Transport for NSW

M1 Pacific Motorway extension to Raymond Terrace

Hunter River Viaduct Consultation

September 2024

transport.nsw.gov.au

NSW GOVERNMENT

Acknowledgment of Country

Transport for NSW acknowledges the Wonnarua, Worimi and Awabakal Traditional Custodians of the land on which the M1 Pacific Motorway Extension to Raymond Terrace project is located.

We pay our respects to Wonnarua, Worimi, Awabakal Elders past and present and celebrate the diversity of Aboriginal people and their ongoing culture and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the lands, waters and seas and their rich contribution to society.

Contents

1 Introduction

1.1 Purpose of this report

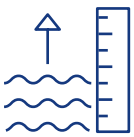
Between April and August 2024 Transport for NSW (Transport) consulted with the community on potential impacts of two methods of construction for the Hunter River section of the 2.6-kilometre viaduct (bridge) over the Hunter River and surrounding floodplain at Hexham, an essential component of the M1 Pacific Motorway extension to Raymond Terrace.

The consultation addressed potential additional temporary flooding impacts should a flood event occur during the construction activities for the viaduct.

This report summarises the feedback received and confirms Transport's preferred approach to construction of the viaduct which has been informed by the feedback received.

1.2 Background

The Australian and NSW Governments are funding the 15-kilometre M1 Pacific Motorway extension to Raymond Terrace. Transport has engaged a joint venture between John Holland Pty Ltd and Gamuda Berhad (John Holland Gamuda Joint Venture) to finalise the design and construct the 10-kilometre southern section from Black Hill to Tomago. This includes the 2.6-kilometre viaduct (bridge) over the Hunter River and surrounding floodplain.



Consultation addressed potential temporary flooding impacts should a flood event occur

During the Environmental Impact Statement (EIS) and planning approvals phase of the project the viaduct construction method was proposed to involve two small rock jetties, dredging and use of large barges. The project approval allows for, and anticipates that, elements of the project will be adjusted or refined during the detailed design phase to, among other things, facilitate more effective or efficient construction, or increase value for money. The EIS listed the construction methodology of bridges and structures including the viaduct as a project uncertainty that would be resolved while considering effective construction methods for complex structures and value for money.

During the detailed design phase, the John Holland Gamuda Joint Venture proposed an alternative construction method for the viaduct.

To ensure better understanding of the proposed methods by the community, to increase Transport's understanding of potential flood impacts and to assist with development of mitigation strategies, both options were presented for community and stakeholder consultation:

1. small rock jetties, dredging and large barges
2. temporary rock platforms.

Modelling of both viaduct construction options identified properties that may be temporarily impacted by changes to predicted flood levels or inundation durations in the event of a flood during construction. Owners of these properties were a focus of the project team's consultation efforts.

During April and May 2024, preliminary feedback was sought from owners of properties where the changes to predicted flood levels or durations exceeded the EIS flood assessment criteria, focusing on mitigation measures and other support that could be considered in specific circumstances to minimise potential flooding impacts.

Following this early consultation, community members and stakeholders were invited to a 'Have your say' consultation program between Friday 12 July and Monday 5 August 2024, which aimed to increase community awareness and understanding of two viaduct construction options, increase Transport's understanding of property impacts and community concerns and to provide a further opportunity for feedback.

This consultation followed earlier engagement by the project team with other stakeholders including commercial fishers and prawn trawlers, the Newcastle Fishermen's Co-op, NSW Fisheries, and commercial cruise operators.

Consultation has also occurred with Port Stephens Council, Maitland City Council, Newcastle City Council, local State Emergency Service (SES), and the Lower Hunter Valley Flood Mitigation Scheme (now part of the NSW Department of Climate Change, Energy, the Environment and Water) regarding access to resources needed for effective flood management plans and procedures in the event of a flood.

Reduced traffic volumes on the existing road network and improved conditions for pedestrians and cyclists

1.3 Benefits of the project

On opening, the project will save motorists between seven and nine minutes of travel time during peak periods, bypass up to five sets of traffic lights and reduce traffic demand on existing key routes across the road network.

Key benefits of the project include:

- Improved connection between the M1 Pacific Motorway and the Pacific Highway
- Improved traffic flow for motorists and freight for more reliable travel times
- Improved access to the surrounding road network
- Improved safety for all road users
- Reduced traffic volumes on the existing road network, improving conditions for pedestrians and cyclists
- More efficient access to facilitate economic growth for the Lower Hunter and key regional employment areas such as the Port of Newcastle, Newcastle Airport, Tomago, Beresfield and Black Hill.

Figure 1.1 Viaduct construction area near Hexham

1.4 Hunter River viaduct construction methods

Two viaduct construction options (small rock jetties and large barges, and temporary rock platforms) presented for consultation during the 'Have your say' period are described in more detail below. Both methods have been used successfully in NSW Transport infrastructure projects. Barges were used in the third Hunter River crossing at East Maitland in 2009 and the duplication of the Tourle Street Bridge in 2016. Rock platforms were used successfully in the construction of Pacific Highway upgrade projects including the bridge over the Wilson River at Telegraph Point, the Kempsey Bypass (Macleay River), the Ballina Bypass (Emigrant Creek North, Emigrant Creek Central and Emigrant Creek South) and Tintenbar to Ewingsdale at Tinderbox Creek as well as for construction of Nowra Bridge in 2021.

1.4.1 Option 1: Small rock jetties and large barges in the Hunter River

Option 1 involves using small rock jetties and large barges to construct the Hunter River crossing portion of the 2.6-kilometre long viaduct. The rock jetties would provide access to support the marine construction works. In addition to small rock jetties of 25-metres in length, dredging of the riverbed would be required to enable barges to access the rock jetties and the shallower locations near the western riverbank. Barges would then be used to transport and allow piling rigs, large cranes and concrete pumps to work over water. Secondary barges would also support construction and assist in supplying materials, removing spoil and piling activities.

An example of this method used for the Tourle Street Bridge project is in Figure 1.2 and its main characteristics are outlined in Table 1.1.

Figure 1.2 Example of barge-based construction – Tourle Street Bridge

Table 1.1 Construction characteristics (Option 1)

Characteristic	Description
Safety	• Barges can be moved and repositioned, allowing for flexibility in accessing different parts of the construction site or even different projects without needing to construct new platforms. • Overloading or uneven loading of a barge can lead to instability and increase the risk of capsizing, especially in rough water conditions. • Secured loads have the potential to shift during operations, leading to sudden changes in the barge's balance and increasing the risk of tipping over.
Construction time / cost efficiency	• Barges can be reused for multiple projects, making them a versatile asset for construction activities. • Barges can be equipped with various facilities such as cranes, storage spaces, and accommodation for workers, providing an all-in-one solution that reduces the need for additional infrastructure. • Barges can be readily outfitted with utilities such as power and water which can be more challenging to provide on a rock platform. • Barges would require dredging and disturbance of the riverbed to enable access for larger vessel types for transport of construction cranes and piling rigs on barges. • Barges of the size and type required must be sourced from greater distances or interstate due to lack of suitable larger vessels locally. • Securing relevant approvals to undertake dredging, obtaining dredge equipment and undertaking dredging activities extends time required for construction and extends the overall period of impact.
Environmental impact / benefit	• Barges are temporary structures that can be removed entirely after project completion. • Barges do not require the placement and subsequent removal of large amounts of rock or other materials into the water, which can disturb aquatic habitats, but do necessitate dredging of the riverbed under this option. • Working directly over water with barges can potentially present greater risk of environmental damage from uncontrolled spills into the river such as fuels and oils and other construction chemicals. • Using barges requires dredging the Hunter River to allow access for the larger vessels required. Dredging may result in localised environmental impacts.
Flood risk in the event of a flood	• The EIS identified potentially impacted property owners requiring consultation. This number has increased since project approval as Transport has expanded the flood model and used updated rainfall data (to ARR2019)* to identify all potentially impacted properties more accurately. • Transport committed to engage and consult with property owners who are potentially impacted by changes in flood levels and inundation durations above flood assessment criteria due to the construction and operation of the project. • There are 315 structures and 136 lots that are potentially flood impacted for Option 1. **Australian Rainfall and Runoff (ARR) is the national guideline document, data and software suite for the estimation of design flood characteristics in Australia.*

1.4.2 Option 2: Temporary rock platform in the Hunter River

Option 2 involves using a temporary rock platform in the Hunter River. The rock platforms would be used in two separate stages – starting with a platform up to 180-metres long constructed from the western side of the river. Once work is complete, the rock material would be removed and relocated to the eastern side of the river to construct a platform up to 100-metres long allowing crews to complete the viaduct construction. Longer platforms would remove the need for dredging, however, may still include the use of small barges to minimise the impacts on nearby properties. Following completion, the rock platform would be removed. The rock platforms would provide land-based access for the workforce, equipment and materials and minimise the need to work over water.

An example of this method used for the Nowra Bridge project (utilising a rock platform of 120 metres) is in Figure 1.3 and its main characteristics are outlined in Table 1.2.

Figure 1.3 Example of rock platform construction (Nowra Bridge)

Table 1.2 Construction characteristics (Option 2)

Characteristic	Description
Safety	• A stable platform reduces the risk of accidents associated with the movement of a barge, making it safer for workers. • In emergencies, evacuation and rescue operations can be easier and more efficient on a stable platform than on a floating barge. • Better access for transporting materials and equipment to and from the construction site. • Rock platforms are less affected by adverse weather conditions compared to barges, which can be significantly impacted by storms. • Eliminates the safety risks associated with marine operations and involves minimal water-based works.
Construction time / cost efficiency	• Using a rock platform would result in an earlier opening date for the project of up to six months, reducing impacts of existing highway congestion and exposure to construction impacts during that reduced construction period including reducing the period when a flood event impact may occur. • Rock platforms generally require less maintenance compared to barges which need regular inspections, repairs, and possibly dry docking if damaged during construction. • The stability of a rock platform allows for more precise construction activities, essential for tasks requiring exact measurements and alignments. • A rock platform is more reliable and provides a stable working surface that is less susceptible to movement from water currents, tides, and waves. This stability is crucial for heavy construction activities.
Environmental impact / benefit	• No dredging required. • Once installed, properly designed rock platforms can minimise the environmental risk from ongoing disturbance to aquatic ecosystems compared to the use of barges which might involve anchors and potential spillage. • Some disturbance of the riverbed during removal of the rock material would occur.
Flood risk in the event of a flood	• Construction via the rock platform would reduce the overall exposure of the community to the risk of construction flooding impacts, which is a risk under either construction method, by up to six months due to the reduced construction period. • There are 339 structures and 357 lots that are potentially flood impacted for Option 2.

2 Community consultation

Transport considers meaningful community consultation is essential in the development and construction of projects. Consultation in relation to temporary flood impacts associated with alternative viaduct construction methodologies has provided important feedback assisting Transport to better understand potential impacts and identify reasonable and feasible flood mitigation and support measures. These consultation activities are further described below.

The consultation process has supported further review and refinement of the viaduct construction methodology, ultimately informing the preferred approach described in section 4 of this report.

2.1 Early consultation

Early consultation occurred during April and May 2024 where the project team contacted (via letters and doorknocking) the 97 property owners identified at that time as being potentially temporarily affected during construction by changes in predicted flood level or inundation durations in excess of EIS flood assessment criteria should a flood event occur. These property owners were informed of the predicted impact on their specific properties and were invited to provide feedback about the viaduct construction methodology, property-specific issues of concern, and possible flood mitigation measures.

The project team also attended meetings with the Millers Forest Progress Association in late May 2024 and late August 2024 to outline the proposed construction methodology and associated impacts.

2.2 'Have your say' consultation

The 'Have your say' consultation commenced in late July 2024. The project team held five community drop-in sessions at three venues near the project site between Wednesday 24 July and Saturday 27 July 2024 (see Table 2.1 for details) and feedback was accepted up until 5 August 2024. All community and project stakeholders were invited to attend and provide feedback on the proposed construction options for the Hunter River crossing portion of the 2.6-kilometre viaduct.

Flood specialists, project engineers, environmental and construction personnel from the project team attended each session. Project team members were available to answer questions about the proposed construction methods and explain the project's approach to managing potential flood impacts during construction.

The drop-in sessions were widely advertised in:

- 477 letters posted to directly affected property owners (including Councils) inviting them to meet with the project team to discuss their individual property impacts
- three social media advertisements with a reach of more than 100,000
- two newspaper adverts published in the *Newcastle Herald* (Wednesday 17 July 2024) and the *Maitland Mercury* (Friday 19 July 2024) with a combined reach of 47,800
- a post-card distributed to 22,000 households surrounding the project.

Table 2.1 ‘Have your say’ community drop-in sessions

Venue	Day and time	Number of Attendees
Millers Forest Popular Hall	Wednesday 24 July from 6pm to 9pm	75
	Thursday 25 July from 10am to 1pm	28
Raymond Terrace Senior Citizens Hall	Thursday 25 July from 6pm to 9pm	17
	Friday 26 July from 10am to 1pm	32
John Holland Gamuda site compound	Saturday 27 July from 10am to 2pm	24

A project webpage was also dedicated to advertising the drop-in sessions and making project information available for download, including an online feedback form.

The project team held five community drop-in sessions at three venues

Materials developed for the drop-in sessions and made available to attendees at each venue included:

- large-format maps illustrating flood levels and inundation durations for a range of flood scenarios
- posters with photographs of the viaduct construction methods used on other projects in the past
- frequently asked questions and answers
- a fly-through digital animation of the temporary rock platform construction
- large-format drawings illustrating the project design.

Transport sent follow-up letters to the directly impacted property owners

All community drop-in session attendees were encouraged to provide feedback to the project team by:

- using the camera on their mobile phone or other handheld device, scanning a feedback QR code at the venue, then completing and submitting an online feedback form
- completing the online survey on one of the tablet devices available at the venue
- obtaining a hard copy feedback form available at the venue, filling it out, and placing it in ‘feedback form’ box at the venue.

Following the sessions, Transport sent follow-up letters to directly impacted property owners who did not register for a community drop-session or had not made a ‘Have your say’ submission. Transport staff also conducted a doorknock of 24 of these properties with the intent of obtaining feedback about the viaduct construction options. Of the 24, seven provided feedback and “Sorry we missed you” cards were left at the remaining 17.

3 Community feedback

This section of the report describes the community feedback received by the project team during early consultation activities and the 'Have your say' period.

3.1 Early consultation

Of the 97 property owners that were contacted for early consultation, three contacted the project team and requested a meeting.

In addition to the contact with directly impacted residents, the project team also:

- published a Frequently Asked Questions document that was made available for potentially affected property owners and placed on the project's interactive portal
- engaged with marine stakeholders, including commercial fishers and prawn trawlers, the Newcastle Fishermen's Co-op, NSW Fisheries, and commercial cruise operators
- consulted with Port Stephens Council, Maitland City Council, Newcastle City Council, Local State Emergency Service, and the Lower Hunter Valley Flood Mitigation Scheme regarding access to resources needed for effective flood management plans/procedures in the event of a flood.

On 28 May 2024, project team representatives attended a meeting with the Millers Forest Progress Association. During the meeting, some members of the association requested additional project details and raised concerns about several issues including:

- potential impacts to property and farming operations (resulting from more frequent flooding and extended inundation)
- how changing flood impacts would affect the levee
- potential impacts to prawning operations
- emergency evacuation.

Following the meeting, 13 stakeholders provided their contact details to the project team or contacted the project team directly and requested ongoing consultation. The project team provided additional property-specific information to these stakeholders and eight (of the 13) were identified as being directly impacted properties.

Additionally, on 27 August 2024, the Minister for Regional Transport and Roads Jenny Aitchison and project team representatives attended a meeting with the Millers Forest Progress Association.

During the meeting, Minister Aitchison provided an update on the of consultation process and some members of the association requested additional project details and raised issues including:

- potential impacts to property and farming operations (resulting from potential for more frequent flooding and extended inundation)
- potential impacts to prawning operations
- which construction option would be adopted
- who to contact to discuss potential flood impact mitigation and support measures.

Figure 3.1 ‘Have your say’ community drop-in session

3.2 ‘Have your say’ submissions

The five ‘Have your say’ community drop-in sessions held between Wednesday 24 July and Saturday 27 July 2024 attracted 176 attendees. The attendees submitted the following correspondence to the project team:

- 71 hardcopy feedback forms
- 3 emailed letters / responses
- 21 online web-form submissions
- 2 phone call responses.

The project team engaged with marine stakeholders including commercial fishers

3.3 Hunter River viaduct construction method preferences

In advance of the drop-in sessions, 477 letters were posted to all owners of directly affected properties (property where there is a changed impact, regardless of whether the impact is consistent with, or exceeds the EIS flood assessment criteria) and a post-card was distributed to 22,000 households surrounding the project. In response a total of 97 submissions relating to 110 properties were received by the project team during the ‘Have your say’ consultation period.

Submissions were made by owners of impacted property and non-impacted property (i.e. owners of property where there are no additional or changed predicted impacts as a result of construction).

Submissions were made by property owners who are predicted to be affected by changes in flood level

60 submissions were received from owners of directly impacted property. Of these, 29 expressed a preference for Option 1 (small jetties, dredging and large barges), primarily because it had the smallest additional flood impacts, and the remaining 31 expressed a preference for Option 2 (temporary rock platforms) (8) or had no preference (23).

The differences in preferences between impacted and non-impacted property owners are described in Table 3.1 and is illustrated by Figure 3.1.

Table 3.1 ‘Have your say’ feedback on viaduct construction options

Property owner	Preference for Option 1 (small rock jetties and large barges)	Preference for Option 2 (temporary rock platform)	Indifferent / no preference selected
Directly impacted	29	8	23
Not directly impact	13	12	22
Unknown	0	0	3 (no address provided)
Totals	42 prefer Option 1 (about 38%)	20 prefer Option 2 (about 18%)	48 are indifferent or did not provide a preference (about 44%)

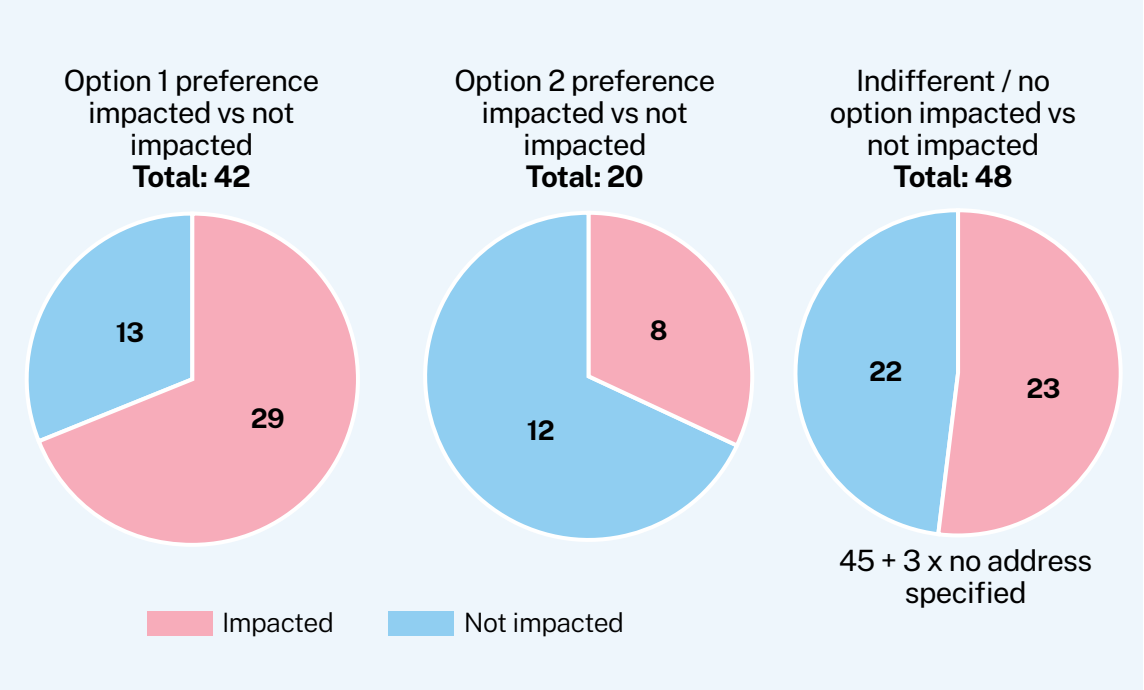


Figure 3.2 ‘Have your say’ feedback on viaduct construction options

3.4 Issues raised in feedback during the 'Have your say' period

3.4.1 Property impacts

In the event of a flood during construction of the viaduct, Transport acknowledges the following impacts could arise and affect a number of residential properties:

- New above floor flooding of habitable structures
- Increased above floor afflux and inundation time of habitable structures
- Increased afflux and inundation time on land

Some drop-in session attendees, including those directly impacted by changes to flooding, expressed concern about the potential for their property to be impacted in these ways. The potential impact to buildings and structures such as houses, sheds, workshops, and fencing were a key concern. Other assets such as machinery, vehicles, and livestock were also raised as issues of concern, alongside the influence that a flood scenario might have on insurance costs.

Response

Construction of the viaduct under either option does not have any flood impact under normal circumstances. In the event of a flood, there may be some increase in impacts to properties under both options. This includes some slight increases in flood levels and some increases in duration. Detailed information on the impacts at specific locations or properties has been made available to property owners, and all potentially affected stakeholders have been informed of how each option impacts them.

Transport will work directly with impacted property owners to develop reasonable and feasible temporary mitigation strategies, depending on specific property impacts and circumstances, for increased flood impacts in the event of a flood during viaduct construction. Strategies that may be considered to address specific issues identified during consultation include assistance with flood preparation (which may include sandbagging or barriers), financial assistance for temporary increased insurance premiums or excess as a result of the construction works, replacement of flood damaged items or other financial support.

Transport will also continue to liaise with affected landowners throughout the viaduct construction to understand their mitigation needs should a flood event occur.

3.4.2 Business impacts

Related to potential property impacts, a number of submissions raised concern about farming and other business impacts including loss of income, stock, and machinery required for business operations in the event of a flood. Several of the community drop-in session attendees operate cattle grazing businesses, agist livestock, and manage pastures which provide fodder for their stock.

A number of submissions raised concerns about impacts on farming and other businesses

Prawn fishing businesses operate in the Hunter River near the proposed viaduct and concerns were expressed about the potential increased impacts on the prawn fishery, damage to fishing equipment, a reduced trawling area, and a resulting loss of income.

Some business owners are anxious about the potential of increased flood-levels which would be detrimental to their businesses. In addition, and particularly for livestock businesses, the prospect of increased flood duration is equally worrying in the context of livestock health and impacts to pasture. Directly affected business owners identified the need for financial support for fodder and soil improvements after floods where the project temporary works results in extended inundation times.

Response

The two viaduct construction options will not have any flooding related impacts under normal circumstances. However, in the event of a flood, there may be some increase in impacts on businesses upstream of the work under both options.

Transport will work directly with directly impacted businesses to develop reasonable and feasible temporary mitigation strategies or other support, depending on specific business impacts and circumstances, for increased flood impacts in the event of a flood during viaduct construction. Strategies that may be considered to address specific issues identified during consultation may include assistance with flood preparation (which may include sandbagging or barriers), insurance excess support, feed for stock, crop replacement, replacement of flood damaged items, clean up or financial support.

Transport also will continue to liaise with directly affected business owners throughout the viaduct construction to understand their mitigation needs should a flood event occur.

For marine business owners that operate in the Hunter River (e.g. prawn trawlers), the viaduct construction will temporarily create navigation changes and will require some changes to trawling practices. Navigation changes will be approved by NSW Maritime and marked out in the river with buoys and a clear navigation channel will be maintained under both viaduct construction options.

Both viaduct construction options would have some potential impacts on aquatic habitats used by prawns and other aquatic life within the river. These potential impacts can be minimised through the design process, the implementation of management measures and adopting a short construction duration. Both options retain a substantial channel that will allow for fish passage.

3.4.3 Impacts to people

Some community drop-in session attendees, including those directly impacted by changes to flooding, predicted that construction in the Hunter River would create adverse impacts to people. These impacts were anticipated to occur as a result of flood-level or inundation duration changes, or alternatively, as a result of people living with *perceptions* that these changes may occur in future.

Fears for personal safety were expressed by some community drop-in session attendees. Others nominated general physical and mental health impacts as being a concern. The unpredictable nature of flood events and memories of recent flood events (during 2015, 2016, and 2022) were identified as a source of anxiety for some people in the community.

Response

Transport acknowledges that some people in the community are anxious about the potential for changes to the existing flood-levels and inundation durations predicted to arise from the project in the event of a flood. It is important to emphasise that the proposed viaduct construction methods are temporary and would therefore not change the long term flood-risk and the impacts arising during construction are incremental to existing risk of flood impacts.

The ability to eliminate flood risk entirely during the construction of new road projects will always be challenging. The priority is the safety of all users of the transport network and surrounding communities. As part of usual planning procedures Transport Emergency Operation Staff work directly with emergency services and Councils to plan for flood events to ensure that the road network is safe and appropriate evacuation routes are available.

Transport remains committed to working with local councils and the State Emergency Service during and after flood events to support evacuation and recovery efforts.

The project team will offer to meet with impacted property owners to discuss in detail their individual circumstances and the impact of flooding on their property, and to address any specific concerns. Depending on specific impacts and individual concerns other mitigation measures may include advice on flood preparation and reference to other support services where needed.

The project team has offered to meet with potentially impacted property owners

3.4.4 Flood model

The project was approved by the then Minister for Planning in November 2022, and included the method of using small rock jetties, some dredging and large barges to construct the viaduct over the Hunter River. Modelling of this method, which was completed as part of the EIS, identified properties that would be potentially impacted by flooding.

The potential flood impacts for the viaduct construction methodologies presented for consultation were assessed using an updated flood model.

The adequacy of the flood model was queried by some community drop-in session attendees. Some attendees queried the accuracy of the model explaining that it does not reflect their lived experiences and observations of flood events on their property. Many of these experiences relate to the flood events in 2015, 2016, and 2022 which affected communities across the Hunter Region. Other attendees, including those directly impacted by changes to flooding, criticised the model because it did not include the 2022 flood event data and, on this basis, questioned its accuracy.

Response

The flood model was initially developed as part of the EIS, response to submissions, design and subsequent project approval, which included modelling of all potential construction activities that could impact flooding characteristics at properties. It incorporated existing flood studies and previous flood models established for the floodplain. As part of the assessment process, feedback about flood modelling methodology from the then Biodiversity Conservation Division of the Department of Planning, Industry and Environment was also considered.

The flood modelling was carried out using TUFLOW software. TUFLOW is a two-dimensional hydrodynamic modelling tool that simulates complex flooding in rural and urban areas. TUFLOW is widely used in Australia and overseas to investigate an array of different flooding problems and has been used in flood studies previously carried out for Newcastle City Council, Port Stephens Council and Maitland City Council. Adjusting the TUFLOW flood model with data from historical floods is a critical and important stage in its development. This process demonstrates the model's ability to accurately reproduce flood behaviour. It involves the collection of rainfall information, streamflow records and observed peak water levels for each historical event. The TUFLOW flood model was adjusted based on data from several observed flood events.

After the EIS, several upgrades were incorporated into the model to reflect the latest floodplain conditions. These include an updated topographic survey, representation of the Hunter Valley Flood Mitigation Scheme and inclusion of updated data and an approach consistent with Australian Rainfall and Runoff (2019) guideline for design flood estimation. Following a more recent review, the model was also extended further upstream to capture the full extent of impacts, which included using the official model (Williamtown Salt Ash) used by Newcastle City Council and Port Stephens Councils, by joining it with the lower portions of the Maitland (Hunter River) and Dungog/Port Stephens (Williams River) Council Flood Models. The revised flood modelling also included adjustments to construction ancillary support sites and access roads across the floodplain that were made to minimise and reduce potential flood impacts during construction.

The TUFLOW model considers both a Hunter and Williams River dominated case. The approach uses the calibrated Council models, similar design flows but with realistic durations and matches the stage frequency and relationship at Raymond Terrace and is therefore considered an acceptable approach for impact assessment of the temporary works.

Figure 3.3 Artist's impression facing north towards Black Hill interchange

The various Council Flood Models incorporated into the TUFLOW flood model had been previously calibrated to various historical flood events including but not limited to the 1955, 1971, 1978, 1990, 2000, 2007 events.

A number of methods were used to verify that the TUFLOW flood model was representing observed flood behaviour. This included comparing design flood levels to flood frequency estimates at Raymond Terrace, as well as previously modelled levels at both Raymond Terrace and Hexham. Design flood surfaces were also compared to those from the EIS. The model was also calibrated against a number of more recent observed flood events including the two specific flood events (April 2015 and January 2016) to confirm its accuracy and has been independently reviewed by flood specialists.

The 2022 flood event was considered but not used for modelling purposes because it was a lower rainfall event with lower impacts than the 2015 and 2016 events used for model calibration. The flood level at Raymond Terrace in the 2022 event reached 2.91 metres which is estimated to be between a 10 per cent and 7 per cent Annual Exceedance Probability (AEP) event. Other earlier flood events used in the flood modelling were much larger at Raymond Terrace and Hexham. An event would therefore need to be above a five-per-cent AEP or show flood behaviour not observed in previous events to be considered for model calibration.

The 2022 event was not in this category and was therefore not recommended for inclusion by Transport's flood expert, but its effects were reviewed and considered as part of the model development.

Transport is confident that the model uses the most reliable flood data, a methodology that represents best practice and is the most accurate tool available for assessing changes to flooding impacts.

3.4.5 Adequacy of consultation

A small number of community drop-in session attendees criticised the adequacy of the 'Have your say' consultation activities and materials. This feedback primarily related to the letter posted to property owners with flood model results outlining floor level and flood duration estimates. Some stated the technical information in the letter was difficult to interpret. Others that did not receive a letter expressed disbelief in the flood model data.

In contrast, the project team also received positive feedback about the 'Have your say' consultation activities and materials.

Response

Transport acknowledges the technical nature of some of the information in the letters may have been confusing to some recipients. Contact details were made available to property owners to make contact and help them understand the potential impacts on their properties and the five community drop-in sessions included flood specialists, project engineers, environmental and construction personnel to answer questions, explain the viaduct construction options as well as our approach to managing flood impacts during construction.

Figure 3.4 Construction of headstocks and columns for the viaduct at Tarro

In response to feedback about the inadequate amount and type of 'Have your say' advertisements and associated materials, Transport confirms this feedback will inform its future consultation programs. The project team has worked hard to reach and consult the project's stakeholders and local community as outlined in Chapter 2 of this report and to ensure that accurate and complete information was provided to every potentially impacted property owner.

3.4.6 Other issues

Operational noise impacts and light-spill

A small number of community drop-in session attendees described their concerns about the potential for the project to create noise impacts and light-spill during its operation. There was some concern that vehicles travelling on the Hunter River viaduct would create noise disturbance for residents living nearby, while one attendee expressed concern about light-spill from street lights fixed to the viaduct and vehicles travelling on the viaduct during the evening. The elevated design of the viaduct was identified as a factor likely to increase the noise and light disturbance.

Response

As required by the project approval, the project has prepared an Operational Noise Review of the final viaduct design which has been approved by NSW Department of Planning, Housing and Infrastructure.

The Operational Noise Review confirms the noise mitigation measures required for operation of the project. Based on the outcomes of the approved Operational Noise Review, operational mitigation measures will be implemented to ensure the project complies with the project approval conditions and Transport's policies regarding road traffic noise. These measures will ensure that any noise impacts associated with traffic using the viaduct will be minimised.

In terms of light-spill, the viaduct design will incorporate screening to minimise visual disruption from vehicle headlights. Lighting designed for the viaduct will address Australian Standard (AS 4282-1997) Control of the Obtrusive Effects of Outdoor Lighting to minimise the likelihood of visual impacts. The light poles, about 12-15 metres high, will have a tapered profile and consist of galvanised steel with single goose neck outreach arms, to reduce light spill to nearby residents. The Design and Landscape Plan and Visual Impact Assessment included as part of the EIS concluded illumination and light spill would be mostly confined within the operational footprint of the project and assessed light impacts as low in the context of the project as a whole.

Hunter Valley Flood Mitigation Scheme

A small number of community drop-in session attendees described their concerns about the integrity of the Hunter Valley Flood Mitigation Scheme and the impact of development in the Maitland and Port Stephens Local Government Areas.

The concerns related to both the increased flooding impacts caused by development on the floodplain and the impacts caused by the operation and maintenance of the Hunter Valley Flood Mitigation Scheme including flood gates and levee height in some locations.

Response

The project will pass the concerns raised by the community onto the relevant agencies for their consideration. This includes providing the information received by Transport during the community sessions to Maitland City Council, Port Stephens Council and Department of Climate Change, Energy, the Environment and Water who manages the Hunter Valley Flood Mitigation Scheme.

While resolution of these issues is outside the scope of the project, Transport acknowledges these concerns raised by residents and where relevant, these issues have been taken into account in flood modelling for the project.

Figure 3.5 Aerial photo of the Hunter River near Tomago

4 Preferred approach and next steps

4.1 Preferred approach

Community feedback on the two viaduct construction options has been carefully considered by Transport. We listened to property owners and stakeholders and while many recognised the benefits of the longer 180-metre and 100-metre platforms, a number were also concerned about the potential flood impacts on their properties and livelihoods.

In response to the 477 letters sent to directly affected property owners, only 29, or approximately half of the 60 who provided feedback, expressed a preference for Option 1 (small jetties, dredging and large barges). Notwithstanding the limited number of responses there was no clear preference from either the directly affected property owners or broader community.

Nonetheless Transport does recognise the concerns of those directly affected property owners who provided a clear message that limiting any effects over and above existing flood impacts was a priority.

To address these concerns, we have refined the Option 2 construction methodology to reduce the length of the rock platform to one 80 metre platform (instead of two longer platforms) to be constructed from the western side of the river, which will be combined with the use of barges and a short jetty on the eastern bank to enable barges to be docked. This hybrid approach is now the preferred methodology for the viaduct construction.

The preferred approach recognises feedback received and reflects a balance between differing community views and the project's objectives. It aims to retain the time and safety advantages of the proposed Option 2, while significantly reducing potential flood impacts in the event of a flood and avoiding the need for dredging. Similar to Option 2, the preferred approach is anticipated to reduce the period required for construction of the viaduct by four months compared with Option 1. The reduced potential flood impacts are considered capable of being mitigated during the works.

Table 4.1 outlines the differences in property impacts between Option 1 (small jetties, dredging and large barges), Option 2 (180 metre and 100-metre temporary rock platforms) and the preferred approach (single 80-metre rock platform, jetty and use of barges, no dredging) .

An analysis of the impacts from the preferred approach demonstrate that it is closely aligned with Option 1 in terms of its impacts. While the preferred approach affects fewer structures, but more lots overall compared to Option 1, the significance of the impacts above existing flood conditions is now largely consistent with, and in some cases less than, those of Option 1.

Table 4.1 Property impacts of viaduct construction options

Property impacts	Option 1 (small rock jetties and large barges)	Option 2 (180-metre temporary rock platform)	Option 2 difference to Option 1
Structures	315	339	+24
Lots	136	357	+221
Property impacts	**Preferred approach (80-metre temporary rock platform)**	**Preferred approach difference to Option 1**	**Preferred approach difference to Option 2**
Structures	282	-33	-57
Lots	279	+144	-78

Table 4.2 Significant property impacts of viaduct construction options

Property impacts	Option 1 (small rock jetties and large barges)	Preferred approach (80-metre temporary rock platform)	Option 2 (180-metre temporary rock platform)	Preferred approach difference to Option 1
Structures - New above floor flooding	2	2	13	0
Structures - Increase in above floor flooding >60mm where already flooded but by less than 200mm	0	0	61	0
Structures - Increase in above floor flood duration >1 hr or 10% where already flooded	24	16	72	-8
Lots - Increase in the flood depth >50mm over an area above 400m^2 or 5% for lots over 8,000m^2	24	7	67	-17
Lots - Increase in duration of 1 hr or 10% over an area above 400m^2 or 5% for lots over 8,000m^2	20	54	117	34

4.2 Next steps

Under the *Environmental Planning and Assessment Act 1979*, changes to State Significant Infrastructure projects, like the M1 Pacific Motorway extension to Raymond Terrace, can proceed without further approval from the Minister for Planning and Public Spaces if they remain consistent with the current project approval. Consistent with best practice, Transport has prepared a consistency assessment for the preferred approach in consultation with all relevant agencies, the project's independent Environmental Representative, and the project's flood expert.

Transport will advise all directly impacted property owners of the outcome of the consultation and the preferred approach.

Transport will work with property owners directly impacted under the preferred approach to develop temporary mitigation measures as outlined in section 3.4 of this report.

Additionally, the project team will continue proactive engagement with the community about potential flood impacts and mitigation options, including arranging meetings with any individual property owners upon request.

For more information, you can contact the project team at:

Phone: 1800 094 895

Email: M12RT@transport.nsw.gov.au

Post: Locked Bag 2030, Newcastle NSW 2300

Visit: nswroads.work/m12rtportal

Figure 4.1 Aerial photo of viaduct location near Tarro

5 Flood Maps

The maps below represent the change in flood level (afflux) for for the preferred approach (80-metre temporary rock platform) described in the events modelled (5%, 10% and 20% AEP).

Legend for the following maps

Flood model extent

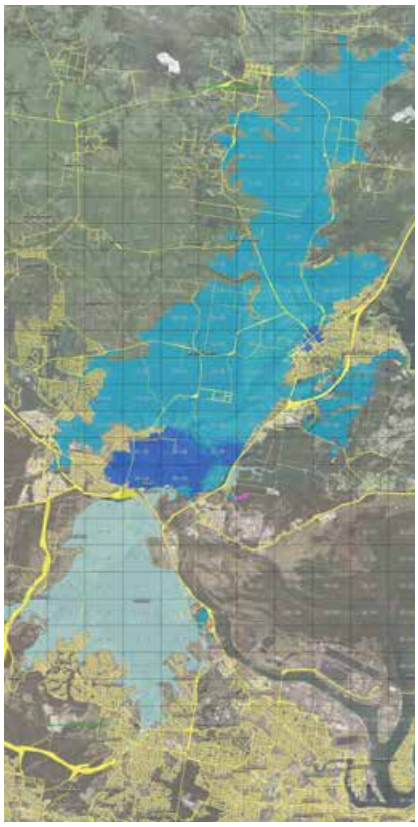
Change in flood level (m)

Was wet, now dry	0.01 – 0.03	0.10 – 0.15
<-0.40	0.03 – 0.05	0.15 – 0.20
-0.10 – -0.01	0.05 – 0.10	Was dry, now wet
-0.01 – 0.01 (not shown)		

5.1 Flood level events

These maps reflect the impact for the preferred approach (80-metre temporary rock platform) against a 5%, 10% and 20% AEP.

Refined Option 2 - 5%AEP



Refined Option 2 - 10%AEP

Refined Option 2 - 20%AEP

M1 Pacific Motorway extension to Raymond Terrace
Hunter River Viaduct Consultation

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