

A737 Dalry Bypass—Mining Consolidation Works

Project Profile

Client: Farrans Roadbridge JV

Designer: Mason Evans

Date: October 17—May 18

Value: £937k

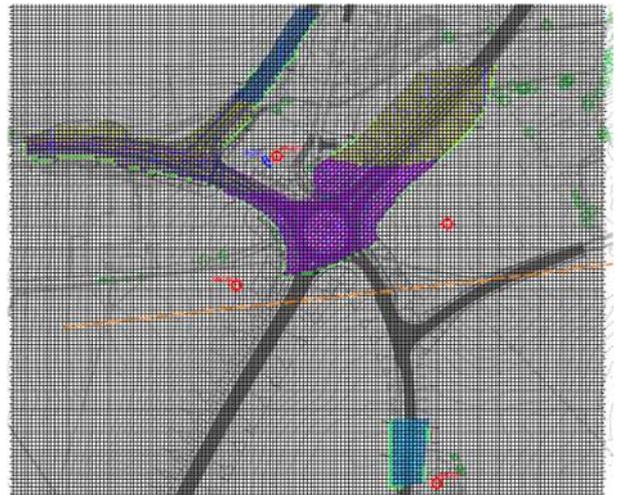


This mine workings treatment scheme was carried out for the Farrans Roadbridge (FRB) JV as part of the new A737 Dalry Bypass scheme at Highfield, Dalry for Transport Scotland. The work was carried out under a re-measurable contract. Multiple coal seams had been highlighted by the site investigation requiring treatment and workings in the 'Smithy', 'Main' and 'Borestone' coals as well as the 'Highfield Limestone' were treated and stabilised to facilitate the new road construction. The contract also included the location and treatment of several mine shafts of which 3 were located and treated.

The contract was challenging due to a number of factors including;

- The undulating and sloping site topography
- The works were spread out over a large area of the site with a number of identified working areas and treatment grids
- The presence of multiple utilities and services
- The shallow depth of the seams in some treatment areas

A large element of the treatment work was to be carried out within the footprint of and adjacent to low overhead electricity cables. This created a difficult drilling environment which was exacerbated by the sloping working areas. We worked with Scottish Power and FRB to identify stand-off zones and agree methods of work. Height restriction markers, barriers and other protection arrangements were established to ensure that these cables were not damaged or struck during the work.



The shallow depth of the seams in some of these locations as well as treatment areas being located under the existing A737 carriageway required arrays of angled boreholes to be drilled at up to 60 degrees to intercept and treat the seam horizons at the correct plan location. This was accommodated by the versatile geotechnical drilling rigs resourced to site.

Main work included;

- A total of 2,310 holes were drilled (40,380m of drilling) and 10,120 tonnes of 10:1 PFA:Cement grout were injected
- 40 test holes were completed using grout acceptance testing methodology
- Holes were drilled using rotary percussive drilling methods with 101mm OD rotary percussive steel casing drilled and sealed into rockhead followed by drilling a 75mm open hole to full hole depth allowing insertion of a 50mm MDPE grout tremmie pipe.
- Water flush was used for all drilling with water piped to drilling rigs through a delivery main established along the treatment areas. The rigs are also equipped with on board water pumps to ensure optimum hole flushing.

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- Preparation of working areas including drill flush and surface water collection trenches & sumps, silt fencing and creation of drilling platforms.
- Drilling and grouting in all treatment areas was carried out in an agreed sequence with down-dip perimeter holes being completed first
- The mixing compound was situated centrally to the treatment areas allowing 'central batching' of grout which was pumped up to 1,000m to the treatment areas. The mixing compound included container surrounded bulk PFA and sand storage areas, 50t horizontal cement silo, water storage tanks, water collection and treatment facilities, including SUDS lagoons and outfall arrangements.
- Central batching reduces the need for multiple grout mixing set ups and gives full control over material storage, deliveries, grout mixing and quality control. It also reduces any impact on adjacent properties.
- A second grouting compound was also set up on the north side of the A737 at Highfield to consolidate the workings that could not be reached by angled drilling from the south of the A737.
- Grout was mixed in a 50m³/hr continuous grout mixing plant and pumped to 2.5m³ hydraulically driven agitation units located in the treatment areas where it was pumped to borehole positions using hydraulic grout pumps.
- Grout mixes varied from a 8:1 PFA/cement for perimeter holes to 12:1 for infill holes.
- Continuous monitoring and recording of injected quantity and pressure was carried out together with extensive quality control and testing of mixed grout.

- **3 mine shafts** were located by probe drilling, drilled to full depth and treated with 1,500 tonnes of 10:1 PFA/Cement grout injected in ascending stages.
- Two of the shafts were grouted from the main grouting setup but the third required a separate drilling and grouting facility of its own due to it being 2 kilometres from the main works area.

All drilling and grouting plant and equipment was resourced from our specialist in-house plant fleet.

During the contract continuous liaison took place with all relevant stakeholders including; FRB, Transport Scotland, Transerv, North Ayrshire Council and SEPA. The combined efforts of all parties ensured that the works were completed on time, to budget and to the satisfaction of all parties.