Hargreaves

Engineering a materials handling solution

A CASE STUDY

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SMALL DEAN CONVEYOR SCHEME

BACKGROUND

HS2 is the UK's largest rail investment scheme and is Europe's biggest infrastructure project. Major Civil Engineering works have commenced at over 350 active sites between London and the West Midlands.

EKFB were appointed by HS2 to deliver civil engineering works across an 80km section of the new high speed rail link between the Chiltern Tunnel and Long Itchington Wood. The scope of the works includes 15 viaducts, 6.9km of green tunnels, 22km of road diversions, 81 bridges and around 30 million cubic metres of excavation.

BACKGROUND CONT'D/…

In 2018, Blackwell, our sister company within Hargreaves Services plc, were appointed by EKFB to undertake a significant contract for 30km of the HS2 earthworks centered on Aylesbury in Buckinghamshire. This involves the movement of nearly 15 million cubic meters of chalk and clay associated with the construction of a new viaduct. Inherent within this is the requirement to move 650,000m^3 of surplus material, created from the changes in the cutting and viaduct dimensions, which must be moved to the Viaduct Main Compound.

ARIEL VIEW OF THE PROPOSED LOCATION OF THE NEW SMALL DEAN VIADUCT, AYLESBURY, BUCKINGHAMSHIRE.

THE 650,000M^3 PROBLEM

BLACKWELL ENGAGES HARGREAVES INDUSTRIAL SERVICES TO DESIGN A MATERIALS HANDLING SOLUTION

The movement of this volumes of material to the specified laydown area presented several challenges, outlined in our challenges below.

OUR CHALLENGES

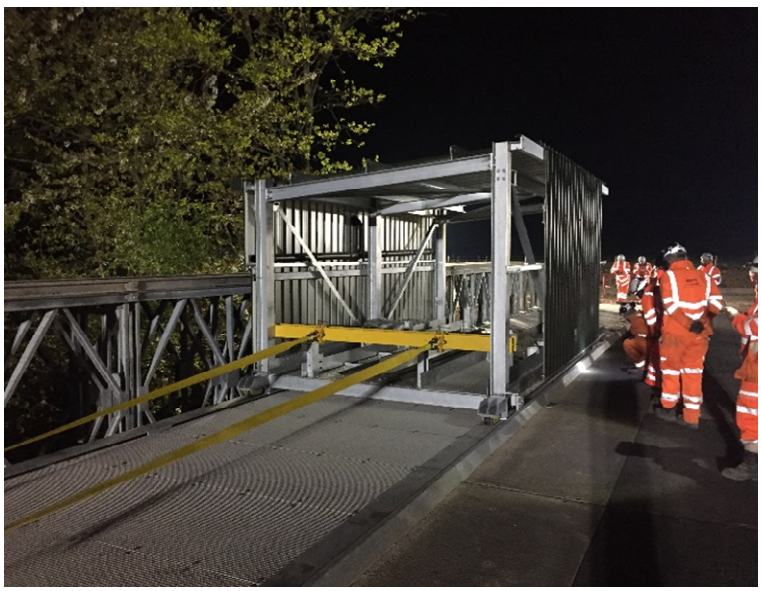
- Move 650,000m^3 of material from the viaduct construction areas to the Viaduct Main Compound.
- Material contains 23% (150,000m^3) of chalk, which is required for the permanent works.
- The new viaduct cannot be used for hauling until 2025
- The material must be cut before 2025 to form the receiving cutting for the tunnel boring machine (TBM)
- Road haulage would result in 72,000 lorry movements
- Restricting the number of lorry movements per day to that required by the undertakings and assurances made as part of the project, would result in a 2-year extension to the programme.

THE SOLUTION

WHAT WE DID

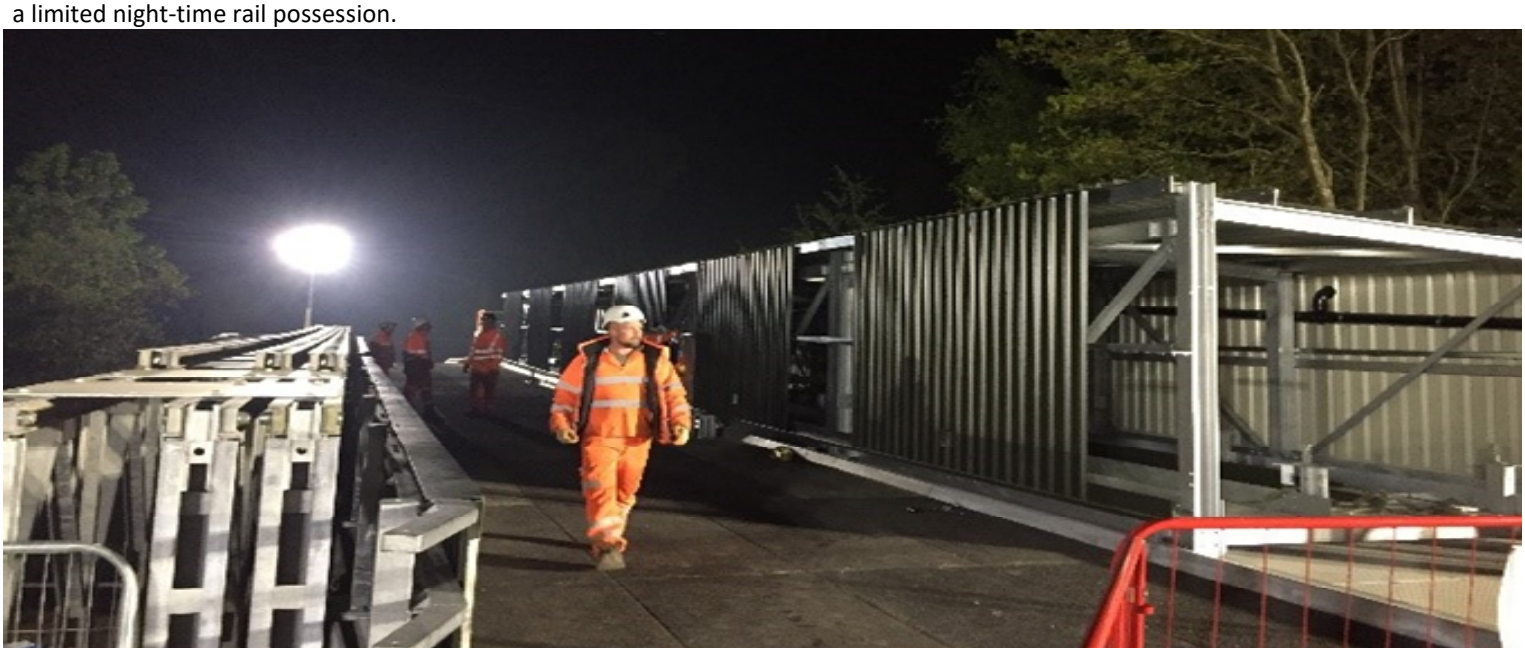
Hargreaves designed, sourced, supplied, and constructed a conveyor scheme, which could transport the material from the viaduct construction site to the main compound. In addition to the conveying structure the solution includes for the provision of processing facility consisting of hopper, apron feeder and crusher, which will size the material into a <200mm, prior to being deposited onto the first conveyor. During the initial design phase several factors had to be given careful consideration:

- The Limited Land Available for Use (LLAU) – a portion of land acquired by HS2 into which the system had to fit.
- Ecology – during site investigation works a tree containing a potentially endangered species of bat was discovered, meaning the conveyor route had to circumnavigate the tree. This let to the intricate 5-leg design eventually implemented.
- The system must traverse 1 rail crossing and 2 road crossings.
- The close proximity of a 400kV overhead power line.



Three significant crossings were incorporated into the design of the conveyor layout. Firstly, a bridge designed and supplied by Mabey was launched over the railway line. Hargreaves conveyor sections had to fit directly onto the structure; this involved a bespoke winching system whereby the sections were pulled into place during a limited night-time rail possession.

The two road crossings were also completed during nighttime road closures and involved a complex lift as the modular sections were craned into place onto pre-installed trestles supplied as part of the design.



THE BENEFITS

ENVIRONMENTAL SUSTAINABILITY INITIATIVES – CARBON OFFSET AND BIODIVERSITY

The use of a crushing and conveying solution to transport this volume of material significantly reduces the environmental impact of the project, for example:

- 1,663 tonnes of CO_2 were offset by the reduction in the use of mobile plant
- Implementation of a 11kV green energy supply, saving 1 million litres of diesel (2,620 tonnes CO_2)
- Feeding the 2 viaduct compounds from the 11kV supply, saving 250k litres of diesel (786 tonnes CO_2)
- Designing the conveyors with Variable Speed Drives (VSD's), saving 300,000kWh per year
- Redesigned the system to avoid the habitats of roosting bats and badgers
- Ensuring de-vegetation is kept to an absolute minimum
- Future proofing the design, such that the conveyors can be reversed to take aggregates in the opposite direction for the construction of the viaduct

LEAVING A POSITIVE LEGACY

All the conveyors are fully enclosed to negate noise/air pollution
Reduction in exhaust pollution and improvement in wellbeing for the local residents by eliminating road haulage
The gantry and substation colours have been designed to reflect the natural environment
The lighting scheme has been designed to negate light pollution
The plant is fitted with monitoring to record running hours, power and tonnage of material conveyed
Components are modular and can be re-used elsewhere. An example of this is the sizer/crusher which was used on the Hinkley Point Nuclear Project prior to this
All the equipment has been manufactured in the UK
At the end of the project the land will be returned to use as farmland and natural wildlife habitats

In Summary our innovative solution has:

- **Offset >5,000 tonnes of CO_2 - this is equivalent to planting >30,000 trees in a carbon sequestration model**
- **Eliminated 1.15 million miles of road haulage and 1.6 million litres of diesel**
- **Been sympathetically designed and constructed to minimize environmental impact**
- **Supported the UK economy through the engagement of British manufacturers**
- **Will leave no trace of its existence – the land will be returned to a natural state**

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