

LINDHURST
MANSFIELD

10. LAND CONTAMINATION

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FIGURES (REFER TO ENVIRONMENTAL STATEMENT VOLUME 2)

- 10.1 Potential Hazard Plan Rev A04

APPENDICES (SUPPLIED SEPARATELY ON CD)

- 10.A Report 10273-2200-001, Desk Study for Lindhurst, South Mansfield, dated August 2008.

10.0 LAND CONTAMINATION

10.1 Introduction

10.1.1 Waterman Civils Limited have been appointed to conduct an assessment of land contamination for the proposed development at Lindhurst, Mansfield. This chapter describes and evaluates the effect of land contamination on the proposed development (Fig 2.1 Framework Plan) and the surrounding area. This Chapter explains the assessment and forecasting methodology and sets out the chosen evaluation criteria. The format follows a standard study pattern by summarising relevant planning policy, describing the baseline conditions, describing the relevant design features and then assessing the likely significant effects on landscape character and visual resources.

10.1.2 This chapter should be read in conjunction with Waterman Civils Limited Report 10273-2200-001, Desk Study for Lindhurst, South Mansfield provided in Appendix 10.A.

10.2 Methodology

10.2.1 This chapter comprises a Contaminated Land Risk Assessment to allow the forecasting and assessment of the likely significant effects of the proposed development. This chapter is based on information contained within the Desk Study (Appendix 10.A) and has been formulated in general accordance with the requirements of; BS5930 'Code of Practice for Ground Investigation' Section 1, Environment Agency CLR 11 'Model Procedures for the Management of Land Contamination' Chapters 1 and 2, and PPS23 Planning and Pollution Control, Annex 2: Development on Land Affected by Contamination.

10.3 Baseline Conditions

History of Site and Surrounding Area

10.3.1 The Site history is derived from the Envirocheck report historical maps and datasheets included in the appendices of the Desk Study (Appendix 10.A). The Site has historically comprised dominantly of agricultural land with Firs Farm shown in the centre of the Site on the earliest maps available dating from 1887. There have also been a number of lanes on the Site throughout its history, providing access to the fields on the Site and defining several of the Site boundaries. The A617 was

constructed within the last 5 years and bisects the Site, running east - west. Taylor's Plantation existed in the west of the Site up to the middle of the 20th century. A gravel pit was present to the north east of the plantation from 1880 – 1900, however, the extent of these excavations are currently unknown. There are a number of water bodies across the Site, some of which mark the south eastern boundary with a drainage system flowing to the south east towards the Foulevil Brook which flows eastwards from the south east corner of the Site.

10.3.2 There are a number of farms surrounding the Site, Rushley Farm, Three Thorn Hollow Farm and Lindhurst Farm to the west, east and south of the Site respectively. Operations commenced at Rufford Colliery to the north east of the Site in 1911, ceasing in 1993. Blidworth Colliery, to the south east, opened after Rufford Colliery in 1924, with operations ceasing in 1984. There are mine workings beneath the Site which may be associated with these collieries. Ratcher Hill Quarry, to the north of the Site, opened in the late 1950's/early 1960's and is still operational. There are a large number of industrial buildings in south Mansfield, many of which are still operational. The industry in this area, to the north of the Site, has been present since the industrial revolution and is shown on the earliest maps available (1887). Rushley Pumping Station has existed adjacent to the south west corner of the Site since approximately 1900. Immediately to the south of the pumping station a saw mill is shown on historical maps between 1920 and the 1950's. This is shown within the area of Harlow Wood, which along with Thieves Wood lies immediately to the south of the southern Site boundary.

Ground Conditions

10.3.3 The likely ground conditions have been inferred from the available information, including borehole records from the BGS, contained in the appendices of the Desk Study in Appendix 10.A of this chapter.

Made Ground and Buried Structures

10.3.4 Significant thicknesses of Made Ground are not anticipated across the Site; however, it may be present in the area of Firs Farm and along the public highways, particularly in the embankments adjacent to the A617. Buried structures are also anticipated to be confined to the area of Firs Farm.

Drift Deposits

10.3.5 Head deposits are shown on the BGS 1:50,000 geological maps for the area adjacent to the western Site boundary. Although the deposits are not shown within the area of

the Site it is anticipated that localised head deposits may be present. Alluvium deposits associated with the drainage system in the south east of the Site are present; however, these are very localised.

Solid Deposits (Bedrock)

10.3.6 The entire Site is indicated to be underlain by the Nottingham Castle Sandstone Formation of the Sherwood Sandstone Group. This is then underlain by the Lenton Sandstone Formation. Below this is the Edlington Formation, part of the Middle Permian Marl and the Cadeby Formation of the Lower Magnesian Limestone. The Lenton Sandstone crops out to the northwest of the Site due to the shallow dip of the strata towards the south-east. A fault is shown trending northwest-southeast in the north western corner of the Site.

Hydrogeology

10.3.7 Groundwater is likely to be present within the permeable strata of the Nottingham Castle and Lenton Sandstone Formations of the Sherwood Sandstone Group at depth. BGS Borehole data suggests that the rest groundwater level is at a depth of approximately 25m in the central and eastern areas of the Site, with no water strike information available in the western area of the Site. It is possible that perched water may be present within the shallow Made Ground or the upper weathered deposits, however this is unlikely.

10.3.8 The Environment Agency groundwater vulnerability map classifies the strata below the Site as a Major Aquifer with soils of high leaching potential. The majority of the Site lies within the Total Catchment Groundwater Source Protection Zone (Zone III), as defined by the Environment Agency. However, the eastern and western extremities fall within the Outer Groundwater Source Protection Zone (Zone II).

10.3.9 There are 3 groundwater abstraction licenses within the Site, associated with boreholes at Firs Farm. These are for the use of groundwater for irrigation.

Hydrology

10.3.10 The nearest surface water is the Foulevil Brook running away from the south eastern corner of the Site towards L Lake, approximately 500m south east of the Site. Cauldwell Brook flows northwards, approximately 1.5km west of the Site. This joins the River Maun, a tributary of the River Trent, in the centre of Mansfield.

10.3.11 The River Maun, located 2.5km north west of the Site, is rated as River Quality A - B (very good - good). There are 2 discharge consents within a 250m radius of the Site. These relate to discharges to the River Idle, a tributary of the River Maun and part of the drainage system to the south east of the Site. These were both revoked in April 2000.

10.4 Contamination Hazards

10.4.1 Assessment of potential contamination and ground gases has been undertaken using a risk assessment based approach, as recommended within the Environmental Protection Act (1990), PPS23 Planning and Pollution Control (2004), CLEA guidelines (2002), CIRIA C552 (2001) and BS10175 (2001). This approach considers the likely source of contamination, given the history and location of the Site, and the potential migration pathways by which potentially hazardous substances may reach likely receptors such as the end users of the Site or the wider environment, in the context of the proposed development.

10.4.2 The Preliminary Contaminated Land Risk Assessment Matrix is based on the initial Conceptual Site Model, both of which are presented in the Desk Study. They are based on the anticipated condition of the Site from the information obtained during the Desk Study research.

Potential Sources of Contamination

10.4.3 The available historical information plans have been reviewed to produce a hazard plan superimposed on a current plan of the Site. A copy of the resulting "Potential Hazard Plan" is shown in Figure 10.1. Likely ground contamination resulting from the current and former land uses has been determined from the desk study research and reference to; the Environment Agency Publication CLR 8 'Potential Contaminants for the Assessment of Land' and the relevant Department of the Environment Industry Profiles.

10.4.4 Potential primary contaminative processes identified on the Site include:

- Fly-tipping on the open farmland, including an incident reported to Mansfield District Council in 2002 and an existing burnt out car on Old Newark Road.
- Tipped material within the infilled gravel pit to the west of Firs Farm.
- Oils and petrol from the use of the public highways on the Site.

- Contamination from agricultural processes occurring on Site at the present and in the past. Including potential for leaks and spills from any tanks associated with the farm buildings.

10.4.5 Potential primary contaminative processes identified close to the Site include:

- Contamination from former factories, including iron foundries and cotton mills, 1.5km beyond the north west boundary of the Site.
- Contamination from former collieries with some associated slurry ponds 1 – 1.5km to the east of the Site.
- Quarrying approximately 250m the north east of the Site, as well as limited historical quarrying within the Site boundary.
- Leaching of organic and pathogenic contaminants from the graveyard 100m to the north west of the Site.
- Contamination from the former saw mill, less than 50m from the south west corner of the Site, with possible use of wood preservatives including copper-chrome-arsenic compounds.

10.4.6 The Site has been dominated by open farmland since at least 1887. Over this period of agricultural use a variety of agrochemicals and fertilisers will almost certainly have been used on the land. Fertilisers, pesticides and herbicides are normally delivered for agricultural use in 200 litre barrels. No spillages or leaks have been recorded; however there is still a potential source for contamination. Modern agrochemicals are normally biodegradable and not persistent due to increased regulatory control and are less likely to be present or of concern.

10.4.7 Working at the gravel pit to the west of Firs Farm ceased in approximately 1900. Since this time the pit has been infilled with waste material, which is now mounded above the natural ground level. The waste includes fragments of brick and tile, wood, rope, metalwork, fabric, glass and plastic sheet. Other unknown materials may be present at depth within the deposit.

10.4.8 The industry to the north west has been shown on historical maps since at least 1887 and is likely to have existed in this area since the first half of the 19th Century. The works are a potential source for a number of contaminants, including metals, inorganic ions, acids, alkalis, asbestos and a number of organic compounds, such as PAH's, PCB's, phenols and petroleum hydrocarbons. This industry is a significant distance from the Site boundary and with no observed linkage to the Site, via surface water courses; the risk of contamination due to processes in this area is considered to be low.

10.4.9 Graveyard leachates generally contain a variety of organic and pathogenic materials from the bodies along with any chemicals used during the embalming process, including formaldehyde. The depth to the regional groundwater table and the lack of any identified direct surface water linkage between the graveyard and the Site means that the risk of contamination as a result of leaching is considered to be low.

10.4.10 There may be a risk of localised contamination from the limited areas of Made Ground on the Site; potential contaminants include asbestos in the vicinity of demolished former farm buildings.

10.4.11 Timber preservatives may have been used at the former saw mill, including copper-chrome-arsenic compounds, organo-chlorine compounds, metal carboxylates, pentachlorophenol, tributyltin oxide, sodium borate and boric acid.

Potential Contamination Pathways

10.4.12 In accordance with the Environment Agency Publication CLR 10 'The Contaminated Land Exposure Assessment Model' the potential pathways by which the on-site contaminants may affect the health of the existing and future human receptors at the site are:

- Inhalation of vapour; including outdoor and indoor exposure
- Inhalation of fugitive dust; including outdoor windblown dust and indoor dust 'tracked' in from outside
- Ingestion and absorption by direct contact; including hand to mouth contact, absorption through the skin, consumption of soil with vegetables

10.4.13 In addition, potential pathways by which the on-site contaminants may affect the existing and future potential receptors at the site are:

- Migration by surface run-off; including in suspension or solution
- Migration in solution via groundwater; including leaching in the unsaturated zone and diffusion in the saturated zone
- Plant Uptake; through root systems

Potential Existing Receptors

10.4.14 The majority of the Site is open farmland with some public access, including roads, bridleways and footpaths. Potential existing receptors are:

- The public, especially children on the Site.

- Groundwater within the Major Aquifer beneath the Site.
- Rainworth Lakes SSSI to the south east of the Site.
- Surface water drainage.
- Local flora and fauna, including crops.
- Adjacent land users, such as Rushley Pumping Station and residential properties to the north.

Potential Future Receptors

10.4.15 Site re-development will require some groundworks and earthworks that will potentially generate fugitive dust and may bring site workers into contact with contaminated soils, if present. Although the duration of exposure to any on site contaminants is likely to be limited the degree of exposure may be significant.

10.4.16 The proposed development (Fig 2.1 Framework Plan) includes approximately 1,750 new homes, 30 hectares of employment, a local centre and community uses, such as a new cemetery. Potential future receptors are:

- Site workers.
- End users of the Site including residents and employees
- New infrastructure, buried pipes and services.
- New structural foundations.
- Future landscaping and planting.
- Surface water features, including Rainworth Lakes SSSI.
- Adjacent property, such as Rushley Pumping Station and residential properties.

10.5 Geotechnical Hazards

10.5.1 Due to the history of the Site and expected geology and ground conditions, described in section 10.3, the Site is considered to be of generally low risk with respect to geo-hazards being present.

10.5.2 Potential Geotechnical Risks for the proposed development are highlighted within the Geotechnical Risk Register included in the Desk Study and are briefly discussed below.

10.5.3 Significant hazards likely to affect Site development include:

- Perched groundwater may be present in any localised Made Ground, around Firs Farm and the public highways, or upper weathered strata across the Site. This may affect any foundations and excavations.
- Hard rock may be present at shallow depths, affecting excavations.
- It is considered likely that some earthworks reprofiling may be required as part of the proposed development. Existing material present on Site should be suitable for proposed earthworks; however, ground investigation and geotechnical laboratory testing will be required to confirm this.
- Weathering of the Sherwood Sandstone may lead to the presence of sandy material at shallow depths. This may result in a running sand hazard, if shallow or perched groundwater is present, and the potential for collapse of shallow excavations.
- The local groundwater table appears to be at approximately 25mbgl, however further work may be required to ensure that this is not artificially lowered by any of the surrounding abstraction activities, such as pumping at Rushley Pumping Station and Ratcher Hill Quarry. The Ground Investigation should seek to confirm current groundwater levels.
- The Site is in the zone of influence of deep mine workings in 5 seams of coal. These were last worked in 1986. Any movement relating to these workings is likely to have occurred shortly after the cessation of working and is anticipated to have stopped. However, the potential for on-going movement needs to be considered in the design of any sensitive structures.

10.6 Design

10.6.1 The Project will be designed to prevent significant adverse environmental effects resulting from construction works. Strategies should be in place in order to prevent significant environmental effects resulting from matters such as the following:

- Direct contamination of soil, surface water and ground water due to leaks or spills of fuel oils, chemicals and spillages of other contaminants associated with the construction plant and processes.
- Direct contamination of surface watercourses by fines from surface water run off during construction works.
- Inhalation of fugitive dust generated by construction works.

- Noise and vibration contamination by construction plant.
- Increased traffic, noise and air pollution levels within the vicinity of the site resultant from construction traffic movements.
- Increased traffic, noise and air pollution levels within the vicinity of the site resultant from importation of large volumes of soil materials.
- Increased traffic, noise and air pollution levels within the vicinity of the site resultant from the removal of large volumes of excess, contaminated or unsuitable soils.
- Loss of void space within off site landfills resulting from unnecessary disposal of excess, unsuitable or contaminated soils.

10.6.2 The Project will also be designed to prevent significant adverse effects resulting during the occupation/operational phase. Direct contamination of soil, surface water and ground water due to leaks or spills of fuel oils, chemicals and spillages of other contaminants associated with the end uses of the application site from industry, employment and commercial areas will be dealt with by appropriate legislation.

10.6.3 Residential areas are not considered to represent a significant potential source of future ground contamination, however the areas of commercial development will require detailed design to prevent any negative impact to the environment. Any potential effects will be minimised by carefully considered design.

10.6.4 The incorporation of ground gas prevention methods may be required within the design of some buildings and structures.

10.7 Assessment of Effects

10.7.1 The likely environmental effects of the proposed development can be divided into the following areas:

Construction Effects

Risk to Human Health

10.7.2 The risk to human health during construction across the Site is generally considered to be **low to negligible**. However, if asbestos is found within the Made Ground then the localised risk to human health is considered to be **moderate**.

Risk to Surface Water & Groundwater

10.7.3 The Site is located on a Major Aquifer. The nearest surface water is the Foulevil Brook, immediately adjacent to the south east corner of the Site. However, it is considered to be unlikely that significant contamination is present and therefore there is thought to only be a **moderate to low** risk to both surface waters and groundwater during construction.

Risk due to Ground Gas

10.7.4 The risks due to ground gases are considered to be **low** across the Site. Only limited depths of Made Ground, adjacent to Firs Farm and the public highways are anticipated, in these areas the risk is considered to be **moderate to low**. There are no known mine shafts on site; however, there are coal seams at depth.

Operational Effects

Risk to Human Health

10.7.5 The risk to human health post construction is considered to be **low to negligible**, with the surfacing of the Site restricting human contact with any contaminated material. The likelihood of contaminated material being present is thought to be very low.

Risk to Local Ecology & Landscape Planting

10.7.6 Despite the low likelihood of contamination being present, the risk to local ecology is considered to be **moderate to low** as the Site is adjacent to Rainworth Lakes SSSI. As part of the proposed development remedial measures will be used to mitigate the risk of contamination of the SSSI, lowering the residual risk to **low to negligible**.

10.7.7 The development will have a number of impacts on the area. The increased population and traffic increases the potential for contamination events to occur, such as road traffic accidents and general fuel spills at commercial and industrial properties that included in the proposals to help support the local population.

10.7.8 The development will also bring a number of benefits to the area. The removal of agricultural land will reduce the amount of agrochemicals being used on Site greatly. In the past these may have entered the local surface water drainage systems causing contamination and potentially affecting the balance of nutrients in the SSSI downstream of the eastern Site boundary.

10.8 Cumulative Effects

10.8.1 This section assesses the likely significant effects of the proposed development when considered in the context of other future Projects.

10.8.2 The effects of the development on the geology, geomorphology and land contamination are generally confined to the site. Site development will aim to achieve an on-site earthworks balance and utilise on-site remediation techniques, if remediation is found to be required, such that the removal off-site of waste spoil is kept to a minimum thus minimising the impact on local waste disposal facilities and the requirement to import fill material to make-up levels is also minimised thus conserving local aggregate resources. In addition, the remediation of land contamination on this site, combined with any remediation on other sites should provide a cumulative benefit to the land quality in the area.

10.9 Statement of Effects (See Table 10.1 Statement of Effects Matrix)

10.9.1 The Sites history suggests that very little contamination should be present on Site, however localised hotspots may be present and areas where these are likely should be targeted by the Ground Investigation. Remediation of this contamination will have a positive effect on the local land quality and underlying groundwater quality. Balancing the earthworks requirements within the development will ensure that the impact on waste-disposal and aggregate supply resources is negligible.