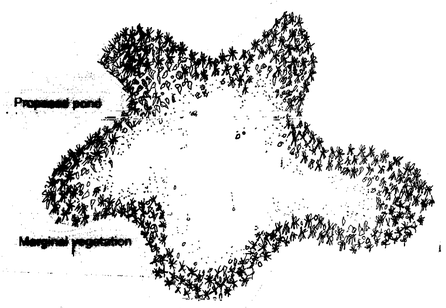
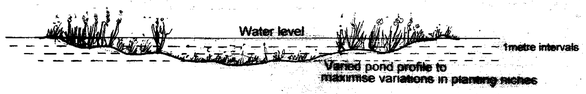
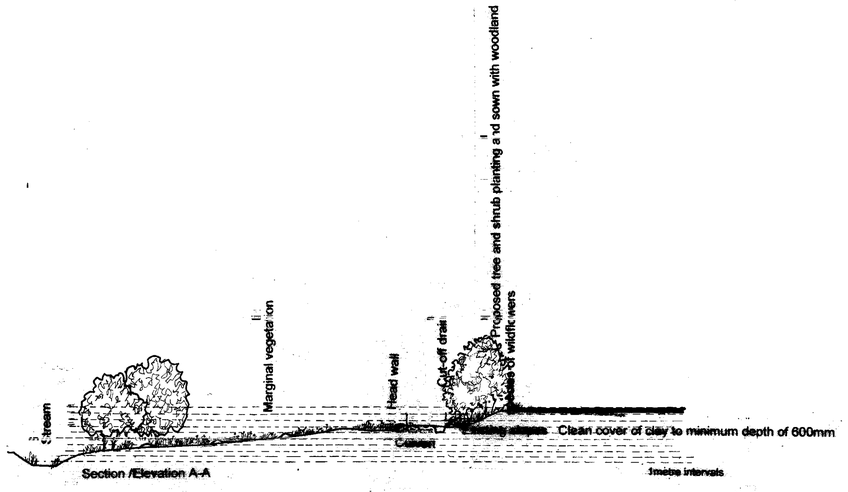


Location of the proposed pond to be determined by excavation a series of trail holes within the existing farm where a good source of consistent clay with a typical density of 1.5 tonnes / m3





Trees and shrubs in the woodland, woodland edge and hedgerow areas will comprise of the following species:

• Quercus robur	*Common oak*
• Quercus petraea	*Sessile oak*
• Fraxinus excelsior	*Ash*
• Betula pendula	*Birch*
• Acer campestre	*Field Maple*
• Crataegus monogyna	*Hawthorn*
• Ilex aquifolium	*Holly*
• Corylus avellana	*Hazel*
• Rosa canina	*Dog rose*
• Rosa rubiginosa	*Sweet brier*
• Rosa spinosissima	*Burnet rose*

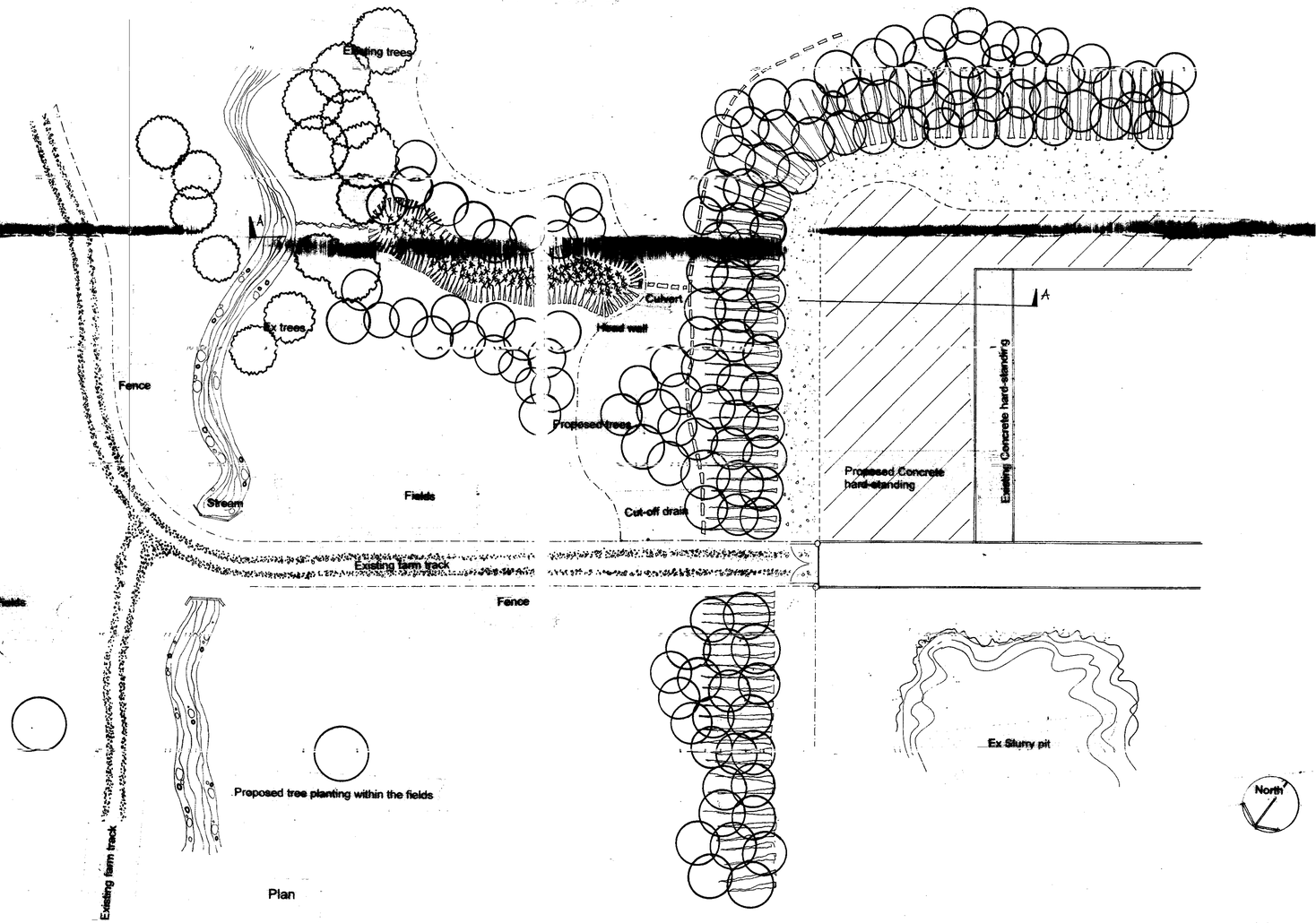
planted at 600-450mm b.r.
Underplanted with a range of wildflower species to include

The woodland, woodland edge and hedgerow margins will be sown and planted with cornfield annuals in the first year and the following year by perennial species consisting of:

• Bluebell	(*Hyacinthoides non scripta*)
• Cow Parsley	(*Anthriscus sylvestris*)
• Devil's Bit Scabious	(*Succisa pratensis*)
• Foxglove	(*Digitalis purpurea*)
• Garlic Mustard	(*Alliaria petiolata*)
• Hedge Woundwort	(*Stachys sylvatica*)
• Perforate St Johns Wort	(*Hypericum perforatum*)
• Primrose	(*Primula vulgaris*)
• Red Campion	(*Silene dioica*)
• Upright Hedge Parsley	(*Torilis japonica*)
• Wood Avens	(*Geum urbanum*)
• Sweet Woodruff	(*Galium odoratum*)
• Yellow Archangel	(*Lamiastrum*

The species mixes for the marginal areas of water, such as the ponds, lake and streamside vegetation of the following species:

• Iris pseudacorus	*Yellow flag*
• Caltha palustris	*King cup*
• Stachys palustris	*Marsh woundwort*
• Butomus umbellatus	*Flowering rush*
• Geum rivale	*Water avens*
• Eupatorium cannabinum	*Hemp agrimony*
• Filipendula ulmaria	*Meadowsweet*
• Lytaynum salicaria	*Purple loosestrife*
• Phragmites australis	*Common reed*

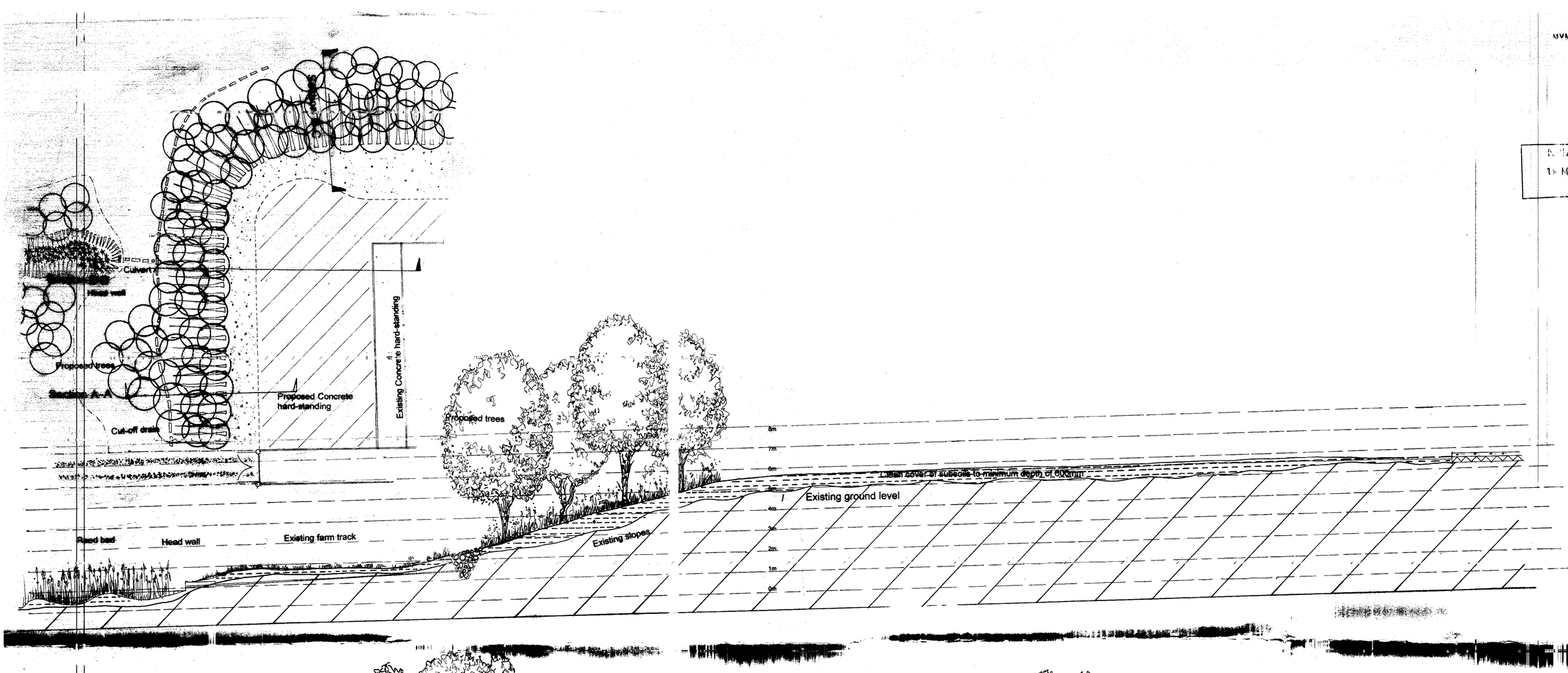


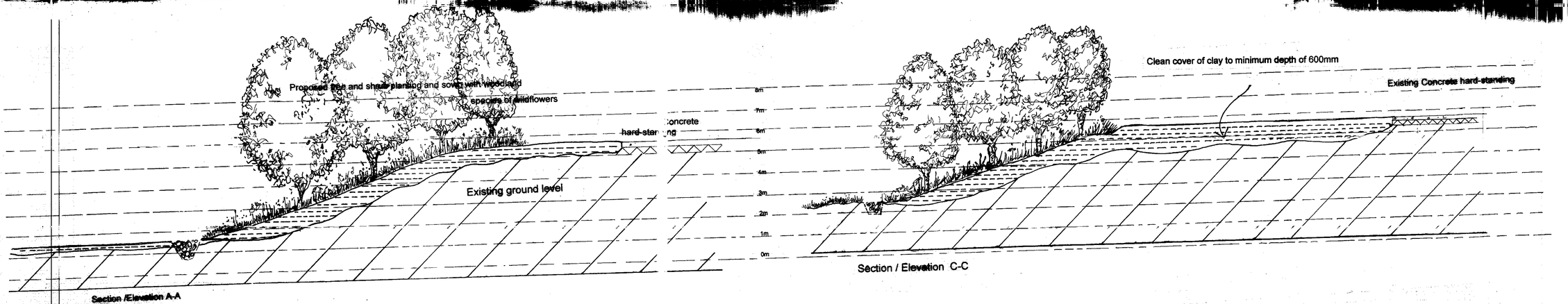
This is a notifiable project under the Construction & Design Regulations 1994. The developer must by law inform the Health and Safety Executive and also obtain the services of a Planning Supervisor

Green Design Partnership
Chartered Landscape Architects, Town Planners, Architectural Consultants & Public Artists
The Studio, 17 The Garlands, York, YO30 6NZ
Phone/fax: 01904 674519 Mob: 07944 081332

Paul Green BSc Hons Dip LA MLI MIoED, Angela Green B Ed Hons (Cantab) Dip OD, Sam Green B Arch Dip Arch, James Green MA TP MRTPI, Alex Green HND Public Art

Project address:	Grange Farm Staintondale Ravenscar YO13 0EM
Project Title:	Remedial work to embankments and associated areas at Grange Farm
Drawing Title:	Proposals Planting Plan & Schedule
Date:	11 th June2007
Scale:	1:500
Drawing No:	GD 0107 Drawn by P.Green





Green Design Partnership

Chartered Landscape Architects, Town Planners,Architectural Consultants and Public Artists

17 The Garlands Clifton Without York YO30 6NZ tel. no 01904 854484

Paul Green BSc hons Dip LA MLI MSGD , Angela Green BEd (Cantab) Dip GD

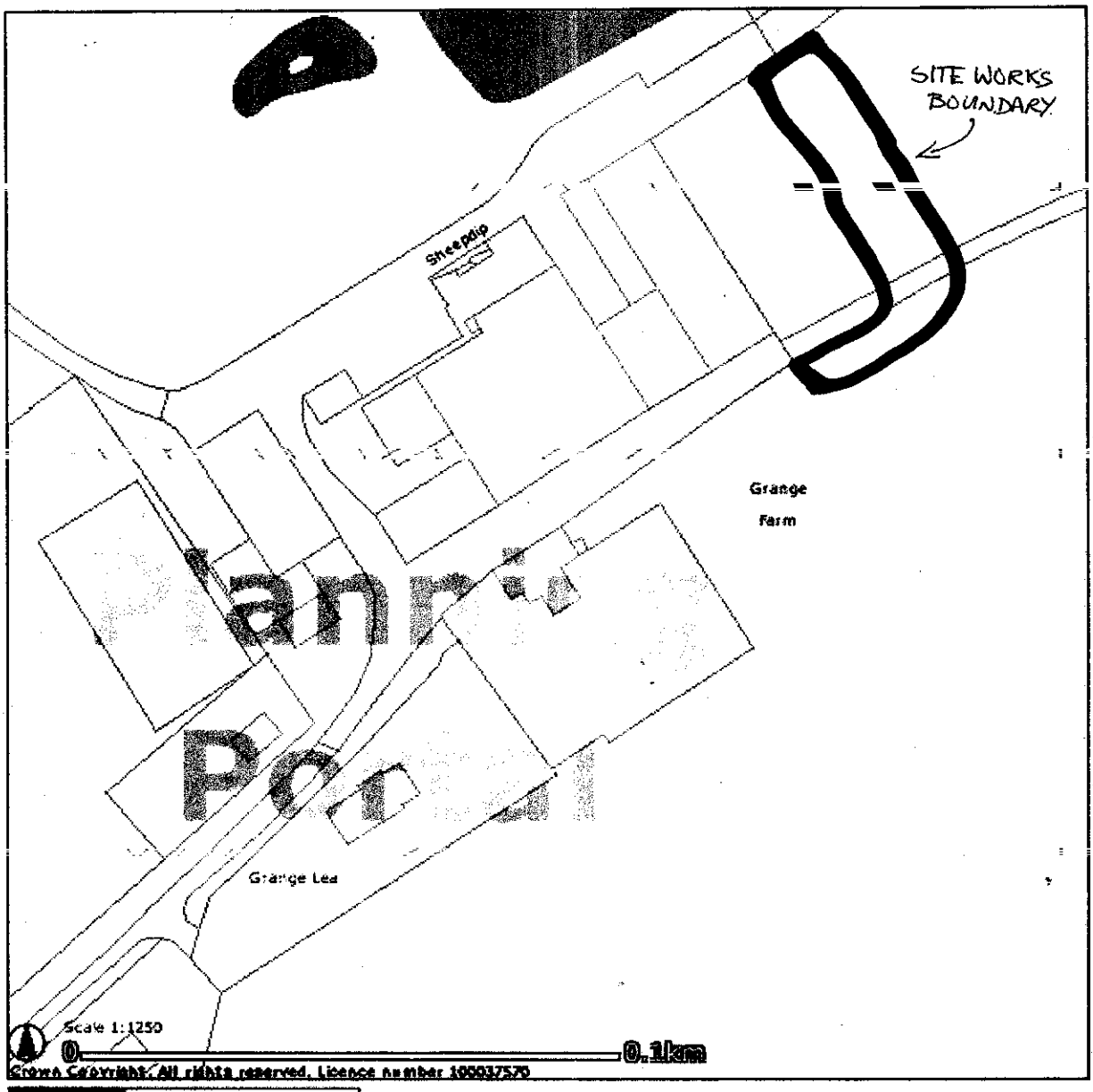
Sam Green B Arch hons Dip Arch James Green MA TP MRTPI Alex Green FND Public Art

Project	Remedial works to embankments at Grange farm Staintondale
Drawing Title and No.	Section /Elevations of existing and proposed QD 0134
Scale 1:100 Job No.	Drawn by PRG / Checked / Date 23/7/07
Revisions	
Notes	

NYM/ 2007 / 0961 / FL

PLANNING PORTAL

Site Location Plan



Mapping sourced from Ordnance Survey

NYMNPA
19 NOV 2007

NYM/ 2007 / 0961 / FL

SECTION 4 **BUSINESS, RETAIL OR OTHER COMMERCIAL USE**

18. Proposed use

Which of the following is involved in the development? ☐ Business ☐ Retail

Other (please specify)

If industrial, please describe the process

Is the proposal part of a larger scheme ? YES / NO (delete as appropriate)

19. Floor space

Please provide the measurements of the following:	Existing m^2	Proposed m^2
Total floor space of all buildings to which this application relates		
Industrial floor space		
Office floor space		
Retail trading floor space		
Storage floor space		
Warehouse floor space		
Other		

20. Employment

	Industrial	Other
a) How many staff in total will be employed on the site as a result of the proposed development ?		
b) How many of the employees will be new staff ?		
c) If staff are to be transferred from other premises, how many will be affected ?		

21. Car parking

How many car parking spaces are to be provided ?

22. Traffic

How many vehicles will be visiting the site each day ?

23. Hazardous materials

Please read Note 23 in the accompanying booklet. Does the proposal involve use or storage of hazardous materials ? YES / NO (delete as appropriate) If **YES**, please state which materials.

Please go back to Section 5 on page 2

Please send or deliver to:
The North York Moors National Park,
The Old Vicarage, Bondgate,
Helmsley,
York YO62 5BP

NYM/ 2007 / 0961 / FL

NORTH YORK MOORS NATIONAL PARK

For office use only

Ref:

Admin Ref: 07/961

Date valid:

Grid ref: SE 98892, 99695

SECTION 1 **YOUR DETAILS**

1. Applicant

Name MR. MATTHEW ELSE

Address GRANGE FARM
STAINTON DALE
RAVENSCAR NR. SCARBOROUGH

Post Code YO13 0EN.

Tel No [redacted]

2. Agent

Name PAUL GREEN

Address GREEN DESIGN PARTNERSHIP
17 THE GARLANDS
CLIFTON WITHOUT YORK

Post Code YO30 6NZ

Tel No [redacted]

3. Applicant's interest in the land

OWNER.

SECTION 2 **YOUR PROPOSAL**

4. Full postal address or location of the application site

PLEASE SEE LOCATION PLAN

NYMNPA
19 NOV 2007

5. Applicant's interest in adjoining land

OWNER.

6. Brief description of proposed development

REMEDIAL ENGINEERING & LANDSCAPING WORKS
TO LAND AT GRANGE FARM.

SECTION 3 **YOUR APPLICATION**

7. Type of application (please tick **ONE** box only)

☑	**A.** Full application including building works	*go to Question 12*
☐	**B.** Application for change of use (no building works)	*go to Question 12*
☐	**C.** Outline application	*go to Question 8*
☐	**D.** Reserved matters application	*go to Question 9*
☐	**E.** Removal or variation of condition	*go to Question 10*
☐	**F.** Renewal of temporary permission	*go to Question 11*

8. Outline Application

What is the area of the site ? 2450 m sq.

Please tick those details which you wish the Planning Committee to consider formally at this stage.

☑ Layout ☑ Scale ☑ Appearance ☑ Access ☑ Landscaping ☐ None

go to Question 12

9. Reserved Matters Application

Date of outline permission _____ plication No _____

Please tick those details which you wish the Planning Comm to consider formally at this stage.

☐ Layout ☐ Scale ☐ Appearance ☐ Access Landscaping

go to Question 12

10. Removal or variation of condition

Date condition imposed _____ plication No _____

Condition No _____

go to Question 12

11. ~~Renewal of temporary permission~~

Date permission granted _____ plication No _____

12. Use

What is the ~~building~~ / land used for at present ? AGRICULTURE.

If it is unused at present, what was its last use ? N.A.

and on what date did it stop being used for this ? (if known) N.A.

13. Access

Does your proposal require new or altered access ? ~~YES~~ / NO lete as appropriate)

If **YES**, please tick the relevant boxes:

New access to a road ☐ Vehicular Pedestrian

Altered access to a road ☐ Vehicular Pedestrian

Even if no alterations or changes are being sought, access arr ements will need to be described in the 'design and access statement'.

14. Water Supply and Drainage

Please state (Please tick one box in each section) the method

Water Supply ☐ Mains ☐ Private existing / proposed*

~~Surface Water Disposal~~ ☐ ~~Public Surface Water Sewer~~ ☑ River/Stream

☐ Soakaway ☐ Other existing / proposed*

Foul Sewage ☐ Public Foul Sewer ☐ Sep ank ☐ Cesspit ☐ Other existing / proposed*

*delete as appropriate

Note: If foul drainage is not to be via a public foul sewer, a dr age assessment will be required. Please see Question 14 in the accompanying booklet.

15. Trees

Does the application involve: Felling or lopping trees dgerows ~~YES~~ / NO (delete as appropriate)

Planting trees ~~YES~~ / NO (delete as appropriate)

16. Materials

Walls N.A.

Roof N.A.

17. Is your application for business, retail or other comme al use ?

~~YES~~ / NO (delete as appropriate) If **NO** *go to Section 5*

If **YES** *please com Questions 18 - 23 of Section 4 on page 4 of this form*

SECTION 5 WHAT YOU NEED TO INCLUDE WITH YO APPLICATION

24. Plans

Please list below the plans which will accompany this applica .

GD0/07 GD0134.

25. Certificate of Ownership and Agricultural Holdings Certificate

You are required by law to complete **either** Certificate A **or** Certificate B (Ownership) **and** the Agricultural Holdings Certificate. It is an offence knowingly to make a false declaration.

CERTIFICATE OF OWNERSHIP : A

Complete if you are the owner of the building / land, along with Agricultural Holdings Certificate below.

I certify that: On the 21 days before the date of the accompanying application nobody, except the applicant, was the owner of any part of the land to which this application relates.

Signed [redacted] (~~Applicant~~/Agent)

* On behalf of M/S MATTHEW ELSE (Applicant)

Date 13 November 2007.

CERTIFICATE OF OWNERSHIP : B

Complete if you do not own any or all of the building / land, along with Agricultural Holdings Certificate below.

I certify that: I have /the applicant has given the requisite notice to everyone else who, on the 21 days before the date of the accompanying application, was the owner of any part of the land to which the application relates, as listed below.

Owner's name _____

Address at which notice served _____

Date on which notice was served _____

Signed _____ (Applicant/Agent)

* On behalf of _____ (Applicant)

Date _____

AGRICULTURAL HOLDINGS CERTIFICATE

This section MUST be completed. Delete **either** A **or** B and complete C.

A. I certify that none of the land to which this application relates is, or forms part of, an agricultural holding.

B. I have/the applicant has given requisite notice to every person other than myself/himself who, 20 days before the date of the application was a tenant of any agricultural holding any part of which was comprised in the land to which this application relates:

Name of tenant NONE

Address _____

Date notice was served _____

C. Signed [redacted] (~~Applicant~~/Agent)

On behalf of M/S M. ELSE (Applicant)

Date 13 NOV 2007

26. I/WE hereby apply for planning permission or approval of reserved matters as described in this application and the accompanying plans. I / We attach:

- for rural building conversion, any bat survey or structural engineer's report undertaken.
- the necessary plans numbered: ✓
- 'design and access statement'. ✓
- completed, dated and signed Certificate of Ownership (A or B above). ✓
- completed, dated and signed Agricultural Holdings Certificate. ✓
- Flood risk assessment if the development lies in zone 2/3 of the indicative floodplain map.

- the fee of £ 405 by cheque/~~postal order~~ no

Signed [redacted] (~~Applicant~~/Agent)

On behalf of M/S M. ELSE (Applicant)

Date 13 November 2007

* delete where appropriate

Design and Access Statement

Proposed Remedial Engineering works and Landscaping works To Grange Farm Staintondale North Yorkshire

Prepared by Green Design Partnership
The Studio 17 The Garlands
Clifton Without
York
YO30 6NZ

Tel no. 01904 674519
E mail gdp04@fsmail.net

On behalf of Mr and Mrs Matthew Else of Grange Farm

November 2007

Scope

The scope of this design and access statement is to detail –

1. The background to the works
2. Describe the design principles and proposals
3. Appraise the agricultural development context and
4. Present the findings of Ground investigation works

1 The background top the works

Mr and Mrs Matthew Else are young Farmers that successfully and expanding Soils Association registered organic dairy farm. As part of the ongoing development programme some engineering works have been undertaken on land adjoining the farm buildings. This work was in preparation for the construction of additional farm buildings. These works involved the importation of fill to extend the level area that adjoins the existing farm buildings. Planning permission was not sought for this works and resulted in objections being raised by the North Yorkshire National Park Planning Department. The objections centred on the concern regarding the impact on the amenity of the landscape and the quality of the imported material and consequently damage to the environment.

It is the aim of this application to satisfy the concerns raised by the Planning Authority and to seek agreement.

2. Describe the design principles and proposals

The topography within the Grange Farm area is characteristically rolling, with small and steep valleys formed by quick moving streams, embankments formed by ancient dykes, railway lines, roads and farm tracks. Hedgerows, copses, wooded valleys, shelterbelts and free standing trees are common. Historically farm ponds where more frequently found however few now remain.

The works are designed to integrate to the existing unplanned land formation works and the planned future additional farm building within the broader landscape.

The works detailed can be summarised as follows –

- The re-grade and cover of the embankments and tipped areas on site with a minimum of 600mm depth of clean clay that will be excavated from a near by field
- Create a wildlife pond on the site of the excavations
- Plant up and sow the slopes with indigenous plant material – we would be pleased to include local BAP species if appropriate
- Stone the plateau are with a 200mm of compacted hardcore DOT1
- Lay a cut off drain to the toe of the slope and discharge into a series of shallow ponds that will be planted with marginal plants that have filtration properties
- Extend the tree planting to the stream and along adjoining slopes to integrate the works into the broader landscape
- Planting works are detailed on plans ref no GD 0107 and has been selected to integrate with the existing and naturally occurring vegetation in the area.
- Re-grading works are detailed in plan ref no GD 0134
- The fill that will form the regarded embankment will be sourced from within the adjoining field at a location at apposition that will be determined depending on the quality of the clay and the depth o the water table. The location will be a minimum of 25 m from a water course.
- The profile of the pond will be varied to increase variation in the types of marginal vegetation that will establish.
- Plants will be where feasible from local provenance sources.

3 Appraisal the agricultural context

Report prepared by I K Halley FRICS please refer to CD

Report and findings of Ground investigation works

Please see attached CD prepared by ARC Environmental Ltd.

If it is necessary to circulate this document please do so digitally.

The Rivergreen Centre
Aykley Heads
Durham
DH1 5TS

Tel: [redacted]
Fax: [redacted]

e-mail: [redacted]
www.arc-environmental.com

PHASE 2: GEO-ENVIRONMENTAL INVESTIGATION REPORT

MR M. ELSE

PROPOSED AGRICULTURAL DEVELOPMENT (CATTLE SHEDS)

GRANGE FARM

STAINTONDALE

SCARBOROUGH

YO13 0EN

Project No: 07-160

Prepared By:

Mark Berriman

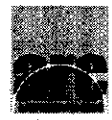
Date: 09/11/07

Approved By:

Terry McMenam

Date: 09/11/07

CONTENTS



1.0 Introduction

October 2007

As requested by Mr. M. Else of Grange Farm, Staintondale, and in conjunction with the Phase 1: Desk Top Study Report, ref no. 07-160, June 2007, Phase 2 Ground Investigation works have been carried out over an area of land adjacent to the existing farm buildings at Grange Farm, Staintondale, Scarborough, North Yorkshire, where it is proposed to construct additional agricultural stock buildings (cattle sheds) in the near future (CLEA end use category taken as *Commercial / Industrial*).

The intrusive investigation works comprised 6 no. mechanically excavated trial pits (TP's 1 – 6) and 4 no. cable percussive boreholes (BH's 1 – 4), accompanied by the installation of 2 no. combined gas and groundwater monitoring standpipes which were installed at the locations of BH's 1 & 2. The positions of all the investigation locations can be seen on an extract of the Existing Site Plan, which can be found in Appendix I. It should be noted that this plan should be used primarily for orientation purposes and not for re-measurement, as the investigation positions have not been surveyed and the scale of the plan is none standard.

2.0 Site Details

Table 2.1

N = north, S = south, E = east, W = west

Site N	Grange Farm.
Site A	Grange Farm, Staintondale, Scarborough, YO13 0DS.
OS Ca	498880, 499700
Descriptio	Grange Farm is situated c.1.2km from the northeast coast, c.1km to the north of Staintondale within an agricultural area.
Site Bo	The site is surrounded by open agricultural land and access tracks
Site Se	The site is set within an agricultural area.
Developm	The proposed development works will comprise the erection of a new agricultural building to house cows (cattle shed) located on an area brought up to its present level from the original ground levels using inert fill materials (natural strata, building waste, etc.).
Additional	Site area is currently used for hard standing and storage of plant and equipment, and is presently unsurfaced. Standing surface water noted during field works.

3.0 Scope of Works

Table 3.1

Client	Mr M Else.
Consultant	Landscape Architects: Green Design Partnership.
Project Type	Proposed new agricultural building (CLEA end use category - *Commercial / Industrial*).
Site Layout Plan	See Appendix I.
Layout Plan (Drawing)	See Appendix I.
Layout plan (Levels)	Not provided – a detailed plan is not currently available.
Intrusive Investigation Works	6 no. mechanically excavated trial pits (TP's 1 – 6), 4 no. cable percussive boreholes (BH's 1 – 4), 2 no. Combined Gas & Groundwater Monitoring Standpipes (BH's 1 & 2).
Laboratory Testing	Geotechnical & Ground Contamination.
CLEA Model Scenario	*Commercial / Industrial.*
Report Type	Factual & Interpretative including Level 1 Quantitative Risk Assessment.
Comments	The site area is currently used for hardstanding for plant and materials and is part of a working farm yard providing access to farm tracks.

The information contained in this report is limited to the area of the site, as indicated on the Existing Site Layout Plan shown in Appendix I, and to those areas accessible during the ground investigation. The depths

3.0 Scope of Works (Cont'd)

of strata on the trial pit and borehole record sheets are recorded from current ground levels. No additional topographical survey or walk over survey was requested or undertaken and therefore when considering the full scope of the development any features and / or issues not specifically mentioned in this report cannot be assumed to have been covered.

4.0 Ground Conditions

For an accurate description of the ground conditions encountered at each investigation position, reference should be made to the trial pit and borehole record sheets attached in Appendix II.

4.1 Soil Profile:-

A summary of the soil profile for this site can be found in Table 4.1, below.

Table 4.1 BGL = Below ground level,

	Depth Encountered (BGL)	
	From 0.00m up to c.2.20m to c.4.00m.	As anticipated, the made ground comprises a mixture of disturbed natural strata (soil, clay, sand, gravel and cobbles) and anthropogenic debris associated with the tipping of inert building/demolition rubble/waste to bring up the site to its present levels, i.e. fragments of brick, concrete, ceramic tiles, metal, glass, etc. In some of the positions thick plastic sheeting was noted along with timber pieces and fragments of polystyrene and plastic pipe. There was no evidence of any significant voiding or cavities within the made ground (see Photographs in Appendix III).
	From c.2.20m to c.4.00m up to c.10.00m (base of boreholes).	Comprising firm to stiff sandy gravelly CLAY to depths of between 5.00m and 5.70m overlying medium dense to dense brown SAND.
	N/E	~

No visual or olfactory evidence of fuel/oil type contamination was noted in any of the investigation positions. In addition no chemical/solvent containers (i.e. paint, oil, grease, etc.) were recovered. Similarly, during the investigation works, no visual evidence of any asbestos containing materials (i.e. fragmented asbestos sheet, roof tiles, guttering, etc.) or 'ashy' type materials were noted within the fill.

The fill materials encountered appear to concur with the type of the materials allowed to be tipped, i.e. excavated natural strata and inert building waste/demolition. There was no evidence of any significant quantities of biodegradable materials, chemical, commercial, domestic or human waste, with the majority of the materials encountered comprising disturbed natural strata, and this generally concurs with the historical evidence provided by the client, relating to nature of the tipping activities used to bring the site up to its present levels.

4.0 Ground Conditions (Cont'd)

4.2 Groundwater:-

There was no significant groundwater encountered in the boreholes and trial pits, the majority of which remained dry throughout the period of the investigation. A small ingress of water was noted in TP4, at a depth of c.2.90m within the made ground, although there was insufficient volume to record a standing level before the excavation was backfilled with arisings.

Consequently, although the investigation was undertaken following a prolonged period of heavy rainfall, there was no evidence of a shallow continuous groundwater surface (water table) being present below this site, and therefore no significant problems are expected with respect to groundwater ingresses into excavations on this site. Deeper groundwater is anticipated to be present within the solid geology, but this will not have a significant influence on the proposed development of the site in the future, and when considering the nature of the natural drift materials below the made ground, they will be direct recharge from surface drainage filtering down through the made ground.

However, it is felt it would be prudent to allow for the possible introduction of temporary groundwater control measures, i.e. pumping equipment, in order to take care of ingresses from unforeseen isolated pockets and lenses of trapped water within the made ground, particularly during the wetter periods of the year.

5.0 Insitu Testing

5.1 Insitu Standard Penetration Tests

Insitu standard penetration tests were carried out within all the boreholes with the use of a normal split spoon sampler (S) or 60° penetrometer (C), in order to determine the relative densities of the materials tested. The results are shown as uncorrected 'N' values on the graphic borehole record sheets in Appendix II, adjacent to the appropriate sample level.

Where the full penetration depth, including seating blows (450mm), could not be achieved, the bottom sampling depth is indicated as less than 0.45m from the top, with the actual depth of penetration also being recorded, and the value given for the full number of blows recorded.

As can be seen from the results of the tests carried out within the made ground materials, these materials appear to be of a medium dense to dense nature with 'N' values ranging from 20 up to 75 for limited penetration, suggesting that these materials would be capable of supporting moderate loadings without the risk of failure or excessive settlements occurring.

From the results for the tests carried out within the natural clays it can be seen that these materials are of a firm to stiff nature with 'N' values ranging from 7 up to 18, suggesting that these materials will be capable of supporting moderate loadings, again without the risk of failure or excessive settlements occurring. Similarly, the tests carried out within the lower natural sands recorded 'N' values ranging from 15 up to 32, indicating medium dense to dense strata, which again would be capable of supporting moderate to heavy loadings.

On closer examination, it can be seen that the higher values recorded in the made ground area likely to be attributable to obstructions, such as cobbles, pieces of concrete, etc., and therefore it is felt are not representative of the general density, strength and settlement characteristics of the made ground. In this case it is felt a typical 'N' value of between 20 and 25 (medium dense) is felt to be more representative of the made ground insitu.

5.0 Insitu Testing (Cont'd)

5.2 Insitu Hand Shear Vane Tests:-

Insitu hand vane tests were carried out, using a portable Controls Testing insitu hand vane tester in order to determine the undrained shear strength of the more cohesive drift materials encountered towards the base of TP's 2 & 3. A series of tests were carried out and an average of the results obtained can be found adjacent to the appropriate sample level, on the graphic trial pit record sheets.

As can be seen from the results of the tests carried out within the natural clays, these materials generally appear to be of firm to stiff nature, with shear strength values ranging from 60kN/m^2 up to 85kN/m^2, with an average value of c.70kN/m^2. These results generally concur with the visual description of the strata noted from the field works, as well as the insitu SPT results, and suggest that the clays are capable of supporting moderate loadings.

5.3 Insitu Gas & Groundwater Monitoring: -

Combined soil gas / vapour & water monitoring standpipes were installed at the locations of BH's 1 & 2, with the response zone of the installations targeted on the fill materials only. A standard 50mm diameter HDPE standpipe, with geo-wrap/gravel surround, bentonite seal, gas valve cap and security cover, was installed to the base of the boreholes, and the soil gas and water levels were allowed to reach equilibrium, prior to the first monitoring visit. Copies of the monitoring record sheets can be found in Appendix IV.

5.3.1 Ground Gas Monitoring: -

Ground Gas monitoring was undertaken using a Gas Data LMSxi Type G3.18 infra-red gas analyser with integral flow meter and a Geotechnical Instruments electronic dipmeter. In accordance with the CIRIA Report C659/C665, the site has initially been assessed as a moderate risk of potential generation of gas but with a low sensitivity rating (commercial) and therefore the minimum requirement of 6 no. visits over a minimum 3 month period has been completed, in order to adequately assess the soil gas conditions below the site.

In total, 7 visits have been undertaken and the results are summarised in Table 5.1 below, along with the 'inert' background gas levels.

Table 5.1 -

Location	Date	Water (m bgl)	CO_2 (%v/v)	CH_4 (%v/v)	LEL (%v/v)	O_2 (%v/v)	Flow (l/hr)	PID (ppm)
Background		~	0	0	0	21.0	~	0
BH1	19/06/2007	'damp'	0.0	0.0	0.0	20.8	1009	<0.1
	19/06/2007	'damp'	1.1	0.0	0.0	18.9	1009	<0.1
	05/07/2007	'damp'	0.0	0.0	0.0	21.0	988	<0.1
	05/07/2007	'damp'	1.4	0.0	0.0	17.7	988	<0.1
	16/07/2007	'damp'	0.0	0.0	0.0	21.0	998	<0.1
	16/07/2007	'damp'	0.9	0.0	0.0	20.1	998	<0.1
	03/08/2007	'damp'	0.0	0.0	0.0	20.6	996	<0.1
	03/08/2007	'damp'	2.4	0.0	0.0	16.4	996	<0.1
	20/08/2007	'damp'	0.3	0.0	0.0	19.5	988	<0.1
	20/08/2007	'damp'	2.2	0.0	0.0	15.8	988	<0.1
	07/09/2007	'damp'	0.5	0.0	0.0	194	1007	<0.1
	07/09/2007	'damp'	1.8	0.0	0.0	17.6	1007	<0.1
	19/09/2007	'damp'	0.2	0.0	0.0	19.8	1005	<0.1
	19/09/2007	'damp'	2.8	0.0	0.0	16.6	1005	<0.1

5.0 Insitu Testing (Cont'd)

5.3 Insitu Gas & Groundwater Monitoring (Cont'd): -

5.3.1 Ground Gas Monitoring (Cont'd): -

As can be seen from the results to date, no Methane (CH_4) and slightly variable but low concentrations of Carbon Dioxide (CO_2), have been recorded in both boreholes, accompanied by fluctuating Oxygen (O_2) levels, as would be expected where these relatively inert fill materials.

Similarly, gas flow rates during the monitoring period to date are negligible, and therefore, in accordance with CIRIA Report C659/C665, the maximum GSV (Gas Screening Value) for CO_2 and CH_4 have been determined by multiplying the concentration recorded for each visit by the maximum flow rate (taken as 0.1l/hr when no flow recorded), and the results are summarised in Table 5.2 below.

Table 5.2

Position	Date	CO_2 (%v/v)	CH_4 (%v/v)	Flow Rate (l/h)	GSV - CO_2	GSV - CH_4	Characteristic Situation
BH1	19/06/2007	0.0	0.0	<0.1	0.0	0.0	1
BH2	19/06/2007	1.1	0.0	<0.1	0.0011	0.0	1
BH1	05/07/2007	0.0	0.0	<0.1	0.0	0.0	1
BH2	05/07/2007	1.4	0.0	<0.1	0.0014	0.0	1
BH1	16/07/2007	0.0	0.0	<0.1	0.0	0.0	1
BH2	16/07/2007	0.9	0.0	<0.1	0.0009	0.0	1
BH1	03/08/2007	0.0	0.0	<0.1	0.0	0.0	1
BH2	03/08/2007	2.4	0.0	<0.1	0.0024	0.0	1
BH1	20/08/2007	0.3	0.0	<0.1	0.0	0.0	1
BH2	20/08/2007	2.2	0.0	<0.1	0.0022	0.0	1
BH1	07/09/2007	0.5	0.0	<0.1	0.0005	0.0	1
BH2	07/09/2007	1.8	0.0	<0.1	0.0018	0.0	1
BH1	19/09/2007	0.2	0.0	<0.1	0.0002	0.0	1
BH2	19/09/2007	2.8	0.0	<0.1	0.0028	0.0	1

As can be seen from these results, the maximum GSV calculated is 0.0024l/hr, which falls well below the Characteristic 1/2 threshold value of 0.07l/hr, and therefore the site would be given a Characteristic Situation 1. In this case, no ground gas protection measures will be required for the proposed new structures.

5.3.2 Groundwater Monitoring: -

As can be seen from the results of the water monitoring, although the base of the standpipe installations were recorded as 'damp', there is no evidence of a perched shallow continuous groundwater surface (water table) being present below this site. Similarly, there is no evidence of trapped surface drainage or 'leachate' collection on top of the relatively impermeable clays below the made ground, most likely due to the high fine soil content within the made ground (arising from the disturbed natural strata present), such that these materials would also be considered as relatively impermeable, particularly at surface. This was verified with pools of rainwater collecting on the surface when the investigation positions were completed, due to the periods of heavy rain preceding these field works.

Bearing this in mind, it can be seen that for any excavations carried out on this site, significant ingresses of groundwater are not anticipated. However, it would be prudent to allow for the introduction of temporary groundwater control measures, i.e. pumping equipment, in order to take care of any localised pockets or lenses trapped within or on top of the made ground, particularly during the wetter periods of the year.

6.0 Laboratory Testing

All geotechnical testing was carried out in accordance with BS1377:1990:Parts 1-9, unless otherwise stated. Ground contamination screening was undertaken by Chemtech Environmental of Consett, Co. Durham, the results of which can be seen in the Chemtech Analytical Report ref no. ARC/34679(1), a copy of which can be seen in Appendix V.

6.1 Determination of pH & SO_4:-

Representative samples (12 no.) of the made ground deposits encountered in the boreholes and trial pits were tested in order to determine their acidic (pH) and soluble sulphate (SO_4) levels. The results are shown in Table 6.1 below.

Table 6.1

Test Hole	Depth (m)	pH	SO_4 (mg/l)	DS Class	ACEC Class
	1.00-2.00	7.3	1190	DS-2	AC-2
	1.00-2.50	8.0	258	DS-1	AC-1
	2.50-3.00	8.3	<10	DS-1	AC-1
	1.00-2.50	7.6	1526	DS-3	AC-3
	0.80	7.7	435	DS-1	AC-1
	0.50	8.1	1925	DS-3	AC-3
	0.50	8.0	1794	DS-3	AC-3
	1.50	7.7	1830	DS-3	AC-3
	1.00	7.5	1750	DS-3	AC-3
	0.50	7.8	1455	DS-2	AC-2
	0.50	8.2	1736	DS-3	AC-3
	1.50	8.1	1744	DS-3	AC-3

ACEC = Aggressive Chemical Environment for Concrete site classification

As can be seen from these results, it can be seen that the pH values for the samples tested range from 7.3 to 8.3, and the amount of Soluble Sulphate present falls both outside and within the negligible range (<500mg/l). Therefore, in accordance with BRE Special Digest 1: 2005 (3rd Edition), the site can be given a classification of Class DS-3 and when considering the nature of the materials tested, assuming mobile groundwater, the assessment of the Aggressive Chemical Environment for Concrete (ACEC) for the site overall, is AC-3.

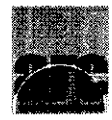
6.2 Contamination Screening: -

Representative samples of the made ground recovered during the investigation were passed onto Chemtech Environmental of Consett, Co. Durham, so that generic soil contamination screening could be carried out.

In total representative samples (12 no.) were screened using a standard contamination suite (based on the current CLEA SGV listed analytes with historical additions), which is used to assess typical made ground (disturbed natural strata mixed with inert anthropogenic debris). In addition, due to the previous identification of asbestos containing materials in some samples recovered by the EA from the sloped north eastern edge of the site area, all the samples were also screened for asbestos.

Due to the lack of historical, visual, olfactory and analytical evidence, no screening for fuels, oils or potential sources of other hydrocarbons (TPH's, PAH's, etc.) was required or undertaken.

The Phase 1: DTS identified that the site was at a low to moderate risk of leachable contaminants due to the depth of made ground on the site, as well as the proximity of potentially sensitive receptors (i.e. Minor Aquifer below the site and a surface watercourse to the east). Consequently 6 (50%) no. soil samples were subjected to generic leachate screening.



6.0 Laboratory Testing (Cont'd)

6.2 Contamination Screening (Cont'd): -

The catalogue of testing results can be found in the Chemtech Analytical Report, ref no. ARC/34679(1) attached in Appendix V, and the results have been used to complete a Level 1 Quantitative Risk Assessment for Human Health and Controlled Waters (Section 7.0).

The total analysis carried out to date is summarised below:

- 12 no. soil samples screened for a generic soil suite (arsenic, cadmium, chromium, lead, mercury, nickel, selenium, free cyanide, free sulphur and Total Organic Carbon (TOC)).
- 6 no. soil samples tested for a generic leachate suite (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, sulphate, boron, free cyanide and sulphide).
- 12 no. soil samples screened for Asbestos.

The samples targeted for contamination screening were placed within either plastic containers or amber glass jars (where organics were suspected / or ash debris was noted) and then stored and transported within refrigerated (cool boxes maintained at c.4°) boxes until delivery to the laboratory.

7.0 Level 1 Ground Contamination Risk Assessment

7.1 Methodology: -

This quantitative ground contamination risk assessment has been carried out generally in accordance with the guidance in Contaminated Land Report CLR11; Model Procedures for the Management of Land Contamination (2004), which is the current UK standard practice for the development of brownfield sites and is based on the established *source-pathway-receptor* pollutant linkage methodology and 'suitable for use' approach (Part IIA, EPA 1990 - inserted through Section 57 EA 1995).

ARC adopts a tiered approach to risk assessment, which is consistent with this guidance, and is also based on the CLEA Model (CLR10), beginning with a 'Level 1' Risk Assessment where site data is compared with published soil guidance values (SGV's), generic assessment criteria (GAC), site specific assessment criteria (SSAC), risk based screening levels (RBSL's) and/or remedial targets. The

For this level of risk assessment, the SGV's, GAC's, SSAC's, guidance levels, etc., used for comparison to site values are essentially intervention values, and represent concentrations below which the risk is considered to be sufficiently low that there will be no *significant risk to human health*, following prolonged exposure, i.e. the Average Daily Human Exposure (ADE) is less than the Tolerable Daily Intake (TDI) or Index Dose (ID) (ratio of ADE/TDI or ID <1.0).

Initially, the primary *source(s)* of potential ground contamination present on the site is determined, based on the results of the Phase 1: DTS as well as any visual and / or olfactory and analytical data obtained during the intrusive investigation works. In accordance with the CLEA methodology, and taking into account the proposed end use, the *pathways* and *receptors* are identified for this site.

The Level 1 risk assessment considers two main categories of receptor, and these are as follows:

- On site Human Health – based on CLEA Model (CLR10 + Briefing Notes 1-4).
- Controlled Waters – (Groundwater & surface water) – EA Remedial Targets Methodology: Hydrological Risk Assessment for Land Contamination (December 2006).

7.0 Level 1 Ground Contamination Risk Assessment (Cont'd)

7.1 Methodology (Cont'd): -

Where any Level 1 criteria have been exceeded, then two courses of action are available for recommendation. The first option is to 'break' the pollutant linkage by designing into the proposed development works or by recommending appropriate remediation works, i.e. removal of source, installation of permanent barriers, etc.

The second option is to carry out more site specific detailed quantitative risk assessment (DQRA, i.e. Level 2 or above) for the contaminants present by taking into account factors such as soil type, properties and characteristics (permeability, porosity, density, etc.), groundwater depth and flow, availability of plausible pathways, site specific exposure values and assumptions and contaminant retardation, attenuation, dilution and degradation.

When considering the risk to the construction workforce, the results of the screening can be used by the Main Contractor / Project Coordinator, when devising an adequate Site Health & Safety Plan, in accordance with current CDM Regulations, and when assessing the level of PPE required on site. When considering the risks to building materials, again the results of the contamination screening as well as Section 6.1 can be used to determine the level of protection that may be required, and therefore it is recommended that reference should be made to the utilities suppliers for their comments.

7.1.1 Level 1 - Human Health: -

Level 1 human health related assessments are currently based upon the CLEA Model, with site values assessed against the published Soil Guidance Values (SGV's) or generic / site specific assessment criteria (GAC's, SSAC's) where necessary using updated Department for the Environment, Food & Rural Affairs (Defra) published toxicological data. Where published SGV's are not available, either the recently adopted LQM CIEH GAC's or Atkins ATRISK^{SOIL} SSV's (Site Screening Values) have been used, based on the appropriate standard end use (*Commercial Industrial*).

If the proposed end use is none standard, and/or SSAC's are required, initially reference is made to the recognised UK sources for physio-chemical, toxicology and building types (i.e. Defra, CLR briefing notes, EA publications, etc.). Where no UK data is available, data for the CLEA Model is supplemented from other appropriate published and recognised sources, following the EA hierarchy of UK, European, WHO, other i.e. US Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG), State of Massachusetts Department of Environmental Protection (MaDEP), Dutch National Institute for Public Health and the Environment (RIVM, 2001).

For the soils, and based on CLR7, the affected area has been assessed to delineate any potentially differing areas of contamination (averaging areas), based on historical, visual, olfactory and analytical evidence, and for this site is discussed further in Section 7.2.

Following this geographical delineation of the site, where appropriate and assuming a normal distribution of results, the statistical upper bound value (95% percentile – US_{95}) for a given analyte, has been determined from the Mean Value Test (MnVT) (CLR7), and then compared with the chosen Level 1 Target Concentration (C_T) value for the site, based on the SGV, GAC, SSAC, etc., values listed in Section 7.4 of this report. Where appropriate the Maximum Value Test (MxVT) is then applied to determine whether the maximum concentrations recorded represent, statistically, potential 'hot spots' (i.e. statistical outliers).

Where potential 'hot spots' are identified, through visual, olfactory, anecdotal and/or analytical results, i.e. potential fuel 'hot spots', or PAH's from ashy materials, the maximum concentrations C_M are compared directly to the chosen Level 1 Target Concentrations (C_T), to determine whether the levels present represent a potential risk to the various receptors under consideration.

7.0 Level 1 Ground Contamination Risk Assessment (Cont'd)

7.1 Methodology (Cont'd): -

7.1.1 Level 1 - Human Health (Cont'd): -

However, no potential 'hot spots' of contamination have been identified within the made ground from these investigation works.

7.1.2 Level 1 – Controlled Waters: -

Level 1 Groundwater risk assessments are carried out (in accordance with the EA Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination, 2006) by comparing recorded leachate values or samples of water, with the chosen Target Concentration (C_T) value, based on an appropriate water quality standard (using the EA EQS – Environmental Quality Standards – for drinking water and freshwater, where appropriate), and which is also taken as the Level 1 Leachate Remedial Target (LTC_1).

The number of samples chosen for leachate screening on the generic made ground is determined by assessing the potential risk of leachate reaching a sensitive receptor, i.e. groundwater, nearby surface water features, etc., based on the results of the Phase 1: Desk Top Study as well as olfactory, visual, anecdotal and analytical evidence collected during the intrusive investigation works. Where the potential risk is considered to be low c.25% of the soil samples screened are targeted for generic leachate screening, c.50% where the risk is considered to be moderate and 100% where the risk is considered to be high, this is discussed further in Section 7.3. This is to ensure that the potential leachate characteristics of the generic made ground are adequately assessed without carrying out unnecessary testing.

The C_T values for this site are primarily based on the EA EQS UK values for drinking water and/or freshwater. Where no UK values are available, EU values for freshwater or drinking water are used or alternatively established WHO values. Where no values are available for specific analytes (typically some organic compounds), the values given for similar compounds or detection limits have been used.

7.2 Conceptual Site & Exposure Models: -

A representative schematic Conceptual Site Model (CSM) can be found in Appendix VI, along with Table 7.1 on the following page, which summarises the conceptual exposure model (CEM) for this particular site post construction of the agricultural buildings, assuming no remediation, additional protection or removal of the source contamination takes place.

7.2.1 Sources: -

As can be seen from this model, the whole of the area below the proposed new agricultural building is made up of fill materials, which were brought to site and tipped, eventually to the current site levels, which resulted in a relatively level area to the east of the original farm buildings and onto which new agricultural buildings can be constructed, without requiring ramps or retaining walls to accommodate the original variation in ground levels. These fill materials originally comprises disturbed natural strata arising from excavations carried out in the surrounding fields and from the end of 2001, these were also mixed with inert building (rubble, concrete and stone waste) and some inert waste from the farm (plastic sheeting, etc.) as well as rubble, concrete, soil and brick from and external source (Marcus Richardson Waste Management).

Consequently, the whole of the made ground is considered to be a source of generic contaminants which could contain some elevated concentrations of metals, metalloids and non-organic compounds. In addition, although there was no evidence of ACM's (asbestos containing materials) being present in any of the investigation positions undertaken during these works, based on the verbal results of the previous sampling

7.0 Level 1 Ground Contamination Risk Assessment (Cont'd)

7.2 Conceptual Site & Exposure Models (Cont'd): -

7.2.1 Sources (Cont'd): -

and screening carried out by the EA, the presence of ACM's has also be considered. Similarly, although there was no evidence of significant quantities of biodegradable materials being present, the made ground has also been considered as a potential source of landfill gas.

Table 7.1: Conceptual Exposure Model Summary

	Pathway(s)	Receptor(s)		
Direct contact	SOIL: Ingestion, Dermal Contact & plant uptake	End Users ..... *Construction Workforce ..... Building materials	YES (Limited) ..... YES ..... YES	Pollutant linkage (PL) available in areas of soft landscaping. During any construction standard PPE will be required. Potential aggression where materials come into contact with made ground (i.e. foundations).
Wind / Volatilisation	AIR: Inhalation of vapour and direct contact with dust	End Users ..... *Construction Workforce	YES (Limited) ..... YES	Pollutant linkage (PL) available in areas of soft landscaping, as well as internally for vapours. During any construction work standard PPE will be required.
Ground Gas	AIR: Inhalation of Landfill Gas	End Users	YES	Pollutant linkage (PL) available where no gas mitigation measures are present.
Surface infiltration / leaching & direct discharge from damaged surface drainage and existing foul drainage system.	WATER: Adjacent sites, Groundwater.	Adjacent sites, Controlled Waters.	YES (Limited)	Pollutant linkage (PL) available where no hard cover is present or leaking drainage allows surface water infiltration. However, the site is underlain by clay strata that will afford significant protection to the underlying Minor Aquifer.

* - not considered as part of Level 1 Human Health or Controlled Waters risk assessment. Screening results can be used to assess level of protection, where necessary.

Therefore, for the potential contamination present within the made ground, the site has been considered as a 'single averaging area'. When considering ground gases, the potential source of production is the made ground below the whole of the proposed building footprint, and the risks associated with this issue have already been considered in Section 5.3 of this report.

The Potential Contaminants of Concern (PCOC's) have been identified for this site and are summarised in Table 7.2 on the following page.

7.2.2 Pathways: -

When considering the proposed end use (*Commercial/Industrial*), and without considering treatment, removal or protection measures, there are some potential plausible pathways available for direct contact, dermal contact,

7.0 Level 1 Ground Contamination Risk Assessment (Cont'd)

7.2 Conceptual Site & Exposure Models (Cont'd): -

7.2.2 Pathways (Cont'd): -

ingestion, inhalation, wind (dust/particulate), volatilization, and vertical and lateral transportation below the site, both within the existing structure and externally, where there is no hard cover, gas or vapour barriers present.

Table 7.2 (after CLR 8) GMG – Generic Made Ground, THS – Targeted Hot Spot

PCOC	Source	Receptors				
		Humans	Water	Vegetation	Construction Workers	Buildings
Arsenic	GMG	YES	YES	NO	NO	YES
Cadmium	GMG	YES	YES	YES	NO	YES
Chromium	GMG	YES	YES	NO	NO	YES
Lead	GMG	YES	YES	YES	NO	YES
Mercury	GMG	YES	YES	YES	NO	YES
Selenium	GMG	YES	YES	YES	NO	YES
Boron	GMG	NO	YES	YES	NO	YES
Copper	GMG	NO	YES	YES	NO	YES
Nickel	GMG	YES	YES	YES	NO	YES
Zinc	GMG	NO	YES	YES	NO	YES
Cyanide	GMG	YES	YES	YES	NO	YES
Sulphate (total)	GMG	NO	YES	YES	YES	YES
Sulphide	GMG	NO	YES	YES	YES	YES
Asbestos	GMG	YES	NO	NO	NO	YES
Landfill Gas	GMG	YES	NO	YES	YES	YES

* - the primary source of ground gases is the backfilled brick ponds.

Within the CLEA Risk Assessment Model for Human Health, there are 3 exposure mediums considered for on site receptors, comprising ingestion of soil containing contaminants, inhalation of contaminated dust/vapours and dermal contact, with up to 10 no. exposure pathways considered, as follows;

- *1. Outdoor ingestion of Soil 2. Indoor ingestion of dust 3. Ingestion of contaminated vegetables 4. Ingestion of soil attached to vegetables 5. Outdoor dermal Contact with soil 6. Indoor dermal contact with household dust 7. Outdoor inhalation of fugitive dust 8. Indoor inhalation of fugitive dust 9. Outdoor inhalation of soil vapours 10. Indoor inhalation of soil vapours.*

Where the future site has hard cover and below new structures, the majority of these pathways will not be available, except where building materials / structures and services come into direct contact with the made ground. Similarly, due to the nature of the proposed end use, pathways 3 & 4 have been removed from the model

When considering the potential pathways for leachate migration, where either hard cover and/or future surface water drainage systems are present, the potential effects of surface infiltration or contaminated surface water runoff will be greatly reduced. In addition, both the clayey content within the made ground and the presence of the relatively impermeable natural clays underlying the made ground below the whole of the site, will prevent significant leaching or vertical migration of any potential contaminants into the Minor Aquifer below this site or towards the stream located 120m to the east. The ponds located to the north west of the site do not lie down gradient and will not be at risk from any lateral or vertical migration, if this takes place. Similarly, when considering the construction work force, exposure pathways through direct contact, ingestion

7.0 Level 1 Ground Contamination Risk Assessment (Cont'd)

7.2 Conceptual Site & Exposure Models (Cont'd): -

7.2.2 Pathways (Cont'd): -

and dust inhalation will be available during part of the construction process, and therefore adequate PPE should be provided to protect the work force during this period.

7.2.3 Receptors: -

Within the CLEA Risk Assessment Model for Human Health, at Level 1 stage, the potential receptors are assessed initially on standard site end uses, followed by a delineation of age category (i.e. child or adult), with default settings for the most sensitive end use (*Residential with Plant Uptake*) based on a female child aged up to 6. The 4 no. end use categories presently in use are as follows;

- *1. Residential with Plant Uptake, 2. Residential without Plant Uptake, 3. Allotments / Ingestion of contaminated vegetables, 4. Commercial/Industrial.*

For this Level 1 Risk Assessment, the end use category (best fit standard end use) for the whole site has been taken as:

4. Commercial/Industrial

For controlled waters, the primary receptors for the Level 1 Risk Assessment are considered to be the water course located c.120m to the east and the underlying groundwater within the Minor Aquifer.

7.3 Screening Strategy: -

The samples screened for the contaminant screening were chosen from various depths within both the boreholes and trial pits to reflect the 'homogeneous' nature of the potential contaminants within the general matrix of the made ground encountered across the site as a whole (considered as a single averaging area), whilst taking into account the historical and current use(s) of various portions of the site.

Taking into account the ground conditions present, the likely sources of contaminants, available pathways and receptors, the potential risk of leachate reaching a sensitive receptor is considered to be low to moderate and therefore six (6 no.) of the soil samples (generally the highest soils concentrations) were chosen for generic leachability screening. The primary screening strategy for the samples chosen has been summarised in Table 7.3 below.

Table 7.3 MG – made ground, R – randomly selected sample, T – targeted sample, * - screening carried out on sample.

BH1	1.00-2.00	MG	R & T	*		*	N
BH2	1.00-2.50	MG	R & T	*		*	N
BH3	2.50-3.00	MG	R & T	*		*	N
BH4	1.00-2.50	MG	R & T	*		*	N
TP1	0.80	MG	R	*			N
TP2	0.50	MG	R	*			N
TP3	0.50	MG	R	*			N
TP3	1.50	MG	R	*			N
TP4	1.00	MG	R & T	*		*	N
TP5	0.50	MG	R	*			N
TP6	0.50	MG	R & T	*		*	N
TP6	1.50	MG	R	*			N

7.0 Level 1 Ground Contamination Risk Assessment (Cont'd)

7.3 Screening Strategy (Cont'd): -

Due to the lack of significant perched water within the made ground or groundwater present, no sampling or screening was undertaken.

7.4 Level 1 Risk Assessment (Soils):-

7.4.1 Human Health – Generic Soils Screening: -

The calculation spread sheet showing the MnVT calculations for the US_{95} values for each metal, metalloid and non-organic compounds selected for generic screening, along with the chosen target concentration C_T values, can be seen in Appendix VI.

In addition, the MxVT (maximum value test) values have been calculated, in order to highlight maximum concentrations, which may represent statistical 'hot spots'. A summary of the results of the Level 1 Risk Assessment from the results of the soil concentrations can be seen in Table 7.4 below.

Table 7.4

Whole of Site Analyte	Target Concentration (C_T) mg/kg	No. of Samples Screened	Maximum Concentration (C_M) recorded	Statistical Upper Bound Value (US_{95}) mg/kg	Has US_{95} exceeded C_T	No. of Sample $> C_T$	Is C_M an outlier (statistical hot spot)
Arsenic	500[1]	12	10.0	8.2	N	0	N
Cadmium	1400[1]	12	0.8	0.4	N	0	N
Chromium	5000[1]	12	27.0	19.6	N	0	N
Lead	750[1]	12	480.0	157.5	N	0	N
Mercury	480[1]	12	0.5	0.5	N	0	N
Selenium	8000[1]	12	0.3	0.3	N	0	N
Nickel	5000[1]	12	35.0	21.0	N	0	N
Cyanide	34[2]	12	2.0	2.0	N	0	N

[1] = CLEA SGV values (Commercial/Industrial) [2] = ATRISK^{SOIL}, ~ = Not applicable, **BOLD** = Elevated result

The results of the Level 1 Risk Assessment for the generic made ground have identified the following;

- None of the C_M values for any of the analytes screened exceed the chosen C_T values for this site.
- The C_M value for Cadmium is noted as a statistical 'hot spot'. However, both the corresponding C_M values and US_{95} values are noted as falling below the relevant and appropriate C_T values.
- None of the remaining C_M values for the analytes screened are recorded as statistical outliers (i.e. 'hot spots') and therefore the US_{95} values can be taken as representative of the site as a whole.
- For all analytes, the US_{95} values are recorded as falling below the relevant C_T values for this site.
- Consequently, when considering these results, the generic made ground below the site is not considered as posing a significant risk to the proposed end users (*Commercial/Industrial*) and therefore no treatment, removal, protection measures and/or further detailed quantitative risk assessment (DQRA) is deemed as necessary.

7.4.2 Human Health – Asbestos Screening: -

The results for the 12 samples screened for ACM's can be found in Table 7.5 on the following page.

7.0 Level 1 Ground Contamination Risk Assessment (Cont'd)

7.4 Level 1 Risk Assessment (Soils) (Cont'd):-

7.4.2 Human Health – Asbestos Screening (Cont'd): -

Table 7.5

BH/ TP	Depth (m)	Chrysotile (white)	Amosite (brown)	Crocidolite (blue)	Anthophyllite	Actinolite	Tremolite	Other Asbestos (Where NAD)
BH1	1.00-2.00	ND	ND	ND	ND	ND	ND	Y
BH2	1.00-2.50	ND	ND	ND	ND	ND	ND	Y
BH3	2.50-3.00	ND	ND	ND	ND	ND	ND	Y
BH4	1.00-2.50	ND	ND	ND	ND	ND	ND	Y
TP1	0.80	ND	ND	ND	ND	ND	ND	Y
TP2	0.50	ND	ND	ND	ND	ND	ND	Y
TP3	0.50	ND	ND	ND	ND	ND	ND	Y
TP3	1.50	ND	ND	ND	ND	ND	ND	Y
TP4	1.00	ND	ND	ND	ND	ND	ND	Y
TP5	0.50	ND	ND	ND	ND	ND	ND	Y
TP6	0.50	ND	ND	ND	ND	ND	ND	Y
TP6	1.50	ND	ND	ND	ND	ND	ND	Y

ND = None detected, Y = Fibres present

- Non-asbestos fibres were identified within all of the samples of made ground tested, with no asbestos containing materials being noted.
- Consequently, the results of the testing completed would indicate that ACM's are not widespread across the development area and as a result no protection measures would be required.
- However, Environment Agency have confirmed verbally that some ACM's (along the NE facing slope) were recorded from samples recovered from the NE facing slope, and as a result it would be considered prudent to provide a barrier layer across the site as a whole, where no future hard surfaces are envisaged.
- In addition, it would be the proposed construction contractor should be advised of the results of this investigation and the previous screening carried out and in order to ensure that they can undertake the relevant Health & Safety risk assessments and where necessary (i.e. if ACM's are encountered) the appropriate protection measures.

7.5 Level 1 Risk Assessment (Leachate): -

Based on the results of the soils screening carried out on the various samples chosen, targeted leachate screening (generic suite) has been carried out, on 6 no. soil samples. The results have been used to complete a Level 1 Risk Assessment for the potential impact on groundwater below this site (based on EA Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination, 2006).

The results are summarised in Table 7.6 on the following page, and have identified the following:

- When considering the results of the generic Leachate screening, none of the C_M values for the generic analytes screened exceed the chosen maximum C_T values for this site, with the exception of two samples where elevated soluble Sulphate (338mg/l & 1086mg/l) has been noted at depths of between c.0.50m and 2.50m within BH4 and TP6.
- However, the values of leachable Sulphate range from <10mg/l (detection limit) up to 1086mg/l, but do not correlate with the results of the soluble sulphate tests carried out for determining the foundation concrete classification.

7.0 Level 1 Ground Contamination Risk Assessment (Cont'd)

7.5 Level 1 Risk Assessment (Leachate) (Cont'd): -

Table 7.6

Analysis		Site Data		P20 Soil Remedial Targets	
LEVEL 1	Target Conc. C_T (ug/l)	Max. Leachate Conc. (ug/l)	Has max. C_T Value Been Exceeded	ATRC (ug/l)	LTG (ug/l)
Arsenic	50[1]	2	NO	~	50[1]
Cadmium	5[1]	<1	NO	~	5[1]
Chromium	50[1]	<3	NO	~	50[1]
Lead	50[1]	50	NO	~	50[1]
Mercury	1[1]	<1	NO	~	1[1]
Selenium	10[1]	<1	NO	~	10[1]
Copper	50[1]	15	NO	~	50[1]
Nickel	50-200[2]	6	NO	~	50-200[2]
Zinc	3000[1]	27	NO	~	3000[1]
Boron	2000[2]	<200	NO	~	2000[2]
Cyanide	50[1]	<20	NO	~	50[1]
Sulphide	100[2]	<100	NO	~	100[2]
Sulphate	250mg/l[1]	1086mg/l	YES (BH4 & TP6)	~	250mg/l[1]

[1] - EQS UK Surface water for abstraction of drinking water – category A2 – normal physical treatment, [2] - EQS UK Freshwater value – where a range is given the value is dependant upon water hardness. [3] – Detection limit

- When considering the levels of leachable Sulphate recorded in the made ground, and compared with the results of the soluble sulphate tests, it can be seen that the risks associated with elevated sulphate concentrations reaching the potential receptors will be low, particularly when considering the relatively impermeable nature of the underlying natural clay layer, the low permeability characteristics of the fill itself and the distance to the nearest watercourse, as well as the final hardcover which will be present once the new agricultural buildings are present.

7.6 Off-Site Disposal: -

When considering the removal of any materials from this site as a waste, to be disposed of at a landfill, it can be seen that if any natural strata (excluding any 'topsoil' or 'peat' materials) can be kept separate from the made ground, then these materials can be considered as 'inert' and taken to an Inert Landfill Site. Prior to disposal of these materials, full WAC screening will need to be undertaken, with the number of samples to be screened dependant upon the volume of material to be disposed of.

Where made ground is to be removed off site as a 'waste', a preliminary assessment, regarding off-site disposal, can be made utilising the generic contamination screening undertaken as part of the Level 1 Risk Assessment. At this stage, it is likely that the generic made ground, will be classified as non-hazardous, although some further preliminary screening may be required to verify this.

However, if any ACM's are encountered during the excavation works, then these will need to be handled appropriately and treated as Hazardous, i.e. disposal at a Hazardous Waste Landfill.

Therefore, prior to disposal of any materials, it is recommended that copies of this report are passed on to landfill operators for their comments, since the amount of addition preliminary and/or WAC screening that will eventual required will be based upon the volume of material to be disposed of. If possible, removal of materials from site as a 'waste' should be kept to a minimum.

8.0 Conclusions & Recommendations

8.1 Ground Conditions: -

From the information gained during these intrusive ground investigation works, it can be seen that the ground conditions encountered are generally as anticipated. From the known history, the site has been brought up to its present level by the tipping of 'inert' waste materials, comprising a mixture of disturbed natural strata, i.e. soil, clay sand and gravel, inert farm waste (demolition rubble, plastic sheets, etc.) and inert demolition rubble from an outside source. As can be seen from the description of the materials encountered in the boreholes and trial pits, the results of these investigation works generally concur with the types of materials which were allowed to be tipped, before the EA prevented further tipping after December 2005.

There was no evidence of significant voiding or cavities within the made ground, with the results of the insitu testing typically confirming a medium density material. Similarly, there was no evidence of significant quantities of biodegradable materials being present within the fill, although some soily materials and pieces of timber were noted. As expected, there was no evidence of any fuel, oil, solvent, chemical or 'ashy' contamination being present within the made ground.

Although the EA recovered samples previously from the face of the slope on the north easterly edge of the site which contained ACM's, there was no visual or analytical evidence noted at any of the investigation positions, and therefore asbestos contamination does not appear to be wide spread or pervasive across the site.

Below the made ground, at depths of between 2.20m and 4.00m below current ground levels, initially a firm to stiff sandy gravelly clay (Boulder Clay) is present, which in turn overlies medium dense to dense brown sands at depths of between 5.00m and 5.70m bgl. The boreholes were all terminated within this sand at depths of 10.00m bgl, indicating that the anticipated solid geological deposits below this site are at depths greater than this.

It should also be noted that the depth of fill generally increases as the site trends towards the eastern corner and this generally concurs with the anticipated original topography of the site.

8.2 Groundwater:-

There was no significant groundwater encountered in the boreholes and trial pits, the majority of which remained dry throughout the period of the investigation period, although a small ingress of water was noted in TP4, at a depth of c.2.90m within the made ground. However, there was insufficient volume to record a standing level before the excavation was backfilled with arisings.

Similarly, following the monitoring period, there was no evidence of a perched shallow continuous groundwater surface (water table) being present within the made ground on top of the fill and therefore no significant problems are expected with respect to groundwater ingresses into excavations on this site for the agricultural building. Deeper groundwater is anticipated to be present within the solid geology, but this will not have a significant influence on the proposed development of the site in the future, and when considering the nature of the natural drift materials below the made ground, there will be no direct recharge from surface drainage filtering down through the made ground.

However, particularly when considering the standing surface water noted at the time of the field works, it is felt it would be prudent to allow for the possible introduction of temporary groundwater control measures, i.e. pumping equipment, in order to take care of ingresses from unforeseen isolated pockets and lenses of trapped water within the made ground, particularly during the wetter periods of the year.

8.0 Conclusions & Recommendations (Cont'd)

8.3 Gas Protection Measures:-

From the results of the gas monitoring (7 no. visits over 3 months) undertaken to date, in accordance with CIRIA Report C659, a maximum GSV value of 0.0024l/hr has been determined and therefore the site can be given a Characteristic Situation 1. Bearing this in mind, it can be seen that there is no required from gas protection measures to be incorporate in any of the new or existing structures on or adjacent to this site, and this concurs with the lack of significant biodegradable materials noted within at the investigation positions.

8.4 Foundation Options: -

When considering the nature of the ground conditions below this site, and the scope of the proposed development works, it can be seen that the fill materials it their present condition should prove a suitable foundation medium for the new agricultural building, particularly as these types of structures traditionally can accommodate significantly greater magnitudes of normal and differential settlements, compared to more sensitive structures such as houses, glass front office blocks, etc.

Although visually the made ground is locally quite variable, the results of the insitu testing suggests are more consistent materials, with typical SPT 'N' values in the range 20 to 25. Under normal circumstances, this would suggest typical maximum allowable bearing pressures of c.200kN/m^2 to 250kN/m^2 for conventional shallow strip and pad footings. However, in order to take into account the inherent inconsistencies associated with made ground, and potential for possible future settlements through further self consolidation or localised compression of timber fragments, etc. (limited), it is recommended that the maximum allowable bearing pressure is restricted to 100kN/m^2. This should ensure that both short and long term normal (25mm max) and differential settlements (15mm max) are well within acceptable limits for the new structure.

The strip and pad foundations should be taken down to a minimum depth of 0.90m below finished ground levels, in order to take into account the clay content within the made ground. However, this should, still prove both adequate and economic for the proposed new cattle shed.

From the results of the insitu CBR tests undertaken, it can be seen that a design CBR value of 4% can be taken, where the natural clays are to be used as an undisturbed subgrade for the design and construction of any areas of hardstanding, access roads or ground bearing floor slabs. Due to the inherent inconsistencies associated with the generic made ground, it is felt that if this material is to be used as an undisturbed subgrade then a design CBR value of 2% should be taken.

Due to the coarse fraction of some of the materials present within the fill, representative insitu or laboratory CBR tests could not be undertaken. However, based on the results of the insitu SPT tests, it is felt that a CBR value of 3% can be taken for the made ground, where it is to be used as an undisturbed subgrade for any new access roads, areas of hardstanding, ground bearing floor slabs, etc.

8.5 Ground Contamination: -

From the results of the contamination screening carried out it on the made ground, it can be seen that generally low levels of contamination are present, such that there is not a significant risk to human health for the proposed end use (*Commercial / Industrial*). Similarly, from the results of the leachability screening, although some elevated concentrations of leachable Sulphate were noted, taking into account the ground conditions present, the nature of the proposed works and the distance to the nearest receptors, there is not a significant risk to controlled waters or adjacent sites, and therefore no additional protection or treatment measures are considered necessary.

8.0 Conclusions & Recommendations (Cont'd)

8.5 Ground Contamination (Cont'd): -

However, although no ACM's were noted in any of the samples recovered during these investigation works, indicating that no protection measures are required, it is felt it would be prudent to take into account the verbal confirmation from the EA that ACM's were noted in samples that they recovered from the north eastern slope of the site. Therefore, the following remediation measures are recommended to be incorporated into the design and construction of the new agricultural structure on this site.

- To provide a clean cover layer (500mm minimum depth) as part of the future landscaping for all areas of soft landscaping to remain after construction of the new agricultural building. Particular care will need to be taken to ensure that this thickness of cover is maintained on all sloped portions of the site post installation – some benefit will be gained by incorporating new planting into the scheme to help 'hold' the clean cover on the slope.
- Design of the clean cover system should comprise a minimum of 500mm of inert material, including a minimum 150mm topsoil layer (root zone). The materials used for this cover should be screened to ensure that they are inert and fall below the Level 1 target concentrations given in this report. It should be noted that site won natural strata from this site can be considered as inert, and used for part of the clean cover system, provided the screening results indicate its suitability for reuse.
- Monitoring of all excavations for foundations, service runs, etc., to check for possible ACM's, with appropriate Health and Safety measures taken by the contractor during these works.
- If ACM's are encountered during future excavation works, then these should be removed to an appropriate waste disposal facility.

When considering the risk to building materials coming into contact with the made ground, it can be seen that a concrete design class of DS-3 and ACEC class of AC-3 will be required due to the elevated concentrations of soluble Sulphate, all foundations and buried concrete. Suitable building materials and service pipes should also be selected where they are envisaged to come into contact with the made ground/fill. The contamination results can also be used by the Main Contractor / Project Coordinator, when devising an adequate Site Health & Safety Plan, in accordance with current CDM Regulations.

8.6 Disposal to Landfill: -

When considering the removal of any materials from this site as a waste, to be disposed of at a landfill, it can be seen that where any uncontaminated natural strata (excluding any 'topsoil' or 'peat' materials) can be kept separate from the made ground, then these materials can be considered as 'inert' and taken to an Inert Landfill Site. Prior to disposal of these materials, full WAC screening will need to be undertaken, with the number of samples to be screened dependant upon the volume of material to be disposed of.

Where made ground materials are to be removed off site as a 'waste', a preliminary assessment, regarding off-site disposal, can be made utilising the generic contamination screening undertaken as part of the Level 1 Risk Assessment in Section 7.0, and at this stage, it is felt likely that the made ground, excluding any ACM's if present, will be classified as non-hazardous, although some further preliminary screening may be required to verify this. As indicated above, if any ACM's are encountered, these materials will need to be considered as Hazardous Waste and dealt with appropriately.

8.7 General Comments: -

For future site works, adequate lateral trench support will be required for excavations, in order to prevent trench wall collapse or over excavations, as well as to create a safe working environment below a depth of 1.20m, and any excavations on this site should remain open for as short a period as possible, since some of

8.0 Conclusions & Recommendations (Cont'd)

8.7 General Comments (Cont'd): -

these materials may be susceptible to deterioration, if left open to the natural elements for any significant period of time. It is also recommended for any new developments, adequate surface drainage should be designed and installed by a competent contractor, in order to prevent surface water 'ponding' or collection, during and post construction, particularly where the existing surface drainage system is disrupted or damaged.

In addition, for deeper excavations, drainage, service runs or the like that may pass close to or beneath any existing or proposed new foundations, these should be undertaken with care and completed prior to the preparation of any new foundations, so as not to allow any loose or granular material to move or 'flow', thus causing settlement to occur to any new or adjacent old foundation based at a higher level.

At the time of these investigation works, it was noted that a number of intact and partially intact 'cement' roofing sheets were present on the south eastern edge of the site, originating from one of the other farm buildings and it is understood that these will be removed from site prior to commencing the construction of the new agricultural building.

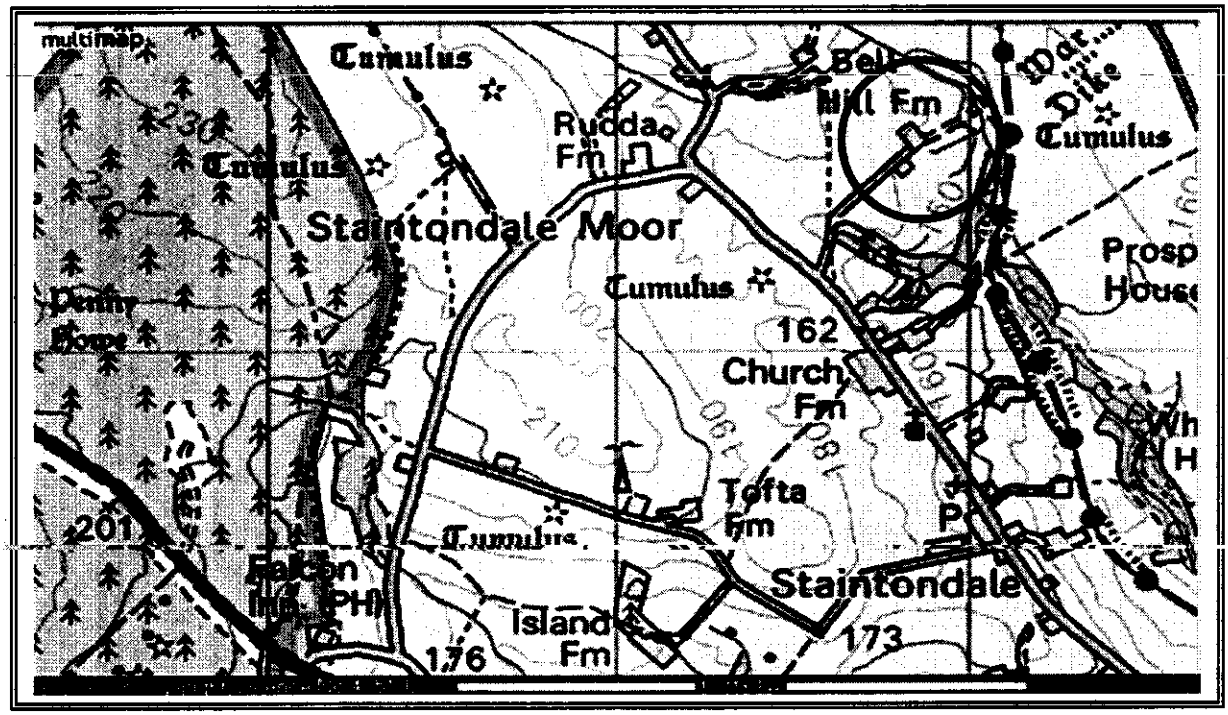
From the results of the Phase 1: Desk Top Study, it can be seen that the site is situated within an area where Basic Radon Protection Measures are not required for new structures and is also not affected by coal mining as there are no productive coal seams present below this site.

An "observational technique" can be applied to the design and construction of any new foundations on this site, and where ground conditions seem to vary from that indicated from the Conceptual Site Model derived from works to date, then advice from a suitably qualified Engineering Geologist/Geotechnical Engineer should be sought.

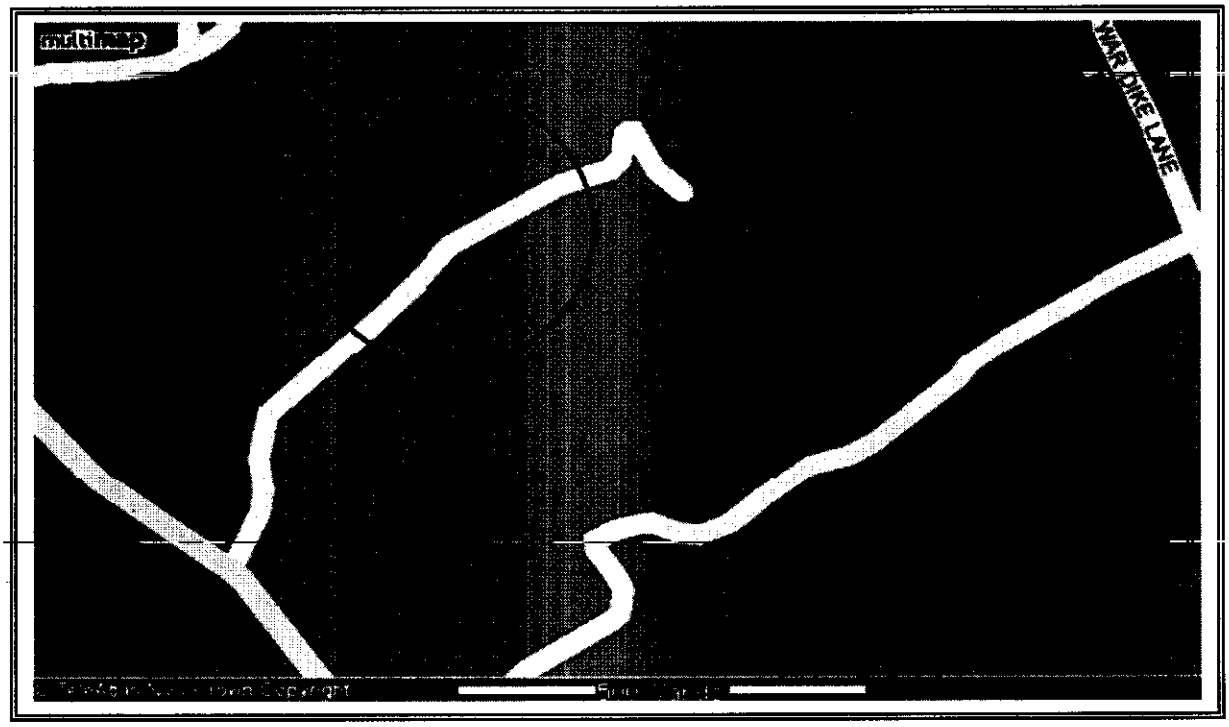
END OF REPORT

APPENDIX I

Site Location Plans
Aerial Photograph
Existing Site Plan with Boreholes and Trial Pit Locatons



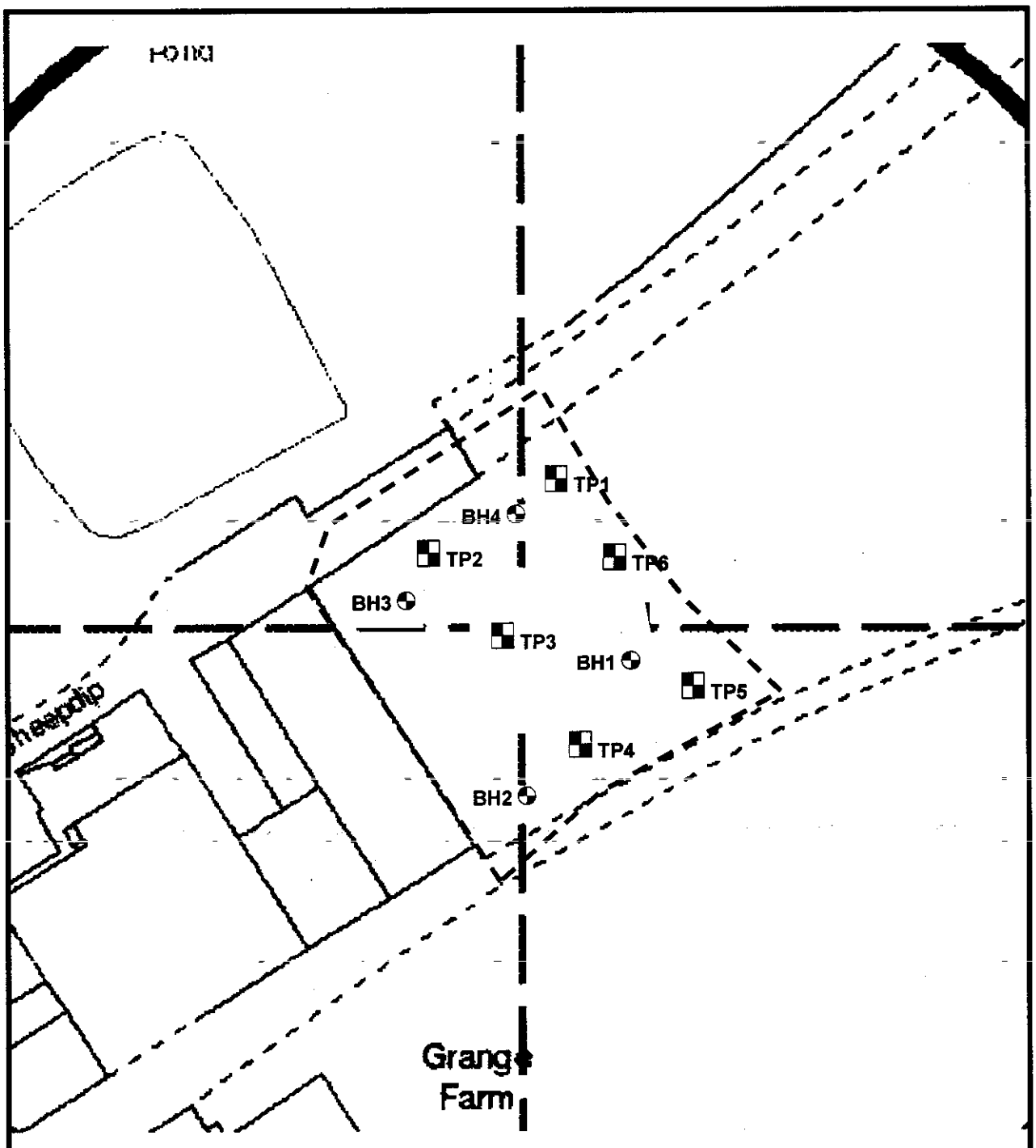
Site Location Plan: 1:25,000



Site Location Plan: 1:10,000

Aerial Photograph

NYM/ 2007 / 0961 / FL



EXISTING SITE LAYOUT PLAN WITH BOREHOLE & TRIAL PIT LOCATIONS

The Rivergreen Centre
Aykley Heads
Durham
DH1 5TS
TEL: 0191 383 7381
FAX: 0191 373 7382

CONTRACT : 07-160, Grange Farm, Staintondale
ENLARGED FROM ORIGINAL SCALE : NA
DATE : NA
CLIENT : Mr M. Else