

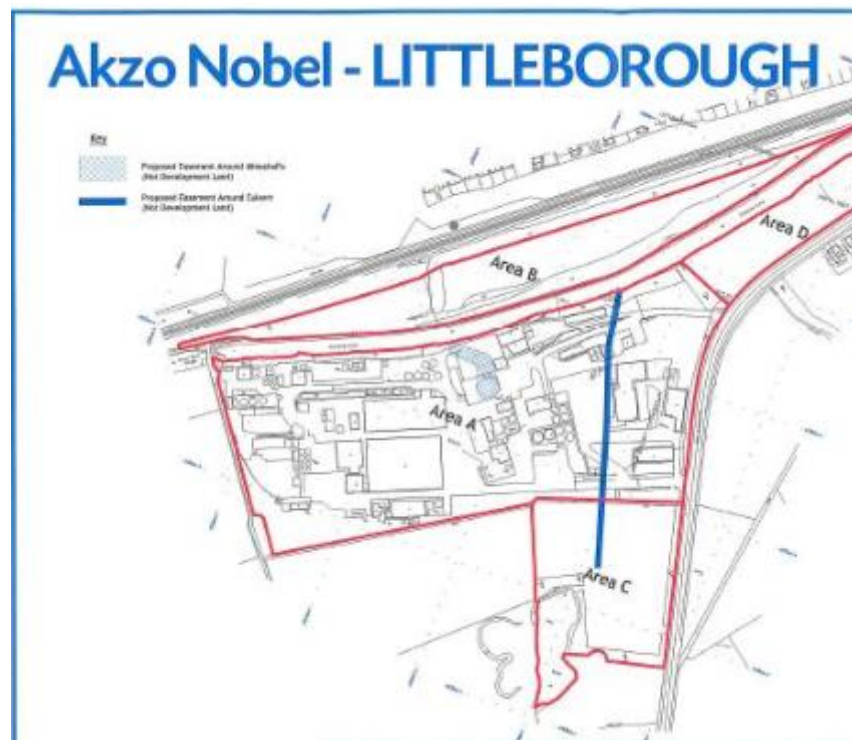
Jill Thwaite
Vistry Partnerships Yorkshire
Strategic Business Centre
Blue Ridge Park
Thunderhead Ridge
Glasshoughton WF10 4UA

KE/45466-001

11 July 2021

Dear Jill,

Former Akzo Nobel Site, Hollingworth Road, Littleborough



For above outlined site which comprises Areas A and C, we have undertaken a high level review of the following documents:

- CELTIC's Outline Foundation Option Plan, dated February 2008, reference P10008/09001/10;
- CELTIC's Phase 2 Remediation Validation Report, Draft for Regulator Comment, March 2009;
- NHBC LQE certificate, 20 August 2009;
- CELTIC's Letter to Rochdale MBC, 21 October 2011;

Directors: P Richardson BSc CEng MICE FStructE S R Ellis BEng CEng MStructE MICE C A Topliss BSc CEnv CSci CGeol SiLC MICE FGS
S J English BEng CEng MStructE A R Priest BEng A G Marshall BEng CEng MStructE
Technical Directors: A Allison BEng M P Chappell BEng IEng AMStructE K Edwards MSc CGeol FGS
P A Harrison BEng CEng MStructE C Hodge EngTech MICE A J Kerslake BEng FGS
Senior Associates: C A Wood BSc, CEng, MStructE, MICE M Dyson BSc CEng MStructE
Associates/Principals: A M Cross MEng CEng MICE A Lavelle MEng CEng MICE R A Noble BSc FGS
C L Capes BSc FGS R Wall BSc CGeol FGS
Consultants: S D Preston BEng CEng FICE FStructE K R Pursall BEng CEng MStructE S J Mitchell BSc MSc CEng MEI MCIBSE MASHRAE

- WYG's Geo-environmental Review Report, October 2017;
- RSK's Coal Mining Risk Assessment, August 2020;
- RSK's Additional Gap Analysis, 14 August 2020; and
- RSK's Additional Soil Sampling Report, 19 November 2020.

Site Description

The Rochdale Canal borders the approximate 7.8 hectare site to the north, with a railway line around 60 m beyond it. The 'island' in between the canal and the railway is a landfill. Hollingworth Road and Cleggswood Hill lies to the east and grassland, Hollingworth Lake and a car park to the south. A track and fields to the west with a bridge (Bridge 52) crossing the canal just off the north west site corner.

Past historical usages of the site include coal mining (two shafts are present on site), sandstone quarry (mid 19th century, adjacent to coal pit) and a former chemical manufacturing works, including the processing of animal fats and tallow for use in soaps and detergents. An oil distillery works was present on later 19th century maps.

The former Akzo Nobel site comprised numerous buildings including offices, labs, warehouses, storage and substations as well as featuring underground tanks and interceptors.

The Hollingworth Lake Conduit is culverted below the eastern half of the site, connecting Hollingworth Lake to the canal.

Historical investigations identified the site to be underlain by between 0.1 and 7.0 m of mixed cohesive and granular made ground, with natural Glacial Till below and Coal Measures strata encountered from between 1.0 and 17 m depth.

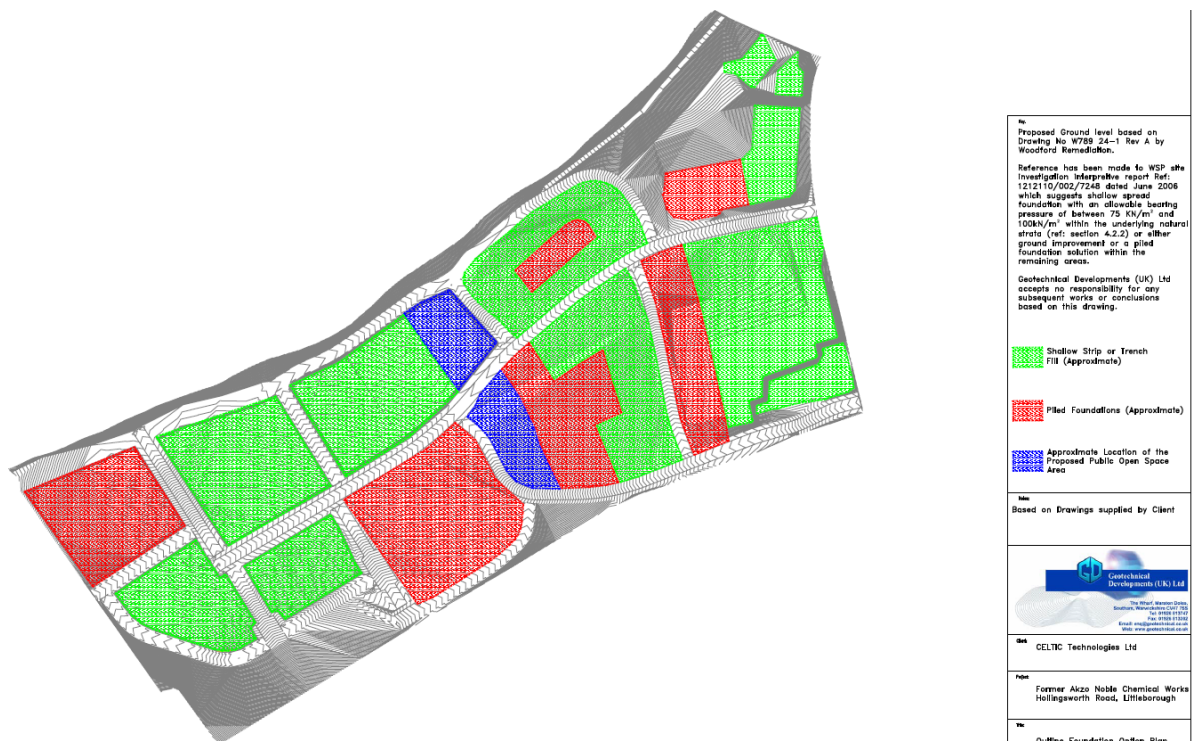
A shallow perched water table was encountered in the made ground as well as a deeper groundwater table within the Coal Measures. Flow is expected towards the north. A 'deep stone culvert' is present in the eastern half of the site, connecting the lake offsite to the south to the river north of the canal.

Remediation of the site is understood to have been completed in 2008; this comprised removal of underground structures, turning over the made ground within minimum 2.0 m of finished ground levels and replacement of arisings as engineered fill. A further phase of remediation was planned in 2011 but is not believed to have been undertaken.

Land 18 m north west is identified as a historical landfill. No other landfills have been identified within 250 m of the site. The site lies within an area where no radon measures are required. Other gas measures will still be necessary.

CELTIC's Outline Foundation Option Plan, dated February 2008, reference P10008/09001/10

The plan notes the 2006 WSP allows for a safe bearing pressure of 75 to 100 kPa in natural strata. The areas where 'shallow strip and trench fill' footings are expected to be appropriate are shaded in green, whilst piled foundations are in red. Blue is POS area (designated at that time):



CELTIC's Phase 2 Remediation Validation Report, Draft for Regulator Comment, March 2009

The remedial strategy included removal and crushing of surface concrete, removal of contamination sources and turnover to identify extent, on site bio-physical treatment of hydrocarbon impacted soils, removal of ACMs and chemical validation of hard to dig layer placed between 600 and 800 mm below final development level, as well as chemical validation of soils to be placed between 800 and 1,000 mm below final ground level.

Capping system was to comprise the upper 600 mm to be placed by the developer, a 200 mm thick hard to dig layer to be placed during remediation and compliance with

remediation target values for the soils placed between 800 and 1,000 mm depth (also to be done during remediation).

Turnover

Relic foundations (including piles) were grubbed out to a depth of 2.0 m below remediation level i.e. top of hard to dig layer. The upper 2.0 m of ground below remediation level was also turned over to inspect for signs of impacted ground. Drawing D1247/3436/A5 denotes depth of turnover; where natural ground was found, turnover was terminated apart from in a few select locations.

Where sandstone bedrock was found at shallow depth below roads, this was excavated to allow for ease of drainage excavations, and sandstone arisings used to bulk up the hard to dig layer material.

Bio-physical Treatment

18 no. contaminant sources were excavated, as shown on drawing D1247/3436/A4.

The report notes that all samples taken from sides and base of the excavations returned results which were below the site soil acceptance guidelines.

Arisings (~1,340 m³) were placed into biopiles on a bunded concrete pad, aerated periodically. Biological nutrients were added regularly. Treated arisings were then used as fill, placed where a 1,000 mm thick cover system is to be installed.

Hard to Dig Layer

38 no. samples of crushed concrete were tested and the material was deemed suitable for use.

Crushed concrete placed to form roadways has not been chemically validated and should not be re-used within the upper 1,000 mm of final ground level without further assessment.

Post Remediation Constraints

Cells 4 and 6 have been left 'uncapped' due to a shortfall in site won soils. When soil is available, material should be placed to within 200 mm of proposed remediation level and capped with a hard to dig layer.

During times of heavy rainfall, there is significant surface run off from the fields off the southern boundary and from the southwestern site corner where springs were encountered. These springs emerged from sand layers within the Glacial Till.

The southern part of the site is formerly referred to as the 'Events Area' (also known as Area C by Celtic and Area D by WSP). For ease of reference, we will refer to this area as the 'Events Area' in this review.

The Events Area is noted to have been predominantly greenfield since the 1850s with the existing lake being constructed in the later part of the 19th century. The 1851 historical map notes the culvert (labelled to be a 'conduit') to cross the site. The majority of the site appears to have remained undeveloped until a car park was constructed in the north western corner in the early 1990s.

The LQE notes the investigation into the Events Area was reported by WSP in their Ground Investigation Report (May 2006) and later by Woodford in 2007 who also undertook sampling. Exploratory holes included 5 window sample holes to maximum 5 m (including 3 monitoring well installations), 11 trial pits to maximum 4 m, 1 rotary hole to 40 m and 22 monitoring rounds. The LQE notes one soil sample recorded a nickel concentration of 66 mg/kg – further testing was proposed to confirm material from the Events Area was suitable for reuse, however this 66 mg/kg concentration does not exceed current assessment value of 180 mg/kg (derived for a residential with home-grown produce end use). The monitoring wells did not report methane concentrations over 1% or carbon dioxide concentrations over 5%. No significant risks were therefore considered to be posed from the Events Area to site end users.

Woodford's 2008 Remediation Statement notes both the car park and the grassland areas of this part of the site have been investigated and do not require remediation except for the removal of the car park hardstanding and subbase.

The document also notes:

No significant observations of soil contamination were identified in the eastern area of the development site, the POS land or the car park area. The EA and EHO have confirmed that the investigations completed to date and including the WSP remediation strategy are acceptable for the POS and car park area. Refer to Appendix A.

As part of Celtic's 2009 works, and reported in their report for Phase 1 (dated July 2009), the LQE notes 7 samples were tested from near surface soils and/or stockpiled topsoil. Although testing recorded one very slightly elevated concentration of Aromatic C12-16 (5.79 ppm compared to 5.60 ppm threshold), no significant concerns were considered to be present.

The LQE summarises the following environmental and geotechnical/engineering outstanding issues:

Environmental	Geotechnical/Engineering
Gas protection strategy required – minimum CS2 or Amber 1 Events Area – CS1	Submit proposals for existing groundwater and surface water drainage system.
Validate placement of lower 600 to 1000 mm of capping in Cells 4 and 6 including placement of 200 mm of anti-dig layer, and chemical test results of material used from 800 to 1000 mm below finished level.	Remediation of Cells 4 and 6 to planning levels to agreed specification with validation testing. Remove all softened surface materials first.
Validate placement of upper 600 mm of capping in all landscaping.	Submit foundation designs.

The LQE notes that at the time, Rochdale MBC had confirmed acceptance of the Phase 2 Validation Report's conclusions and had no concerns relating to Phase 1.

A temporary drain is believed to have been installed on southern boundary but may not have been approved by the local authority as a permanent structure. A temporary drain is also understood to have been installed along the northern boundary to stop surface run off from entering the canal.

CELTIC's Letter to Rochdale MBC, 21 October 2011

This letter notes the eastern part of the site was remediated in 2008 for a commercial end use; it was then recognised that the area should instead be submitted for residential development, meaning additional remediation may have been required. The letter states the original remedial targets were set assuming a residential development applied to the whole site, not just Phase 2.

The strategy was to remediate hydrocarbon impacted soils for re-use below a 1000 mm cover system, provide a 200 mm thick anti-dig layer, following which a 600 mm or 800 mm thick capping would be installed in landscaped areas (800 mm was where a 1000 mm of clean cover is proposed over hydrocarbon impacted soils). A 200 mm thick band of soil below the anti-dig layer was also to be validated.

Regrading of the development platform was recommended for the former Phase 1 area and proposed works included removal of anti-dig layer, regrade underlying soils (expected to comprise Glacial Till) and use excess arisings on Phase 2, test soils which will be located below the anti-dig layer i.e. between 800 and 1000 mm below final ground level and then replace the anti-dig layer.

Planning conditions dated 20 December 2011 includes condition 4 which notes the 2008 Remediation Statement and the 2011 Celtic proposals should be adhered to. Condition 5

also notes gas protective measures should be installed. These conditions are also included on the planning conditions dated 3 October 2017.

WYG's Geo-environmental Review Report, October 2017

This report was prepared for Homes & Communities Agency and provides a summary of the remediation undertaken on the former Akzo Nobel site and a desk study for the farmland to the east and south of the site.

The report notes elevated concentrations of hydrocarbons and metals were recorded in the west of the site, associated with former process/storage areas. Odours and impacted ground were noted here, extending into the Glacial Till. Asbestos was also identified across the site. Groundwater impacted with hydrocarbons and ammonia was encountered in the north west corner.

The early investigations recommended a 600 mm clean capping in all landscaped areas and the incorporation of DS-4 AC-4 sulphate measures in below ground concrete. No treatment of groundwater was recommended, and the gassing regime was classified as Characteristic Situation 3 (CS3).

Post investigation, demolition of various structures was carried out including removal/flushing of storage vessels and tanks as well as the removal of 'nearly all' asbestos from buildings, eleven months of gas monitoring, drainage investigation including into the mine sump.

The WSP report notes the remediation strategy included 'removal of buildings and foundations with a site wide turnover of site soils to a nominal depth of 2.0 m below proposed finished levels.' Easements were left either side of the canal, culvert and the mine shafts (approximately 5 m).

Contaminants of concern included asbestos, metals, TPH, VOCs and ground gas. Mitigation measures proposed included a 200 mm thick anti-dig layer below a minimum 600 mm clean capping in gardens, with a 200 mm capillary break layer below the anti-dig layer *[this capillary break layer was refuted in other reports as no longer being required, although the lower 200 mm of material below the anti-dig layer still needed to be below site specific assessment criteria]*. Gas/vapour protective measures were also recommended, as well as keeping all services within the capping layer.

After consultation with the EA, a perimeter interceptor drain was to be installed along the western and southern boundaries to limit offsite run off, post remediation groundwater and surface water sampling was to be undertaken, and an interceptor/bund to be installed along the northern boundary during the remediation works.

The WSP notes 'the remediation strategy was designed to ensure the site was suitable for a commercial and residential development'. Post remediation constraints include:

- Construction works/service installers must ensure no contact between impacted arisings and capping material (200 to 400 mm anti-dig layer with or without a capillary break);
- Site will be engineered to allow for 2 to 3 storey plots with semi-stiff rafts;
- Gas measures required;
- Obstructions may be left in situ >1.5 m below plots and >3 m below roads;
- 600 mm capping with basal geogrid/geotextile required in all landscaping;
- DS3/DS-4 AC4 sulphate measures;
- Permanent land drains and groundwater control may be required on northern and southern boundaries;
- No development within 5 m of canal. Easements also required around shafts and culvert, or culvert diversion undertaken;
- Well on south western slope to be retained;
- All future extensions to plots, ponds, trees etc must not extend below the anti-dig layer, and must include gas measures where appropriate.

The WYG report notes the 2011 CELTIC letter confirmed the site had been remediated in 2008 (Phase 1 for commercial end use, Phase 2 for residential) and that further remediation needs to take place to allow for Phase 1 to now be residential as well. The strategy included remediation of hydrocarbon contamination to enable material to be re-used below a 1.0 m thick capping system, regrading of ground levels, installation of 200 mm thick anti-dig layer and validation of 200 mm of soil below the anti-dig layer.

WYG have subsequently identified a number of 'data gaps':

- A review is required of all reports pertaining to the 2008 and 2011 CELTIC remediation works to see if additional site investigation is required and confirm if previously agreed remedial targets meet current guidance;
- Update gas risk assessment to see if CS3 regime is still applicable.

RSK's Coal Mining Risk Assessment, August 2020

This report was prepared for Homes England and includes a summary of WYG's 2006 'Report on Past Mining Activities', as well as consultation of abandonment plans, geological maps and a Consultant Coal Mining Report. The Littleborough Civic Trust have advised that clay extraction took place in the local area.

Historically, the 1851 map shows an 'old shaft' near the northern boundary. By the 1890s, Cleggswood Works (possible oil distillery) and Clough Field Works are shown on site, but no reference to a shaft. Several coal pits and shafts are evident in the surrounding area. Cleggswood Hill's pits are labelled 'clay' from 1910.

Pennine Lower Coal Measures strata underlie the site, with eastern half of the site underlain by the Milnrow Sandstone group. Superficial Till is also shown to cover the majority of the site, with a thin band of Head deposits possibly extending onto the centre-south of the site.

Two faults trending north west to south east cross the site on the eastern and western boundaries. The strata are inferred to dip to the south and west between 7 and 20 degrees.

The BGS hold a record for the on-site shaft associated with Cleggswood Colliery. This record notes the shaft is around 115 m deep and the following stratigraphic sequence:

Drift deposits (clay and gravel, sand and loam)	Surface to 6.4 m
Milnrow Sandstone	To 19.8 m
Coal Measures	To 46.7 m
Inch Coal	To 46.7 m (0.02 m thick)
Coal Measures	To 71.9 m
Upper Mountain Mine coal	To 72.3 m (0.41 m thick)
Coal Measures	To 82 m
Inch Mine coal	To 82 m (0.03 m thick)
Coal Measures	To 102.8 m
Bullion coal	To 103.1 m (0.31 m thick)
Coal Measures	To 114 m
Lower Mountain Mine coal	To 114.7 m (0.66 m thick)
Coal Measures	To >115 m

The Lower Mountain Mine coal was economically the most valuable seam in the area, and was found to be underlain by a 0.44 m thick layer of ganister. The overlying Bullion, Inch Mine and Inch coals were not worked. The Upper Mountain Mine coal along with an underlying bed of fireclay (thought to be around 1.5 m thick) were known to be worked in the area, including Cleggswood Colliery.

The Consultants Coal Mining Report, obtained in July 2020, notes there is not likely to be unrecorded shallow workings (i.e. within the upper 30 m), but past workings are recorded in the Upper Mountain coal (0.3 m thick, 59 m depth) and Lower Mountain coal (0.6 to 1 m thick, 84 to 96 m deep).

RSK's review of the information obtained concludes there are no recorded workings in the Upper Mountain Mine (anticipated to lie from at least around 72 m depth) or Lower Mountain Mine coal (anticipated to lie at around 90 to 139 m below the site) which extend below the site.

Clay extraction may have also taken place alongside the Upper Mountain Mine and Lower Mountain Mine coal seams, although since the CA plans indicate no coal was worked below the site the likelihood of clay workings being present would be low. A 2.5 m thick band of fireclay may be present below the Inch coal but even if workings are present, they should have at least 40 m of competent cover above.

Precautions against the effects of shallow coal workings are therefore not considered to be required.

Two shafts are recorded on site, with an adit recorded offsite at Cleggswood Hill. The RSK report notes the following:

CA Reference	Details
393415-008	On site shaft. Cleggswood Colliery downcast shaft, ovoid shape, 2.7 by 4.3 m dia, brick lined, 112.7 m deep to Lower Mountain seam. Possibly capped in 1935. Later treated November 1984, filled with 'fatty waste material' and capped by Akzo Nobel; cap detail shows a 1.15 m thick reinforced concrete plug founded on bedrock, overlain by 4 m of 'compressed infill material' and a 0.35 m thick concrete cap. CCMR notes '<i>shaft was excavated to a depth of 5.2 m, through 2 m of bedrock. A reinforced concrete cap 12 m² at the base increasing to 12.5 and 1.2 m thick formed over shaft. Excavation backfilled and compressed.</i>' Located in vicinity of former boiler house. A pipe extends 6 m into shaft is connected to a concrete duct which connects to the culvert. The 'off-take pipe' located 6 m below the top of the shaft is positioned to restrict fatty deposits from blocking the discharge pipework. Water flow from the shaft estimated at 3 litres/sec. A second pipe joins the shaft discharge pipe, draining water from weathered bedrock at a rate of 2.8 litres/sec. Combined discharge into River Roch is up to 5.8 litres/sec
393415-009	On site shaft. Cleggswood Colliery upcast shaft, brick lined, 2.4 or 3 m dia, 114.5 m deep. Filled with 'fatty waste material'. Possibly capped in 1952. Akzo Nobel also capped shaft in same spec as downcast shaft, but at a higher level and with no drainage. CCMR notes '<i>excavated to a depth of 7.8 m removing 2.6 m of bedrock where a reinforced concrete cap was formed. The cap measures 8.5 m² at the base increasing to 10 m² at the top by 1.2 m thick. The excavation was backfilled to the surface with compressed fill. An inspection pipe was installed passing through the cap and incorporating an inspection plate at the surface. Branching from this is a ventilated pipe fitted with a flame arrestor.</i>' Located in vicinity of former boiler house.

393415-010	Offsite adit, approx. 50 m east of site from Hollingworth Road to the Upper Mountain workings. No treatment details recorded.
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The RSK report notes chemical residue is present in the shafts and this is prevented from discharging into the river by the design of the drainage system.

RSK's Additional Gap Analysis, 14 August 2020

This report was prepared for Homes England and was aimed to confirm the integrity of the existing monitoring wells, determine the thickness of anti-dig layer, confirm if asbestos fibres were present, and discuss the site with regulators. The area covers excludes the Events Area.

Monitoring Wells

RSK noted historical gas monitoring data was incomplete and that it was uncertain if additional monitoring would be required. RSK found 15 monitoring wells, 10 of which were deemed suitable for re-use subject to finding out the well construction details. The depth of the wells ranged between 0.68 and 3.86 m, most were dry except for three which recorded water in the upper 1 m.

Hard Dig Layer

The report notes that the past two remediation phases included placing a 250 to 300 mm thick hard dig layer on the development platform. Eight 'cells' were completed, with two 'cells' to be completed by the developer. Material for use in these two cells is stockpiled; additional material may need to be imported.

The report notes the hard dig layer material originated from crushing and screening processes undertaken during demolition. Since there was potential for asbestos to be present within this material, additional testing was recommended. Using an excavator, RSK carried out 21 shallow trial pits across the eight 'cells', recording an average 380 mm thickness of the hard dig layer, which ranges between 0.1 and at least 0.9 m thick.

A geotextile was encountered below the hard dig layer in most positions.

A concrete obstruction was noted in HD07. In HD08, no hard dig layer was recorded; RSK thought this was due to HD08's location near the southern edge of the cell. RSK also note there was a noticeable thinning of the layer towards the southern boundary and towards the elevated mound in the south east corner.

Five pits were also excavated in two stockpiles, finding coarse limestone aggregate.

27 samples of the hard dig layer were tested and RSK noted 'numerous' fragments of possible asbestos containing material (ACM) at the site surface. Five samples recorded amosite or chrysotile fibres, 0.003% or less. Of the fragments tested, two were identified as ACM.

Regulators

RSK contacted Rochdale in July 2020 who confirmed the past report recommendations should still be relevant, but that a new 'review' will likely be required for a new application to confirm the reports comply with current guidance.

The EA confirmed to RSK in July 2020 that there are no outstanding permit related issues.

The Coal Authority confirmed the two mine entries have been treated to industry standards and development will be advised to avoid these features.

Summary

Some remedial work is required for the 10 wells found before they can be suitable for use. It is unclear if additional gas monitoring is required.

The hard dig layer is between 100 mm and >900 mm thick, occasionally underlain by a geotextile, and its base may be difficult to differentiate. Asbestos was encountered in the material and in ACM fragments noted at site surface.

A formal review of past reports will be required by Rochdale for a new planning application.

RSK's Additional Soil Sampling Report, 19 November 2020

This is a factual report on soil sampling and asbestos analysis. The report mentions additional sampling is ongoing. RSK's July 2020 report noted visible ACM at the site surface, and fibres up to 0.003% in the hard to dig layer (at depths of up to 0.9 m) in 5 out of 27 samples tested.

This investigation included a walkover by an asbestos consultant to identify suspected ACM, and sampling and analysis of 8 bulk bags and 55 samples taken between site surface and 0.3 m. The hard to dig layer comprised sandy cobbles of concrete and brick with fragments of wood, plastic and rebar, and was found up to 0.2 to 0.6 m thick. Three locations found a geotextile below the layer and in seven locations, the layer appeared more cohesive. The report notes the hard to dig layer was absent in selected pits. Concrete obstructions were also noted in five holes.

Visible ACM was noted in four surface locations, and 27 of 55 samples recorded up to 0.019%. Of the 8 bulk bags, 4 contained ACM.



The report concludes the material is ingrained with asbestos, and that mitigation measures are required during future disturbance of the ground including notifying future works to the HSE and 'employing the specialisms of a licensed asbestos contractor to manage such future works appropriately'. Air monitoring around the site's perimeter may also be required during drier times of the year. The hard to dig layer could be considered 'hazardous waste' if removed from site in its current state. If it remains in place, it should be capped with 600 mm of clean cover and a visible marker layer. Where services are to be installed, the surrounding soils should also be 'clean'.

E&P Summary

- Asbestos fibres and ACM have been noted at site surface of the main development area and in the material placed to act as an anti-dig layer. Safe methods of working should be implemented when investigating and excavating through this material;
- Further remediation is required to trim the area east of the culvert to a residential end use;
- Capping to be placed in landscaped areas to be 1,000 mm thick; this should comprise 600 mm of clean cover, 200 mm anti-dig layer, 200 mm of material below a certain

site specific threshold. Levels in Cells 4 and 6 have been left low due to a shortfall of material; lowest layer of capping still to be placed;

- Should any landscaped areas be present in the Events Area, no capping is at this stage assumed to be required based on previous testing. However, should material from the main development area be moved to the Events Area, a capping will then need to be provided;
- Regrade in ground levels to be reviewed to ensure impacted ground still has sufficient cover; further investigation required to assess if material is suitable to remain below 800 to 1000 mm;
- Level of gas measures to be Amber 1 or CS2 for main development area, and CS1 for Events Area. We assume precast concrete floors will be the developer's preference, meaning Amber 1 measures should be appropriate. Additional gas monitoring is recommended to confirm this level is appropriate;
- Permanent drainage works required along the southern and western site boundaries;
- A well is expected in the south western site corner; structure will need exposing if still in use by farmer;
- Slope stability assessments required for offsite slopes, including northern boundary adjacent to the canal;
- Regulatory discussion required to confirm remediation proposals are still appropriate;
- No build easements required on northern boundary, around mine shafts and either side of the culvert.

Yours sincerely,

A handwritten signature in black ink that reads 'Kate Edwards'.

Kate Edwards