

Hamiltonhill Advance Works - Mine Workings Consolidation

Project Profile

Client: Robertson Construction
for Queens Cross Housing
Association

Designer: G3 Consulting Ltd

Date: June 2020—October 2020

Value: £1.4m



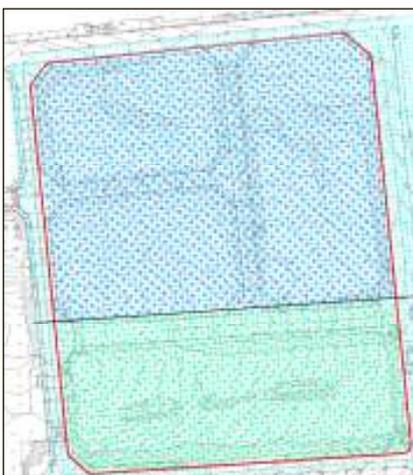
The contract was undertaken to treat shallow coal and ironstone mine workings beneath a large site at Hamiltonhill, Glasgow, in advance of infrastructure works for a proposed social housing development. Treatment of the affected areas was undertaken by grid drilling and grouting to consolidate the worked seams to a maximum depth of 40m, together with location and treatment of mineshafts affecting the development footprint. Treatment designs, specifications and drilling grids were determined by G3 Consulting Ltd who also supervised the site works.

The site was split into 3 main zones (Zone A; Zone B1 and Zone B2 as shown below) each having slightly differing geology and Zone B2 requiring dual seam treatment. Analysis of drilling logs during the work resulted in a design change with the treatment grid being extended to the north to ensure sufficient rock cover. Additionally, after confirmatory probing, some holes were deleted from Zone A and Zone B1 as some areas had not been worked.

A maximum of 12 drilling rigs and 2 grout mixing set ups were resourced to site during peak activity requiring 30 personnel. All drilling and grouting plant and equipment used on the contract was supplied from our specialist in-house plant fleet.

In summary the work completed included;

- Mine Workings Treatment
 - ◇ 3,073 boreholes drilled (84,452 metres of drilling)
 - ◇ 7,671 tonnes grout (12:1 PFA:OPC)
 - ◇ Grout acceptance test holes were completed to validate treatment effectiveness
- Mineshaft Location and Treatment
 - ◇ 3 mineshafts (2 No. Recorded and 1 No. unrecorded)
 - ◇ 181 Probe holes, 2,974 metres drilled
 - ◇ 2 No. mineshafts treated up to 42m depth (213m of drilling) from fully designed drilling platforms
 - ◇ 794 tonnes of grout injected (12:1 PFA:OPC)



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- Mine Workings Consolidation (Cont'd)

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The site was located in the middle of a large residential area and all zones were separated by several public roads. The preparation of working areas was completed by Forkers Scotland and included the installation of drill flush/surface water collection trenches and silt ponds to help keep the surrounding pavements and roads clean and tidy. The design of the silt ponds was agreed with SEPA prior to beginning site works.

Robertson Construction Ltd are members of the 'Considerate Constructors Scheme' and we assisted Robertson in adhering to the 'Code of Considerate Practice' by maintaining a good external appearance of the site and operating strict working hours to minimise disruption to local residents.

Holes were drilled with 101mm OD rotary percussive steel casing drilled and sealed into rockhead followed by drilling a 75mm open hole to allow for grout injection. The use of steel casing drilled to rockhead was a specified requirement. Water flush was utilised due to the proximity to residential housing and to mitigate the risk of mine gas migration.

Some inclined drilling was required (30%) to treat under the existing roads. Whilst all our drilling rigs can accommodate angle holes, specialist Casagrande C6 geotechnical drilling rigs with versatile kinematics were required to complete the more difficult drilling angles as they are capable of angles up to 55 degrees. A C6 drilling rig was also utilized for a complicated shaft probing exercise where angled probing around several live services (including electricity cables, water and gas pipelines) was required and was completed successfully.

Zone A and B1 (80% of site) were serviced with; water feed, drill flush return and grout pipelines from a centrally established compound. 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.

Grout was mixed in an electrically driven 2.5m³ batch mixer capable of producing 350 tonnes of mixed grout per day. Mixed grout was held in agitators and distributed directly to treatment area grout holes via high capacity grout pumps. Continuous monitoring and recording of injected quantity and pressure was carried out together with extensive quality control and testing of mixed grout.

The work was successfully carried out during the Covid-19 pandemic and we provided safe systems of work in line with the CLC Safe Operating Procedures guidance.

