

Technical Note

Project:	P17-176 Athersley RLE		
Subject:	Technical Note – Remedial works to north west area		
Prepared by:	Adam Taylor MGeol (Hons) FGS Geo-Environmental Engineer	Date:	7 Aug 2020
Authorised by:	Stewart Friel MSc BSc (Hons) MEnvSc Director	Status:	S2 - Information
Document Ref:	17176-RLE-19-XX-RP-O-007	Revision:	P02

1 Introduction

1.1 Terms of Reference

In August 2020, Harworth Estates commissioned Rodgers Leask Environmental Ltd (RLE) to provide a Technical Note to summarise the ground constraints and remediation works required in the north western area of the site at Wakefield Road, Athersley, Barnsley. The Site is proposed to be re-developed for a residential end use.

This area was considered to be an area with some significant obstacles mainly relating to historic mining features but with contamination issues also, which if overcome would reduce risk for an ongoing developer.

The objective of the note is to summarise the constraints, potential remediation options and extent of works required in this area of the site to allow a remediation contractor to provide an estimate for investigation and remediation of these constraints.

Other constraints exist on the wider site and are outside the scope of this note.

2 Reference Documents

RLE has previously produced the following documents which have been used to summarise the information with this technical note:

- Phase 1 Desk Study, May 2017, ref: 17176-RLE-17-00-RP-O-001
- Coal Mining Risk Assessment, May 2017, ref: 17176-RLE-17-00-RP-O-002
- Phase 2 Geo-Environmental Report January 2018, ref: 17176-RLE-17-00-RP-O-003

- Technical Note: Coal Mining Investigation, November 2019, ref: 17176-RLE-19-00-RP-O-004
- Technical Note: Contamination and Remediation Summary, November 2019, ref: 17176-RLE-19-00-RP-O-005.

For further detail reference should be made to the above documents.

3 Background Information

3.1 Site History and Setting

The northwest of the Site was formerly occupied in part by the East Gawber Hall Colliery between c.1856 and 1922, with the remainder of the colliery being situated off-site to the north and west. This colliery included several shafts, adits and railway sidings located in the north of the Site, and numerous additional buildings including some coke ovens situated off-site to the northwest. Additional collieries were present in the wider surrounding area including Primrose Main and Wharncliffe Carlton to the south.

Since closure of the colliery on Site, land north of the Site was redeveloped as an engineering works. The remainder of the Site appears to have been restored to the present condition of grass pasture.

4 Ground Constraints

RLE Drawing 17176-RLE-17-XX-DR-0-011 provided as Appendix A summarises the ground constraints present in this area of the site and these are discussed in more detail below.

Further details of mining related constraints are provided in Technical Note 17176-RLE-19-00-RP-O-004.

Further details of contamination related constraints are provided in Technical Note 17176-RLE-19-00-RP-O-005.

4.1 Mine Entries

Of the 9 No recorded mine entries on or within 20m of the site, 6 No and have been investigated by RLE including 2 No. shafts and 4 No adits (3 on site and 1 off site). 3 No mine shafts off site adjacent to the west have not been investigated.

Table 1 below summarises the status of each feature:

Table 1 Summary of findings relating to shafts and adits.				
Mine entry reference:	on or off site	Coordinates /	Investigation Undertaken	Found or not found?
Adit 434408-017	On site	434695, 408822 (CA Coordinates)	6 No BHs to 12m bgl along line of adit	ADIT NOT IDENTIFIED
Adit 434408-018	On site	434629, 408802 (CA Coordinates)	9 No BHs to 12m bgl along line of adit	POSSIBLE ADIT OR WORKINGS IDENTIFIED
Adit 434408-021	Off site, may underlie site	434662, 408874 (CA Coordinates)	10 No BHs to 32m bgl along line of adit	ADIT NOT IDENTIFIED
Adit 434408-022	On site	434666, 408847 (CA Coordinates)	6 No BHs to 22m bgl along line of adit	ADIT NOT IDENTIFIED
Shaft 434408-007	On site	434707, 408848 Estimated shaft centre	23 No BHs to 12m bgl at 1m centres around shaft coordinates	POSSIBLE SHAFT IDENTIFIED
Shaft 434408-023	On site	434693, 408837 (CA Coordinates)	20 No BHs to 20m bgl at 1m centres around shaft coordinates	SHAFT NOT IDENTIFIED

4.2 Shallow workings

A number of shallow coal seams were encountered across the Site, some of which were of workable thickness and quality. However, limited evidence for shallow working was encountered on Site. This is likely due in part to the influence of faulting in the north of the Site, the somewhat variable thickness and quality of coal and the presence of more

attractive coal seams to work in the local area (i.e. the Barnsley Seam, and the Abdy seam to the north where the influence of faulting is greatly reduced).

The table below summarises where it is considered a risk of shallow workings exist

Table 2. Summary of shallow coal workings in NW of the site			
Coal Mining Issue	Risk Assessment	Remediation / further works	Likely depth of workings m bgl
Shallow working in the Abdy Seam	HIGH (hatched area in NW)	Drill and grout areas of shallow working in this seam, in vicinity of RBH06A – approximate extent of working indicated as hatched area on RLE Drawing 17176-RLE-20-XX-DR-O-011.	5-7
Possible unrecorded shallow working near Adit 434408-018	HIGH (hatched area in NW)	Further investigation is recommended, drilling and grouting is likely to be required in hatched area shown on RLE Drawing 17176-RLE-20-XX-DR-011. Voids and backfilled ground were identified at shallow depth close to Adit 434408-018, at depths between the Abdy and Top Beamshaw seams – no coal was encountered at this depth hence this may either be the adit or unrecorded working for another mineral such as fireclay or ironstone.	5-9
Shallow working in the Low Beamshaw Seam	HIGH (hatched area in SW)	Drill and grout areas of possible shallow working in this seam, identified in RBH18A – approximate extent of working indicated as hatched area on RLE Drawing 17176-RLE-20-XX-DR-O-011. Further drilling investigation may further constrain this area.	7-13

4.3 Coal Tar Contamination

Trial pits have delineated the area of coal tar contamination in the northwest of the Site, as depicted on drawing 17176-RLE-20-XX-DR-O-011. This area is delineated in greater details on drawing 17176-RLE-20-XX-DR-O-006 contained in the Technical Note 17176-RLE-19-00-RP-O-005.

Ground conditions comprised mixed made ground with lenses of red burnt shale gravel. Coal tar contamination was typically identified at the base of burnt shale, at the interface of the underlying natural clay. Trial pits downhill (south) of the initially identified area of contamination also identified evidence of coal tar contamination, whereas trial pits to the north, east and west generally did not. This suggests that there may be a degree of

mobilisation of the coal tar downhill to the south, likely associated with perched groundwater.

To aid future identification, two figures are provided below to indicate the nature of the contaminated material.

Figure 1 below shows the free product in-situ within TP102, as a small pocket of coal tar impacted material perched on impermeable natural clay.



Figure 2 below shows the free-product, red shale and underlying natural clay excavated from TP102.



One contamination test was undertaken on the coal tar impacted soil taken from TT5, which identified the following:

- Total TPH concentration of 25,000 mg/kg (mostly heavy-end aromatic hydrocarbons)
- Total PAH concentration of 960 mg/kg
- Highly elevated concentrations of BTEX including benzene (280 µg/kg), toluene (2900 µg/kg), ethylbenzene (4000 µg/kg), m&p-xylene (64,000 µg/kg), o-xylene (34,000 µg/kg), 1,3,5-trimethylbenzene (41,000 µg/kg) and 1,2,4-trimethylbenzene (68,000 µg/kg).
- Elevated (albeit low) concentrations of various other VOCs and SVOCs including dibenzofuran and numerous halocarbons such as trichlorofluoromethane, 1,1,2-trichloroethane and 1,2,3-trichloropropane.
- It is also noted that the area of burnt shale and coal tar coincides with the anticipated location of a recorded mine entry, Adit 434408-017. It is possible that this material was brought onto site and used to infill the mine entry, or the placement may merely be coincidental. This material may also have originated as waste from coke ovens, which were present ~100m north as part of the former East Gawber Hall Colliery.
- An approximate volume of 1,100 m³ of coal tar impacted material and 2,500 m³ of red burnt shale material exists in this area.

4.4 Contaminated Topsoil

Two areas of unsuitable topsoil have been previously identified on Site within the blue hatched areas as shown on RLE Drawing 17176-RLE-19-XX-DR-0-005 rev A, provided in Appendix B.

Topsoil should be stripped and stockpiled separately depending on the contaminative status/area of the Site as detailed in the above drawing.

An area of made ground topsoil in the centre-south of the Site was found to contain statistically elevated concentrations of lead, arsenic and PAHs. This has been assessed against the criteria for a residential end use, and is not considered suitable for re-use on a residential Site or in POS. Any topsoil excavated from this area will require excavation and disposal at a suitable off-site facility.

A potential hotspot of lead contamination in the made ground topsoil has also been identified from TP10 in the north of the Site. Further testing is recommended prior to stripping of the topsoil or from within separate stockpiles once excavated. The advice of a geo-environmental engineer should be sought as to whether these soils represent a hotspot or whether the original elevated exceedances observed are an isolated occurrence.

Should a hotspot be identified and delineated it shall require excavation and removal from site.

All excavated and stockpiled topsoil should be replaced from whence it came, once Site works are completed.

5 Proposed Remedial works

It is recommended the following procedure is adopted to address these issues shown on RLE Drawing 17176-RLE-17-XX-DR-0-011 in Appendix A:

1. Any existing stockpiles (e.g. stone and bricks observed) shall require relocation.
2. Assess and delineate lead hotspot and topsoil and segregate/remove off site as necessary.
3. Strip topsoil and stockpile separately. Contaminated topsoil containing elevated lead, arsenic and PAHs (as indicated in blue hatched areas on drawing 17176-RLE-19-XX-DR-0-005) should be stockpiled/disposed of separately, and additional contaminated testing should be undertaken prior to replacement.

4. Mine shaft 434408-007 is drilling and grouted to stabilise this area and make safe. Construct reinforced concrete cap at rockhead.
5. Contamination associated with coal tar is excavated and remediated / disposed off site.
6. A bulk earthworks exercise is undertaken over the area outlined in magenta on RLE Drawing 17176-RLE-17-XX-DR-0-011 in Appendix A. Any unidentified on site mine entries in this area (1 No mine shaft and 2 No adits) can be investigated through inspection. If identified, these will require either excavation to full depth or drilling and grouting and/or capping, subject to the depth and orientation of the mine entry. The excavation will provide further certainty over the location of recorded off site mine entries. It is recommended that the excavation commences at the recorded co-ordinates of the mine entries and work outwards. Once the mine entries have been identified, or a distance of 20m from the recorded location has been reached, the excavation can stop (the area outlines in magenta is ~4680m², and using an estimated depth of made ground of 3m, this would equate to approximately 14,000m³.)
7. A drilling and if necessary grouting exercise is undertaken to investigate and remediate shallow mining voids / broken ground where encountered at RBH06A and RBH18A. It is anticipated this would be most economically undertaken prior to backfill of the excavation.
8. Re-engineering of the excavated fill to formation. Fill should be replaced and compacted to existing ground level (prior to excavation works), and in accordance with the Specification for Highway Works (MCHW1), May 2018 - Series 600 (Earthworks). All stockpiled topsoil should then be replaced in the area from whence it came, observing the contaminative nature of the topsoil as above (point 3).

Treatment for the adits may simply involve excavation of the adit assuming it was driven to a relatively shallow depth to provide access to coal. If the adit is identified to greater depth than that of the excavation, either extended excavation, or drilling and grouting to investigate and stabilise the adit will be required.

The following table summarises the mineshafts and recommended remedial works

Mine entry reference:	on or off site	Coordinates /	Found or not found?	Recommended remedial works
Adit 434408-017	On site	434695, 408822	ADIT NOT IDENTIFIED	Investigate post removal of contamination.

Mine entry reference:	on or off site	Coordinates /	Found or not found?	Recommended remedial works
		(CA Coordinates)		Excavate out or drill and grout if deep
Adit 434408-018	On site	434629, 408802 (CA Coordinates)	POSSIBLE ADIT OR WORKINGS IDENTIFIED	Undertake further drilling to investigate.
Adit 434408-021	Off site, may underlie site	434662, 408874 (CA Coordinates)	ADIT NOT IDENTIFIED	Eliminate potential for on site by excavation and inspection
Adit 434408-022	On site	434666, 408847 (CA Coordinates)	ADIT NOT IDENTIFIED	Excavate to investigate/remove. Possible drill and grout if extends to depth
Shaft 434408-007	On site	434707, 408848 Estimated shaft centre	POSSIBLE SHAFT IDENTIFIED	Drill and grout to stabilise prior to excavation. Cap at rockhead.
Shaft 434408-023	On site	434693, 408837 (CA Coordinates)	SHAFT NOT IDENTIFIED	Excavate to investigate/remove. Possible drill and grout if extends to depth
Shaft 434408-010	Off site	434701 408909	SHAFT NOT Investigated	Eliminate potential for on site by excavation and inspection. If encountered drilling and grout and cap
Shaft 434408-006	Off site	434654 408858	SHAFT NOT Investigated	Eliminate potential for on site by excavation and inspection
Shaft 434408-001	Off site	434681 408877	SHAFT NOT Investigated	Eliminate potential for on site by excavation and inspection

It should be appreciated there are the following constraints to undertaking the remediation works which need to be considered:

- 2 No live concrete sewers – the approximate line of these are shown on RLE Drawing 17176-RLE-17-XX-DR-0-011 in Appendix A. These will need to be either diverted or supported during the works. Supporting the sewers may reduce the extent of excavation and thus impact the success of the remedial works in providing confidence that mine entries do not remain
- Overhead power lines in this area.

6 Recommendations

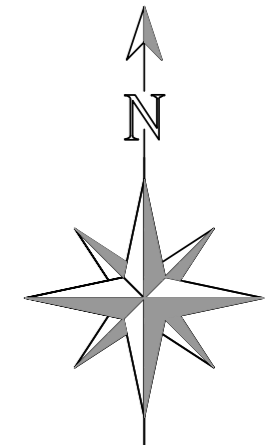
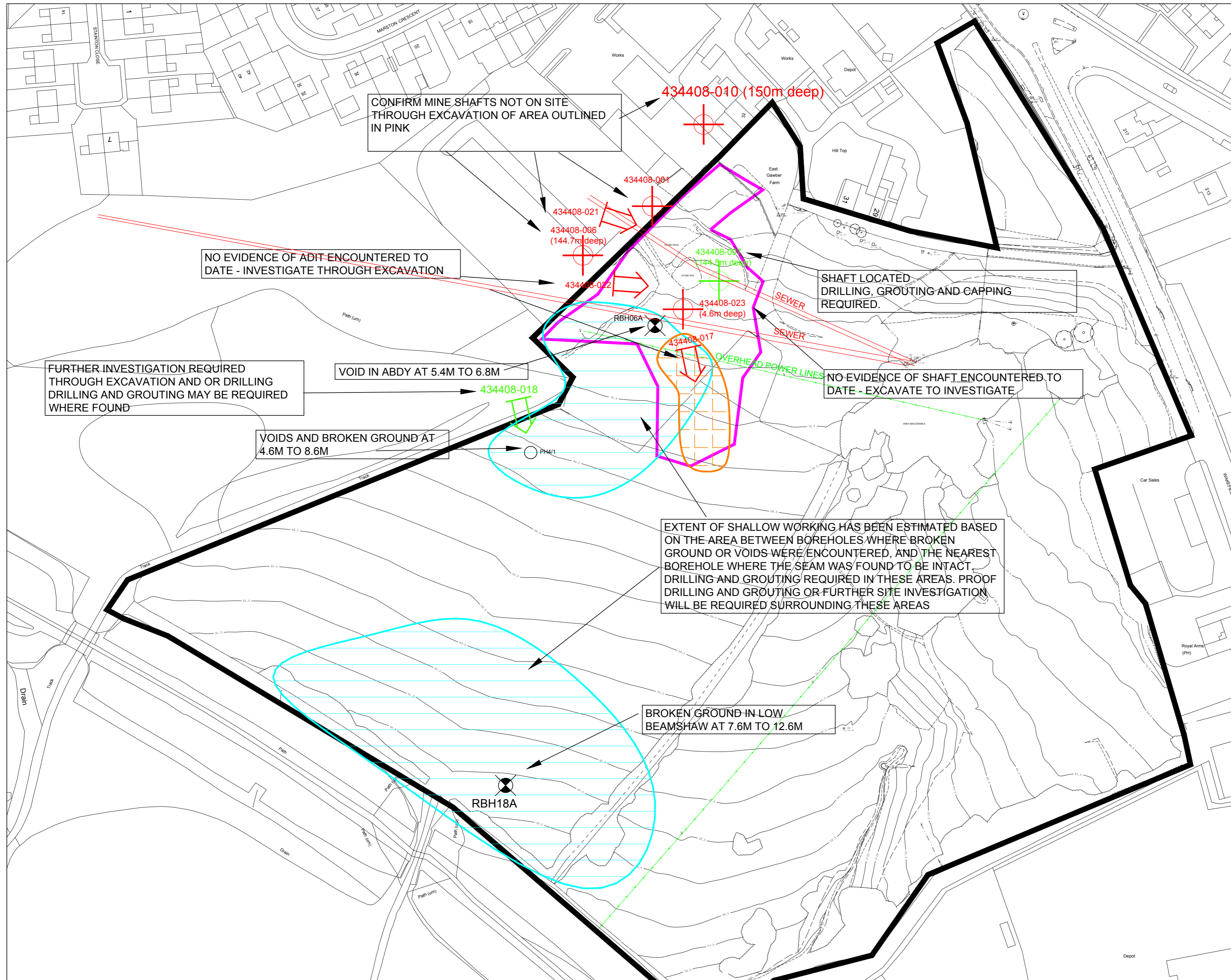
The northwest area of the site poses several constraints to development associated with mine entries, unrecorded shallow workings and contamination issues.

It is considered that drilling and grouting of the on site mineshaft, removal of the coal tar contamination, followed by an earthworks excavation exercise to investigate the on and off site mine entries is the most appropriate strategy for dealing with these constraints. Further rotary drilling and grouting to investigate workings and stabilise the ground is also proposed.

The earthworks are likely to involve the excavation and recompaction of 20-25,000m³ of material. Approximately 1,100 m³ of coal tar impacted material requires remediation and /or disposal.

Appendix A: NW area Remediation Works Plan

Drawing No: 17176-RLE-19-XX-DR-O-011



KEY

- SITE BOUNDARY
- APPROXIMATE LOCATION OF MINESHAFT ON OR WITHIN 20M OF THE SITE (POSITION PROVIDED BY COAL AUTHORITY) NOT IDENTIFIED BY ROTARY DRILLING
- LOCATION OF MINESHAFT IDENTIFIED ON SITE BY ROTARY DRILLING
- APPROXIMATE LOCATION OF ADIT ON OR WITHIN 20M OF THE SITE (POSITION PROVIDED BY COAL AUTHORITY) NOT IDENTIFIED BY ROTARY DRILLING
- LOCATION OF POSSIBLE ADIT IDENTIFIED ON SITE BY ROTARY DRILLING
- ESTIMATED EXTENT OF IDENTIFIED POSSIBLE SHALLOW WORKINGS REQUIRING TREATMENT
- ESTIMATED EXTENT OF IDENTIFIED COAL TAR REQUIRING TREATMENT
- ESTIMATED EXTENT OF MATERIAL TO BE EXCAVATED TO IDENTIFY MINE ENTRIES

Rev	Date	Amendments	By	Chk



Client
HARWORTH ESTATES

Project
ATHERSLEY

Drawing Title
NW AREA REMEDIATION WORKS PLAN

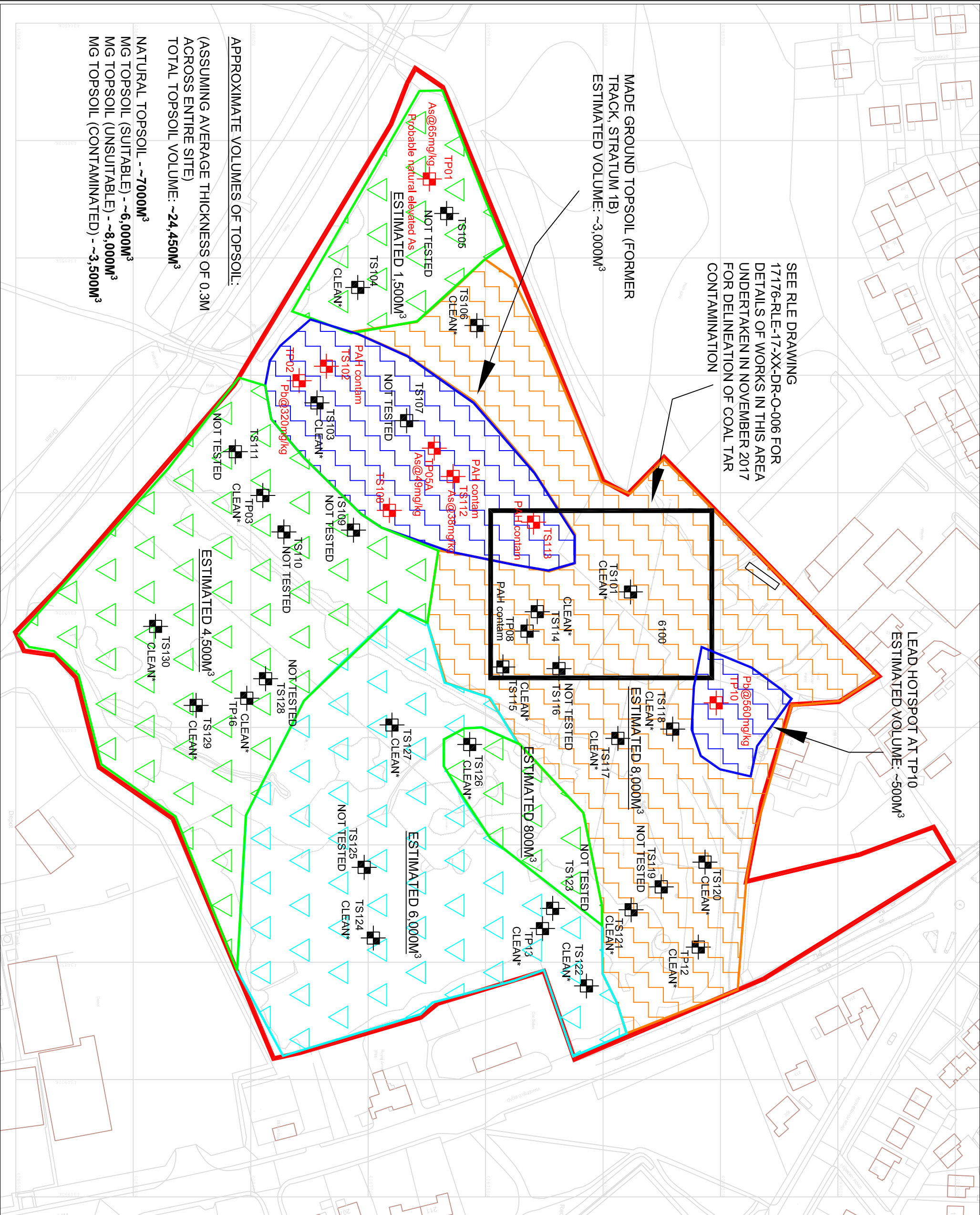
Scale 1:100 at A2AT Drawn IPB Checked IPB Date 06/08/20

Drawing No. 17176-RLE-19-XX-DR-0-011 Rev. PO1

Appendix B:

Topsoil test location plan Plan

Drawing No: 17176-RLE-19-XX-DR-O-005A



GENERAL NOTES

NO DIMENSIONS TO BE SCALED OFF THIS DRAWING.
THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS.
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

KEY

- TP01 APPROXIMATE LOCATION AND REFERENCE OF TOPSOIL SAMPLED FROM TRAIL PIT EXCAVATED BY RLE IN JULY 2017. TOPSOIL SAMPLES IN EXCEEDANCE OF THE GENERIC ASSESSMENT CRITERIA HIGHLIGHTED IN RED
- TS01 APPROXIMATE LOCATION AND REFERENCE OF ADDITIONAL TOPSOIL SAMPLE EXCAVATED BY RLE IN NOVEMBER 2017. TOPSOIL SAMPLES IN EXCEEDANCE OF THE GENERIC ASSESSMENT CRITERIA HIGHLIGHTED IN RED
- MADE GROUND TOPSOIL - NOT SUITABLE TO REMAIN IN-SITU DUE TO:
 - STATISTICAL ARSENIC AND PAH CONTAMINATION ACROSS A BROAD AREA OF A FORMER TRACK IN SOUTHWEST OF SITE (STRATUM 1B)
 - HOT SPOT OF LEAD CONTAMINATION IN THE NORTH OF THE SITE (STRATUM 1A)
- MADE GROUND TOPSOIL STRATUM 1A - NOT SUITABLE FOR REUSE/SALE DUE TO VERY POOR QUALITY, GRAVELLY/ASH NATURE, NO CONTAMINANTS OF CONCERN IDENTIFIED
- MADE GROUND TOPSOIL 1C - SUITABLE FOR REUSE/SALE, NO CONTAMINANTS OF CONCERN IDENTIFIED, MATERIAL IS OF ACCEPTABLE QUALITY.
- NATURAL TOPSOIL STRATUM 6 - SUITABLE FOR REUSE/SALE, NO CONTAMINANTS OF CONCERN IDENTIFIED, MATERIAL IS OF ACCEPTABLE QUALITY. FURTHER ASSESSMENT REQUIRED FOR POSSIBLE AS HOTSPOT AT TP01

ALL SAMPLES TESTED HAVE BEEN SCREENED AGAINST GENERIC ASSESSMENT CRITERIA (GAC) DERIVED USING THE CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL (CLEM), INCLUDING C-ASL AND S-4UL VALUES FOR CONTAMINANTS BASED ON A RESIDENTIAL END USE WITH PLANT UPTAKE SCENARIO.



Client
HARWORTH ESTATES
Project
ATHERSLEY

Drawing Title
TOPSOIL TEST LOCATION PLAN

Scale
A3@NTS AT

Drawn
Checked
Date
11/11/19

Rev.
A

17176-RLE-19-XX-DR-0-005