GRIFFITHS

civil engineering and construction

Rail Division Case Study
Trewoon Underbridge Replacement

Griffiths acted as Principal Designer and Principal Contractor for the replacement of Trewoon Underbridge. Works included the demolition of the existing deck structure, preparation of abutments, installation of two steel 'U-type' decks using Self-Propelled Modular Transporter (SPMT), installation of cantilevered walkways and reinstatement of the railway to normal operational conditions.

Spanning the A3058, the Trewoon Underbridge carries two non-electrified lines of the Paddington to Penzance Main Line (MLN3) over the A3058 in the village of Trewoon in south Cornwall.

Constructed circa 1971, the original superstructure comprised three steel box girders with Llantarnam-type steel cross girders and steel decking. A structural inspection undertaken in 2019 revealed fractures to the ends of the steel cross girders due to the fatigue susceptible Llantarnam connection detail. Following the inspection, a GRIP 3 options selection report identified the most favourable option for deck replacement to be a pair of Network Rail Standard Design U-type decks.

The main demolition and installation works were scheduled to place during a 72 hour disruptive rail blockade.

During the Detailed Design stage it was decided to use bespoke steelwork girder sizes for the decks. This would keep the weight of the deck down and make it safer for fabrication, transportation and installation.

To complete the enabling works prior to the rail blockade, a series of Rules of the Route (ROTR) possessions were booked during the ECI stage by Griffiths' inhouse rail planning team working with Network Rail planning teams, which ensured integration with comparable contractors and Network Rail delivery units.

A significant amount of Temporary Works were required during the project, including the installation of a temporary catenary bridge to support 14 existing signalling and power cables and two Trans-Atlantic fibre optic cables. Two ROTR possessions in advance of the disruptive possession were used to construct two temporary cable support structures with lift & shift of the cables in a third possession.

In order to minimise the number of possession required Griffiths also saw cut the abutments during the third possession. The methodology de-risked the programme critical works during the disruptive possession and minimised the number of ROTR possessions required.

Specialist temporary works designers worked with Griffiths' inhouse engineering management team to develop robust solutions to ensure high that risk activities associated with the demolition works were risk assessed, which reduced any likelihood of damage throughout the construction phase. Temporary surfacing was laid under the bridge to prevent damage to the existing carriageway during the construction phase.

During the demolition stage, the north abutment was found to be not in the condition shown on 'as built' drawings provided following previous widening works. Griffiths encountered loose material in the abutment that was breaking away during excavation. This resulted in a narrowing of the abutment. Griffiths' project and engineering teams worked with designers Arcadis on a solution that could be met during the possession, that would meet the design requirements and that the Network Rail project team and Route Asset Manager (RAM) were happy with. The solution was to rebuild part of the abutment using readily available precast concrete barriers which were later clad with recovered material to match the existing.

A heavy lift crane was used to lift out the 175 tonne existing deck, which was then cut into seven manageable sections, each weighing approximately 25 tonnes. Due to the limited space around the structure, existing overhead powerlines were taken down and trenched underground to allow the crane to slew 360°, which eliminated contact with overhead apparatus.

The replacement deck was assembly at the compound and a trial lift conducted using SPMTs ahead of the possession.

Minimising disruption for rail users and local community was crucial to the project. As a full road closure was required to allow the transport of the new deck from the compound 900m away using SPMTs and for the subsequent installation, Griffiths liaised with Cornwall Council and Network Rail Streetworks to arrange the temporarily closure of the road and the footpaths adjacent to the site. However, to significantly reduce the impact on the local community and maintain emergency services access to properties, Griffiths planned the methodology to ensure that managed access was maintained to the adjacent residential areas at all times.

All works were completed on programme without any accidents or incidents and within the clients budget.

Project details at a glance

Client: **Network Rail - Western Works Delivery Unit**
Location: **South Cornwall**
Completed: **May 2021**
Value: **£2.1m**
Contract: **NR9 Design and Construct**

Pictured above:

TOP: A 200 tonne crane was deployed for demolition of the existing structure.

CENTRE: Temporary Works to support the new deck cill beams during SPMT transportation.

BOTTOM: The completed bridge replacement at Trewoon.