# CHALK MINE STABILISATION PROJECT
# HIGHBARNS, HEMEL HEMPSTEAD

## Treatment Area 13: Highbarns, East Green and Pond Road

Report Number: 0013-UA000857-TR-01-TAR-0013

OCTOBER 2015

Incorporating

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# CONTENTS



# APPENDICES

## APPENDIX A

# 1 INTRODUCTION

Dacorum Borough Council (DBC) has commissioned Arcadis Consulting (UK) Ltd (Arcadis) (formerly Hyder Consulting (UK) Limited) to oversee the treatment and validation of abandoned chalk mines identified beneath residential areas in the Nash Mills area of Hemel Hempstead, Hertfordshire. The mine workings identified at the site have been assessed to comprise a single level of chalk mine galleries in the vicinity of Highbarns, Pond Road and East Green Road junction. The mine treatment has been funded under the Land Stabilisation Programme (LSP), administered by the Homes and Communities Agency (HCA).

The background to the scheme, interpretation of the mine, and treatment works are set out in the overarching Treatment Report (Arcadis, 2015). This report forms an addendum to the above report and should be read in conjunction with it.

The objective of this report is to set out the works that were undertaken to treat the mines and provide the results of post mine treatment validation probing. The areas discussed in this report are as follows:

- Highbarns, East Green and Pond Road

The broader site location, treatment areas and interpreted extent of mine workings within the Derelict Land Clearance Order site boundary are shown in Appendix A of the overarching Treatment Report (Arcadis, 2015).

This Treatment area, validation probes and extent of grouting work specific to this treatment area are shown on drawings TA0013-01 and 02 in Appendix A.

Factual information relating to the investigative probes, validation probes and extent of grouting work are contained in the BAM Ritchies' Sectional Validation Reports named 'Central Area Highbarns & Pond Road' and 'Central Area East Green' (BAM, 2015).

# 2 SUBSURFACE INVESTIGATIONS

The subsurface investigations undertaken in these areas were undertaken in response to historical subsidence events across the site.

The pre-contract investigations were undertaken by Soil Engineering Ltd in 2012 and included investigative dynamic probes and dynamic windowless sampled boreholes. A review of historical information, the natural topography and the geotechnical investigations were used to identify zones of probable mining related disturbed ground.

Following and during each stage of the treatment works, validation dynamic probing was undertaken to establish the effectiveness of the mine treatment.

The scope of the validation dynamic probing completed during and following the treatment works for Highbarns, East Green and Pond Road are summarised inTable 1 below.

Table 1: Summary of Validation Investigations

| Type of Investigations | Number |
|---|---|
| Total No. of Validation Dynamic Probes (VP) | 311 |

The results of the validation dynamic probes undertaken during and after treatment works are presented in the relevant sectional factual report VR0013 for this treatment area (BAM, 2015). For the purposes of this report, additional dynamic probes undertaken concurrently with the grouting works in order to further investigate the extent of mine workings are designated validation probes.

Findings of the pre-contract design phase ground investigation undertaken by Soil Engineering and subsequent interpretations are contained in the Interpretive Ground Investigation Report for the site (Hyder, 2012a).

# 3 TREATMENT RECORDS

Mine treatment works have been undertaken in accordance with the Specification for Site Works (Hyder, 2012b). The techniques of mine treatment adopted at the site consisted of bulk infilling of open voids and compaction grouting of collapsed ground.

A summary of the treatment works are set out in Table 2 below.

Table 2: Summary of Treatment Works

| Property | Location | Type of Hole | Number of Holes | Range of Grout volumes[1] ($m^3$) | Total Grout volume[1] ($m^3$) |
|---|---|---|---|---|---|
| **Highbarns, Pond Road and East Green highways** (Total Grout Holes = 269, Total Grout Volume = 3417.2$m^3$) | Highbarns | Bulk infilling | 16 | 1.5 (BG004) to 147 (BG021) | 693.3 |
| | Highbarns | Vertical compaction grout holes | 129 | 0.38 (CGV206A) to 63.2 (CGV648) | 1268.2 |
| | Pond Road | Bulk infilling | 4 | 32 (BG012) to 48 (BG014) | 80 |
| | Pond Road | Vertical compaction grout holes | 30 | 0.2 (CGV202) to 9.05 (CGV634) | 82.5 |
| | East Green | Bulk infilling | 10 | 0.5 (BG026) to 83 (BG019) | 240.3 |
| | East Green | Vertical compaction grout holes | 80 | 0.5 (CGV460) to 72.5 (CGV456) | 1052.85 |

Notes:

The above extract is based on data from BAM Ritchies' Sectional Validation Report for Highbarns, East Green and Pond Road (BAM, 2015). The factual report should be referenced for further details of treatment works including the volumes of grout injected and injection pressures per grout hole.

The treatment was undertaken in a phased approach with several stages of grouting and validation dynamic probe testing. Additional stages of grouting and validation testing were completed where validation testing raised doubts as to the extent of the grout penetration beneath properties or where additional mining related disturbed ground was identified.

# 4 VALIDATION

Validation of the treatment works has been based upon a combination of factors including a comparison of pre-treatment investigations, validation probing and grout volumes recorded during treatment. The number of grout holes, their location and the phasing of the grouting was adjusted as the work proceeded in order to accommodate the findings of the treatment works. Experience gained from other chalk mine projects has identified that dynamic probe blow counts of less than 3 per 100mm penetration is indicative of the presence of mine workings. Consequently, treatment was only

considered complete where validation probes proved blow counts greater than 3 per 100mm penetration at the level of the suspected mine as interpreted from the pre-contract investigations.

A detailed scope of validation procedures adopted during the treatment works is presented in the Highbarns Chalk mine Stabilisation Treatment Report (Arcadis, 2015).

The main mine complex is thought to be centred around the junction of Highbarns, Pond Road and East Green where numerous mine passages merge. The grout volumes recorded were generally comparable to the expected volumes as assessed from the pre-contract ground investigation and microgravity surveys. However, a number of locations were treated with greater than expected volumes of grout as explained in the following sections indicating a greater extent of mine than previously assessed.

Treatment along the main roadways at Highbarns, East Green and Pond Road located within the Derelict Land Clearance Order (DLCO) boundary confirmed the expected location of four shafts assessed from the pre-contract investigations. Two shafts have been treated adjacent to No. 1 Pond Road. A third shaft was located beneath an area of public open space adjacent to No. 24 Highbarns and a fourth shaft within an open space along East Green. The locations of several areas of open mine workings identified during laser scanning surveys that have been bulk filled are shown on Drawing TA0013-01 presented in Appendix A.

## 4.1 Highbarns / East Green / Pond Road junction

Initial treatment at the road junction involved bulk infilling of the extensive open mine gallery uncovered across Highbarns. High grout volumes were recorded at BG005 (113.0m$^3$), BG006 (84.5m$^3$) and BG008 (117m$^3$) confirming the interpreted mining extents. Further bulk infilling was carried out along the open mine workings south of the main voided area and a combined grout volume of 80.0m$^3$ at locations BG017 and BG018 confirmed the voided nature of the mine. During ongoing treatment works at BG017, grout was observed emerging from the adjacent grout hole BG018 which confirmed the extent of treatment of open mined ground at this location.

Following an initial phase of bulk infilling at known open mine workings, compaction grouting was undertaken along the interpreted mine galleries treating areas of collapsed ground. Subsequent compaction grouting close to a previous bulk infill location (BG008) resulted in a high grout volume at CGV217A (20.7m$^3$) indicative of residual weak ground probably associated with the adjacent shaft location. Similarly consistent high volumes were observed closer to the central mine junction. Initial bulk infilling at BG011 (36.0m$^3$) was followed by high volumes at compaction grout holes CGV250 (18.8m$^3$) and CGV220 (35.1m$^3$). This suggested incomplete treatment during the initial grouting phase probably due to the collapsed nature of the mine. This was confirmed by low blow counts in pre-contract validation probes VP077 and VP081. Additional grouting at CGV610 (12.0m$^3$), CGV611A (11.4m$^3$) and CGV612 (14.9m$^3$) was carried out to re-treat the area with the resultant volumes confirming the necessity of further treatment. A final phase of validation dynamic probing (particularly VP516 and VP736) identified improved ground conditions which were not suggestive of residual untreated mines. Similarly, CGV260 (10.2m$^3$) and CGV262 (21.4m$^3$) located either side of open mine working (BG017 and BG018) at the central junction suggested further extension of the mine workings both north and south along Highbarns.

High grout volumes were also observed in areas away from open mine workings. Adjacent high volumes at CGV246 (13.5m$^3$), CGV242 (29.4m$^3$), CGV239 (12.2m$^3$) and CGV237 (25.4m$^3$) suggested more collapsed mine workings extending towards the centre of the road junction. Similarly high grout volumes at CGV209b (12.6m$^3$), CGV210b (20.0m$^3$), CGV233A (18.0m$^3$) and CGV234a (10.9m$^3$) close by were also

seen to be related to previous treatment at No. 5 Chantry Lane as well as the adjacent open workings treated at BG015A and BG016A (44.4m$^3$).

Extensive validation dynamic probing was carried out following completion of the grouting works to confirm the termination of the assumed mine gallery extents. Additional dynamic probes VP560, VP561 and VP649 were carried out following high volumes at CGV254 (10.9m$^3$) and CGV318 (14.0m$^3$) suggested possible residual weakness towards the central road junction. The resultant dynamic probes did not uncover any evidence of untreated mined ground confirming the original mine layout. Validation probe VP119 in front of Nos. 5 and 7 Chantry Lane where high grout volume at CGV228 (25.4m$^3$) was recorded did not reveal any residual untreated mining. An additional validation probe (VP779) was undertaken at the location of treatment works at CGV610 and CGV612. Results showed an improvement in ground conditions and did not indicate any residual untreated ground.

There was a general reduction in grout volumes as grouting progressed across the central mine complex and where weaknesses were recorded additional grouting was undertaken. The results of the validation probes following the treatment did not uncover any areas of weakness that could be attributed to residual untreated mining.

## 4.2 Highbarns

Treatment works along Highbarns Road north of the central mine junction commenced with treatment at the known mine shaft location. High bulk infill volumes at BG002 (47.0m$^3$) confirmed open mine workings in the area. Grout volumes remained high during the subsequent compaction grouting phase in the area. The resultant high volumes at CGV118 (16.4m$^3$) and CGV121A (13.6m$^3$) suggested a possible greater mine extent than originally envisaged. Following works carried out at Nos. 1-3 Pond Road (see Treatment Area Report TAR012) resulting in further high volumes adjacent to the roadway, an investigation into additional mine workings extending northwards along Highbarns was undertaken.

Two dynamic probes (VP477 – VP478) were initially carried outside the original mine extents. VP478 highlighted low blow counts at depth between 6.4m and 10.7m bgl which, while indicative of poor ground, was not considered sufficient evidence of further mine workings. A second row of dynamic probes (VP620-VP622) showed extensive evidence of low blow counts, particularly at VP620 and VP621, with a consistent mine depth between 14.0m and 18.0m below ground level.

Once additional mine workings were confirmed, several phases of compaction grouting followed by validation probing were carried out to determine the gallery extents and success of the treatment along Highbarns. Investigative probe locations VP714, VP792, VP795 and VP799 revealed a single mine gallery at a consistent depth and the grouting works at these locations confirmed the presence of the mine gallery with high grout volumes at CGV648 (63.2m$^3$), CGV662 (5.7m$^3$), CGI665 (53.5m$^3$) and CGV668 (113.7m$^3$). Subsequent validation probing (VP847-VP852) did not reveal any untreated areas. This mine gallery was later found to intersect with further mine workings at the Highbarns / Meadow Road mine junction. Further treatment was carried out in the area (see Treatment Area Report TAR010) to ensure comprehensive treatment of this area of mining.

## 4.3 East Green

Treatment works along East Green initially involved bulk infilling of four distinct open mine workings uncovered during the pre-treatment investigation. These were known to extend partly into other treatment areas (particularly Nos. 28-30 East Green). Bulk infilling at these locations confirmed more open mine galleries closer to the central mine junction. BG021 and BG022 had a combined total grout volume of 147.0m$^3$ confirming the open mine workings in the area adjacent to the central mine complex. West along East Green BG019 (83.0m$^3$) and BG020 (20.0m$^3$) confirmed the presence of a mine passage under the road. A general reduction in grout volumes was noted as

grouting proceeded west along East Green, although a higher grout volume was recorded in BG029 (30.9m$^3$) located close to a known shaft location. Furthermore subsequent compaction grouting close to the shaft location resulted in several high volumes at CGV416A (55.1m$^3$), CGV425A (30.5m$^3$) and CGV626 (18.3m$^3$) indicating an extensive open mined area. Dynamic probes, VC330a and VC331a, were subsequently carried out to validate the treatment works around the shaft location and these did not uncover any conditions that would indicate residual untreated areas. Subsequent dynamic probes VP237 and VP239 close to the shaft did not find any evidence that there were residual untreated areas. Grout volumes closer to Nos. 28-30 East Green at CGV409 (25.9m$^3$) and CGV410 (11.6m$^3$) confirmed that the mine extended beneath these properties which were treated separately (see Treatment Area report TAR008).

Following the bulk infilling and compaction grouting that was anticipated from the pre-contract investigations and along with the evidence from the grouting works, it was suspected that the mine was more extensive and further high grout volumes at CGV456A (72.5m$^3$), CGV455 (13.6m$^3$) and CGV429 (40.9m$^3$) suggested a greater extent of collapsed ground than originally interpreted. Further mine galleries extending northwards towards the East Green garages and back gardens of Nos. 14-24 Highbarns incorporated two known areas of open mine workings were identified. Bulk infilling at these two open void locations resulted in high grout volumes at BG033 and BG034 (combined volume of 55.2m$^3$) when compared to adjacent BG031 and BG032 (total volume of 17.2m$^3$). While treatment at BG033 and BG034 was anticipated due to known open mine workings in the area, the low grout volumes at BG031 and BG032 suggested that the bulk infilling may not have fully treated the mine. Subsequent compaction grouting in the area resulted in high volumes at CGV506A (54.0m$^3$), CGV502A (27.6m$^3$) and CGV499 (18.9m$^3$). This led to an additional compaction grout hole location (CGV635 – 8.8m$^3$) at the previous bulk infill location which confirmed the generally collapsed nature of ground in the area. A final validation probe VP739 did not uncover any residual areas of untreated ground. Final validation probes VP719 and VP720 confirmed competent ground conditions in between the two bulk infill locations with no evidence of further weak ground extending towards the properties. Two high grout volumes carried out close to the East Green garages at CGV496 (15.9m$^3$) and CGV495 (14.9m$^3$) were recorded due to a possible junction of mine passages in the area.

Validation probing to investigate the extent of the mining was carried out following treatment works along East Green. Validation probes VP572 – VP576 failed to identify an additional mine gallery extending northwards while VP577 confirmed that there was no residual untreated ground at the suspected mine junction. Similarly, validation probes VP554 – VP556 confirmed no additional mine galleries extending eastwards along East Green.

Further investigation was undertaken in the grass verge in front of Nos. 25-27 East Green to identify potential mine galleries extending beneath the adjacent East Green Flats. The grout volumes in holes CGV466 (9.4m$^3$) and CGV467 (8.0m$^3$) were not suggestive of a larger extent of mine workings than previously interpreted. Successive rows of additional validation probes (VP624-VP630; VP721-VP724) did not suggest any evidence of weak ground extending beneath East Green Flats.

## 4.4 Pond Road

The extensive open mine workings located along the Highbarns / East Green / Pond Road (see sub-section 4.1 above) were seen to progress along the front of Nos. 1-3 Pond Road (see Treatment Area Report TAR012).

Pre-treatment ground investigation revealed two open void locations adjacent to No. 5 Highbarns along Pond Road. Grout volumes at BG012 / BG013 (total 32.0m$^3$) and BG014 / BG035 (total 48.0m$^3$) confirmed the presence of open mine workings at these two locations. These open voids were thought to be related to previous

treatment undertaken beneath No. 5 Highbarns which prompted the need for the investigation and treatment of the wider Highbarns area. A high grout volume at CGV634 (9.0m$^3$) during the compaction grouting phase was seen to treat further mined ground not indicated by previous ground investigation. Following treatment, an additional validation probe (VP75) did not identify any untreated ground.

Generally average-to-low grout volumes (compared to site-wide volumes) were observed during the compaction grouting phase in the Pond Road area. Grout volumes close to known open voids at CGV616 (1.5m$^3$), CGV197 (2.2m$^3$) and CGV202A (0.2m$^3$) confirmed that treatment by bulk infilling. High grout volumes at adjacent locations CGV083 (2.8m$^3$), CGV085A (5.2m$^3$) and CGV089 (4.7m$^3$) were suspected to be related to a known mine junction adjacent to Pond Road garages. An additional grout hole at CGV637 (2.1m$^3$) within the anticipated mine and validation probes VP511, VP512 and later VP734 confirmed that there did not remain any untreated mining.

Compaction grouting volumes at CGV096 (0.5m$^3$), CGV089 (0.9m$^3$) and CGV095A (0.4m$^3$) confirmed the eastern termination point of the mine workings along Pond Road. The grout volume in CGV088 (2.4m$^3$) was likely to treat the known mine passage crossing Pond Road oblique at this location. The validation probes along Pond Road did not generally indicate any residual areas of untreated mined ground. Additionally, validation probe VP513 in front of No. 1 Pond Road were carried out to confirm any suspected weak ground between compaction grout hole locations.

# 5 CONCLUSIONS

Grouting has been completed under the main roadways at Highbarns, East Green and Pond Road to stabilise mining related disturbed ground due to former chalk mining. From the investigations and treatment work undertaken and the subsequent validation testing it can be reasonably concluded that;

- based upon the evidence, all mined ground encountered has been treated and that compaction and consolidation of collapsed voids and mine shafts has taken place;
- as a result of the above assessment, significant risk from chalk mine workings within the treatment area has reduced to an acceptably low level following treatment;
- there is no evidence of any adverse impacts on groundwater quality beneath the site as a consequence of the work;
- there is no evidence of any significant movement or other adverse effects on buildings or infrastructure during the works; and
- the risks from further untreated workings in the treatment area is considered to be no higher than elsewhere in Hemel Hempstead.

The grouting work undertaken has only targeted the treatment of mined ground for the current site use and building layout. It is still the responsibility of the land owner to seek appropriate design advice prior to any future development.

Dacorum Borough Council Building Control should be informed if any evidence of mine workings (such as shafts, voids or collapsed ground) is found during any future works undertaken as part of redevelopment.

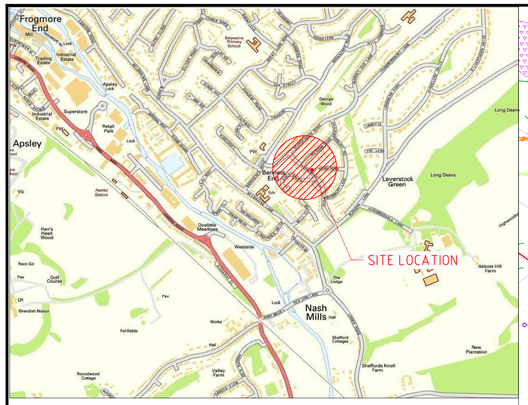
# 6 REFERENCES


1. Arcadis Consulting (UK) Limited (2015), Chalk Mine Stabilisation Project, Highbarns, Hemel Hempstead, Treatment Report, No 0013-UA000857-TR-01, October 2015.
2. BAM Ritchies (2014), *Highbarns Sectional Validation Reports ref*. BBK704U, VR-001 to 012. March 2014.
3. Hyder Consulting (UK) Limited (2012a), *Highbarns Chalk Mines Project, Interpretive Ground Investigation Report,* No 0010-UA000857-GDR-01, September 2012.
4. Hyder Consulting (UK) Limited (2012b), Highbarns, Hemel Hempstead, Chalk Mine Stabilisation Project, Specification for Site Works, No 0007-UA000857-GDR-01, September 2012.

# APPENDIX A

## Drawing TA0013-01 – Treatment Area Plan for TAR0013 with Grout Holes

## Drawing TA0013-02 – Treatment Area Plan for TAR0013 with Validation Probes




SITE MAP

NTS

POND ROAD

HIGHBARNS

EAST GREEN

TAR0013
POND ROAD, EAST GREEN AND HIGHBARNS



TREATMENT AREA PLAN

SCALE 1:250

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS IN METRES UNLESS NOTED OTHERWISE.
3. VALIDATION AND GROUTING DATA BASED ON BAM RITCHIES' SECTIONAL VALIDATION REPORT (BBK706E VR0001 TO VR00012) AND DATED APRIL 2015.
4. VOIDS IDENTIFIED BY LASER SURVEYS UNDERTAKEN IN 2008 AND REMEDIATED IN 2008 ARE BASED ON PETER BRETT ASSOCIATES (2008), INTERPRETATIVE GEOTECHNICAL REPORT - PHASE 1, NO 20247/0043/INT01/REV2, JULY 2008.
5. VOIDS IDENTIFIED BY LASER SURVEYS UNDERTAKEN IN 2012 ARE BASED ON INSPECTAHIRE (2012), CALS AND CCTV INSPECTION OF VOIDS REPORT NO 6658, ISSUE 02, AUGUST 2012.

| LEGEND | |
|---|---|
| PATTERN | DETAIL |
| | TREATMENT AREA BOUNDARY |
| | DERELICT LAND CLEARANCE ORDER BOUNDARY |
| | INTERPRETED MINE EXTENTS FOLLOWING TREATMENT |
| | VOIDS IDENTIFIED BY LASER SURVEYS UNDERTAKEN IN 2012 ( SEE NOTE 5) |
| | VOIDS IDENTIFIED BY LASER SURVEYS UNDERTAKEN IN 2008 AND REMEDIATED IN 2008 ( SEE NOTE 4) |
| | INTERPRETED SHAFT LOCATION FOLLOWING TREATMENT |
| | COLLAPSED GROUND RECORDED DURING TREATMENT |
| CGV138 / CGVM138 | COMPACTION VERTICAL GROUT HOLES |
| CGI138 / CGIM138 | COMPACTION INCLINED GROUT HOLES (ORIENTATION INDICATED BY DASHED LINE WHERE INFORMATION PROVIDED IN FACTUAL REPORT (SEE NOTE 3)) |
| CG138 | COMPACTION GROUT HOLES ( INCLINED OR VERTICAL (SEE NOTE 3)) |
| BG138 / BGHM138 | BULK GROUT INFILL HOLES (SEE NOTE 3) |

| GROUTING LEGEND | |
|---|---|
| PATTERN | DETAIL |
| BG007 CGV138 CGI108 | COMPACTION GROUT HOLES (0.0-1.0m³) |
| BG007 CGV138 CGI108 | COMPACTION GROUT HOLES (1.0-2.0m³) |
| BG007 CGV138 CGI108 | COMPACTION GROUT HOLES (2.0-5.0m³) |
| BG007 CGV138 CGI108 | COMPACTION GROUT HOLES (5.0-10.0m³) |
| BG007 CGV138 CGI108 | COMPACTION GROUT HOLES (>10.0m³) |

| Rev | Date | Auth | Description | Ckd | Apprd |
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| A01 | 21.10.15 | AB | FIRST ISSUE | AH | RB |

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Project:
HIGHBARNS
CHALK MINE STABILISATION PROJECT

Drawing status:
PRELIMINARY

Drawing title:
TREATMENT AREA PLAN FOR TAR0013 WITH GROUT HOLES

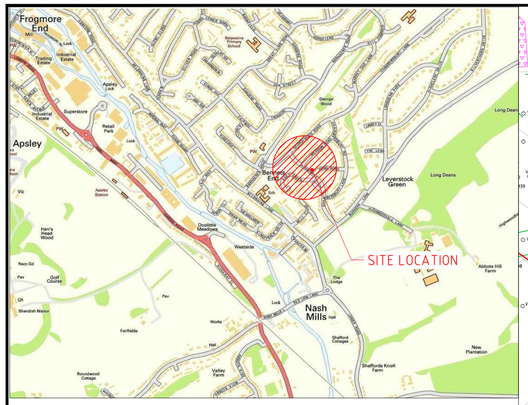
| Drawn by: | Date: | Author: | Date: |
|---|---|---|---|
| SANDIP P | 21.10.15 | A.BLAKE | 21.10.15 |
| Checker: | Date: | Approver: | Date: |
| A.HOPE | 21.10.15 | R.BARSBY | 21.10.15 |

Scale: AS SHOWN ON DRAWING

Sheet No.: 01

Drawing No: TA0013-01

Revision: A01




SITE MAP

NTS

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS IN METRES UNLESS NOTED OTHERWISE.
3. VALIDATION AND GROUTING DATA BASED ON BAM RITCHIES' SECTIONAL VALIDATION REPORT (BBK706E VR0001 TO VR00012) AND DATED APRIL 2015.
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| LEGEND | |
|---|---|
| PATTERN | DETAIL |
| | TREATMENT AREA BOUNDARY |
| | DERELICT LAND CLEARANCE ORDER BOUNDARY |
| | INTERPRETED MINE EXTENTS FOLLOWING TREATMENT |
| | VOIDS IDENTIFIED BY LASER SURVEYS UNDERTAKEN IN 2012 ( SEE NOTE 5) |
| | VOIDS IDENTIFIED BY LASER SURVEYS UNDERTAKEN IN 2008 AND REMEDIATED IN 2008 ( SEE NOTE 4) |
| | INTERPRETED SHAFT LOCATION FOLLOWING TREATMENT |
| | COLLAPSED GROUND RECORDED DURING TREATMENT |
| VP249/VPM249/ DPM249/VPP249 | VALIDATION DYNAMIC PROBES |

TAR0013
POND ROAD, EAST GREEN AND HIGHBARNS



TREATMENT AREA PLAN

SCALE 1:250

| Rev | Date | Auth | Description | Ckd | Apprd |
|---|---|---|---|---|---|
| A01 | 21.10.15 | AB | FIRST ISSUE | AH | RB |

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Project:

HIGHBARNS
CHALK MINE STABILISATION PROJECT

Drawing status:

PRELIMINARY

Drawing title:

TREATMENT AREA PLAN
FOR TAR0013
WITH VALIDATION PROBES

| Drawn by: | Date: | Author: | Date: |
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| Checker: | Date: | Approver: | Date: |
| A.HOPE | 21.10.15 | R.BARSBY | 21.10.15 |

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| Drawing No: | Revision: |
| TA0013-02 | A01 |

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