

New Grafton bridge

Piling fact sheet - August 2017



The new Grafton bridge and its approaches rely on piles (concrete columns) to form the bridge's solid foundation for the structure. The foundation is what connects the piers and the main structure with the ground. Land and river piling in Grafton, South Grafton and within the Clarence River has started and is expected to be completed by the end of 2017, weather permitting.

What is piling?

Piles create a strong foundation to support a structure and its loads (such as self-weight, traffic, wind and flooding) by connecting to a strong layer of soil or rock.

Piles are commonly used when the soil closer to the surface does not have the strength to support a structure.

The method used to install the piles depends on the type of pile and factors such as soil type and the size of the load that each pile must support.

Types of piling

There are two types of piles in bridge construction: driven piles and bored piles. Bored piles are constructed by drilling into the ground and then filling the hole with steel reinforcing cages and concrete. Depending on the geology of the site, temporary or permanent steel liners are often inserted into the ground (using a vibration method). The liner is the same shape as the finished pile and, once in place, the soil and rock inside the liner is removed using a drilling rig to create a circular hole. A steel reinforcing cage is placed into

the drilled hole and concrete is poured to create the pile. The temporary liner is then removed, or the permanent liner left in place, depending on the soil type and pile design.

Driven piles are constructed by driving pre-manufactured piles (usually concrete or steel) into the ground using a large impact hammer on a piling rig. This method of piling is generally noisier, with a constant banging sound, as the piles are driven into place, and typically creates more vibration.

The Grafton bridge project has chosen to use bored piles. This helps mitigate noise associated with piling as bored piles do not require large hammers to impact liners into rock. Instead, the permanent or temporary liners are vibrated into the ground.

River piling

The five piers in the Clarence River sit on two side-by-side piles with large, three-metre diameter permanent steel liners. The 10 river piles will range from approximately 21 to 26 metres deep and go into the bedrock up to seven metres deep. The piers will then be constructed on top to connect the main structure to the piles.



The barge, cranes and piling rig, which will be used for river piling

River piles have a permanent 16-20mm thick steel liner (tube), which is vibrated into rock prior to excavating the pile. The liners prevent the soil laying at the river bed from collapsing into the excavation. They also form the shape of the pile when they are filled with concrete. The liner also helps to protect the concrete and provides a more durable pile.

The Maeve-Anne barge has been set up specifically for the new Grafton bridge project with a BG40 piling rig on the bow, serviced by a 250-tonne crawler crane. A temporary jetty has been constructed on the south bank of the river to provide logistical support to the operations.

Land piling

Fifteen land piles will be built for the project. The land piles will use a combination of permanent and temporary liners (or fluid) to support the pile hole excavation. For some of the pile holes the temporary liner can be extracted after the pile hole is filled with concrete.

The land piles on the new Grafton bridge will be up to 30 metres deep. The noise level for land piling and river piling is similar.

Pound Street rail bridge piling

The new Pound Street rail bridge will comprise four piles, using the same method as the new Grafton bridge land piling.

Prior to the start of drilling, trucks will deliver rock to build a stable temporary working platform for the drilling rig, crane and excavator to operate from. Prefabricated reinforcement cages and steel tubes will be delivered, ready for installation.

The crane will lift and place the tubes and steel reinforcement into position ready for concrete to be poured. On the day of the pour, the concrete will be delivered by trucks from a concrete batch plant off site.

Frequently asked questions

Are there any impacts to residents during piling?

Piling can create increased levels of construction noise and vibration. Bored piles, which are the type being constructed on the Grafton bridge project, generate less noise and vibration impacts than driven piles.

The project undertakes a number of measures to reduce noise and vibration impacts from piling. These include:

- Where possible, only piling during the approved construction hours
- Selection of best available technologies which generate lower noise and vibration levels
- Using appropriate machinery to reduce the duration of work

- Switching off machinery when not in use
- Placing temporary acoustic barriers around the noise source
- Orienting equipment so that the noise source is directed away from receivers.

These measures are set out in the Noise and Vibration Monitoring Plan which is part of the Construction Environment Management Plan approved by the Department of Planning and Environment. The plan is available on the project website.

What is ground vibration?

Ground vibration is the energy transmitted through the ground by work. The level of ground vibration will vary according to the local terrain, geology, groundwater, weather and the distance to the receiver.

Ground vibration will generally move faster and at a higher frequency in rock compared to soil and reduces in strength as the distance increases from the work.

Ground vibration is measured by Peak Particle Velocity (PPV) in millimetres per second (mm/s).

Ground vibration is generally considered with respect to two aspects:

- Property damage – either structural or cosmetic
- Human comfort.

A common concern is that ground vibration will cause damage to property and structures. Cosmetic damage, such as small hairline cracks, can occur to residential properties or light commercial-type buildings, when the level reaches about 20mm/s. Depending on the structure type and condition, structural damage is not expected until vibration levels exceed 50mm/s.

Prior to the commencement of construction, property condition reports were prepared for all properties expected to receive vibration from the project. These reports will be used to assist in considering whether property damage has occurred.

While everyone's perception and tolerance levels are different, a person can generally feel vibration levels in excess of 1mm/s.

Is there any monitoring of noise and vibration?

Noise monitoring is carried out to assess the impact of construction activities against existing noise levels. This is undertaken monthly and for specific activities. Vibration monitoring is undertaken when new work starts and throughout the duration of any work that creates vibration. Both noise and vibration monitoring will be undertaken for all piling work.

How does the project team know if noise or vibration levels are exceeded?

An automatic alert system has been set up on our vibration monitor to alert members of the project team if vibration exceeds a set trigger value. This trigger value is below that at which structural damage can occur and alerts a member of the project team to closely monitor the activities onsite.

Noise and vibration is monitored to ensure that piling work is done in accordance with the Minister's Conditions of Approval for the project, NSW Environment Protection Authority and Roads and Maritime procedures and guidelines.

If there is an exceedance of noise or vibration, the following measures will be implemented:

- Additional noise monitoring may be undertaken at sensitive receivers to determine if the actual construction noise generated exceeds the predicted 'worst case' construction noise levels identified in the plan
- Noise monitoring may be carried out for the purpose of refining construction methods or techniques to minimise noise
- Ongoing spot checks of noise intensive equipment will be undertaken throughout construction to ensure compliance with manufacturer's specifications
- Where actual noise levels are found to exceed the predicted worst case levels by more than 2(dB)A the source of excessive noise generations will be identified and any reasonable and feasible measures available will be implemented to either reduce noise emissions or impacts on residents.

The project has chosen to use the lowest impact piling method possible and it is not expected that noise or vibration limits will be exceeded.

How will I be informed about piling and noisy activities?

The project informs the community about piling or noisy activities in a number of ways. These include:

- Regular project updates
- Updates on the project website
- Notifications
- One-on-one consultations.



Piling hammer vibrating a steel casing into place



The BG40 piling rig boring the first pile in the Clarence River



Artist's impression of the new Grafton bridge alongside the existing bridge

Where do I find out more information?

For more information about the project, please contact us:

☎ 1800 918 759 (toll free)

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✉ PO Box 546 Grafton, NSW 2460

🌐 rms.nsw.gov.au/griftonbridge

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