

M8 M73 M74 Motorway Improvement, Mine Workings Consolidation

Project Profile

Client: Ferrovial Lagan JV for
Transport Scotland

Designer: Amey

Date: Nov 14 — May 2016

Value: £6.1m



Contract to undertake shallow mine workings consolidation along the route of the M8 improvements being constructed by the Ferrovial Lagan JV in a DBFO contract for Transport Scotland.

The project to upgrade 8km of the existing A8 and M8 between Ballieston and Newhouse junctions to full motorway standards together with improvements to the existing Raith Interchange and sections of the M73 & M74 included a number of areas affected by shallow coal workings and mine entries.

Treatment of the affected areas was undertaken by grid drilling and grouting to consolidate the worked seams generally to a maximum depth of 40m together with location and treatment of the shafts and adits which affected the scheme footprint. Treatment designs, specifications and drilling grids were determined by designer Amey Consulting.

During the workload peak up to 20 drilling rigs were resourced to site together with 9 grout mixing set ups requiring over 90 personnel. All drilling and grouting plant and equipment was resourced from our specialist in-house plant fleet.



The scheme was split into 2 main sections within which there were 28 working zones. in summary the work completed included;

Mine workings Treatment

- 12,265 boreholes drilled (293,315 metres of drilling)
- 71,385 tonne Infill grout (12:1 PFA:OPC)
- 5,241 tonnes 5:4:1 Perimeter grout (PFA:Sand:OPC)
- 3,561 tonnes 3:1 Sand:OPC grout
- 1,401 tonnes 2:1 Sand:OPC grout

Mineshaft Location—Probing

- 13 mineshafts – 1,850 Probe holes / 22,088 metres drilled
- 2 Adits – 45 probe holes / 350 metres drilled

Mineshaft Treatment

- 7 mineshafts treated up to 260m depth
- 350m of mineshaft drilling
- 2,807 tonnes grout (12:1 PFA:OPC)



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- Mine shaft drilling was carried out by a Casagrande M9 drilling rig working from one of our bespoke 12m long steel framed drilling platforms to ensure safe working in case of any collapse. In addition operatives were harnessed to fall arrestor units which were secured to anchor positions outside the potential collapse zone
- Treatment grids were serviced with; water feed, drill flush return and grout pipelines from centrally established compounds in each zone. The central batching and servicing concept reduces the need for multiple grout mixing, water treatment and water supply set ups and gives full control over grout materials deliveries, storage, mixing and quality control.
- Preparation of working areas was completed by FLJV and included installation of drill flush and surface water collection trenches & sumps, silt fencing and creation of drilling platforms.
- Holes were drilled with 101mm OD rotary percussive steel casing drilled and sealed into rockhead followed by drilling a 75mm open hole allowing insertion of a 50mm MDPE grout tremmie pipe.
- A significant amount of inclined drilling was required (30%) to treat under the existing road, existing and proposed structure footprints and other constraints with angles of up to 50° being accommodated by the versatile drilling resources on the site.
- Water flush was used with water piped to drilling rigs via a delivery main along the treatment areas. The rigs are also equipped with on board water pumps to ensure optimum hole flushing.
- Drilling & grouting treatment was carried out in an agreed sequence with down-dip perimeter holes being completed first and advance probing to characterise and better delineate the mineworkings.
- Grout was mixed in a range of mixing plant including 2.5m³ hydraulically driven batch mixers and continuous grout mixers of up to 80m³/hr capacity, grout was held in agitators and pumped directly to treatment area grout holes.
- Grout mixes were 5:1:4 PFA/cement/sand for perimeter holes & 12:1 PFA/cement for infill holes.
- 3:1 and 2:1 sand/cement mixes were used at the North Calder Water Crossing at Shawhead to mitigate against the risk of pollution in the fractured nature of the mudstones present.
- Continuous monitoring and recording of injected quantity and pressure was carried out together with extensive quality control and testing of mixed grout.
- Continuous liaison took place with SEPA to ensure our procedures and facilities for the collection and disposal of drill flush returns and surface water run off were discussed and approved.
- Works were co-ordinated and phased carefully with FLJV to ensure that there was no impact upon the follow-on bulk earthworks, drainage and foundation operations.

