



**REPORT SDL3556
AUGUST 2018**

COMPLETION REPORT FOR THE TREATMENT OF MINEWORKINGS

**at
CROSLAND ROAD, LINDLEY, HUDDERSFIELD**

**prepared for
PERSIMMON HOMES (WEST YORKSHIRE) LIMITED**





| | | | |
|-----------------------|---|--|-------|
| REPORT NUMBER: | SDL3556 | REPORT STATUS: | FINAL |
| REPORT TYPE: | COMPLETION REPORT FOR TREATMENT OF MINEWORKINGS | | |
| REPORT DATE: | AUGUST 2018 | | |
| SITE: | CROSLAND ROAD, LINDLEY | | |
| PREPARED FOR: | PERSIMMON HOMES (WEST YORKSHIRE) LTD | | |
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COMPLETION REPORT FOR THE DRILLING AND

GROUTING TREATMENT OF MINE WORKINGS

at

CROSLAND ROAD, LINDLEY, HUDDERSFIELD

Prepared for

PERSIMMON HOMES (WEST YORKSHIRE) LIMITED

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1. INTRODUCTION

It is understood that Persimmon Homes Limited (Persimmon) are in the process of developing land at Crosland Road, Lindley for residential housing with private gardens and associated infrastructure. A site location plan and the proposed development layout are included within Appendix A as drawings SDL3556/CS/01 and SDL3556/CS/02 respectively.

Intrusive site investigation works by Lithos Consulting (Lithos) in April 2017 proved that across the majority of the development site, including all the residential development area, there was no risk of shallow mineworkings. However, evidence of shallow mineworkings within the Middle Band Coal and Soft Bed Coal was encountered below the spur of land at the southern extent of the site below the footprint of the proposed Carlow tank (surface water attenuation tank).

SDL were commissioned by Persimmon as specialist contractors to stabilise the mine workings exhibiting inadequate competent cover that were identified within the probe drilling, A Permit to undertake the pressure grouting of the shallow mine workings within the treatment area was obtained from the Coal Authority (CA) prior to commencement, a copy of the Permit is included with Appendix B

This Completion Report includes the following information:

- A summary of the works undertaken and presentation of the findings.
- Confirmation that the works have been carried out in accordance with the current guidelines.

The principal parties to the contract are:

- Persimmon Homes (West Yorkshire) Limited – Developer.
- Sirius Drilling Ltd (SDL) –Specialist Sub-Contractor for the drilling and grouting.

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2. SITE DETAILS AND DESCRIPTION

2.1 Site Location

The site is located off Crosland Road, Lindley, Huddersfield at an approximate National Grid Reference of 410874, 418661. A site location plan is included as Drawing SDL3556/CS/01 in Appendix A.

2.2 Site Description

The broader Persimmon development site is roughly rectangular in shape, with approximate dimensions of 150m by 180m, covering an area of approximately 2.8 hectares with the Carlow tank occupying a spur of land in the south east of the site. The site is bounded by residential developments to the south and east, Crosland Road to the west and agricultural farm land to the north.

2.3 Geology

A summary of available published geological information is provided in Table 2.1.

Table 2.1 Geological Summary

| | |
|-------------------------------|--|
| Sources of Information | BGS 1:10,000 scale geological map (Sheet SE11NW) The Coal Authority Interactive Viewer. |
| Made Ground | No made ground is recorded on the BGS map within the site boundary. |
| Drift Geology | No superficial soils recorded on the BGS map. |
| Solid Geology | The site is underlain by the Carboniferous Lower Coal Measures strata which typically comprises undifferentiated mudstone, siltstone, sandstone and coal seams with associated seatearths and marine bands. The Soft Bed seam is conjectured as outcropping to the north of the treatment area within the broader site. |
| Mining and Quarrying | The south eastern portion of the site is within an area of probable shallow coal mining and is a CA designated Development High Risk Area. There are no recorded mine entries on, or within 20m of, the site. |

2.4 Previous Investigations

The broader site has been subject to a number of previous appraisals and investigations. These works were informed by the most recent of these, a letter report prepared by Lithos Consulting (Report Ref. 021/1823/GLM/REG) which comprises a review of an earlier investigation as well as the results of supplementary intrusive investigations including a mining investigation which incorporates a programme of rotary probe drilling.

A summary of the salient information from the Lithos Report is included below.

Summary of Relevant Findings

“In the far south of Persimmon’s site, two seams of coal were encountered:

- The Middle Band Coal (0.5m to 0.8m thick) beneath the north of the southern spur.*
- The Soft Bed Coal (0.9m to 1.1m thick) at depths of <20m only beneath the southern spur.*

Examination of the proposed layout shows that only a surface water attenuation structure (Carlow tank) is proposed in the southern spur which is underlain by very shallow Middle Band coal, and possible workings in the deeper Soft Bed coal. No plots are shown in this area.

It is understood that the Carlow tank will have an invert level of 242.5m AoD. The top of the Soft Bed coal and associated workings lie at around 228m AoD beneath the north of the tank, and 231m AoD beneath the south of the tank. Rockhead is typically 1m to 2m bgl, so there is between 9m and 14m of competent rock cover between the base of the tank and possible mineworkings.

Excavation required for the northern half of the Carlow tank is likely to result in complete removal of the shallow Middle Band coal, but the excavation should be deepened if necessary through this seam if any residual coal is exposed at formation level.”

3. DRILLING AND GROUTING WORKS

3.1 The Works

The previous site investigation works informed the basis of the treatment works undertaken at the site. All works were carried out in general accordance with CIRIA SP 32.

Within the areas of the site affected by shallow workings, the intention of the works was to stabilise the footprint of the proposed Carlow tank, extending up to 3m beyond. Treatment boreholes were drilled on a nominal 3m x 3m grid across the defined treatment area.

The stabilisation works were undertaken by injecting a 12:1 mix of PFA / cement grout into the boreholes.

3.2 Programme

The programme of drill and grout treatment work was carried out as a continuous operation from the 13th to the 19th June 2018.

3.3 Drilling Procedure

Boreholes were drilled using open hole rotary percussive drilling rigs utilising water and air mist flush.

Each hole was extended to the base of the coal seam, or the base of the workings if apparent, to a minimum of 1.0m thickness of solid strata to prove competent rock. Sacrificial plastic casing was used at the top of each borehole to maintain integrity prior to grouting.

Throughout the treatment area, boreholes/ grout injection points were drilled in accordance with the layout as shown on Drawing No SDL3556/CS/03 within Appendix A.

The ground conditions encountered in each borehole are tabulated in a summary table and detailed within daily drill log sheets, included within Appendix C of this report.

3.4 Ground Conditions Encountered

A total of 80 boreholes were drilled amounting to a total of 1328.20m of drilling. The layout of boreholes / grout injection points, together with ground conditions encountered are shown on Drawing No. SDL3556/CS/03 presented within Appendix A.

Within the Soft Bed Coal seam the rotary boreholes encountered intact coal or evidence of mineworkings at depths ranging between 12.80m and 16.80m bgl; with a seam thickness ranging between 0.40m and 1.00m.

- Solid coal was encountered in 50 boreholes (approx. 63%) ranging in thickness from 0.40m to 1.00m.
- Broken ground was encountered in 2 boreholes (approx. 2%) with a thickness of 0.80m.
- Soft ground was encountered in 1 boreholes (approx. 1%) with a thickness of 0.80m.
- No coal or mine workings were encountered in 27 boreholes (approx. 34%) – conjectured to be as a result of a geological fault

The shallow Middle Band Coal was encountered in 10 boreholes as intact coal with a maximum thickness of 0.6m, at a depth just below the superficials.

3.5 Grouting Procedure

Boreholes were injected with grout comprising a 12:1 ratio mixture of Pulverised Fuel Ash (PFA) and Ordinary Portland Cement (OPC) respectively with 40 to 45% water.

Grout was injected into all boreholes utilising a tremie pipe. Grout was injected under static head until grout appeared at the surface.

A total of 17.18 tonnes of grout was injected into these boreholes with grout acceptance varying between 0.13 tonnes and 3.90 tonnes with an arithmetical average of 0.21 tonnes per hole.

4. VALIDATION

Validation of the stabilisation works was undertaken utilising a test boreholes drilled in selected locations within the treatment area. The locations of the test boreholes are shown on Drawing No. SDL3556/CS/03 within Appendix A.

The location of the test borehole was selected by the supervising engineer with the emphasis on localised high grout takes within the treated area.

The test borehole encountered solid strata with either grout returns. The efficacy of the treatment works was assessed using a grout injection test in the test hole under a constant pressure of up to a maximum of 200kN/m². This pressure was maintained for a period of 5 minutes, after which the recorded drop in pressure was found to be less than 10%. On this basis the treatment was considered satisfactory, with substantial filling of workings.

Bleed tests and flow tests on the grout were carried out regularly during the grouting works. Bleed tests were undertaken over a 6 hour test period, with bleed capacities recorded as being below the maximum 5%, as detailed within CIRIA SP32. Flow tests, carried out at a minimum frequency of two per week, recorded grout flowability readings between 450mm and 500mm, using a 'Colcrete' type flow meter, in accordance with guidance contained within CIRIA SP32. The results of these tests are presented within Appendix E of this report.

In order to determine the compressive strength of the grout, test cubes were formed on site at a frequency of two sets of test cubes of grout from 1 batch of grout per week, and subject to testing by Environmental Scientifics Group Ltd, based in Warrington, a UKAS accredited laboratory.

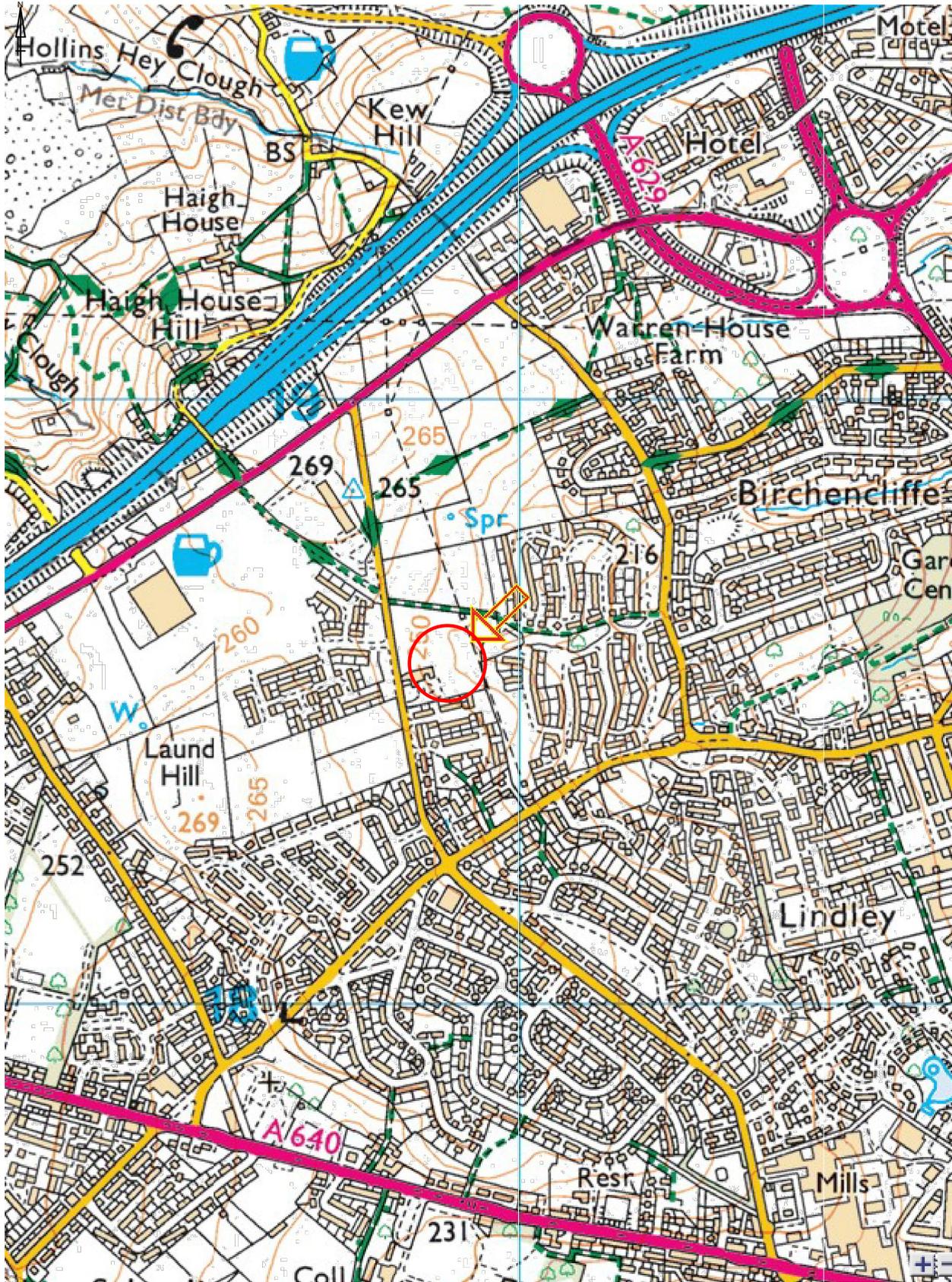
Grout cubes were scheduled to be crushed at 7-day and 28-day intervals in accordance with BS 1881. The results of testing are presented within Appendix D of this report. After 28 days the result was 3.1 MN/m², significantly above the industry standard required 1.0 MN/m².

5. CONCLUSIONS

The site observations, drilling and grouting records, and test boreholes indicate that the drilling and grouting works have been carried out to a satisfactory standard in general accordance with the established methodologies set out within CIRIA SP 32.



APPENDIX A
DRAWINGS



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NOTES

○ Site

REVISION

| | |
|---|----|
| 0 | >> |
| A | >> |
| B | >> |
| C | >> |
| D | >> |

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FAX: 0113 264 9962



CLIENT

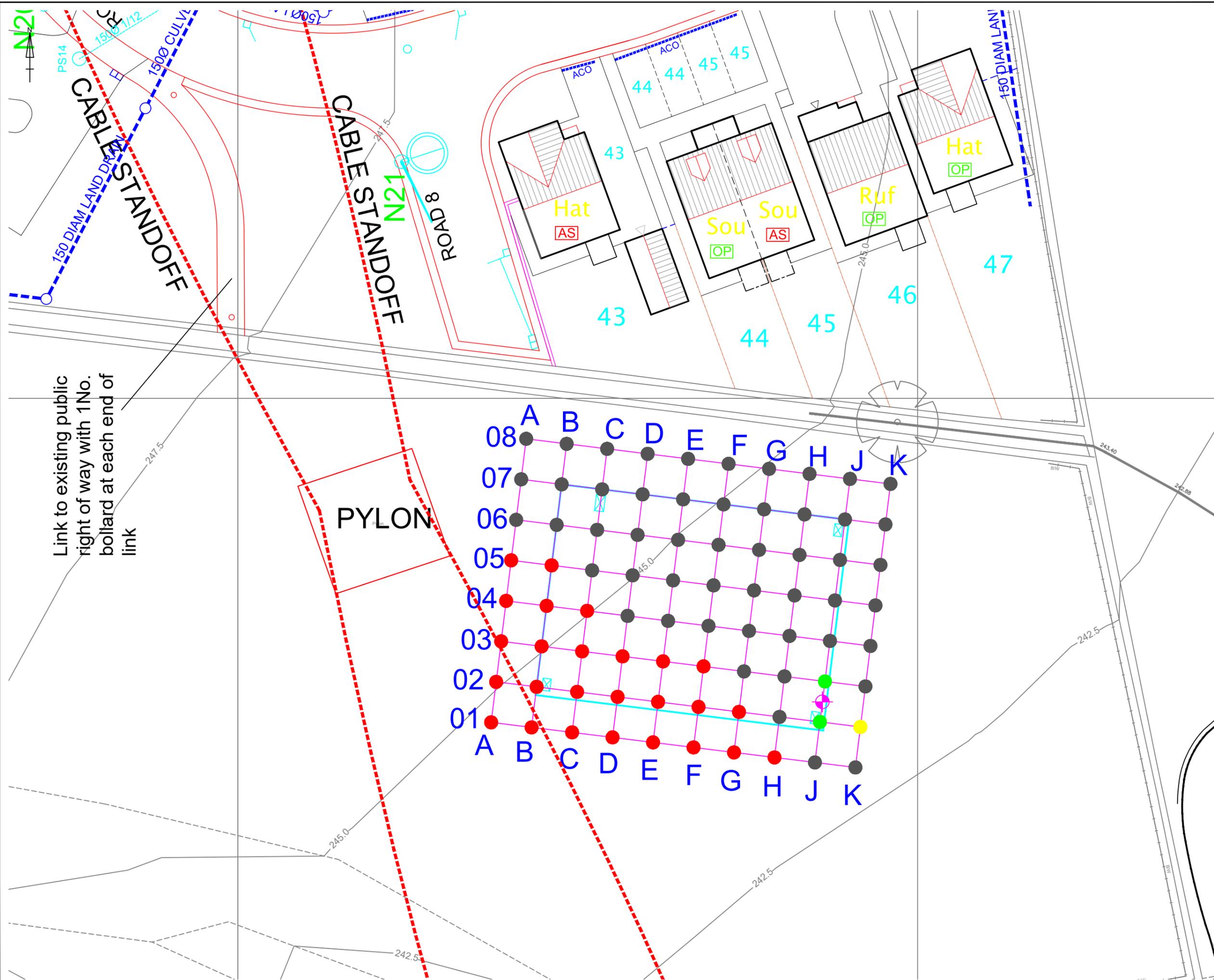
PERSIMMON HOMES (WEST YORKSHIRE) LIMITED

SITE
CROSLAND ROAD, LINDLEY - CARLOW TANK TREATMENT

DRAWING TITLE

SITE LOCATION PLAN

| | |
|------------------------------|--------------------|
| DRAWING NO. SDL3556-SP-01 | REVISION NO. 0 |
| DRAWN BY NJI | APPROVED BY JCC |
| DATE AUGUST 2018 | SCALE 1:25,000 |
| | PAPER SIZE A4 |



NOTES

DRILLING RETURNS

- COAL
- NO COAL/WORKINGS
- SOFT GROUND
- BROKEN GROUND
- ◆ TEST BOREHOLE

| REVISION | |
|----------|----|
| 0 | >> |
| A | >> |
| B | >> |
| C | >> |
| D | >> |

SIRIUS DRILLING LTD
 4245 Park Approach,
 Thorpe Park,
 Leeds
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CLIENT
PERSIMMON HOMES (WEST YORKSHIRE) LIMITED

SITE
CROSLAND ROAD, LINDLEY - CARLOW TANK TREATMENT

DRAWING TITLE
AS-BUILT DRILL & GROUT TREATMENT PLAN

| | |
|------------------------------|--------------------|
| DRAWING NO. SDL3556/CS/02 | REVISION NO. 0 |
| DRAWN BY NJI | APPROVED BY JCC |
| DATE AUGUST 2018 | SCALE 1:250 |
| | PAPER SIZE A3 |



APPENDIX B

COAL AUTHORITY PERMIT



The Coal
Authority

Permit to Enter or Disturb Coal Authority Mining Interests

Permit Reference Number 16249

Name and Address of Permit Holder:

*Persimmon Homes (West Yorks) Ltd
3 Hepton Court
York Road
Leeds
LS9 6PW*

Site Location:

*Crosland Road
Lindley
Huddersfield
HD3 3TD*

This certificate hereby grants the above named Permit Holder a Permit to carry out:-

Treatment of shallow mine workings on 3m grid

within the Authority's mining interests at the identified site location for the period of 12 months from the granted date shown below. The granting of this Permit does not constitute advice given by the Authority in relation to the proposed operations. It is the Applicant's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.

Signed: Granted Date: **21.6.18**

For and on behalf of The Coal Authority

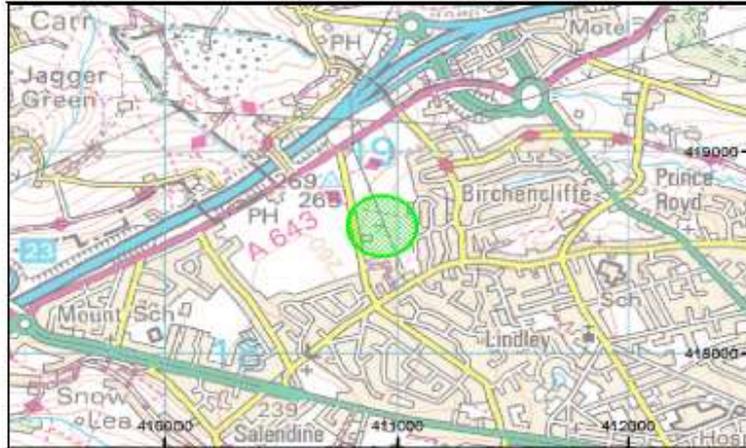
Nominated Representative: Helen Bennett, Permitting Manager;

The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG

Tel: 01623 637263; E-Mail: permissions@coal.gov.uk



Overview map



Permit Boundary



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APPENDIX C

DRILL LOGS, GROUT LOGS & SUMMARY TABLE

| Borehole ID | Drilled by | Date Drilled | Angle | Superficials (m bgl) | Strata | From (m bgl) | To (m bgl) | Thickness (m) | Strata | From (m bgl) | To (m bgl) | Thickness (m) | BH Depth (m bgl) | Grout Take (T) | Comments |
|-------------|------------|--------------|-------|----------------------|--------|--------------|------------|---------------|--------|--------------|------------|---------------|------------------|----------------|----------|
| A01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| A02 | M. THOMAS | 16/06/2018 | 20 | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| A03 | M. THOMAS | 15/06/2018 | 10 | 1.70 | | | | | NC | | | | 16.00 | 0.13 | |
| A04 | M. THOMAS | 15/06/2018 | 10 | 1.60 | | | | | NC | | | | 16.00 | 0.13 | |
| A05 | M. THOMAS | 14/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| A06 | M. THOMAS | 14/06/2018 | | 1.50 | | | | | C | 15.30 | 15.80 | 0.50 | 16.80 | 0.13 | |
| A07 | M. THOMAS | 14/06/2018 | | 1.60 | | | | | C | 15.20 | 16.00 | 0.80 | 17.00 | 0.13 | |
| A08 | M. THOMAS | 13/06/2018 | | 1.60 | | | | | C | 15.60 | 16.40 | 0.80 | 17.40 | 0.13 | |
| B01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| B02 | M. THOMAS | 16/06/2018 | 10 | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| B03 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| B04 | M. THOMAS | 15/06/2018 | | 1.60 | | | | | NC | | | | 16.00 | 0.13 | |
| B05 | M. THOMAS | 14/06/2018 | | 1.50 | | | | | NC | | | | 21.00 | 0.13 | |
| B06 | M. THOMAS | 14/06/2018 | | 1.60 | | | | | C | 15.50 | 16.00 | 0.50 | 17.00 | 0.13 | |
| B07 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | C | 15.30 | 16.10 | 0.80 | 17.10 | 0.13 | |
| B08 | M. THOMAS | 13/06/2018 | | 1.60 | | | | | C | 15.80 | 16.60 | 0.80 | 17.60 | 0.13 | |
| C01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| C02 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| C03 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| C04 | M. THOMAS | 15/06/2018 | | 1.60 | | | | | NC | | | | 16.00 | 0.13 | |
| C05 | M. THOMAS | 14/06/2018 | | 0.60 | C | 0.60 | 1.00 | 0.40 | NC | | | | 16.00 | 0.13 | |
| C06 | M. THOMAS | 16/06/2018 | | 1.60 | | | | | C | 15.40 | 15.90 | 0.50 | 16.90 | 0.13 | |
| C07 | M. THOMAS | 13/06/2018 | | 1.40 | | | | | C | 15.40 | 16.20 | 0.80 | 17.20 | 0.13 | |
| C08 | M. THOMAS | 13/06/2018 | | 1.60 | | | | | C | 15.90 | 16.70 | 0.80 | 17.70 | 0.13 | |
| D01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| D02 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| D03 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| D04 | M. THOMAS | 15/06/2018 | | 1.60 | | | | | C | 13.90 | 14.30 | 0.40 | 15.30 | 0.13 | |
| D05 | M. THOMAS | 14/06/2018 | | 1.00 | C | 1.00 | 1.40 | 0.40 | C | 14.50 | 15.00 | 0.50 | 16.00 | 0.13 | |
| D06 | M. THOMAS | 14/06/2018 | | 1.80 | | | | | C | 15.50 | 16.00 | 0.50 | 17.00 | 0.13 | |
| D07 | M. THOMAS | 13/06/2018 | | 1.50 | | | | | C | 15.50 | 16.30 | 0.80 | 17.30 | 0.13 | |
| D08 | M. THOMAS | 13/06/2018 | | 1.60 | | | | | C | 16.10 | 17.10 | 1.00 | 18.10 | 0.13 | |
| E01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| E02 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| E03 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| E04 | M. THOMAS | 15/06/2018 | | 1.70 | | | | | C | 14.10 | 14.50 | 0.40 | 15.50 | 0.13 | |
| E05 | M. THOMAS | 14/06/2018 | | 1.00 | | | | | C | 14.60 | 15.10 | 0.50 | 16.10 | 0.13 | |
| E06 | M. THOMAS | 14/06/2018 | | 2.00 | C | 2.00 | 2.40 | 0.40 | C | 15.70 | 16.20 | 0.50 | 17.20 | 0.13 | |
| E07 | M. THOMAS | 13/06/2018 | | 1.60 | | | | | C | 15.60 | 16.40 | 0.80 | 17.40 | 0.13 | |
| E08 | M. THOMAS | 13/06/2018 | | 1.40 | | | | | C | 16.30 | 17.10 | 0.80 | 18.10 | 0.13 | |
| F01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| F02 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| F03 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| F04 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | C | 14.30 | 14.70 | 0.40 | 15.70 | 0.13 | |
| F05 | M. THOMAS | 14/06/2018 | | 1.50 | | | | | C | 14.80 | 15.30 | 0.50 | 16.30 | 0.13 | |
| F06 | M. THOMAS | 14/06/2018 | | 2.00 | C | 2.00 | 2.30 | 0.30 | C | 16.00 | 16.40 | 0.40 | 17.40 | 0.13 | |
| F07 | M. THOMAS | 13/06/2018 | | 1.60 | | | | | C | 15.80 | 16.60 | 0.80 | 17.60 | 0.13 | |
| F08 | M. THOMAS | 13/06/2018 | | 1.40 | | | | | C | 16.40 | 17.20 | 0.80 | 18.20 | 0.13 | |
| G01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| G02 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |

| Borehole ID | Drilled by | Date Drilled | Angle | Superficials (m bgl) | Strata | From (m bgl) | To (m bgl) | Thickness (m) | Strata | From (m bgl) | To (m bgl) | Thickness (m) | BH Depth (m bgl) | Grout Take (T) | Comments |
|-------------|------------|--------------|-------|----------------------|--------|--------------|------------|---------------|--------|--------------|------------|---------------|------------------|----------------|----------|
| G03 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | C | 13.20 | 14.00 | 0.80 | 15.00 | 0.13 | |
| G04 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | C | 14.50 | 14.90 | 0.40 | 15.90 | 0.13 | |
| G05 | M. THOMAS | 14/06/2018 | | 1.50 | | | | | C | 15.00 | 15.50 | 0.50 | 16.50 | 0.13 | |
| G06 | M. THOMAS | 14/06/2018 | | 1.30 | C | 1.30 | 1.90 | 0.60 | C | 16.00 | 16.60 | 0.60 | 17.60 | 0.13 | |
| G07 | M. THOMAS | 13/06/2018 | | 1.50 | | | | | C | 16.00 | 16.80 | 0.80 | 17.80 | 0.13 | |
| G08 | M. THOMAS | 13/06/2018 | | 1.50 | | | | | C | 16.50 | 17.30 | 0.80 | 18.30 | 0.13 | |
| H01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | NC | | | | 16.00 | 0.13 | |
| H02 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | C | 12.80 | 13.50 | 0.70 | 14.50 | 0.13 | |
| H03 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | C | 13.50 | 14.30 | 0.80 | 15.30 | 0.13 | |
| H04 | M. THOMAS | 15/06/2018 | | 1.40 | | | | | C | 14.60 | 14.90 | 0.30 | 15.90 | 0.13 | |
| H05 | M. THOMAS | 14/06/2018 | | 1.50 | C | 2.00 | 2.20 | 0.20 | C | 15.10 | 15.60 | 0.50 | 16.60 | 0.13 | |
| H06 | M. THOMAS | 14/06/2018 | | 1.00 | C | 1.00 | 1.50 | 0.50 | C | 16.30 | 16.80 | 0.50 | 17.80 | 0.13 | |
| H07 | M. THOMAS | 13/06/2018 | | 1.50 | | | | | C | 16.20 | 16.90 | 0.70 | 17.90 | 0.13 | |
| H08 | M. THOMAS | 13/06/2018 | | 1.50 | | | | | C | 16.60 | 17.40 | 0.80 | 18.40 | 0.13 | |
| J01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | C | 12.80 | 13.40 | 0.60 | 14.40 | 0.13 | |
| J02 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | BG | 13.00 | 13.80 | 0.80 | 14.80 | 3.90 | |
| J03 | M. THOMAS | 15/06/2018 | | 1.60 | | | | | BG | 13.50 | 14.30 | 0.80 | 15.30 | 2.60 | |
| J04 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | C | 14.80 | 15.20 | 0.40 | 16.20 | 0.13 | |
| J05 | M. THOMAS | 14/06/2018 | | 1.50 | C | 2.00 | 2.30 | 0.30 | C | 15.30 | 15.80 | 0.50 | 16.80 | 0.13 | |
| J06 | M. THOMAS | 14/06/2018 | | 0.60 | C | 0.60 | 1.10 | 0.50 | C | 16.50 | 17.00 | 0.50 | 18.00 | 0.13 | |
| J07 | M. THOMAS | 13/06/2018 | | 1.50 | | | | | C | 16.40 | 17.20 | 0.80 | 18.20 | 0.13 | |
| J08 | M. THOMAS | 13/06/2018 | | 1.60 | | | | | C | 16.70 | 17.50 | 0.80 | 18.50 | 0.13 | |
| K01 | M. THOMAS | 16/06/2018 | | 1.50 | | | | | C | 13.00 | 13.60 | 0.60 | 14.60 | 0.13 | |
| K02 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | S | 13.20 | 14.00 | 0.80 | 15.00 | 1.30 | |
| K03 | M. THOMAS | 15/06/2018 | | 1.60 | | | | | C | 14.00 | 14.60 | 0.60 | 15.60 | 0.13 | |
| K04 | M. THOMAS | 15/06/2018 | | 1.50 | | | | | C | 15.00 | 15.40 | 0.40 | 16.40 | 0.13 | |
| K05 | M. THOMAS | 14/06/2018 | | 1.50 | | | | | C | 15.40 | 15.80 | 0.40 | 16.80 | 0.13 | |
| K06 | M. THOMAS | 14/06/2018 | | 0.30 | C | 0.30 | 0.80 | 0.50 | C | 16.40 | 17.20 | 0.80 | 18.20 | 0.13 | |
| K07 | M. THOMAS | 13/06/2018 | 10 | 1.50 | | | | | C | 16.50 | 17.30 | 0.80 | 18.30 | 0.13 | |
| K08 | M. THOMAS | 13/06/2018 | 10 | 1.60 | | | | | C | 16.80 | 17.70 | 0.90 | 18.70 | 0.13 | |

TEST BOREHOLE

0.00

0.00

0.00

| Borehole ID | Drilled by | Date Drilled | Angle | Superficials (m bgl) | Strata | From (m bgl) | To (m bgl) | Thickness (m) | BH Depth (m bgl) | Grout Take (T) | Comments |
|----------------|------------|--------------|-------|----------------------|--------|--------------|------------|---------------|------------------|----------------|----------|
| TH01 (J02/J03) | M. THOMAS | 18/06/2018 | | 1.50 | G | 12.80 | 13.80 | 1.00 | 14.80 | 0.13 | |

KEY

| | |
|----|---------------|
| C | COAL |
| NC | NO COAL |
| BG | BROKEN GROUND |
| S | SOFT PUSH |
| G | GROUT |



OPENHOLE DRILL LOG

Job No. SOL 3556
 Contract Name: Lindley
 Working Day: Wednesday

Date: 13/6/18
 Client: Persimmon Homes
 Sheet: 1 of 2

| Hole No. | From | To | Flush (W/A/M) | Casing T/S (m) | Strata Description | Rig Type: CSXP |
|------------------|-------|-------|---------------|----------------|-----------------------|---|
| K08 10' Angle | 0:00 | 1:60 | | | Overburden | Crew Details: M. Thomas D. Steinhorn |
| | 1:60 | 16:30 | | | Black / Grey Mudstone | |
| | 16:30 | 17:20 | | | coal intact | |
| | 17:20 | 18:20 | | | Light Grey Mudstone | |
| J08 | 0:00 | 1:60 | | | Overburden | Remarks: |
| | 1:60 | 16:20 | | | Black / Grey Mudstone | |
| | 16:20 | 17:50 | | | coal intact | |
| | 17:50 | 18:50 | | | Light Grey Mudstone | |
| H08 | 0:00 | 1:50 | | | Overburden | Gas Monitoring |
| | 1:50 | 16:60 | | | Black / Grey Mudstone | |
| | 16:60 | 17:40 | | | coal intact | |
| | 17:40 | 18:40 | | | Light Grey Mudstone | |
| G08 | 0:00 | 1:50 | | | Overburden | % O ₂ CO ₂ CH ₄ CO |
| | 1:50 | 16:50 | | | Black / Grey Mudstone | Start 20.7 0 0 0 |
| | 16:50 | 17:30 | | | coal intact | Mid 20.7 0 0 0 |
| | 17:30 | 18:30 | | | Light Grey Mudstone | End 20.7 0 0 0 |
| F08 | 0:00 | 1:40 | | | Overburden | Weather Conditions: Sun / overcast |
| | 1:40 | 16:40 | | | Black / Grey Mudstone | |
| | 16:40 | 17:20 | | | coal intact | |
| | 17:20 | 18:20 | | | Light Grey Mudstone | |
| E08 | 0:00 | 1:40 | | | Overburden | Boreholes Total |
| | 1:40 | 16:30 | | | Black / Grey Mudstone | |
| | 16:30 | 17:10 | | | coal intact | |
| | 17:10 | 18:10 | | | Light Grey Mudstone | |
| D08 | 0:00 | 1:60 | | | Overburden | Today |
| | 1:60 | 16:10 | | | Black / Grey Mudstone | |
| | 16:10 | 17:10 | | | coal intact | |
| | 17:10 | 18:10 | | | Light Grey Mudstone | |
| C08 | 0:00 | 1:60 | | | Overburden | Previous |
| | 1:60 | 15:40 | | | Black / Grey Mudstone | |
| | 15:40 | 16:20 | | | coal intact | |
| | 16:20 | 17:20 | | | Light Grey Mudstone | |
| B08 | 0:00 | 1:60 | | | Overburden | To Date |
| | 1:60 | 15:80 | | | Black / Grey Mudstone | |
| | 15:80 | 16:60 | | | coal intact | |
| | 16:60 | 17:60 | | | Light Grey Mudstone | |
| A08 | 0:00 | 1:60 | | | Overburden | Signed by Sirius Drilling Ltd: |
| | 1:60 | 15:60 | | | Black / Grey Mudstone | |
| | 15:60 | 16:40 | | | coal intact | |
| | 16:40 | 17:40 | | | Light Grey Mudstone | |



OPENHOLE DRILL LOG

Job No. SOL 3556
 Contract Name: Hindley
 Working Day: Wednesday

Date: 13-6-18
 Client: Persimmon Hares
 Sheet: 2 of 2

| Hole No. | From | To | Flush (W/A/M) | Casing T/S (m) | Strata Description | Rig Type: <u>CSXP</u> |
|-------------------------|-------|-------|---------------|----------------|-----------------------|---|
| K07 <i>10° Angle</i> | 0:00 | 1:50 | | | Overburden | Crew Details: <u>M. Thomas</u> <u>D. Skelhorn</u> |
| | 1:50 | 16:50 | | | Black / Grey Mudstone | |
| | 16:50 | 17:30 | | | coal intact | |
| | 17:30 | 18:30 | | | Light Grey Mudstone | |
| J07 | 0:00 | 1:50 | | | Overburden | Remarks: |
| | 1:50 | 16:40 | | | Black / Grey Mudstone | |
| | 16:40 | 17:20 | | | coal intact | |
| | 17:20 | 18:20 | | | Light Grey Mudstone | |
| H07 | 0:00 | 1:50 | | | Overburden | Gas Monitoring % O ₂ CO ₂ CH ₄ CO Start <u>20.7</u> <u>0</u> <u>0</u> <u>0</u> Mid <u>20.7</u> <u>0</u> <u>0</u> <u>0</u> End <u>20.7</u> <u>0</u> <u>0</u> <u>0</u> |
| | 1:50 | 16:20 | | | Black / Grey Mudstone | |
| | 16:20 | 16:40 | | | coal intact | |
| | 16:40 | 17:40 | | | Light Grey Mudstone | |
| G07 | 0:00 | 1:50 | | | Overburden | Weather Conditions: <u>AM Sun / PM overcast</u> |
| | 1:50 | 16:00 | | | Black / Grey Mudstone | |
| | 16:00 | 16:30 | | | coal intact | |
| | 16:30 | 17:30 | | | Light Grey Mudstone | |
| F07 | 0:00 | 1:60 | | | Overburden | Boreholes Total Today <u>18</u> |
| | 1:60 | 15:30 | | | Black / Grey Mudstone | |
| | 15:30 | 16:60 | | | coal intact | |
| | 16:60 | 17:60 | | | Light Grey Mudstone | |
| E07 | 0:00 | 1:60 | | | Overburden | Drilled Total Today <u>322.7</u> |
| | 1:60 | 15:60 | | | Black / Grey Mudstone | |
| | 15:60 | 16:40 | | | coal intact | |
| | 16:40 | 17:40 | | | Light Grey Mudstone | |
| D07 | 0:00 | 1:50 | | | Overburden | Casing Total Today Previous To Date |
| | 1:50 | 15:50 | | | Black / Grey Mudstone | |
| | 15:50 | 16:30 | | | coal intact | |
| | 16:30 | 17:30 | | | Light Grey Mudstone | |
| C07 | 0:00 | 1:40 | | | Overburden | Signed by Sirius Drilling Ltd: Signed by Client: |
| | 1:40 | 15:40 | | | Black / Grey Mudstone | |
| | 15:40 | 16:20 | | | coal intact | |
| | 16:20 | 17:20 | | | Light Grey Mudstone | |



OPENHOLE DRILL LOG

Job No. SDH 3556
 Contract Name: Lindley
 Working Day: Thursday

Date: 14/6/18
 Client: Persimmon Homes
 Sheet: 1 of 3

| Hole No. | From | To | Flush (W/A/M) | Casing T/S (m) | Strata Description | Rig Type: <u>ESD</u> | | | | | | | | | | | | | | | | | | | | |
|------------------------|----------|----------------|------------------|----------------------|----------------------|---|-------|----------------|-----------------|-----------------|---------|-------|------|---|---|---|-----|------|---|---|---|-----|------|---|---|---|
| A07 | 0:00 | 1:60 | | | overburden | Crew Details: <u>M. Thomas</u> <u>D Sheehorn</u> | | | | | | | | | | | | | | | | | | | | |
| | 1:60 | 15:20 | | | Black/Grey Mudstone | | | | | | | | | | | | | | | | | | | | | |
| | 15:20 | 16:00 | | | coal intact | | | | | | | | | | | | | | | | | | | | | |
| | 16:00 | 17:00 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | |
| K06 10 ^B | 0:00 | 0:30 | | | overburden | Remarks: | | | | | | | | | | | | | | | | | | | | |
| | 0:30 | 0:50 | | | coal | | | | | | | | | | | | | | | | | | | | | |
| | 0:50 | 16:40 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | |
| | 16:40 | 17:20 | | | coal intact | | | | | | | | | | | | | | | | | | | | | |
| | 17:20 | 18:20 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | |
| J06 | 0:00 | 0:60 | | | overburden | Gas Monitoring <table border="1"> <thead> <tr> <th>%</th> <th>O₂</th> <th>CO₂</th> <th>CH₄</th> <th>CO</th> </tr> </thead> <tbody> <tr> <td>Start</td> <td>20.7</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Mid</td> <td>20.7</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>End</td> <td>20.7</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table> | % | O ₂ | CO ₂ | CH ₄ | CO | Start | 20.7 | 0 | 0 | 0 | Mid | 20.7 | 0 | 0 | 0 | End | 20.7 | 0 | 0 | 0 |
| | % | O ₂ | CO ₂ | CH ₄ | CO | | | | | | | | | | | | | | | | | | | | | |
| | Start | 20.7 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| | Mid | 20.7 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| | End | 20.7 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| 0:60 | 1:10 | | | coal | | | | | | | | | | | | | | | | | | | | | | |
| 1:10 | 16:50 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | | |
| 16:50 | 17:00 | | | coal intact | | | | | | | | | | | | | | | | | | | | | | |
| 17:00 | 18:00 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | | |
| H06 | 0:00 | 1:00 | | | overburden | Weather Conditions: <u>Am</u> <u>overcast/sun</u> | | | | | | | | | | | | | | | | | | | | |
| | 1:00 | 1:50 | | | coal | | | | | | | | | | | | | | | | | | | | | |
| | 1:50 | 16:30 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | |
| | 16:30 | 16:50 | | | coal intact | | | | | | | | | | | | | | | | | | | | | |
| | 16:50 | 17:30 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | |
| G06 | 0:00 | 1:30 | | | overburden | Boreholes Total <table border="1"> <tr><td>Today</td><td></td></tr> <tr><td>Previous</td><td></td></tr> <tr><td>To Date</td><td></td></tr> </table> | Today | | Previous | | To Date | | | | | | | | | | | | | | | |
| | Today | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Previous | | | | | | | | | | | | | | | | | | | | | | | | | |
| | To Date | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1:30 | 1:40 | | | coal | | | | | | | | | | | | | | | | | | | | | |
| 1:40 | 16:00 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | | |
| 16:00 | 16:60 | | | coal intact | | | | | | | | | | | | | | | | | | | | | | |
| 16:60 | 17:60 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | | |
| F06 | 0:00 | 2:00 | | | overburden | Drilled Total <table border="1"> <tr><td>Today</td><td></td></tr> <tr><td>Previous</td><td></td></tr> <tr><td>To Date</td><td></td></tr> </table> | Today | | Previous | | To Date | | | | | | | | | | | | | | | |
| | Today | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Previous | | | | | | | | | | | | | | | | | | | | | | | | | |
| | To Date | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2:00 | 2:30 | | | coal | | | | | | | | | | | | | | | | | | | | | |
| 2:30 | 16:00 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | | |
| 16:00 | 16:40 | | | coal intact | | | | | | | | | | | | | | | | | | | | | | |
| 16:40 | 17:40 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | | |
| E06 | 0:00 | 2:00 | | | overburden | Casing Total <table border="1"> <tr><td>Today</td><td></td></tr> <tr><td>Previous</td><td></td></tr> <tr><td>To Date</td><td></td></tr> </table> | Today | | Previous | | To Date | | | | | | | | | | | | | | | |
| | Today | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Previous | | | | | | | | | | | | | | | | | | | | | | | | | |
| | To Date | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2:00 | 2:40 | | | coal | | | | | | | | | | | | | | | | | | | | | |
| | 2:40 | 3:00 | | | fine grain Sandstone | | | | | | | | | | | | | | | | | | | | | |
| 3:00 | 15:70 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | | |
| 15:70 | 16:20 | | | coal | | | | | | | | | | | | | | | | | | | | | | |
| 16:20 | 17:20 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | | |
| D06 | 0:00 | 1:30 | | | overburden | Signed by Sirius Drilling Ltd: | | | | | | | | | | | | | | | | | | | | |
| | 1:30 | 15:50 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | |
| | 15:50 | 16:00 | | | coal intact | | | | | | | | | | | | | | | | | | | | | |
| | 16:00 | 17:00 | | | Mudstone | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Signed by Client: | | | | | | | | | | | | | | | | | | | | |



OPENHOLE DRILL LOG

Job No. SD4 355G
 Contract Name: Lindley
 Working Day: Thursday

Date: 14-6-18
 Client: Persimmon Holes
 Sheet: 2 of 3

| Hole No. | From | To | Flush (W/A/M) | Casing T/S (m) | Strata Description | Rig Type: eSXP | | | | |
|------------|-------|-------|------------------|----------------------|--------------------|---|----------------|-----------------|-----------------|----|
| B06 | 0:00 | 1:60 | | | overburden | Crew Details: M. Thomas D. Shehorn | | | | |
| | 1:60 | 15:50 | | | Mudstone | | | | | |
| | 15:50 | 16:00 | | | coal intact | | | | | |
| | 16:00 | 17:00 | | | Mudstone | | | | | |
| A06 | 0:00 | 1:50 | | | overburden | Remarks: | | | | |
| | 1:50 | 15:30 | | | Mudstone | | | | | |
| | 15:30 | 15:50 | | | coal intact | | | | | |
| | 15:50 | 16:50 | | | Mudstone | | | | | |
| K05 10° | 0:00 | 1:50 | | | overburden | Gas Monitoring | | | | |
| | 1:50 | 15:40 | | | Mudstone | | | | | |
| | 15:40 | 15:50 | | | coal intact | | | | | |
| | 15:50 | 16:50 | | | Mudstone | | | | | |
| J05 | 0:00 | 1:50 | | | overburden | % | O ₂ | CO ₂ | CH ₄ | CO |
| | 1:50 | 2:00 | | | Mudstone | Start | 20.7 | 0 | 0 | 0 |
| | 2:00 | 2:30 | | | coal | Mid | 20.7 | 0 | 0 | 0 |
| | 2:30 | 2:60 | | | Hard Sandstone | End | 20.7 | 0 | 0 | 0 |
| | 2:60 | 15:30 | | | Mudstone | Weather Conditions: Am overcast / Sun | | | | |
| | 15:30 | 15:50 | | | coal intact | Boreholes Total | | | | |
| | 15:50 | 16:50 | | | Mudstone | Today | | | | |
| | | | | | | Previous | | | | |
| H05 | 0:00 | 1:50 | | | overburden | To Date | | | | |
| | 1:50 | 2:00 | | | Mudstone | Drilled Total | | | | |
| | 2:00 | 2:20 | | | coal | Today | | | | |
| | 2:20 | 15:10 | | | Mudstone | Previous | | | | |
| G05 | 15:10 | 15:50 | | | coal intact | To Date | | | | |
| | 15:50 | 16:50 | | | Mudstone | Casing Total | | | | |
| | | | | | | Today | | | | |
| | | | | | | Previous | | | | |
| F05 | 0:00 | 1:50 | | | overburden | To Date | | | | |
| | 1:50 | 2:00 | | | coal | Signed by Sirius Drilling Ltd: | | | | |
| | 2:00 | 14:50 | | | Mudstone | Signed by Client: | | | | |
| | 14:50 | 15:30 | | | coal intact | | | | | |
| 15:30 | 16:30 | | | Mudstone | | | | | | |
| | | | | | | | | | | |
| E05 | 0:00 | 1:00 | | | overburden | | | | | |
| | 1:00 | 1:50 | | | coal | | | | | |
| | 1:50 | 14:50 | | | Mudstone | | | | | |
| | 14:50 | 15:10 | | | coal intact | | | | | |
| | | | | | 15:10 | 16:10 | | | | |
| | | | | | | | | | | |



OPENHOLE DRILL LOG

Job No. SON 3556
 Contract Name: Hindley
 Working Day: Thursday

Date: 14-6-18
 Client: Persimmon Hires
 Sheet: 3 of 3

| Hole No. | From | To | Flush (W/A/M) | Casing T/S (m) | Strata Description | Rig Type: CSXP |
|----------|-------|-------|------------------|----------------------|--------------------|---|
| D05 | 0:00 | 1:00 | | | overburden | Crew Details: M. Thomas D. Skelhorn |
| | 1:00 | 1:40 | | | coal intact | |
| | 1:40 | 14:30 | | | Mudstone | |
| | 14:30 | 15:00 | | | coal intact | |
| | 15:00 | 16:00 | | | Mudstone | |
| C05 | 0:00 | 0:60 | | | overburden | Remarks: |
| | 0:60 | 1:00 | | | coal intact | |
| | 1:00 | 16:00 | | | Mudstone | |
| B05 | 0:00 | 1:50 | | | overburden | Gas Monitoring |
| | 1:50 | 21:00 | | | Mudstone | |
| A05 | 0:00 | 1:50 | | | overburden | % O ₂ CO ₂ CH ₄ CO |
| | 1:50 | 16:00 | | | Mudstone | Start 20.7 0 0 0 |
| | | | | | | Mid 20.7 0 0 0 |
| | | | | | | End 20.7 0 0 0 |
| | | | | | | Weather Conditions: Am overcast / Pm Sun |
| | | | | | | Borehole Total |
| | | | | | | Today 20 |
| | | | | | | Previous 20 |
| | | | | | | To Date 40 |
| | | | | | | Drilled Total |
| | | | | | | Today 342.5 |
| | | | | | | Previous |
| | | | | | | To Date |
| | | | | | | Casing Total |
| | | | | | | Today |
| | | | | | | Previous |
| | | | | | | To Date |
| | | | | | | Signed by Sirius Drilling Ltd: |
| | | | | | | Signed by Client: |



OPENHOLE DRILL LOG

Job No. SDL 3556
 Contract Name: Lindsey
 Working Day: Friday

Date: 15/6/18
 Client: Persimmon Homes
 Sheet: 1 of 2

| Hole No. | From | To | Flush (W/A/M) | Casing T/S (m) | Strata Description | Rig Type: CBXP |
|---------------------|-------|-------|------------------|----------------------|--------------------|--|
| K04 | 0:00 | 1:50 | | | overburden | Crew Details: M. Thomas D. Steinhorn |
| | 1:50 | 15:00 | | | Mudstone | |
| | 15:00 | 15:40 | | | coal intact | |
| | 15:40 | 16:40 | | | Mudstone | |
| J04 | 0:00 | 1:50 | | | overburden | Remarks: |
| | 1:50 | 14:30 | | | Mudstone | |
| | 14:30 | 15:20 | | | coal intact | |
| | 15:20 | 16:20 | | | Mudstone | |
| H04 | 0:00 | 1:40 | | | overburden | Gas Monitoring % O ₂ CO ₂ CH ₄ CO Start Mid End |
| | 1:40 | 14:60 | | | Mudstone | |
| | 14:60 | 14:90 | | | coal intact | |
| | 14:90 | 15:90 | | | Mudstone | |
| G04 | 0:00 | 1:50 | | | overburden | Weather Conditions: Am overcast / Pm Sun |
| | 1:50 | 14:50 | | | Mudstone | |
| | 14:50 | 14:90 | | | coal intact | |
| | 14:90 | 15:90 | | | Mudstone | |
| F04 | 0:00 | 1:50 | | | overburden | Boreholes Total Today : Previous To Date |
| | 1:50 | 14:30 | | | Mudstone | |
| | 14:30 | 14:70 | | | coal intact | |
| | 14:70 | 15:70 | | | Mudstone | |
| E04 | 0:00 | 1:70 | | | overburden | Drilled Total Today Previous To Date |
| | 1:70 | 14:16 | | | Mudstone | |
| | 14:16 | 14:50 | | | coal intact | |
| | 14:50 | 15:50 | | | Mudstone | |
| D04 | 0:00 | 1:60 | | | overburden | Casing Total Today Previous To Date |
| | 1:60 | 13:90 | | | Mudstone | |
| | 13:90 | 14:30 | | | coal intact | |
| | 14:30 | 15:30 | | | Mudstone | |
| C04 | 0:00 | 1:60 | | | overburden | Signed by Sirius Drilling Ltd: |
| | 1:60 | 16:00 | | | Mudstone | |
| B04 | 0:00 | 1:60 | | | overburden | Signed by Client: |
| | 1:60 | 16:00 | | | Mudstone | |
| A04 Angie 10° | 0:00 | 1:60 | | | overburden | |
| | 1:60 | 16:00 | | | Mudstone | |



OPENHOLE DRILL LOG

Job No. SDL 3556
 Contract Name: Lindley
 Working Day: Friday

Date: 15/6/18
 Client: Persimmon Homes
 Sheet: 2 of 2

| Hole No. | From | To | Flush (W/O/V/M) | Casing T/S (m) | Strata Description | Rig Type: CSXP |
|----------------------|-------|-------|--------------------|----------------------|--------------------|--|
| K03 | 0:00 | 1:60 | | | Overburden | Crew Details: M. Thomas D. Skelhorn |
| | 1:60 | 14:00 | | | Mudstone | |
| | 14:00 | 14:60 | | | coal intact | |
| | 14:60 | 15:60 | | | Mudstone | |
| J03 | 0:00 | 1:60 | | | Overburden | Remarks: |
| | 1:60 | 13:50 | | | Mudstone | |
| | 13:50 | 14:30 | | | Broken Ground | |
| | 14:30 | 15:30 | | | Hard Strata | |
| H03 | 0:00 | 1:50 | | | Overburden | Gas Monitoring % O ₂ CO ₂ CH ₄ CO Start Mid End |
| | 1:50 | 13:50 | | | Mudstone | |
| | 13:50 | 14:30 | | | coal intact | |
| | 14:30 | 15:30 | | | Mudstone | |
| G03 | 0:00 | 1:50 | | | Overburden | Weather Conditions: overcast |
| | 1:50 | 13:20 | | | Mudstone | |
| | 13:20 | 14:60 | | | coal intact | |
| | 14:00 | 15:00 | | | Mudstone | |
| F03 | 0:00 | 1:50 | | | Overburden | Boreholes Total |
| | 1:50 | 16:00 | | | Mudstone | |
| E03 | 0:00 | 1:50 | | | Overburden | Today 22 |
| | 1:50 | 16:00 | | | Mudstone | |
| D03 | 0:00 | 1:50 | | | Overburden | Previous 38 |
| | 1:50 | 16:00 | | | Mudstone | |
| C03 | 0:00 | 1:50 | | | Overburden | To Date 60 |
| | 1:50 | 16:00 | | | Mudstone | |
| B03 | 0:00 | 1:50 | | | Overburden | Drilled Total |
| | 1:50 | 16:00 | | | Mudstone | |
| A03 | 0:00 | 1:50 | | | Overburden | Today 345.9 |
| | 1:50 | 16:00 | | | Mudstone | |
| 10 th Aug | 0:00 | 1:70 | | | Overburden | Previous 664.8 |
| | 1:70 | 16:00 | | | Mudstone | |
| K02 | 0:00 | 1:50 | | | Overburden | To Date 110.7 |
| | 1:50 | 13:20 | | | Mudstone | |
| | 13:20 | 14:00 | | | Soft Ground | |
| | 14:00 | 15:00 | | | Mudstone | |
| J02 | 0:00 | 1:50 | | | Overburden | Casing Total |
| | 1:50 | 13:00 | | | Mudstone | |
| | 13:00 | 13:80 | | | Broken ground | |
| | 13:80 | 14:80 | | | Hard Strata | |

Signed by Sirius Drilling Ltd:

Signed by Client:



OPENHOLE DRILL LOG

Job No. SDL 3556
 Contract Name: Lindley
 Working Day: Saturday

Date: 16-6-18
 Client: Persimmon Homes
 Sheet: 1 of 2

| Hole No. | From | To | Flush (W/M) | Casing T/S (m) | Strata Description | Rig Type: e5XP |
|----------|-------|-------|----------------|----------------------|--------------------|---|
| B07 | 0:00 | 1:50 | | | Overburden | Crew Details: M. Thomas D. Stelhorn |
| | 1:50 | 15:30 | | | Mudstone | |
| | 15:30 | 16:10 | | | coal intact | |
| | 16:10 | 17:10 | | | Mudstone | |
| C06 | 0:00 | 1:60 | | | Overburden | Remarks: |
| | 1:60 | 15:40 | | | Mudstone | |
| | 15:40 | 15:90 | | | coal intact | |
| | 15:90 | 16:90 | | | Mudstone | |
| H02 | 0:00 | 1:50 | | | Overburden | Gas Monitoring |
| | 1:50 | 12:80 | | | Mudstone | |
| | 12:80 | 13:50 | | | coal intact | |
| | 13:50 | 14:50 | | | Mudstone | |
| G02 | 0:00 | 1:50 | | | Overburden | % O ₂ CO ₂ CH ₄ CO |
| | 1:50 | 16:00 | | | Mudstone | Start 20.7 0 0 0 |
| F02 | 0:00 | 1:50 | | | Overburden | Mid 20.7 0 0 0 |
| | 1:50 | 16:00 | | | Mudstone | End 20.7 0 0 0 |
| E02 | 0:00 | 1:50 | | | Overburden | Weather Conditions: |
| | 1:50 | 16:00 | | | Mudstone | overcast |
| D02 | 0:00 | 1:50 | | | Overburden | Boreholes Total |
| | 1:50 | 16:00 | | | Mudstone | Today |
| C02 | 0:00 | 1:50 | | | Overburden | Previous |
| | 1:50 | 16:00 | | | Mudstone | To Date |
| B02 | 0:00 | 1:50 | | | Overburden | Drilled Total |
| | 1:50 | 16:00 | | | Mudstone | Today |
| A02 | 0:00 | 1:50 | | | Overburden | Previous |
| | 1:50 | 16:00 | | | Mudstone | To Date |
| K01 | 0:00 | 1:50 | | | Overburden | Casing Total |
| | 1:50 | 13:00 | | | Mudstone | Today |
| | 13:00 | 13:60 | | | coal intact | Previous |
| | 13:60 | 14:60 | | | Mudstone | To Date |
| J01 | 0:00 | 1:50 | | | Overburden | Signed by Sirius Drilling Ltd: |
| | 1:50 | 12:80 | | | Mudstone | |
| | 12:80 | 13:40 | | | Coal intact | |
| | 13:40 | 14:40 | | | Mudstone | Signed by Client: |



OPENHOLE DRILL LOG

Job No. SDU 3556
 Contract Name: Lindley
 Working Day: Saturday

Date: 16-6-18
 Client: Persimmon Hoses
 Sheet: 2 of 2

| Hole No. | From | To | Flush (W/L/M) | Casing T/S (m) | Strata Description | Rig Type: | | | | |
|----------|------|-------|------------------|----------------------|--------------------|---|----------------|-----------------|-----------------|----|
| | | | | | | e5XP | | | | |
| H01 | 0:00 | 1:50 | | | overburden | Crew Details: M. Thomas D. Skelhorn | | | | |
| | 1:50 | 16:00 | | | Mudstone | | | | | |
| G01 | 0:00 | 1:50 | | | overburden | Remarks: | | | | |
| | 1:50 | 16:00 | | | Mudstone | | | | | |
| F01 | 0:00 | 1:50 | | | overburden | Gas Monitoring | | | | |
| | 1:50 | 16:00 | | | Mudstone | | | | | |
| E01 | 0:00 | 1:50 | | | overburden | % | O ₂ | CO ₂ | CH ₄ | CO |
| | 1:50 | 16:00 | | | Mudstone | Start | 20.7 | 0 | 0 | 0 |
| D01 | 0:00 | 1:50 | | | overburden | Mid | 20.7 | 0 | 0 | 0 |
| | 1:50 | 16:00 | | | Mudstone | End | 20.1 | 0 | 0 | 0 |
| C01 | 0:00 | 1:50 | | | overburden | Weather Conditions: overcast | | | | |
| | 1:50 | 16:00 | | | Mudstone | | | | | |
| B01 | 0:00 | 1:50 | | | overburden | Boreholes Total | | | | |
| | 1:50 | 16:00 | | | Mudstone | | | | | |
| A01 | 0:00 | 1:50 | | | overburden | Today | 20 | | | |
| | 1:50 | 16:00 | | | Mudstone | Previous | 60 | | | |
| | | | | | | To Date | 80 | | | |
| | | | | | | Drilled Total | | | | |
| | | | | | | Today | 286.5 | | | |
| | | | | | | Previous | 1010.7 | | | |
| | | | | | | To Date | 1297.2 | | | |
| | | | | | | Casing Total | | | | |
| | | | | | | Today | | | | |
| | | | | | | Previous | | | | |
| | | | | | | To Date | | | | |
| | | | | | | Signed by Sirius Drilling Ltd: | | | | |
| | | | | | | Signed by Client: | | | | |



OPENHOLE DRILL LOG

Job No. 3556

Date: 18-6-18

Contract Name: Lindley Moor

Client: Persimmon Homes

Working Day: Monday

Sheet: 1 of 1

| Hole No. | From | To | Flush (M/A/M) | Casing T/S (m) | Strata Description | Rig Type: CSXP |
|-----------|-------|-------|------------------|----------------------|--------------------|---|
| J2-3 | 0:00 | 1:50 | | | overburden | Crew Details: M. Thomas D. Skelhorn |
| | 1:50 | 12:80 | | | Mudstone | |
| | 12:80 | 13:80 | | | Soft Grout | |
| TEST HOLE | 13:80 | 14:80 | | | Mudstone | |
| | | | | | | Remarks: Testhole J2-3 |
| | | | | | | Gas Monitoring |
| | | | | | | % O ₂ CO ₂ CH ₄ CO |
| | | | | | | Start 207 0 0 0 |
| | | | | | | Mid |
| | | | | | | End |
| | | | | | | Weather Conditions: overcast |
| | | | | | | Boreholes Total |
| | | | | | | Today |
| | | | | | | Previous |
| | | | | | | To Date |
| | | | | | | Drilled Total |
| | | | | | | Today |
| | | | | | | Previous |
| | | | | | | To Date |
| | | | | | | Casing Total |
| | | | | | | Today |
| | | | | | | Previous |
| | | | | | | To Date |
| | | | | | | Signed by Sirius Drilling Ltd: |
| | | | | | | Signed by Client: |



DAILY GROUTING RETURN

Job No. SDL3556
 Contract Name: Lindley
 Working Day: 1

Date: 18/06/2018
 Client: Persimmon Homes
 Sheet: 1 of 4

| Hole No. | Depth (m) | Strata* | PFA | OPC | Sand | Gravel | Total Grout | Full | Still Taking | Top Up | Press (psi/ bar) | Crew Details D GAYLOR J FLINT | | | | |
|-----------------------|-----------|---------|------|------|------|--------|-------------|-----------------|--------------|--------|------------------|-------------------------------------|-----------|------------|--------|-------|
| | | | | | | | | | | | | | | | Item | Quant |
| A08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | . | | | | |
| B08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | . | | | | |
| C08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | . | | | | |
| D08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | Materials Delivered Today | | | | |
| F08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | | | | | |
| G08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | Item | Quant | Ticket No. | | |
| H08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | PFA | 19.62 | 860999 | | |
| J08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | OPC | 1.40 | STOCK | | |
| K08 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | | | | | |
| A07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | | | | | |
| B07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | | | | | |
| C07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | | | | | |
| D07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | | | | | |
| E07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | Testing | | | | |
| F07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | Flow (mm) | Bleed (%) | Bleed (%) | | |
| G07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | 500 | 2hr | 1 | 2hr | 1 |
| H07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | 450 | 4hr | 1 | 4hr | 2 |
| J07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | 450 | 6hr | 2 | 6hr | 2 |
| K07 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | Number of Cubes Taken | | 3 | | |
| A06 | | C | 0.12 | 0.01 | | | 0.13 | X | | | | | | | | |
| Total Used | | | 2.40 | 0.20 | 0.00 | 0.00 | 2.60 | | | | | | | | | |
| Previous Total | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Today | | | | PFA | OPC | Sand | Gravel | |
| | | | | | | | | Previous | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 19.62 | 1.40 | |
| Total to Date | | | 2.40 | 0.20 | 0.00 | 0.00 | 2.60 | Total Delivered | | | | 19.62 | 1.40 | 0.00 | 0.00 | |
| | | | | | | | | Total Used | 2.40 | 0.20 | 0.00 | 0.00 | 17.22 | 1.20 | 0.00 | 0.00 |
| Total to Date | | | 2.40 | 0.20 | 0.00 | 0.00 | 2.60 | Stock on Site | | | | 17.22 | 1.20 | 0.00 | 0.00 | |
| | | | | | | | | | | | | | | | | |

Signed by Sirius Drilling Ltd: _____

Date: 18/06/2018

Signed by Client: _____

Date: _____

* C-Coal, S-Soft, BG-Broken Ground, V-Void, N/C-No Coal/Workings



APPENDIX D
CUBE RESULTS

29 Rufford Court
Woolston
Warrington
WA1 4RF
United Kingdom
Tel: +44(0) 1925 286220

CONCRETE TEST CUBE REPORT

(BS EN 12390-3:2009)



Date: 16/07/2018

Report no: WAB50940515_01

Client: SIRIUS REMEDIATION LTD

Scheme: SDL3556- LINDLEY

Contract no: 51043197

| Request Sheet No. | Lab Ref. | Client Ref. | Date Made | Time Made | Date Received in Laboratory | Date Tested | Age days | Dimensions mm | Density kg/m ³ | Failure Load kN | Compressive Strength N/mm ² | Specified Strength N/mm ² |
|-------------------|----------|-------------|-----------|-----------|-----------------------------|-------------|----------|---------------|---------------------------|-----------------|--|--------------------------------------|
|-------------------|----------|-------------|-----------|-----------|-----------------------------|-------------|----------|---------------|---------------------------|-----------------|--|--------------------------------------|

| | | | | | | | | | | | | |
|---------|----------|---------|------------|--|------------|------------|----|-------------|------|------|-----|-----------|
| 0149299 | 50940515 | SDL3556 | 18/06/2018 | | 04/07/2018 | 16/07/2018 | 28 | 100x100x100 | 1180 | 30.7 | 3.1 | not given |
|---------|----------|---------|------------|--|------------|------------|----|-------------|------|------|-----|-----------|

Location: -
Mix details: 12:1

The following apply unless otherwise stated under Remarks.

- 1) Laboratory curing range 18°-22°C.
- 2) Cube appearance as received satisfactory.
- 3) Test moisture condition and density saturated.
- 4) Cube failure normal. Concrete appearance normal.
- 5) Volume determined by measurement or designated size. Any fins removed by abrasive stone.
- 6) Laboratory curing conditions cannot be assured during tank cleaning.
- 7) Certificate of sampling not received. Certificate of making and curing not received.

8) Rate of Loading 0.4 to 0.8 N/mm² per sec.

Certified that curing in the laboratory and testing carried out in accordance with BS EN 12390-2 and 12390-7 and 12390-3.

Signed

Paul Haddock - Laboratory Manager

for and on behalf of SOCOTEC UK Limited

Issued to: SIRIUS REMEDIATION LTD