



J N P G R O U P
CONSULTING ENGINEERS

Implementation Plan

Project: Manor Farm,
Great Houghton,
South Yorkshire,
S72 0AZ

Client: Harron Homes

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EXECUTIVE SUMMARY

Site location	Manor Farm, Great Houghton, South Yorkshire, S72 0AZ	
Development scheme	Construction of 86 residential properties with associated infrastructure and public open space.	
NGR	SE 42935 07028	
Current use	On-site: Agricultural fields and farmyard.	Off-site: agricultural, residential, and road infrastructure.
Pollutant Linkages	1. Made ground in the farmyard area comprising various topsoils, sands and gravels, containing fragments of brick, crushed concrete, glass, sandstone and occasionally ash extending from ground level to between 0.20m and 0.80m bgl. Underlain by the Newstead Rock Formation (heavily weathered sandstone). Contaminants – beryllium, PAHs and asbestos (fibres less than detectable). 2. Ground gas from DS01 (close to a former pond in the north of the site). Gas monitoring ongoing but site potentially classed as CS2 requiring gas mitigation measures.	
Remediation of Made Ground in the Farmyard	Removal of up to 600mm of made ground or to natural ground, whichever is the lesser in proposed garden areas. Excavation to be capped with 150mm of topsoil and 450mm subsoil to make up full depth of capping layer. Excavated materials to be removed from site by licensed waste contractor. Records to be kept of all material exported from site. Hazardous waste assessment indicates that the made ground is likely to be classified as non-hazardous. Estimated maximum volume 900 m³. Imported materials (if required) to be tested at the frequency indicated in Table 5.1 and comply with criteria in Tables 5.2 and 5.3. Re-use of natural materials on-site will require a materials Management Plan or other environmental permit.	
Gas Risk Mitigation	Gas monitoring is ongoing. If gas protection measures are required, the following would need to be implemented: • Good performance passive sub-floor ventilation (venting can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.); • Traditional beam-and-block floor; • Installation of gas resistant membrane fulfilling all requirements within Table 7 of BS8485 (2015 +A1 2019), with verification in accordance with CIRIA C735.	

Other	It remains possible that unexpected soil, groundwater contamination or visible asbestos containing materials may be encountered during the process of any site demolition, clearance, excavation and / or construction. The earthworks Contractor shall inform JNP Group immediately who shall then advise on the best course of action. In the event of an unforeseen environmental incident (pollution occurrence) on-site work should be stopping in that area immediately affected and the Environmental Agency should be contacted via their incident hotline 0800 807 060. Emergency spill kits shall be kept on-site in strategic locations and a member of staff who is trained to use them shall be present on-site at all times.
Verification Reporting	Records of works undertaken (including drawings and photographs), capping depth validation, gas membrane certificates of conformity, duty of care certificates and imported soil chemical testing certificates shall be provided to JNP Group for inclusion in the Verification Report. JNP Group can undertake the verification visits if required.

1 INTRODUCTION

- 1.1.1 JNP Group was instructed by the client to undertake a ground investigation of:
Manor Farm,
Great Houghton,
South Yorkshire,
S72 0AZ,
hereinafter referred to as 'the site'. This report is subject to the limitations presented in Appendix A.
- 1.1.2 It is understood that the existing farmyard buildings at the southern end of the site are to be demolished and the site redeveloped with 86 new two-storey residential properties, with roads and areas of hardstanding for access servicing and parking, and with private gardens. Attenuation basins for the surface water drainage are proposed in the north east of the site. The proposed redevelopment layout is shown on external Drawing Reference RED115 910 produced by Residential Engineering Design Ltd., issued October 2020.
- 1.1.3 All comments given are based on the understanding that the proposed redevelopment will be as detailed above. It should be noted that if there are any changes to the proposed redevelopment it may affect whether the remediation strategy outlined in this report is still appropriate, and hence warrants further consideration.
- 1.1.4 Should there be any deviation from the agreed remediation strategy, then it may affect whether final discharge of any planning conditions pertaining to the site is granted by the Local Authority.

1.2 Objectives

- 1.2.1 The purpose of this report is to identify the Best Practicable Techniques(s) (BPT) for the remediation of the site. This has been achieved by undertaking an options appraisal of potential remediation techniques and then designing a sustainable remediation strategy including verification plan.

1.3 Methodology

- 1.3.1 This report has been compiled in accordance with the on-line Land contamination: risk management (LCRM) guidance produced by the Environment Agency (June 2019). This can be found on the UK government website: <https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks>.
- 1.3.2 The LCRM guidance outlines a three-stage process in deriving a remediation strategy:
- Identification of Feasible Remediation Options – this considers the general and technical factors that may affect the remedial option as well as the remediation and managerial objectives and produces a short list of potential BPT;
 - Detailed Evaluation of Options – this considers the characterisation of the short listed remedial options and remediation costs. An evaluation of environmental attributes is undertaken to select the BPT most suitable for the site;
 - Remediation Strategy Design – this identifies the areas of the site requiring remediation and how the works are to be phased. It outlines the verification process and plan which

ensure that the remediation works are complete in line with the desired remediation and managerial objectives.

1.3.3 This report should be read in conjunction with the following reports:

- JNP Group Phase II Geotechnical and Geoenvironmental Report. S11400-JNP-XX-XX-RP-G-1002 P01, May 2021.

2 REMEDIATION REQUIREMENTS

2.1 Pollutant Linkages

- 2.1.1 From the ground investigation works reported in May 2021, contamination was recorded within the made ground in the farmyard area only at the site in the following locations:
- DS05 @ 0.1m below ground level (bgl) beryllium (1.8 mg/kg);
 - TP04 @ 0.1m bgl benzo(a)anthracene (13 mg/kg), benzo(b)fluoranthene (20 mg/kg), benzo(a)pyrene (2.2 mg/kg, dibenzo(a,h)anthracene (2.8 mg/kg);
 - DS06 @ 0.1m bgl dibenzo(a,h)anthracene (0.61 mg/kg);
 - DS02 @ 0.2m bgl asbestos (<0.001%)
- 2.1.2 Made ground was encountered across the farmyard area in the south-west corner of the site, and consisted of various topsoils, sands and gravels, containing fragments of brick, crushed concrete, glass, sandstone and occasionally ash. The made ground extended from ground level to depths of between 0.20m and 0.80m bgl. This was underlain by the Newstead Rock Formation (heavily weathered sandstone).
- 2.1.3 Hence remediation at the site is required in areas of private gardens and soft landscaping areas in the farmyard area only in order to break the source-pathway-receptor linkages and ensure that the site is suitable for use.
- 2.1.4 Gas readings were taken from the monitoring boreholes during the groundwater monitoring visits, to allow a preliminary ground gas risk assessment to be undertaken.
- 2.1.5 Based on the original three rounds of gas monitoring results and one visit with elevated flow, a “CS2” determination was derived for the results from DS01 (close to a former pond in the north of the site) in accordance with BS 8485:2015 and CIRIA C665 suggesting that the whole site should be given a CS2 classification, pending further gas monitoring.
- 2.1.6 The NHBC ‘traffic lights’ characterisation system, outlined in “NHBC: Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. 2007”, is specific to low-rise housing with a clear ventilated under floor void (minimum 150mm), and the calculated GSVs come to a “Green” classification, based on Table 14.1.
- 2.1.7 Due to the discrepancy between the level of gas protection measures recommended by the two assessments, JNP Group recommended that a full gas monitoring and assessment programme be undertaken for the site, based on the guidance given in the documents listed previously, with six monitoring visits undertaken over three months. This further monitoring which is ongoing, and subsequent reassessment, should clarify the ground gas risk across the site, and allow the site to be fully classified, or zoned.
- 2.1.8 If, following the further planned gas monitoring and assessment, it is considered appropriate to classify the whole site, or part of the site, as CS2 (based on BS 8485:2015 and CIRIA C665 guidance), then ground gas protection measures with a score of at least 3.5 points would be required for the areas of the proposed development classified as CS2. Based upon the options available within BS 8485: 2015 +A1 2019, the following ground gas protection measures are recommended:

- Good performance passive sub-floor ventilation (venting can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.) - 1.5 points;
- Traditional beam-and-block floor – 0 points;
- Installation of gas resistant membrane fulfilling all requirements within Table 7 of BS8485 (2015 +A1 2019), with verification in accordance with CIRIA C735 – 2 points.

2.2 Remediation Objectives

- 2.2.1 The overall remediation objective is to ensure that the site is suitable for use and to protect the identified receptors (future site residents).
- 2.2.2 The following remediation objectives specific to the contaminants apply to the site:
- To remove the risk to receptors from hydrocarbon, metalloid and asbestos (fibres less than detectable) contaminated made ground in all garden areas and areas of soft landscaping;
- 2.2.3 The following remediation objectives relating to the remediation option are considered applicable to the site:
- Any amount of material going off site to landfill must be kept to a minimum.

2.3 Material Volumes

- 2.3.1 In planned areas of private gardens in the farmyard area only, the top 600 mm of made ground material should be remediated; in any soft landscaping areas planned in the farmyard this can be reduced to 300 mm. Where natural strata are encountered at less than these depths, only the made ground needs to be removed. The area requiring soils removal is shown in Appendix B.
- 2.3.2 Based on the current layout it is estimated that the total area requiring remediation is approximately 1500 m². This equates to an estimated maximum volume of 900 m³ of material requiring remediation.
- 2.3.3 The anticipated small volume of material requiring remediation is likely to make on-site treatment methods unviable at the site.
- 2.3.4 Subsoil from foundation arisings and the topsoil from the wider farm area can be used to form the capping layer in the farmyard area and as such we do not anticipate a need to import any materials to site.

2.4 Hazardous Waste Assessment

- 2.4.1 The concentrations of contaminants recorded during the ground investigation have been assessed using the HazWasteOnline classification tool (Appendix C). This classification tool is based on the methodology outlined in the Hazardous Waste Technical Guidance publication WM3 (EA, SEPA, NIA, NRW. May 2015).
- 2.4.2 The concentrations of waste are considered to be potentially hazardous; this classification arises as the tool assumes liquid oil is present on site. As none was observed, the soils can be considered to be non-hazardous waste.

3 EVALUATION OF REMEDIATION OPTIONS

3.1 Management Objectives Affecting Remediation Options

3.1.1 The following management objectives are considered to be appropriate for the site:

- To reduce the amount of hazardous waste being landfilled in line with current UK waste hierarchy (reduce - re-use – recycle – recover – disposal);
- To achieve a remediation strategy that can be agreed by all key stakeholders (client, regulators);
- To meet all regulatory requirements relevant to the installation or operation of remediation options;
- To avoid unacceptable health and safety, and adverse environmental impacts during remediation;
- To minimise long term liabilities;
- To avoid long term maintenance or monitoring obligations;
- To ensure the scheme takes into account any design requirements of the overall redevelopment;
- To undertake remediation in accordance with good technical practice;
- To achieve successful remediation within a particular timescale and budget.

3.2 Design Requirements Affecting Remediation Options

3.2.1 There is no known design requirement to raise ground elevation in the farmyard area.

3.3 Technical Factors Affecting Soil Remediation Options

3.3.1 Contaminant type and soil type are the two key factors that affect the choice of any remediation option being considered.

3.3.2 To treat sandy gravelly soils contaminated with PAHs and metalloids the following are options:

- Solidification / stabilisation: cement and pozzolan based system, vitrification;
- Other: cover; disposal to landfill;
- Other: transfer to soil treatment centre (some centres can accept low concentrations of asbestos).

3.4 Evaluation of Remediation Options

3.4.1 Due to the thickness of the made ground and the relatively small nature of the area to be remediated, it is proposed that the garden areas are locally reduced to allow the placement of a clean capping layer.

4 REMEDIATION STRATEGY – IMPLEMENTATION PLAN

4.1 Introduction

- 4.1.1 The main works shall be undertaken by a suitably qualified earthworks Contractor and the works shall be supervised by JNP Group on an “as and when” required basis.
- 4.1.2 As there is asbestos present within the soils, all works undertaken must be in accordance with the guidance given in the CIRIA C733 (CIRIA 2014) and CL:AIRE Industry Guidance on Interpretation for Managing & Working with Asbestos in Soil and Construction and Demolition Materials (CL:AIRE 2016). The earthworks Contractor must be licensed to work with asbestos containing materials.
- 4.1.3 All works on site shall be undertaken following the guidance given in C762 Environmental Good Practice on-site (CIRIA C762) and Construction Site Safety GE700E/18 (CITB 2018).
- 4.1.4 A Construction Environmental Management Plan (CEMP) and method statements for all aspects of work shall be provided to JNP Group by the earthworks Contractor, and any specialised subcontractors. These will include any details of proposed toolbox talks. The CEMP and method statements shall require approval prior to commencement of the works on site. The CEMP should cover, as a minimum, the following items: nuisance dust; asbestos fibres release; odours; noise and traffic management.

4.2 Programme of Works

- 4.2.1 In order to ensure the works are undertaken in a suitable order, the following are proposed:
- Excavation of cut areas to allow for the provision of a capping layer and removal of surplus material to a designated waste receiver.
 - Importation and placement of a capping layer up to 300mm / 600mm thick to include a minimum of 150mm topsoil and 150mm / 450mm of subsoil.

4.3 Material Requiring Excavation

- 4.3.1 The area of ground requiring excavation is within the curtilage of the farmyard. Only the garden areas require excavation; the larger area can be cleared if more practical (note volumes reflect garden areas only). If practicable the ground requiring excavation shall be directly excavated onto haulage lorries or if this is not achievable stockpiled in a designated area to await disposal. Any stockpiled material shall be placed on tarpaulin sheets to avoid any cross contamination.
- 4.3.2 Should hydrocarbon impacted material or unexpected contamination be encountered requiring excavation as directed by JNP Group then the earthworks contractor shall make the necessary arrangements with the waste receiver and programme in further excavation work.
- 4.3.3 Should asbestos impacted material be encountered during the demolition, then the earthworks contractor shall arrange for its suitable disposal. In the case of any visual asbestos sheeting, this is likely to be a hand picking exercise to be undertaken by the earthworks contractor with the sheeting being bagged and disposed of appropriately. Any soils impacted with loose fibres shall require disposal to a suitable licenced landfill site and shall be transported using a suitably licenced haulier.
- 4.3.4 Records shall be kept of any material removed off-site either for treatment and re-use or as a waste destined for landfill. The Waste License and Permit Register form, as given in

Appendix D, detailing the waste codes, haulier and waste receiver details should be completed by the Contractor for each waste material generated requiring removal. In addition, all material removed off-site shall be logged on the Waste Disposal Log form given in Appendix E. The completed waste management form, duty of care and consignment notes shall be provided to JNP Group for inclusion in the verification report.

4.4 Specifics for Capping Layer

- 4.4.1 A capping layer is required in all gardens / POS areas and should be up to 600mm / 300mm thick consisting of a minimum of 150mm topsoil and 450mm / 150 mm subsoil. The material shall be chemically suitable for a residential development with plant uptake criteria and should be free of any visually deleterious material.

4.5 Re-use of Site Won Material

- 4.5.1 The existing topsoil may be stripped and stockpiled for re-use in gardens areas.. Subsoil from foundations arisings may also be stockpiled for re-use in gardens areas.
- 4.5.2 Should site won materials be re-used on site, JNP Group recommends that the proposed development works are undertaken in accordance with the definition of Waste Code of Practice (DoWCoP); in following this guidance and to ensure materials are managed correctly, A Materials Management Plan will need to be prepared and declared in advance by a Qualified Person, then implemented and documented in a Verification Report. If this process is not undertaken, then following recent changes in Landfill Tax Regulations by HMRC there is a risk of penalties equating to twice the Landfill Tax being applied to the re-use of material on site. If the proposed works are to be undertaken outside the DoWCoP, there would need to be some of Environmental Permitting or suitable equivalent. The requirements of such are likely to be more onerous and may take longer to be granted.

4.6 Imported Fill

- 4.6.1 Any imported fill such as subsoil or topsoil used at the site should be sourced from a suitable provider of such material, who should provide chemical testing certificates of the material for destined for the site. These certificates should be issued to JNP Group for approval prior to accepting the material. In addition, the imported fill should be free of any deleterious material such as glass fragments, wire, wood and a visual inspection should be undertaken once the material arrives on site.
- 4.6.2 Any topsoil and subsoil imported to site shall be classified and characterised in accordance with the requirements of BS3882:2015 [Specification for topsoil and requirements for use] and BS8601:2013 [Specification for subsoil and requirements for use] respectively as well as the chemical testing criteria given in Tables 5.2 and 5.3.
- 4.6.3 There reader is referred to section 5 for chemical testing requirements.
- 4.6.4 All chemical testing shall be undertaken by a UKAS and MCERTS accredited testing laboratory using standard turnaround times.

4.7 Dealing with Unexpected Contamination

- 4.7.1 Whilst investigation works has been undertaken at the site, it remains possible that unexpected soil, groundwater contamination or visible asbestos containing materials may be encountered during the process of any site demolition, clearance, excavation and / or construction.

4.7.2 If during the works such material is encountered, then the earthworks Contractor shall inform JNP Group immediately who shall then advise on the best course of action. Photographic and written records should be kept by the earthworks Contractor detailing any such material.

4.7.3 A copy of this strategy for dealing with unexpected contamination should be made available on site and ground workers should be made aware of it.

4.8 Environmental Incidents

4.8.1 In the event of an unforeseen environmental incident (pollution occurrence) on-site work should be stopping in that area immediately affected and the Environmental Agency should be contacted via their incident hotline 0800 807 060.

4.8.2 Emergency spill kits shall be kept on-site in strategic locations and a member of staff who is trained to use them shall be present on-site at all times.

5 REMEDIATION STRATEGY – VALIDATION PLAN

5.1 Validation Chemical Testing – Imported Fill

- 5.1.1 Chemical testing certificates should be available for any imported fill including subsoil or topsoil and reviewed as below prior to any verification sign off. However, it is unlikely that such material will need to be imported to site if subsoil and topsoil from the wider farm area is used to form the capping layer in the farmyard area.
- 5.1.2 Testing of any imported material should be in accordance with YAHPAC Verification Requirements for Cover Systems included as Appendix F with an extract below.

Table 5.1 YAHPAC Verification Requirements for Cover Systems

Type	Number of Samples	Testing Schedule	Assessment Criteria
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As,Cd,Cr,CrVI,Cu,Hg,Ni,Pb,Se,Zn)	This needs to be agreed with the Local Authority. The Assessment criteria needs to be UK based, e.g. SGV's, LQM or other similarly derived GAC's.
Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m ³	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Greenfield/ Manufactured Soils	Minimum 3 or 1 per 250m ³ (whichever is greater)	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Brownfield/ Screened Soils	Minimum 6 or 1 per 100m ³ (whichever is greater)	Standard metals/ metalloids (As above) PAH (16 USEPA speciation) TPH (CWG banded) Asbestos Any additional analysis dependant on the history of the donor site.	

- 5.1.3 All chemical testing shall be undertaken by a UKAS and MCERTS accredited testing laboratory.
- 5.1.4 Any chemical testing results shall be compared to the screening values given in Table 5.2. As the final end use of the site is a residential building with private gardens, current UK residential with plant uptake guideline values have been selected for use.
- 5.1.5 In addition, as copper, nickel and zinc are considered phytotoxic in nature the criteria given in Table 5.3 should be used (these values are less than the published UK screening values and hence are considered protective of human health).