to respond to all complaints within 24 hours; investigate appropriate mitigation measures to prevent further impacts; and report monthly on all complaints received.

The RMS has also committed to rectifying any damage to property caused by blasting. The RMS notes that, whilst damage to property is considered unlikely, it has previously conducted detailed property condition reports and structural assessments for all potentially affected residences within 500 metres of the St Helena hill tunnel works. A property condition survey would be completed two months after the end of construction to assess any impacts to residences from blasting. A damage claim procedure has been developed to allow residents to seek compensation in the event of property damage.

Blasting hours

Existing blasting hours
The relevant working hours for blasting at the St Helena hill tunnel works are specified in Condition 2.14 of the project approval. Condition 2.14 restricts blasting for the project to between 9:00 am and 5:00 pm, on Mondays to Fridays. It is noted that the blasting hours differ from the general construction hours provided in condition 2.12, which allows construction activities (excluding blasting) to be undertaken on the site between 7:00 am to 6:00 pm.

Proposed blasting criteria
The RMS considers that, in order to allow for greater efficiency in blasting schedules, there is a need to extend the period for morning and afternoon blasting works. The proponent seeks

to amend condition 2.14 to allow blasting between 7am to 6pm, Mondays to Fridays, inclusive for the St Helena Hill tunnel works between Chainage 27800 and Chainage 28500.

The St Helena tunnel works involve morning and afternoon blast periods, involving a cycle of one blast at each of the three blasting locations (tunnel portals and tunnels) around 9.00am and 5.00pm. Each blast requires set preparatory work, including drilling and loading of the required charge. The RMS has indicated that this process may be interrupted by equipment failures and unforeseen geotechnical conditions. Further, no blasting would occur where RMS determines that environmental conditions mean that the blast criteria may be exceeded; for example, during strong winds in the direction of sensitive receivers. The RMS asserts that the current approved blasting hours limits the flexibility to absorb delays to blasting into the construction schedule.

The RMS has indicated that an extension to blasting hours to allow blasting between 7.00am and 6:00pm would provide the project team with flexibility to respond to unexpected delays and environmental issues. The extended morning hours would enable the RMS to conduct blasting immediately after 7:00am, which would enable earlier afternoon blasts; and after 5:00pm, in the event, for example, morning blasts are delayed. This would provide additional time for blasting when interruptions occur during the morning and afternoon blast period. In limited circumstances, additional blasting cycles could occur to reduce impacts to the blasting schedule from missed blasting cycles.

The RMS indicates that the blasting between 7:00am and 6:00pm Mondays to Fridays would create offsite noise and vibration impacts. The RMS asserts, however, that these impacts would be minimal and last for a few seconds. As discussed above, ground vibration and airblast overpressure impacts would impact upon the amenity of residents, but impacts would last a few seconds and would not cause cosmetic damage or impact on the structural integrity of adjacent buildings. Noise impacts from blasting activities would continue to comply with the approved noise criteria.

The RMS acknowledges that road closures at St Helena Road and rolling stoppages on the Pacific Highway would be required for up to 10 minutes during some blasting at the northern tunnel portal. Blasting at the southern portal and within the twin tunnels does not require the closure of these roads. The RMS anticipates, however, that the total number of blasts that would require road closures would be halved as a result of the increased blasting limits, from six blasts to three.

The RMS considers that other environmental impacts would be minimal, and able to be managed through existing controls and mitigation measures proposed for blasting on the site. While the proposal would generate additional traffic during the extended hours (including transport of staff to and from site), overall construction traffic in the area would remain consistent with existing construction traffic levels at the site during these hours. Offsite air quality impacts from dust generation would be appropriately managed through wetting of the blast area before and after blasting in dry and windy conditions, and stemming (placing material in the blast holes).

The RMS notes that, during consultation for the proposal (as discussed above), all residents within a 500 metre radius of the St Helena hill tunnel works were consulted. Fourteen residences would be affected by increased noise and vibration levels during the increased blasting hours. The RMS asserts, however, that the project would continue to comply with the noise criteria at all fourteen residences, and with the existing blasting criteria at nine residences. Further, the RMS asserts that the intermittent nature of noise and vibration from the blasts would be minimal relative to the otherwise continuous general construction noise at the site. Of the fourteen affected landowners consulted, eleven indicated they did not object to the increase in blasting hours (three did not respond). As discussed above, all five landowners who would experience ground vibration and airblast overpressure impacts above the existing blasting limits have also entered into agreements with the RMS, consenting to the increased impacts.

Department's consideration

The department considers that the proposal represents an opportunity to reduce the blasting schedule for the construction of the twin St Helena hill tunnels, thereby reducing the overall construction duration of the project. The RMS states the extended blasting hours could potentially result in controlled blasting being carried out six times per day (e.g. two blasts in each tunnel at the southern portal end and two blasts in the northbound tunnel from the northern portal end). Blasts are likely to be carried out in the morning and late afternoon. The RMS envisages an eight hour cycle between blasts, with the removal of spoil following a blast, inspection, roof support installation and drilling and loading for the next blast. It should be noted that with blasting at the approved limits, the time between blasts is likely to be shorter (due to the lesser amount of spoil to be removed, roof supports installed and blast hole drilling) compared to the removal of spoil and preparation work for a larger blast size.

The department acknowledges that the proposed modification would allow for blasting that exceeds recommended levels for human comfort. Five residences would experience increased vibration impacts as a result of the use of larger blasting charges at the St Helena hill tunnel works; these impacts would affect the amenity of residents but would not result in damage to buildings. However, the department notes the limited nature of the impact, in terms of duration and extent. Impacts such as noise would potentially be the greatest (but within the construction noise goals) during the opening of the Northern and Southern Portals, but would likely be inaudible once blasting occurs underground within the twin tunnels. It is also noted that the increased blasting hours are restricted to weekdays (Monday to Friday) and there are no changes to blasting hours on Saturdays (9.00am to 1.00pm) and no blasting is permitted on Sundays and public holidays. The department has also restricted the increased blasting hours to a twelve month period, which would provide certainty to the community of the duration of the construction period. The overall effect is a reduction in the construction duration of the project, which would be of benefit to the community and motorist.

The department considers that the RMS' proposal to limit the increased blasting criteria to residents who have signed private agreements is appropriate. The department notes that increasing blasting criteria through private agreement with landowners is consistent with AS 2187.2-2006, which recognises that higher limits may be entered into by agreement. Should a landowner withdraw their agreement, the department would require the RMS to comply with the existing (more stringent) blasting limits at that residence. The department acknowledges that this approach has previously been adopted for approved increases to blasting criteria for the Banora Point, Kempsey to Eungai and Sapphire to Woolgoolga Pacific Highway Upgrade projects. The department therefore recommends that the increase in blasting criteria be made contingent on the continued agreement of affected landowners.

The department considers that the proposal to increase the blasting criteria and extend the blasting hours is justified by the increased flexibility it would provide to the RMS to reduce the construction schedule. The department considers that the most significant offsite impact of increased blasting hours is increased vibration. The department notes that, whilst there would be impacts to the amenity of residents immediately following each blast, ground vibration and airblast overpressure impacts would be limited to a few seconds per blast, and cosmetic damage or impact on the structural integrity of adjacent buildings would be avoided.

It is noted that the RMS advises the likely period for excavation at the St Helena hill tunnel is eleven to twelve months. The department has recommended a condition allowing the Director-General to elect to extend this period in consultation with the EPA in the event that excavation works exceed twelve months. The department notes that the RMS has committed to the monitoring and mitigating the environmental impacts of the larger blasts, and reporting on the adequacy of control measures in its quarterly compliance tracking report during this twelve month period. The results of monitoring and reporting would be considered in any request to extend the application of the increased blasting limits.

The department considers that other environmental impacts of increased blasting criteria and blasting hours would be minimal. The department notes that, while larger blasts would be noisier, the RMS has indicated that the project would continue to comply with the project noise criteria at all offsite sensitive receivers. The department also considers that air quality impacts would be appropriately minimised by implementation of existing controls, including wetting the blast area and stemming where required. Traffic generation associated with blasting between 7:00am to 9:00am and 5:00pm to 6:00pm would be consistent with the impacts already associated with general construction works during those times. The department notes that the number of total blasts requiring road closures (for blasting at the Northern Portal only) would reduce from six to three when larger blasts are used.

The department notes that the proposal generally has the support of those residents affected by the proposed increase in vibration levels and relevant agencies. The department acknowledges the proponent has undertaken extensive consultation to identify and address community concerns with the proposal. Further, the department notes that the EPA and Byron Shire Council have reviewed the proposal, and are satisfied that the proposed modification would minimise the impacts of increased blasting criteria and working hours. The department notes that the environment protection licence for the project (EPL 20138) would need to be amended to reflect the proposed modified conditions.

6. CONCLUSION AND RECOMMENDATIONS

The proposal to allow an increase in blasting levels with the agreement of property owners would have benefits for the local and broader community and road users. The ability to increase blast sizes would facilitate a substantial reduction in the blasting program. Further, the proposed modification would continue to protect nearby residences from cosmetic and structural damage from airblast overpressure and ground vibration.

The department notes that the proposal would have minimal impact upon human comfort, but acknowledges that proponent has committed to restricting the proposed increase in blasting impacts to properties for which an agreement has been entered into. The existing blasting criteria would continue to apply to properties which do not have an agreement. The proposed maximum ground vibration and airblast levels are consistent with AS 2187.2-2006, which sets recommended guidelines for human comfort and damage to buildings, and recognises that higher limits may be entered into by agreement. The department also notes that based on the likely blasting schedule, there is sufficient respite (up to 8-hours) for potentially affected receivers between blasts (due to the need to remove spoil, install roof supports and drilling and loading for the next blast).

The department considers the increase in blasting hours is appropriate, given the minimal impacts of increased blasting limits to affected receivers, and the limited duration (a matter of seconds) of blast impacts. Overall, the department considers that the proposal generally has positive benefits for the local community as it would contribute to a reduction in the construction program. Furthermore, the proponent has proposed feasible and reasonable mitigation measures that would adequately monitor and address noise and vibration impacts from the larger blasts at the tunnel portal. Therefore, the department recommends that the A/Director Infrastructure Projects approve the modification request under section 75W of the Act, by signing the attached Instrument of Modification.

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Endorsed by

Kylie Seretis 18/3/13
Manager Roads
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