

Ward Street, Bilston—Mine Workings Stabilisation for Persimmon Homes Phases 1 to 3.

Project Profile

Client: Persimmon Homes

Designer: Spillman Associates

Period: Phased 2008—2018

Value: £1.835m (to date)



Treatment of mine workings and mine shafts on a 20ha former industrial site in Bilston, West Midlands which is being redeveloped in several phases by Persimmon Homes for residential use. The site is underlain by the Staffordshire Thick Coal (up to 10m thick) at depths of 30—40m which has been heavily worked in the past and therefore requires drilling and grouting stabilisation prior to development.

There are also a significant number of mine shafts on the site which are also being located and treated during the phased development. The mine shafts are treated as the first stage of remediation and enabling works on each of the development phases. This then allows safe site access by heavy construction plant for demolition of remaining structures, slabs and foundations, concrete crushing, remediation work and preparatory earthworks to development platforms.

Due to the depths of fill across the site (up to 18m) all treated shafts have had 'grout caps' installed by completing a close centred drilling & grouting grid above rockhead to create a monolithic stabilised plug above the shaft position.

The treatment works phases carried out to date are;

- **Phase 3:** 2017/18 (Current contract), £1.15m—Mine workings treatment to 89 residential housing plot footprints by grid drilling and grouting for as shown on the attached layout drawing involving;
 - ◇ 667 primary boreholes (6m grid)
 - ◇ 260 secondary boreholes (overlapping 6m grid)
 - ◇ 20 validation test boreholes
 - ◇ 3,050 tonnes of 10:1 PFA/Cement grout injected
 - ◇ 2 unrecorded mine shafts were treated to full depth and grout capped
- **Phase 2:** 2014, £241k—9 recorded mine shafts were investigated by probe drilling on a 1.2m spiral search grid. 4 shafts were located and confirmed to be circa 39m deep. The shafts were drilled and treated to full depth with an average grout take of 105 tonnes. The shafts were grout capped on completion.



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- **Phase 1b:** 2010/11, £125k – Mine workings treatment to development footprints by grid drilling and grouting to the initial development of 83 housing plots. This involved;
 - ◇ 769 primary boreholes (6m grid)
 - ◇ 544 secondary boreholes (overlapping 6m grid)
 - ◇ 3,855 tonnes of 10:1 PFA/Cement grout injected
 - ◇ 2 unrecorded mine shafts were treated to full depth and grout capped.
- **Phase 1a:** 2008, £115k—7 Mine shafts were located by probe drilling, drilled and treated to full depth and grout capped during a preliminary phase to allow initial site mobilisation and enabling works.



Drilling and grouting treatment is generally carried out on a primary 6.0m grid with secondary centre holes instructed depending on primary hole grout take giving an effective 4.25m treatment grid over most of the treatment area.

Drilling is carried out using up to 6no JCB/Krupp & Klemm KR 901 rotary percussive geotechnical drilling rigs. Drill holes are cased with 101mm OD rotary percussive steel casing which is sealed into rock head followed by drilling a 75mm open hole to the workings to facilitate insertion of grout injection tubes.

Water flush drilling is used as required by the Coal Authority/HSE guidance on Managing the Risk of Hazardous Gases in order to prevent the possibility of any mine gas migration due to the treatment works.



The Shaft treatment is being carried out from our own fully designed steel drilling platforms with drilling personnel protected with harnesses and fall arrestors attached to safe anchor points outside the potential collapse zone in case of shaft collapse.

All drilling, grout mixing & pumping plant and ancillary equipment was resourced from our specialist in-house plant fleet based at our West Bromwich depot.

Phases 4 & 5 are still to be completed for a further 125 housing plots.