

# Ballina Bypass

Precast arches

Case study



# Ballina Bypass takes arch engineering to the limit

When Humes won the tender to supply three arch structures for the Ballina Bypass, its engineers took on some major design challenges - a steep gradient of 13.5 degrees, soil movement of 50mm, asymmetrical loadings, and the tightest centerline radius on an arch ever built in Australia.

The bypass project involves the upgrade of 11.5 km of dual carriageway road on the approaches to Ballina, to allow commuters to bypass the town, avoiding five roundabouts, two traffic lights and the 60kph speed zones.

The client recognized the practical, aesthetic and environmental advantages of precast arches and elected to install them rather than the standard bridges with cantilever piers for three of the underpasses. With a faster construction process than traditional bridge and culvert solutions (because site work is reduced considerably), the arch design met the project's tight timeframes and could also be customised to suit the site's exact clearance envelope requirements. Humes staff worked closely with the client and designer from the early stages of the project to ensure the arch designs met structural stability requirements, design life, design loads and safe operation.

The project involved the supply of arches at three locations with each structure presenting unique engineering challenges.

The arch on the Shared Property access needed to be built on a steep gradient of 13.5 degrees. Humes' arch design and manufacturing expertise helped to identify installation techniques to minimise the need for on-site cranes, and the design of temporary support systems for the arches to enable continuous installation. This advice helped the client to reduce their costs and their installation time by approximately five days.

The arch structure at Upper Sandy Flat was to be situated in very soft, weak soil, so the design had to ensure the arch could withstand movement of up to 50mm (arch designs usually cater to movement of 10-15mm).

The arch at Sandy Flat Road was to be built on a centreline radius of 45 metres, making it the tightest centreline radius arch ever to be built in Australia. Although Humes had been manufacturing precast arch components since 1985, it had never been called on to supply an arch with such a severe centerline radius; typical arches have a centerline radius of 80 metres plus.

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## Project

Ballina Bypass, NSW

## Client

Ballina Bypass Alliance

## Product supplied

Three arch designs involving  
36 standard 18600t arches,  
38 skewed 18600t arches,  
and 15 15650t arches  
including two tapered  
arches; 6 spandrels;  
15 wingwalls

