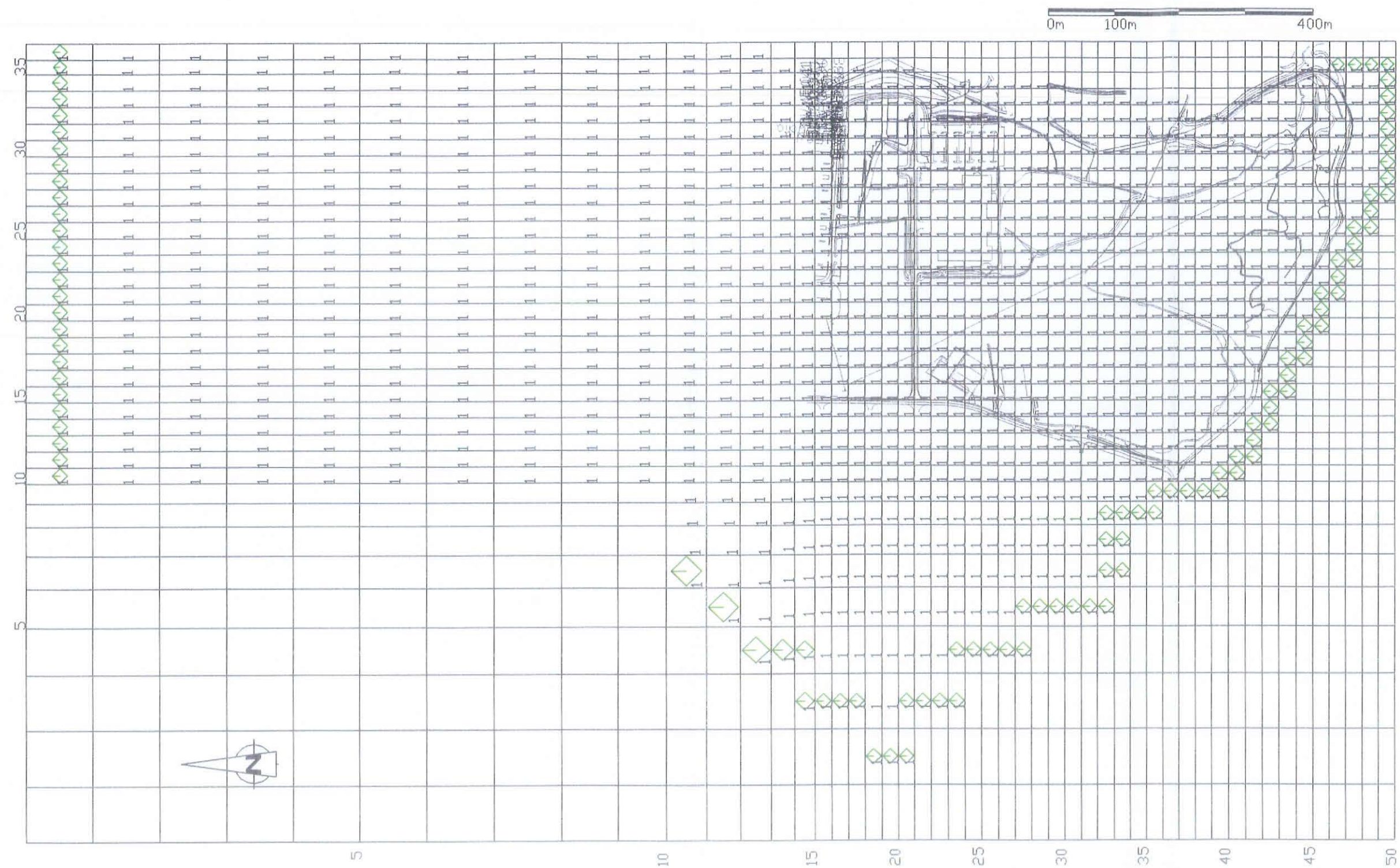




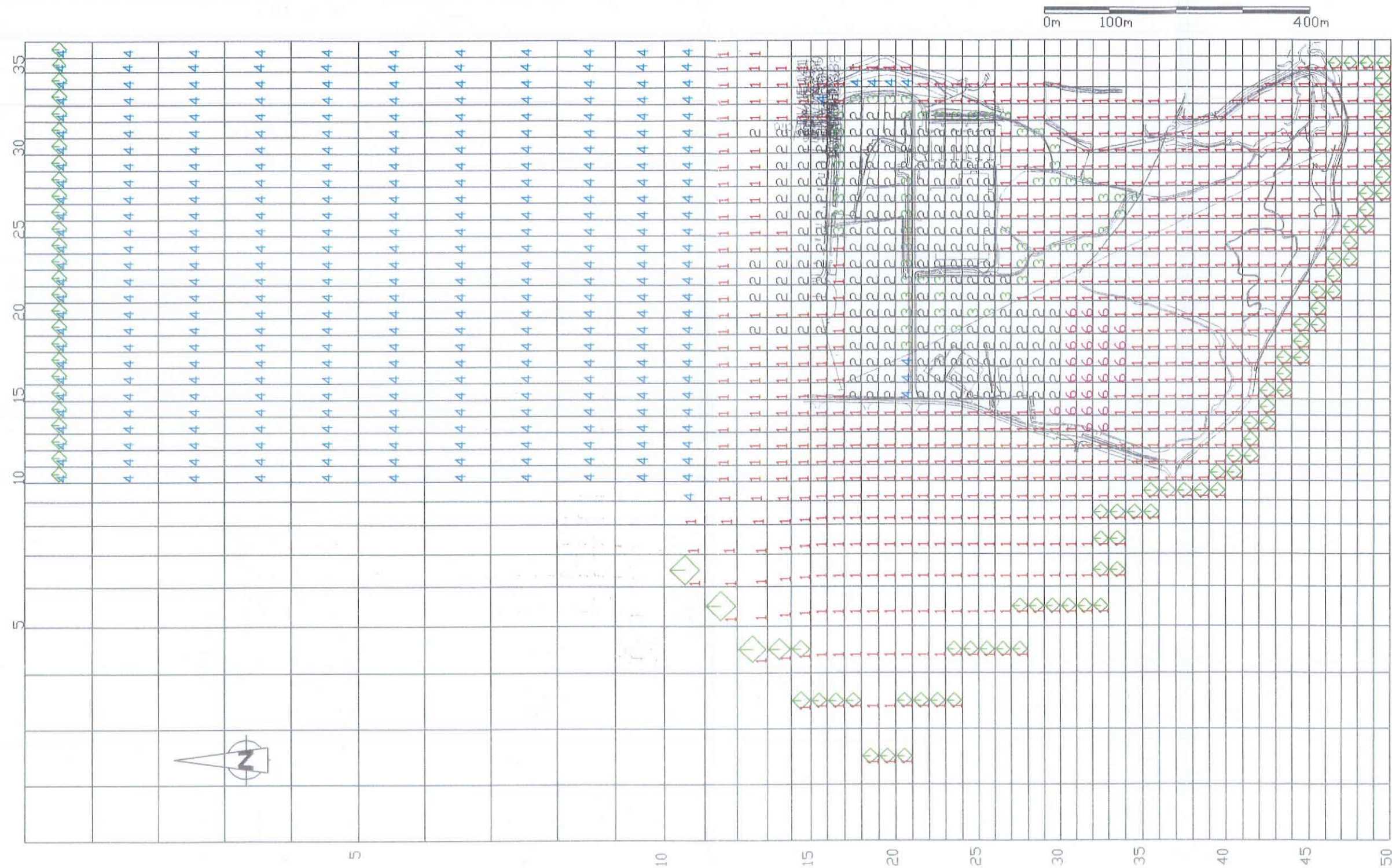
zone	storage	porosity
1	0.15	0.2
2	0.01	0.02

IBM LAND AT SOUTHMOOR, HAVANT

MODELLING PARAMETERS:
STORAGE/POROSITY (LAYER 2)

SYMONDS
TRAVERS MORGAN

DRAWN BY	CHECKED BY	PASSED BY	DATE	SCALES	ISSUING OFFICE	DRAWING NUMBER	REV
GC			APR'97	N.T.S	E.Grinstead		X



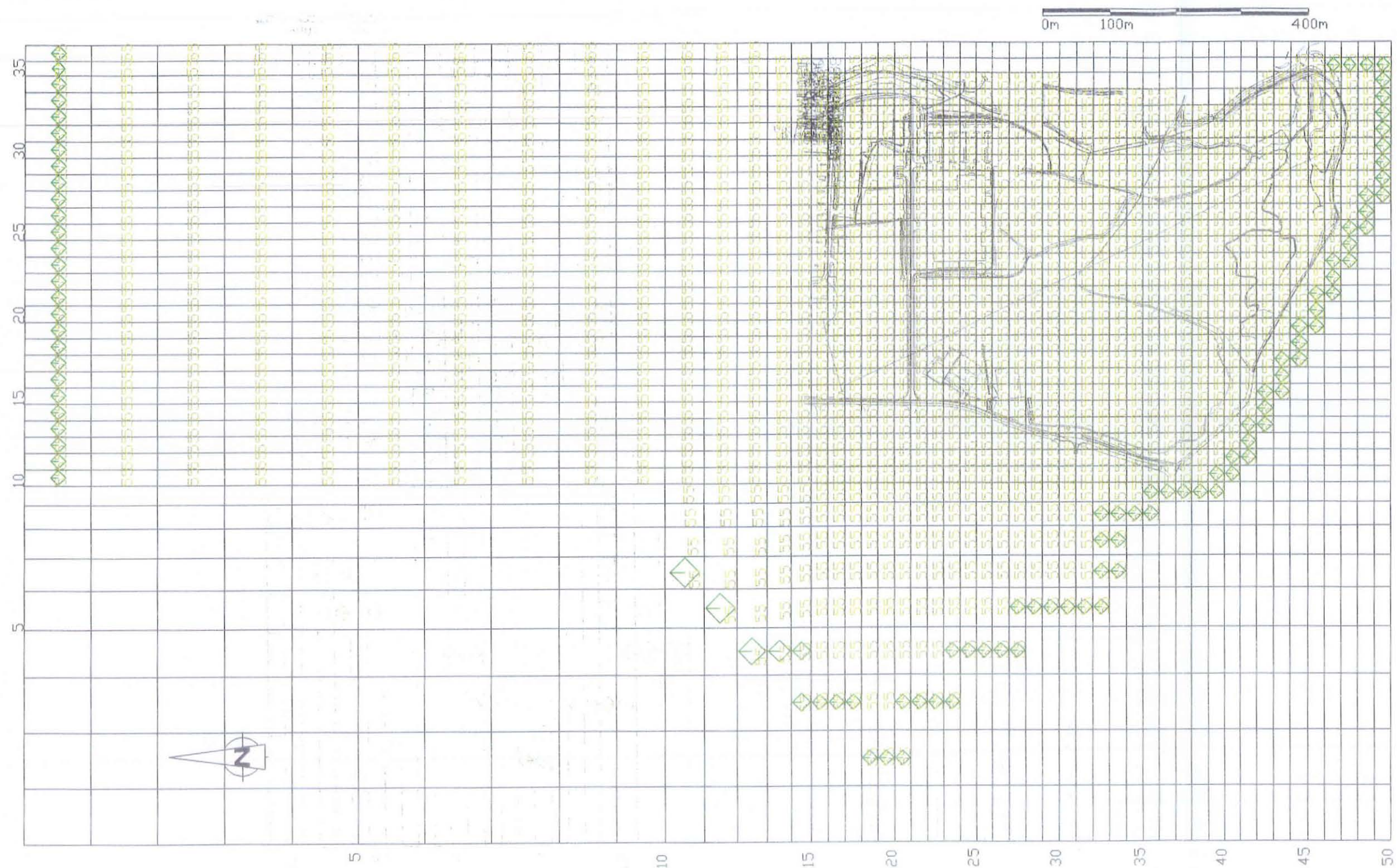
zone	Recharge (m/day)
1	0.0019
2	0.000095
3	0.008
4	0.00095
5	0
6	0.000095
7	0.00095

IBM LAND AT SOUTHMOOR, HAVANT

MODELLING PARAMETERS:
FUTURE DEVELOPMENT - RECHARGE

SYMONDS
TRAVERS MORGAN

DRAWN BY	CHECKED BY	PASSED BY	DATE	SCALE	ISSUING OFFICE	DRAWING NUMBER	REV
GC			APR'97	N.T.S.	E.Grinstead	XI	

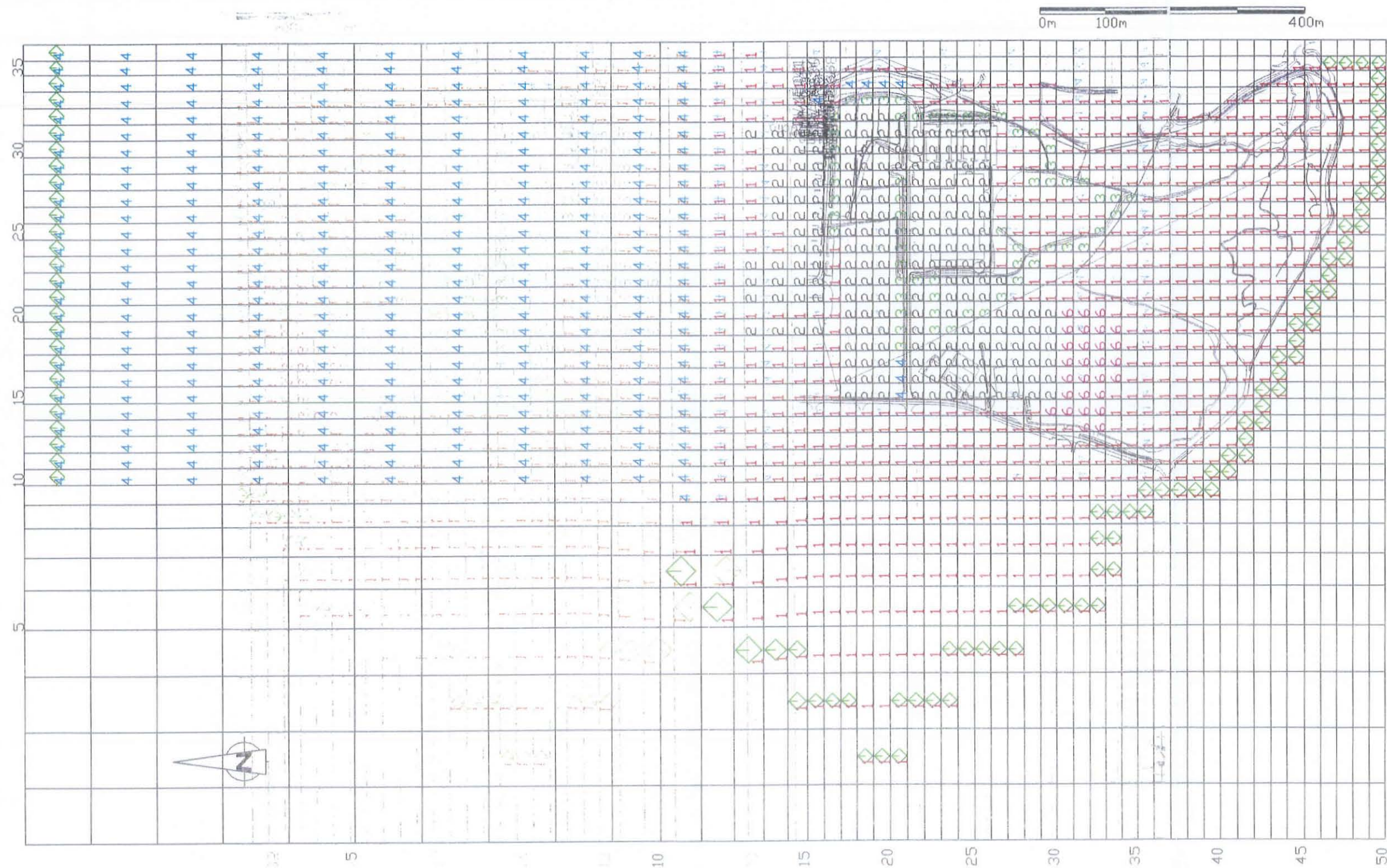


IBM LAND AT SOUTHMOOR - HAVANT

MODELLING PARAMETERS:
BOTTOM ELEVATION OF
LAYER 2

SYMONDS
TRAVERS MORGAN

DRAWN BY GC	CHECKED BY	PASSED BY	DATE APR'97	SCALE @ A3 N.T.S.	ISSUING OFFICE E.Grinstead	DRAWING NUMBER APPENDIX VI	REV
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zone	Evapotranspiration (m/day)
1	0.00147
2	0.0021
3	0
4	0.000735

IBM LAND AT SOUTHMOOR, HAVANT

MODELLING PARAMETERS:
FUTURE DEVELOPMENT – EVAPOTRANSPIRATION

SYMONDS
TRAVERS MORGAN

DRAWN BY	CHECKED BY	PASSED BY	DATE	SCALE	ISSUING OFFICE	DRAWING NUMBER	REV
GC			APR'97	N.T.S.	E.Grinstead	XII	

Confidential

Southmoor Park, Havant

**Contamination Assessment
Report**

on behalf of

SEEDA

Project N^o: 7816

May 2001

Campbell Reith Hill
21 Dartmouth Street
St. James's Park
London
SW1H 9BP

Tel: 020 7565 1600
Fax: 020 7565 1666

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- 2.0 SITE STATUS AND BACKGROUND
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- 4.0 SUMMARY OF RESULTS
- 6.0 CONCLUSION

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- Figure 1 - Site Location Plan
- Figure 2 - Sample Point Locations
- Appendix 1- Chemical analysis for ICRL suite and bacteriological analyses

Document History

Date	Status	WP Ref.	Prepared by	Initials	Reviewed by	Initials
May 2001	D1	THth7816-150501	T.Hillier		D.Innes	

1.0 INTRODUCTION

- 1.1 Campbell Reith Hill have been commissioned by SEEDA to undertake environmental and engineering appraisals of a site known as Southmoor Park in Havant, Hampshire. The first phase of this work was concluded in the production of a desk study Environmental and Site Appraisal report (ref:THth7816-120401).
- 1.2 The Environmental and Site Appraisal report (which is summarised in section 2.0) identified the potential for mercury contamination to exist at the site, and therefore recommended the investigation of the site accordingly. The report also highlighted the potential risk due to unexploded munitions, and recommended a more detailed appraisal of the issue. This report presents the findings of the mercury contamination investigation and appraisal, along with an assessment of the results and their implications with respect to SEEDA's potential acquisition and redevelopment of the site.
- 1.3 This report should be read in conjunction with the environmental and site appraisal report.
- 1.4 This report has been produced solely for the benefit of SEEDA, and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing.

2.0 SITE STATUS AND BACKGROUND

2.1 *Description and Setting*

- 2.1.1 The site comprises of two parcels of land forming an 'L' shape, totalling an area of 18.6 acres. The site is covered largely by rough vegetation with some areas of hard standing. There is a network of drainage ditches across the site, however there is no evidence of contamination or contaminative uses on the site.
- 2.1.2 The site is intermittently underlain by Aeolian deposits over alluvium, these drift deposits are underlain by Seaford Chalk. The underlying chalk is classified as a major aquifer with a soil classification of high leachability, therefore the site has been classified as lying within a hydrogeological setting of high sensitivity.
- 2.1.3 The site also lies in close vicinity to a number of surface water features, with the Lavant stream running north to south directly east of the site and Langstone Channel approximately 500m south of the site. Due to the proximity of these water courses the sites surface water sensitivity was assessed as being high.
- 2.1.4 The overall sensitivity of the site and the area surrounding it was also increased due to the presence of a Site of Special Scientific Interest (SSSI) located south of the site.

2.2 *Desk Study Findings*

- 2.2.1 Three key issues were identified from the Environmental and Site Appraisal which would required further investigation in order to understand and quantify the potential environmental risks associated with the site and their implications for the acquisition and proposed development of the site. These issues were suspected mercury contamination in the drainage ditches and waters adjoining the site, the potential for the presence of unexploded munitions on the site from the Second World War and the effect of site development on the local ecology.

Mercury Contamination

- 2.2.2 There is no evidence to suggest that any significant sources of on site contamination exist, although previous site investigations have identified that historically sewage sludge spreading may have taken place on the site. One of these investigations, undertaken by Soils Limited, reported elevated levels of mercury concentrations in the drainage ditches and waters adjoining the site. The spreading of sewage sludge and a historical nearby plating works were identified as possible sources. However a level of uncertainty surrounded this information, as subsequent reports failed to identify further evidence of mercury contamination.
- 2.2.3 Due to the risk associated with mercury in terms of its toxicity, persistence and bioaccumulation effects CRH identified the need to undertake a validating exercise of surface sampling of soil, sediment and surface waters at the site in order to eliminate the uncertainty with respect to the presence of mercury, both in terms of the potential liability issues and associated remedial costs.
- 2.2.4 The methodology and results from this validating exercise are presented in sections 3.0 and 4.0 respectively

Unexploded Munitions

- 2.2.5 A second issue arose from research into the historical uses of the land surrounding the site. This research identified that areas surrounding Southmoor Park, namely Hayling Island and Langstone Harbour, were used in the Second World War as decoy sites to draw German bombing raids away from areas such as Portsmouth.
- 2.2.6 No obvious evidence for the presence of munitions was identified at the site, however it was agreed to commission a specialist desk study investigation to establish that there is no risk from munitions remaining on the site. The results of this work will be reported separately.

Ecology

- 2.2.7 The third issue related to the potential ecological sensitivity of the site due to the nearby SSSI's. As a result, a more detailed appraisal by a specialist ecological consultancy has been commissioned. The results of this work will be reported separately.

3.0 METHOD OF ANALYSIS

- 3.1 Surface soil, sediment from the drainage ditches and where possible water samples were collected across the site and from the drainage ditches. Soil samples were collected on an approximate 50m by 50m grid across the site. Samples were not collected where there were areas of hard standing. The samples were collected using a trowel, removing a sufficient quantity of material for sample analysis from beneath any vegetation that was present. The sampling was undertaken from the surface 300mm of soil and/or sediment. The location of each sample was logged on a site plan as shown in Figure 2.
- 3.2 Sediment samples were collected at approximately 25m intervals where possible from the drainage ditches across the site, following the same methodology. These sample points were again logged on a site plan (Figure.2).
- 3.3 Water samples were collected in clear plastic bottles at locations where surface water was present in the drainage ditches. Surface water was only found at two locations and these sample locations are also logged on the site plan (Figure.2).
- 3.4 The samples were immediately dispatched to the laboratory of Geochem Alcontrol (a NAMAS accredited testing house). All samples were analysed for the full suite of ICRL determinands and at a number of locations across the site a second sample was collected and analysed for bacteriological contamination.

4.0 SUMMARY OF RESULTS

4.1 *Soil Samples*

- 4.1.1 Mercury was found to be below the limit of detection (LoD) of 1 mg/kg for every soil sample collected on the site. Any mercury in the soil is therefore below the ICRL concentration threshold value of 20 mg/kg for parks, playing fields and open spaces.
- 4.1.2 Some elevated levels of Polyaromatic Hydrocarbons (PAH's) were found in some of the soil samples at various locations across the site. However these were all found to be below the ICRL concentration threshold value for landscaped areas, buildings and areas of hard cover of 1000 mg/kg.
- 4.1.3 Some elevated levels of arsenic were found in some of the soil samples at various locations across the site. However these were all found to be below the ICRL concentration threshold for parks, playing fields and open spaces of 40 mg/kg.

4.2 *Sediment samples*

- 4.2.1 Mercury was found to be below the limit of detection (LoD) of 1 mg/kg for every drainage ditch sediment sample collected on the site. Any mercury in the drainage ditch sediment samples is therefore below the ICRL concentration threshold value of 20 mg/kg for parks, playing fields and open spaces.
- 4.2.2 Some elevated levels of Polyaromatic Hydrocarbons (PAH's) were found in some of the drainage ditch sediment samples at various locations across the site. However these were all found to be below the ICRL concentration threshold value for landscaped areas, buildings and areas of hard cover of 1000 mg/kg.
- 4.2.3 Some elevated levels of arsenic were found in some of the drainage ditch sediment samples at various locations across the site. However these were all found to be below the ICRL concentration threshold for parks, playing fields and open spaces of 40 mg/kg.

4.3 Water Samples

4.3.1 Mercury was found to be below the limit of detection (LoD) of 0.05 mg/kg for both water samples collected on the site.

4.4 Table summarising the presence of contaminants with respect to their associated guidelines.

Contaminant	Sample type	Min.conc (mg/kg)	Max.conc (mg/kg)	Concentration Threshold (mg/kg)	Action value (mg/kg)	% of samples above threshold value
Mercury	Soil	<1	<1	40	*	0
PAH's	Soil	<20	472	1,000	10,000	0
Arsenic	Soil	5	14	40	*	0
Mercury	Sediment	<1	<1	40	*	0
PAH's	Sediment	<20	951	1,000	10,000	0
Arsenic	Sediment	2	15	50	*	0
Mercury	Water	<0.05	<0.05	0.01 [#]	*	0

* No value given in ICRCL guidelines

[#] Dutch guideline intervention value given

4.5 According to ICRCL guidelines all other contaminants tested for in the ICRCL suite were shown to be at levels below the limit of detection for the method of analysis used, or significantly below the Concentration Threshold value. Therefore the site can be regarded as uncontaminated as far as the hazards from these contaminants are concerned.

4.5 No evidence of bacteriological contamination caused by the inferred sewage sludge spreading in the form of coliform was identified by the sample analysis.

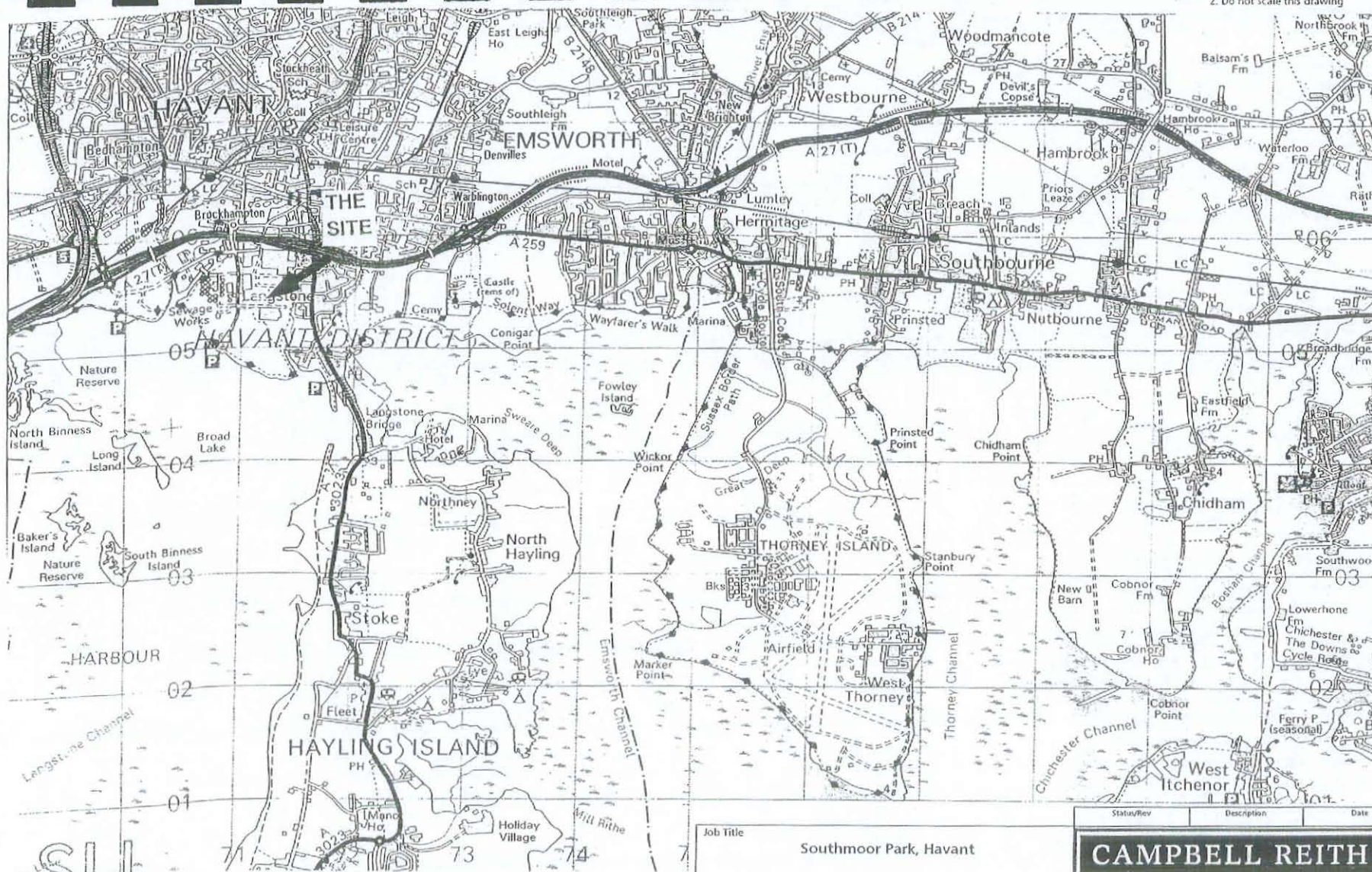
4.6 Results of analysis are contained in Appendix 1 for ICRCL suite and bacteriological analyses.

5.0 CONCLUSION

5.1 *Soil, Sediment and Water Analyses*

- 5.1.1 The data obtained from the validity sampling exercise undertaken at Southmoor Park has provided a comprehensive data set with respect to the sites contaminative status. The data shows that no elevated levels of mercury were found in the samples. All mercury levels were found to be below the limit of detection for mercury. Interpretation of this data indicates that the potential risk from on site mercury contamination is low in terms of possible liability and remedial costs. No subsequent recommendations are therefore required with regards to further intrusive investigation works or remediation requirements.
- 5.1.2 Analyses have confirmed no other determinands to be elevated with respect to the published guideline thresholds relevant to an industrial end use.
- 5.1.3 In conclusion, the validity investigation works have not identified the presence of significant contamination. The site is therefore considered to be low risk with respect to its contaminative status, and no further works or action are considered necessary.

Figure 1: Site Location



Job Title					Status/Rev	Description	Date	By
Southmoor Park, Havant					CAMPBELL REITH HILL			
Site Location Plan					Consulting Engineers 21 Dartmouth Street St James Park • London • SW1H 9BP Telephone 020 7565 1600 • Facsimile 020 7565 1666			
drawn	Date	Scale	Cl checked	Filename	Job No.	Orig No.	Status/Rev	
TH	12/04/01	NTS			7816	Figure 1	01	

Figure 2: Surface sample points

Appendix 1:
Chemical analysis for ICRCL suite and bacteriological analyses



Client Name: Campbell Reith Hill
GRT Job No.: 01/04063/06/01

Location: Not Specified

GRT Job No.: 01/04063/06/01

Reference: 7816

[illegible]



GEOCHEM REMEDIATION TESTING

Client Name:

Campbell Reith Hill

Location:

Not Specified

GRT Job No.:

01/04063/06/01

Reference:

7816

[illegible]



GEOCHEM REMEDIATION TESTING

Client Name: Campbell Reith Hill
GRT Job No.: 01/04063/06/01

Location: Not Specified
Reference: 7816

[illegible]



Location: Not Specified
Reference: 7816

[illegible]



Location: Not Specified
Reference: 7816

UKAS Accredited



GEOCHEM REMEDIATION TESTING

Client Name: Campbell Reith Hill

Location: Not Specified

GRT Job No.: 01/04063/06/01

Reference: 7816

[illegible]

Validated by	Yvonne Edge
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Date 14/05/2001

UKAS Accredited

APPENDIX E

SPECIFICATION FOR EARTHWORKS

SPECIFICATION

SECTION 1 - GENERAL

1.1 Location and Extent of Site

The site is located adjacent to Southmoor Lane and Penner Road in Havant, Hampshire as shown on Campbell Reith Hill's drawing no. 7816 Fig01 rev D1. The extent of the site is shown on Campbell Reith Hill's drawing no. 7816 P01 Rev. D1.

1.2 General Description of the Works

The objective of these Works is to raise levels for flood protection purposes and to create a construction platform to enable the future development of the site.

1.3 Extent of the Works

The Works comprise:

1. Removing the vegetation from the site including existing trees.
2. Stripping the topsoil from site and stockpiling it in a location to be agreed with the Engineer.
3. Levelling the site.
4. Undertaking a topographical survey of the site and recording these levels on a 5m grid.
5. Importing Class 1 Fill and spreading and compacting this across the site to achieve the required finished levels.
6. Carrying out a topographical survey of the reprofiled site.

1.4 Drawings

The following drawings are issued with this specification.

<u>Drawing no.</u>	<u>Title</u>
7816 Fig01 rev D1	Location Plan
7816 P01 rev D2	Site Layout and general requirements
7816 S01 rev S2	Existing Services Plan
7816 P02 rev D1	Temporary Construction Plan

1.5 Contractor's Accommodation and Welfare Provisions

1. The Contractor's Accommodation shall be located on the Site as agreed with the Engineer prior to the commencement of the Works.
2. The Contractor shall vacate and remove from the Site all accommodation, facilities and plant etc., within seven days of the Issue of the Certificate of Completion of the Works under Clause 4.5 of the Conditions of Contract.

3. The Contractor shall provide to all his workforce safety jackets, boots and hard hats.

1.6 Privately and Publicly Owned Services

A plan showing the location of existing publicly and privately owned services and supplies is included with the Contract documentation. This is based on information supplied by the service companies and is not exhaustive. A list of contacts is supplied in Appendix B and original drawings are available from Campbell Reith Hill's office. The Contractor is responsible for checking the location of any services that may cross the site in so far as they may affect the Works. The Contractor is responsible for ensuring that all publicly and privately owned services and supplies are protected from damage during the course of the works.

1.7 Working Areas

The Contractor shall have access to Area A and Area B as shown on Campbell Reith Hill's drawings.

1.8 Working Hours

Monday - Friday	0800 - 1800
Saturday	0800 - 1300

The Contractor shall give the Engineer seven days notice in writing if he wishes to work outside these hours. No working will be permitted on Sundays or Public Holidays. No HGV movements to or from the site will be permitted between 09.30 and 16.00 hours.

1.9 Contractor's Reports

The Contractor shall submit a progress report every two weeks during the Works. These reports shall include details of all work carried out to date with records of the plant and labour involved on a daily basis with the activities referred to in the progress report.

1.10 Progress Meetings

Following the commissioning meeting at the start of the works, the Contractor shall be expected to attend two progress meetings on site during the course of the Works. The Contractor is expected to provide facilities for this meeting.

1.11 Returns and Drawings

All reports, diagrams or drawings etc., which the Contractor is required to submit to the Engineer during the progress of the works shall be, unless otherwise directed, furnished in duplicate.

1.12 Ground Investigations

Ground investigation information is appended. The Contractor is deemed to have visited the site prior to the return of tender.

1.13 Datum

The datum to which all levels have been reduced for the purposes of the drawings and the Contract is the Ordnance Survey Bench Mark on the east face, south-east angle of 1 Harts Farm Cottage, Brockhampton Road, Havant, the value of which is 4.228m AOD and west face of wall junction of Cottage Boundary, east side of Langstone Road, Havant, the value of which is 4.029m AOD.

1.14 Setting Out

The Contractor shall provide such bench marks and setting out points as are necessary for the correct setting out and level control for the works in accordance with Clause 3.5 of the Conditions of Contract.

1.15 Site Access

Access to the Works must be arranged with the Engineer and Havant Borough Council generally in accordance with Drawing 78216/P02. Vehicular access to the site can be achieved from Southmoor Lane (Area B) and Penner Road (Area A). The Contractor will be required to enter into a Routing Agreement with the Council.

1.16 Site Security

The Contractor shall secure the site by means of perimeter fencing, ensuring that access to the site by unauthorised persons is prevented.

1.17 Use of Site

The Contractor may use the site only for the purposes connected with the Contract.

1.18 Notices of Operations

The Contractor shall keep the Engineer advised of progress of important activities and give the Engineer 48 hours notice in writing of the completion of important activities so that the Engineer might make arrangements to inspect the works.

1.19 Stability of Unfinished Work

The Contractor shall ensure the stability of the Works at all time, with particular regard to the stability of the slopes of the existing ditches. These ditches shall also be kept operational and free from debris during the works.

1.20 Method Statements

The Contractor shall submit to the Engineer method statements for each work activity at least five full working days before the activity is due to commence.

1.21 Programme

1.27 Site Safety Officer

1. The Contractor shall appoint a site safety officer who shall be suitably qualified and be responsible for ensuring that the site operation are carried out in accordance with all current Health and Safety Legislation.
2. The Contractor shall inform the Engineer in writing prior to the commencement of the works of the identity of the site safety officer.

1.28 Contractor's Monthly Statement

The Contractor shall submit on a monthly basis as stated in Clause 7.2 of the Conditions of Contract a statement showing the estimated value of the works executed up to the end of that period.

SPECIFICATION

SECTION 2 - SITE REPROFILING WORKS

2.1 General

- 2.1.1 The site as shown on Drawing 7816/ P01 rev D1 comprises two areas, Area A and Area B. The reprofiling works are to take place in Area A. Area B is provided purely for the purposes of stockpiling topsoil material arising from the works in Area A.
- 2.1.2 The Specification for Highway Works as referred to in this Specification shall be the current version as published by the Highways Agency (1998), with Amendments..

2.2 Site Preparation

- 2.2.1 The site is covered in vegetation and this is to be stripped and disposed of by the Contractor off-site. Trees are also to be removed as part of the vegetation works. However, the rows of mature conifer trees on the western and north-western boundaries of the site are to be protected and retained. No earthworks operations shall take place within 3 metres of these trees.
- 2.2.2 Following the vegetation strip, the topsoil shall be stripped to a depth of up to 0.35m. This topsoil is to be stockpiled in Area B at a location to be agreed with the Engineer. The stockpiles shall not exceed 2m in height. Material/general fill deemed unsuitable for topsoil shall be removed from the Site.
- 2.2.3 Should the Contractor need to temporarily bridge any of the existing ditches to gain access to parts of the site, the Contractor is responsible for these Works and ensuring that the bridges are removed afterwards and the ditches are returned to their original condition.
- 2.2.4 All concrete hard standings and foundations are to be broken up and removed from site. All existing car parking areas and other non-concrete paved areas are to be broken up such that they are fully permeable. The Contractor is to ensure that no impermeable surfaces in excess of 0.5m² remain in the area.

2.3 Earthworks

- 2.3.1 Following a vegetation and topsoil strip, the Contractor shall regrade the Area A to a maximum finished level of 3.8m AOD to within a tolerance of +/- 50mm. All material placed shall be recompacted in accordance with the 600 Series Clauses and Table 6.4 of the Specification for Highway Works. The Contractor's attention is drawn to the existing ditches across the site which must remain operational and free from debris.
- 2.3.2 Following regrading, the formation is to be proof rolled in accordance with Clause 612 of the Specification for Highway Works. Any soft spots thus identified are to be removed and replaced with Class 1 Fill in agreement with the Engineer. The undrained shear strength of the cohesive material present at the formation is to be

determined at regular intervals. The contractor is to include in his Tender a price for carrying out a minimum of 100 undrained shear strength determinations using Hand shear Vane apparatus. The location of these tests is to be agreed with the Engineer and to be carried out in the presence of the Engineer. The Contractor shall also provide a price for additional tests. If the undrained shear strength of the formation is determined as being less than 50kN/m², or, with the agreement of the Engineer, the formation is otherwise determined as being unsuitable as a platform above which compaction of Class 1 Fill can be undertaken, the Contractor is to provide proposals as to how the formation is to be rendered suitable. The placement of Class 1 Fill will not occur until these proposals have been approved by the Engineer and undertaken as appropriate.

- 2.3.3 When the regraded surface has been approved by the Engineer, the Contractor shall then import Class 1 material as defined in the Specification for Highway Works and spread, level and compact this across the site to achieve a minimum finished level of 4.2m AOD to within a tolerance of +10mm/-25mm. This Class 1 Fill shall be profiled to a notional gradient of 1:500 towards the nearest ditch. The Class 1 Fill shall be laid and compacted in accordance with Table 6.4 of the Specification for Highway Works.
- 2.3.4 The Contractor should note that any material laid in the vicinity of the existing ditches or open drains should slope at a maximum gradient of 1:2 and that no material should be allowed to block the ditches. The Contractor shall remove any material that enters the ditches to the satisfaction of the Engineer and keep the ditches in an operational condition at all times. 
- 2.3.5 The Contractor is to construct new boundary ditches at the locations shown on Drawing No 7816 P01 Rev D2. The precise location of this ditch is to be agreed on site with the Engineer. The ditch shall have side slopes of 1 in 2 throughout and a constant base width of 0.5m. A minimum gradient to the base of the ditch of 1 in 500 shall be maintained from its start point on the northern boundary of the site to the point at which it connects to the existing ditch. Revetments to the existing ditch must be adjusted, if necessary to accommodate entry of the new ditch.
- 2.3.6 The Local Authority has identified that an archaeological watching brief shall be carried out on the site in order to ensure that any archaeological remains are protected and preserved for prosperity either by Preservation In-situ or Preservation by Record. The Contractor will provide all facilities as the Archaeologist may require and follow all instructions, with regard to archaeology, as may be required. Confirmation should be sought from the County Archaeologist at the first opportunity.

2.4 Materials

- 2.4.1 The Contractor is to provide recent test results for the Class 1 Fill, namely wet sieve analysis in accordance with BS1377:1990 Part 2, and chemical testing in accordance with Tables 3 and 4 of the Interdepartmental Committee of Redevelopment of Contaminated Land (ICRCL), Guidance Note 59/83. All tests to be undertaken by UKAS accredited laboratories.

2.5 Monitoring

2.5.1 Following completion of the placement and compaction of the Class 1 Fill, the Contractor shall carry out a survey of the relevelled site and provide a schedule of 3-dimensional coordinates on a grid at 5m centres covering the site. A tolerance of +/-10mm is required for this part of the survey work.

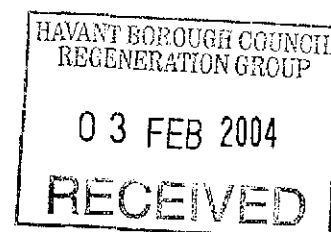
2.5.1 The Contractor is to ensure that the Class 1 Fill has a minimum thickness of 400mm at all locations.

2.6 Mapping Updates

2.6.1 The Contractor is to be provided with base topographical mapping in digital AutoCAD Release 14 format. On completion of the site works the Contractor shall check, update, and amend Area A of this digital mapping to address any changes to topographical features, including site levels that may have changed as a result of the works. The Contractor shall also record on the mapping any drainage features (including ditches, outfalls, and culverts) not already shown on the mapping.

Report for
Havant International Limited
commissioned by
Glanville Consultants Limited

Site Investigation Report



**Langstone Technology Park,
Havant, Hampshire**

October 2003

Report No. 33893/01

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FIGURES

Figure 1	Location Plan
Figure 2	Exploratory Point Location Plan
Figures 3 to 12	Extracts from Historical Ordnance Survey Maps
Figure 13	Plasticity Classification Chart

APPENDICES**Appendix A****Fieldwork Records**

Sheets A1 to A13	Trial Pit Records
Sheets A14 to A21	Results of Dynamic Cone Penetrometer tests for CBR
Sheets A22 & A23	Results of Trial Pit Soakaway Tests

Appendix B**Geotechnical Laboratory Test Records**

Sheet B1	Moisture Content and Plasticity Index of Soil
Sheets B2 to B5	Particle Size Distribution Results
Sheet B6	Sulphate and pH Analysis Test Results

Appendix C**Chemical Laboratory Test Records**

Sheet C1	Chemical Analysis of Soils
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Appendix D**Standard Ground Investigation Information**

DOCUMENT CONTROL

Document Title: Site Investigation Report for Langstone Technology Park,
Havant, Hampshire

The Client: Havant International Limited

STATS Geotechnical, a division of STATS Limited (STATS), has prepared this report in accordance with the instructions of Glanville Consultants Limited on behalf of Havant International ("the Client") by fax of 18th August 2003 under the terms of appointment for site investigation services. This report is for the sole and specific use of the Client, and STATS shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared and provided. Should the Client require to pass copies of the report to other parties for information, the whole of the report should be so copied, but no professional liability or warranty shall be extended to other parties by STATS in this connection without the explicit written agreement thereto by STATS.

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Geotechnical Engineering
Geoenvironmental Engineering
Analytical Chemistry
Asbestos Management
Building Technology
Construction Materials
Environment & Pollution
Expert Witness
Geology & Petrography
Inspection & Quality Assurance
Occupational Hygiene
Structural Investigations
UKAS Laboratory Testing

Report prepared by:

Name: James Dennis
Designation: Geotechnical Engineer

Signed:

Date:

16/10/03

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SITE INVESTIGATION REPORT FOR SITE AT LANGSTONE TECHNOLOGY PARK

1. INTRODUCTION

1.1 Purpose of Investigation

On the instructions of Glanville Consultants Consulting Engineers on behalf of Havant International Limited, STATS Geotechnical has carried out a site investigation of an area within Langstone Technology Park. The project was commissioned in order to obtain information on the ground conditions in relation to the proposed new paved car park and roundabout on the site.

1.2 Project Brief

The project was carried out to an agreed brief, as set out in STATS proposal letter of 7th August 2003, and has included the following tasks:

Desk Study

- A study of local geology and hydrogeology
- A study of the land-use and development history of the site and its surroundings from archival Ordnance Survey mapping
- The identification of aquifer vulnerability rating beneath the site and local water abstraction points from Environment Agency records
- The identification of potential geotechnical hazards
- The identification of potential targets at risk from possible contamination

Site Investigation

- Machine excavation of 13No. trial pits.
- 8No. Dynamic Cone Penetration Tests to assess CBR values.
- Associated sampling and on-site testing.
- Laboratory chemical testing of 10No soil samples for common contaminants.
- Laboratory geotechnical testing of soil samples for classification purposes.
- Interpretative reporting

1.3 Limitations

The opinions and recommendations expressed in this report are based on the ground conditions encountered during the site work, the results of field and laboratory testing and interpretation between exploratory holes. The material encountered and samples obtained represent only a small proportion of the materials present on-site, therefore other conditions may prevail at the site which have not been revealed by this investigation.

The investigation itself was designed generally to meet the objectives of an exploratory investigation, as defined by BS 10175:2001 Code of Practice for the Investigation of Potentially Contaminated Site. As an exploratory investigation, the results may not provide sufficient data to make detailed estimates of the quantities involved in any remediation work, if required.

The results of laboratory tests are covered by UKAS (formerly NAMAS) accreditation, but opinions and interpretations expressed in the report and on the fieldwork records are outside the scope of this accreditation.

2. SITE DETAILS

2.1 Site Location

The site, which may be located by National Grid reference SU 712059, is situated just south of the A27, on Langstone Technology Park, Havant, Hampshire.

An extract of the 1:50 000 Ordnance Survey map showing the location of the site is included in Figure 1.

2.2 Site Description

The site, which covers approximately 0.65 hectares, encompasses a roughly rectangular grassed area running along the north side length of Building 1000 (occupied by Xyratex).

The site contains a number of mature and semi-mature trees predominantly of the Maple, Sycamore and Laburnum variety. The trees are scattered in a linear fashion running the length of the site. In addition to this there are a number of mature herbaceous shrubs as well as a 13m high closely planted row of conifers forming the western most boundary to the site.

The immediate boundaries to the site comprise:

- > North A 1.5m chain-link fence and a footpath running parallel with the A27 slip-road.
- > East Open grassed area with adjoining car park serving Building 1000.
- > South Grass-crete roadway and a 1.5m high grassed bank backing onto Building 1000.
- > West 13m high row of conifers, semi-detached residential housing and industrial units.

Ground levels at the site range from 5.28mAOD to 6.03mAOD approximately and with the general fall towards the west.

Some investigative work (excavation of 2No. trial pits) was carried out in the rear garden of the house on the corner of Brookside Road.

A site plan showing the main features of the site is given in Figure 2.

2.3 Local Geology and Hydrogeology

The published 1:63,360 scale geological map of the area (Sheet No 316 "Fareham") indicates the site to be underlain by Quaternary Brickearth and Alluvium deposits, overlying White Chalk (formerly the Upper Chalk) of the Cretaceous System.

The existing topography and history of development of the site suggests that, in addition to these natural strata, made ground may be present on the site.

The hydrogeology of the site is likely to be characterised by the presence of an unconfined shallow aquifer comprising Alluvial Deposits, overlying the Cretaceous Chalk, which is a major aquifer. Variability in the nature of the alluvial deposits may result in perched groundwater being present.

According to the Environment Agency Groundwater Vulnerability Classification (Sheet No.45 "West Sussex & Surrey"), the Alluvial Deposits are a Minor Aquifer and the underlying White Chalk is a major aquifer, both of High Vulnerability.

An abstraction well is located approximately 400m north of the site.

3. DEVELOPMENT HISTORY

The history of the site's land-use and development from Victorian times onwards has been researched from early Ordnance Survey (OS) maps.

Extracts of the OS maps and plans are presented in Figures 3 to 12.

Reference to historical maps provides invaluable information regarding the land use history of the site, but historical evidence will be incomplete for the period pre-dating the first edition and between successive maps.

OS Map, Sheet Hants. 76.11 Dated 1866 at Scale 1:2,534 (Figure 3)

The Ordnance Survey edition of 1866 shows the site to be undeveloped fields. Havant Mill is located approximately 1.6km to the east-north-east.

OS Map, Sheet Hants. 76.11 Dated 1896 at Scale 1:2,534 (Figure 4)

The site and surroundings remain unchanged.

OS Map, Sheet Hants. 76.11 Dated 1907 at Scale 1:2,534 (Figures 5 & 6)

A sewage works has been constructed immediately to the east of the site and an engine house on the western boundary of the sewage works appears to exist on the eastern margin of the site. Filter beds associated with the sewage works are shown immediately to the southeast.

OS Map, Sheet Hants. 76.11 Dated 1931 at Scale 1:2,534 (Figures 7 & 8)

The sewage works has extended so that associated buildings would have occupied the eastern part of the site, approximately 170m in from the east site boundary.

OS Map, Sheet SU 7105 Dated 1972 at Scale 1:2,500 (Figure 9)

The site is occupied by a landscaped area that contains some trees. The A27 Havant bypass is located along the northern site boundary and a large 'works' has been constructed immediately to the south of the site. The sewage works and associated buildings mentioned above have been removed.

OS Map, Sheet SU 7105 Dated 1984 (Figure 10 – not to scale)

The site is unchanged and the immediate surroundings remain essentially unchanged.

OS Map, Sheet SU 7105 Dated 1996-7 at Scale 1:2,000 (Figures 11 & 12)

The site is little changed, although an east-north-east, west-south-west running drain is shown near the centre of the site.

4. GROUND INVESTIGATION

4.1 Fieldwork

The fieldwork was carried out on 18th and 19th September 2003 and involved the following:-

Table 4.1 Summary of ground investigation fieldwork items

Investigation Type	Number	Location/ Designation	Appendix
Trial Pits - excavated by mechanical excavator	13	TP1 to TP13	A1 to A13
<i>In situ</i> Dynamic Cone Penetrometer	8	DCP1 to DCP8	A14 to A21
Trial Pit Soakaways	2	TP9 & TP10	A22 & A23

The location of all investigation points is shown on the site layout plan in Figure 2. The depths of boreholes, descriptions of strata encountered and comments on the groundwater conditions are given in the trial pit records in Appendix A.

The exploratory points were located approximately by reference to physical features present on the site at the time of investigation using the site plan provided by GJanville Consultants Ltd (drawing ref: ML 230287/101). The ground levels at the borehole locations have not been determined.

4.2 Laboratory Testing

A programme of geotechnical and chemical laboratory testing, scheduled by STATS, was carried out on selected samples taken from various strata. The results are presented in Appendices B and C, respectively.

The chemical analyses were carried out by ALcontrol Geochem (Geochem) under sub-contract to STATS. Geochem are an approved subcontractor in accordance with the requirements of STATS' quality system and are themselves UKAS accredited for a range of chemical analyses (UKAS Laboratory Testing No 1291).

5. GROUND CONDITIONS

5.1 Ground

5.1.1 General Succession of Strata

The exploratory holes revealed that the site is underlain by a variable thickness of made ground over alluvial deposits comprising sandy Clay over sandy Gravel. This appears to confirm the published geological records, although the White Chalk was not proven due to the shallow depth of investigation. For the purpose of discussion, the ground conditions are summarised in Table 5.1 below.

Table 5.1 General succession of strata

Brief Description	Depth to top of stratum m.bgl (mAOD)	Thickness (m)
Made Ground	Ground Level	0.35 to 2.9 (generally 0.65 to 0.8)
Sandy Clay (locally absent in TP11 and TP12)	0.35 to 1.1	Absent to 1.75
Sandy Gravel	1.1 to 2.3	0.9 Proven in TP10

5.1.2 Topsoil / Made Ground

The exploratory holes encountered a variable thickness of topsoil / made ground across the site. The maximum thickness of made ground was encountered in TP13 where a sub-surface concrete tank was uncovered, presumably related to the sewage works that were present on the site. The tank was found to be in-filled with a clayey sand Fill containing many whole bricks and occasional metalwork.

In general the made ground comprises a 0.1m thick superficial layer of topsoil over sandy gravelly clay with frequent sand sized brick and sand to gravel sized flint fragments with occasional chalk pieces.

5.1.3 Sandy CLAY

The sandy CLAY typically comprised stiff to very stiff light brown sandy clay with occasional to frequent sub-angular to sub-rounded gravel to cobble sized flints and flint fragments. A layer of soft silty CLAY with lenses of organic material was found to separate the sandy CLAY and sandy GRAVEL in TP9 between depths of 1.75m and 2.25m.

The measured and inferred soil parameters for the stratum are listed in Table 5.2 below.

Table 5.2 Summary of soil parameters for sandy Clay

Soil Parameters	Range	Results
Liquid Limit (%)	46% (71%)	Appendix B
Plastic Limit (%)	23% – 26% (34%)	Appendix B
Plastic Index (%)	20% – 23% (37%)	Appendix B
Plasticity Term	Intermediate plasticity (very high)	Figure 13
Shrinkage Potential (NHBC)	Medium	-
Moisture Content (%)	13% – 21%	-
Strength Term	Stiff to very stiff (soft)	-
Shear Strength Inferred by Pocket Penetrometer (kN/m ²)	158 – 225 (25)	-

Note: value in brackets refers to soft silty clay encountered in TP9 from 1.75m to 2.25m.

5.1.4 Sandy Gravel

The sandy GRAVEL typically comprised dark brown to light grey clay-bound sandy gravel. The gravel is sub-angular to sub-rounded flints and flint fragments with occasional sand sized chalk pieces. Within some of the trial pits (i.e. TP1, TP2, TP3 & TP8) white comminuted chalk is noted on the surface of the flints some 0.3m from the top of the unit. Further down the gravel sequence the clay is absent and the unit appears light orange brown in colour.

5.2 Groundwater

Groundwater was encountered in TP1, TP9 & TP10 at depths of between 2.25m and 2.7m depth. Groundwater was only seen to flow within trial pits TP9 & TP10 and the inflow was noted as slow.

It should be noted that groundwater levels might fluctuate for a number of reasons including seasonal variations. On-going monitoring would be required to establish both the full range of conditions and any trends in groundwater levels.

5.3 Chemical Analysis of Soil Samples

5.3.1 Introduction

Chemical analyses have been performed on a total of 10no. soil samples, including both fill materials and natural soils, down to a maximum depth of 0.75m below existing ground level. The test results are reported in Sheet C1.

5.3.2 Data Summary

With respect to the current CLEA Soil Guideline Values (SGV) and, where applicable, the former Dutch Guidelines the following summary can be made.

Table 5.3 Summary of Soil Results versus All Land Use Criteria

Substances present above CLEA Soil Guideline Values or ICRL Threshold Trigger Concentrations¹ (maximum concentrations in mg/kg)				
Category of Substance	Residential - with plant uptake	Residential - without plant uptake	Commercial - Industrial	Dutch Target Value ²
"Heavy" Metals:	N/A	N/A	None	None
Phytotoxins:	N/A	N/A	None	Copper (63), Zinc (267)
Non-metals:	N/A	N/A	None	None

1. Substances assessed against CLEA SGV's include: Arsenic, Cadmium, Chromium, Lead, Mercury, Selenium, Nickel. The remaining determinands have been assessed versus the Dutch target value.

2. Substances above the Dutch intervention value are highlighted in bold.

5.3.3 Discussion of Results

The chemical analyses have indicated that the samples tested are uncontaminated, with the exception of isolated elevated concentrations of copper and zinc.

A single copper concentration and two zinc concentrations exceeded the Dutch target values of 36mg/kg and 140mg/kg respectively, but were well below their respective Dutch intervention values of 190mg/kg and 720mg/kg. It should be noted that the Dutch guideline values do not take into account the type of proposed land use. It is considered that the concentrations of copper and zinc present on the site are below acceptable levels for the commercial land use proposed.

In conclusion, this reconnaissance-level exploratory investigation has found no evidence of significant ground contamination on the site.

5.4 Chemical Analysis of Water

An investigation of groundwater quality beneath the site was outside the scope of this investigation.

6. ENGINEERING CONSIDERATIONS

6.1 Details of Proposed Development

It is understood that the proposed development will comprise a new paved car park and roundabout (easing access to/from the west) to the side and rear of Building 1000.

6.2 Alleviation Measures in Respect of Ground Contamination

The results of the chemical analyses on the samples tested indicate that the materials on-site do not exceed the CLEA SGV's (and are acceptable within the Dutch guidelines) for commercial land use. Therefore, there is no evidence of significant ground contamination on the site in relation to the proposed end-use.

In view of the above findings, no special measures are required in terms of remediation, subject to ensuring that suitable topsoil is present in landscaped areas.

Suitable health and safety precautions should be adopted during the site works and care should be taken to minimise the amount of dust generated on-site. Site workers engaged in earthworks and working in trenches/excavations should, as a precautionary measure, minimise physical contact with the soil, and be rigorous in matters of personal hygiene.

With respect to off site disposal, the results of the chemical analyses indicate that the majority of soils will be classified as "uncontaminated". This is in accordance with the Environment Agency Interim Guidance on the Disposal of "Contaminated Soils".

6.3 Geotechnical Hazards

A summary of commonly occurring geotechnical hazards is given in Table 6.1 together with an assessment of whether the site may be affected by each of the stated hazards.

Table 6.1 Summary of main potential geotechnical hazards that may affect site

Hazard category (excluding contamination issues)	Hazard status based on investigation findings and proposed development			Engineering considerations if hazard affects site
	Found to be present on site	Could be present but not found	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions		✓		Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓	Silty Clay and sandy Clay – medium potential		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)	✓	Soft Silty Clay with organic-rich lenses in TP9 only		Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓	Silty / Sandy Clay		Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)		✓		May affect ground engineering and foundation design and construction
Evaporite dissolution features and/or subsidence			✓	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides			✓	Likely to require special stabilisation measures

Ground subject to peri-glacial valley cambering with gulls possibly present			✓	Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion			✓	Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)		✓		May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area			✓	May affect deep foundations, basements and tunnels
Underground mining			✓	Likely to require special stabilisation measures
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓	Buried sub-structure found in TP13		Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	✓	Maximum of 2.9m of made ground present in TP13.		Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)			✓	May affect ground engineering and foundation design and construction

Seismicity is not included in Table 5.1 as this is not normally a design consideration in the UK.

The likely presence of chalk at shallow depth indicates that subsidence related to chalk dissolution features might be a possibility. Based on the Edmond's risk assessment model for natural dissolution features referred to in CIRIA Project Report II (1994), the site falls into the "moderately low subsidence risk" category. With reference to Edmond's data-base of known natural/man-made chalk solution features there are no such features in the immediate vicinity of the site.

6.4 Sub-grade Conditions for Road Pavements

Sub-grade materials present and groundwater levels

It is understood that the finished ground level of the proposed development will be at approximately the existing ground level.

In the 1m to 1.1m below the proposed finished ground level the exploratory holes have revealed a soil profile comprising made ground composed of clayey sand overlying sandy clay. The potentially poorest sub-grade material within this profile is the made ground due to its variable nature and unknown history of compaction.

The groundwater conditions are anticipated to comprise a low water-table, i.e. at least 1m below the pavement formation level. The ground investigation revealed the shallowest water strike to be 2.25m b.g.l, however, groundwater levels should be expected to be higher in the winter months

Estimated minimum CBR under long-term conditions

The estimated minimum, equilibrium soil-suction, CBR value for the soils (sandy clay) and groundwater conditions described above under a completed pavement is 4%, after Table C1 in TRRL Report LR1132 (1984).

CBR values determined under current conditions

The in situ sub-grade soils CBR values have been assessed under present conditions using the DCP test apparatus and the results are summarised in Table 6.2.

Table 6.2 Summary of CBR values derived from in situ DCP tests

Test Location	Material Type	Minimum CBR value determined at or just below anticipated formation level
TP1	Made Ground	5% (typically above 10%)
TP2	Made Ground	6%
	Sandy Clay	10%
TP3	Made Ground	6% (typically above 10%)
	Sandy Clay	9%
TP4	Made Ground	12%
TP5	Made Ground	12% (typically above 20%)
TP6	Made Ground	12% (typically above 30%)
TP7	Made Ground	5%
TP8	Made Ground	7%
	Sandy Clay	4%

The made ground materials in the vicinity of test locations may be susceptible to improvement by rolling with conventional compaction plant.

Recommended CBR value for road pavement design

The recommended sub-grade soil CBR value for road pavement design is therefore 6%. This value assumes that during construction the formation level will be carefully compacted and any soft spots dug out and replaced by compacted suitable fill material.

Frost-susceptibility of sub-grade soils

The sandy clay sub-grade soils can be regarded as non-frost-susceptible ($PI > 15\%$), after the criteria given in Appendix 1 of TRRL Report Road Note 29 (Ref). The made ground may be frost susceptible due to the presence of chalk gravel. When the sub-grade is frost-susceptible the thickness of sub-base must be sufficient to give a total thickness of non-frost-susceptible pavement construction over the soil of not less than 450mm.

6.5 Chemical Attack on Buried Concrete

The results of chemical tests carried out on soil samples indicate 2:1 water soil extract sulphate contents of up to 0.06g/l with generally near neutral pH values.

These results indicate that, in accordance with BRE Special Digest 1: 2001 *Concrete in aggressive ground*, the Aggressive Chemical Environment for Concrete (ACEC) Classification is **AC-1s** with a Design Sulfate Class for the site of **DS-1**. This assumes nominally static groundwater conditions and that no significantly disturbed clay comes into contact with concrete foundations or structures.

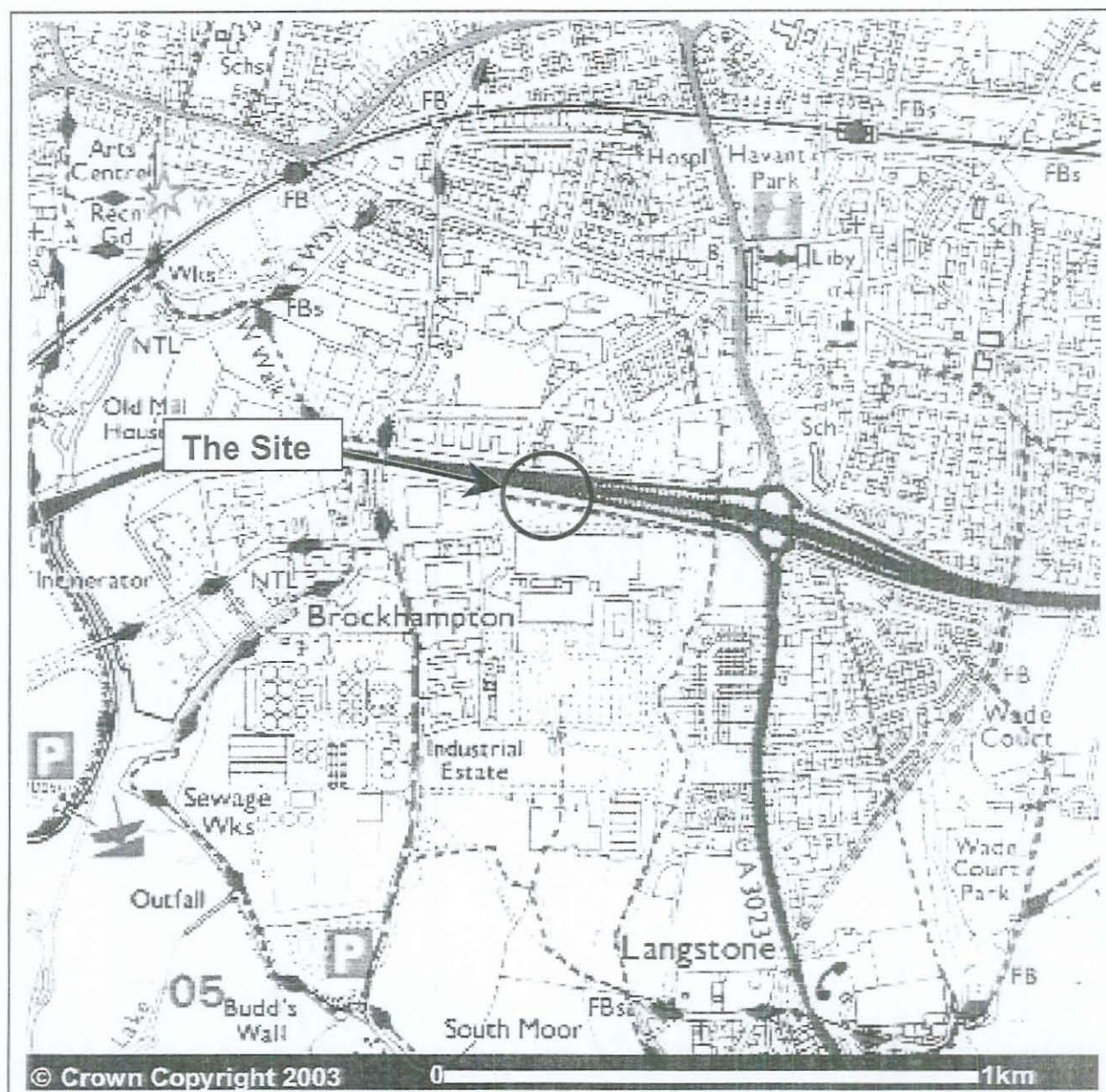
If significantly disturbed clay is likely to come into contact with concrete foundations or structures it will be necessary to carry out additional tests on the soil to investigate its total potential sulphate content. This will facilitate a revaluation of the ACEC Classification and Design Sulfate Class for the material, to take into consideration potential oxidation of available sulphides (e.g. pyrite), as defined in Table 2 BRE Special Digest 1: 2001.

6.6 Soakaways

Soakage tests were carried out in trial pits TP9 and TP10 in general accordance with BRE 365 and the results are given in Appendix A, Sheets A22 and A23.

The test results both show some infiltration. By adjusting the soakage calculations to consider infiltration through the permeable gravel horizontally, infiltration rates of 2.66×10^{-5} and 1.99×10^{-5} have been calculated for TP9 and TP10, respectively.

FIGURES



Extract of 1:50,000 Ordnance Survey Landranger Map

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Site: Langstone Technology Park	Client: Havant International
National Grid Reference: SU 7105 NW	Scale: See attached scale

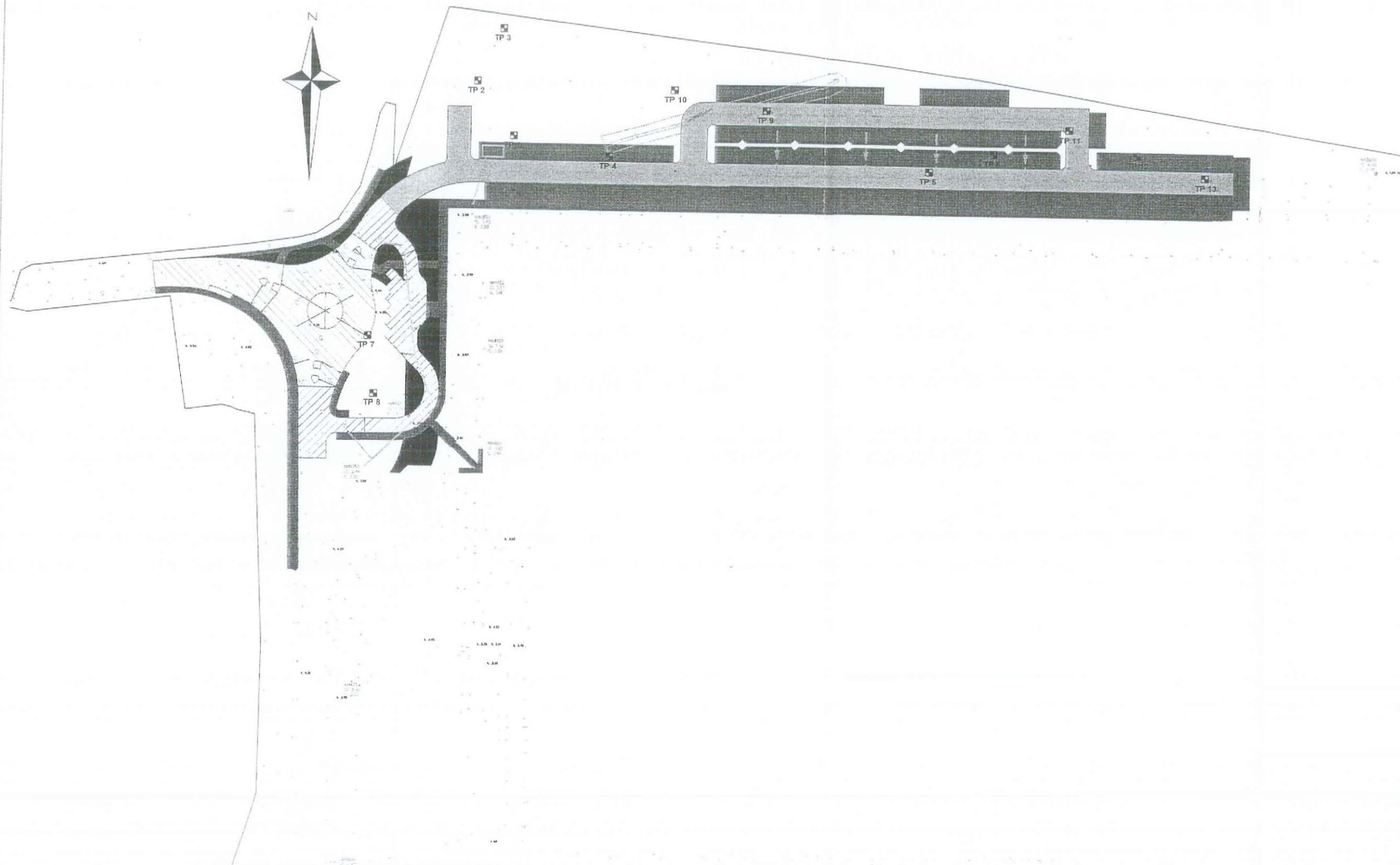
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SITE LOCATION PLAN

Job No: 33893/01

Fig No: 1

NOTES:



LANGSTONE TECHNICAL PARK

Exploratory Hole
Location Plan

Client:

GLANVILLE
CONSULTANTS

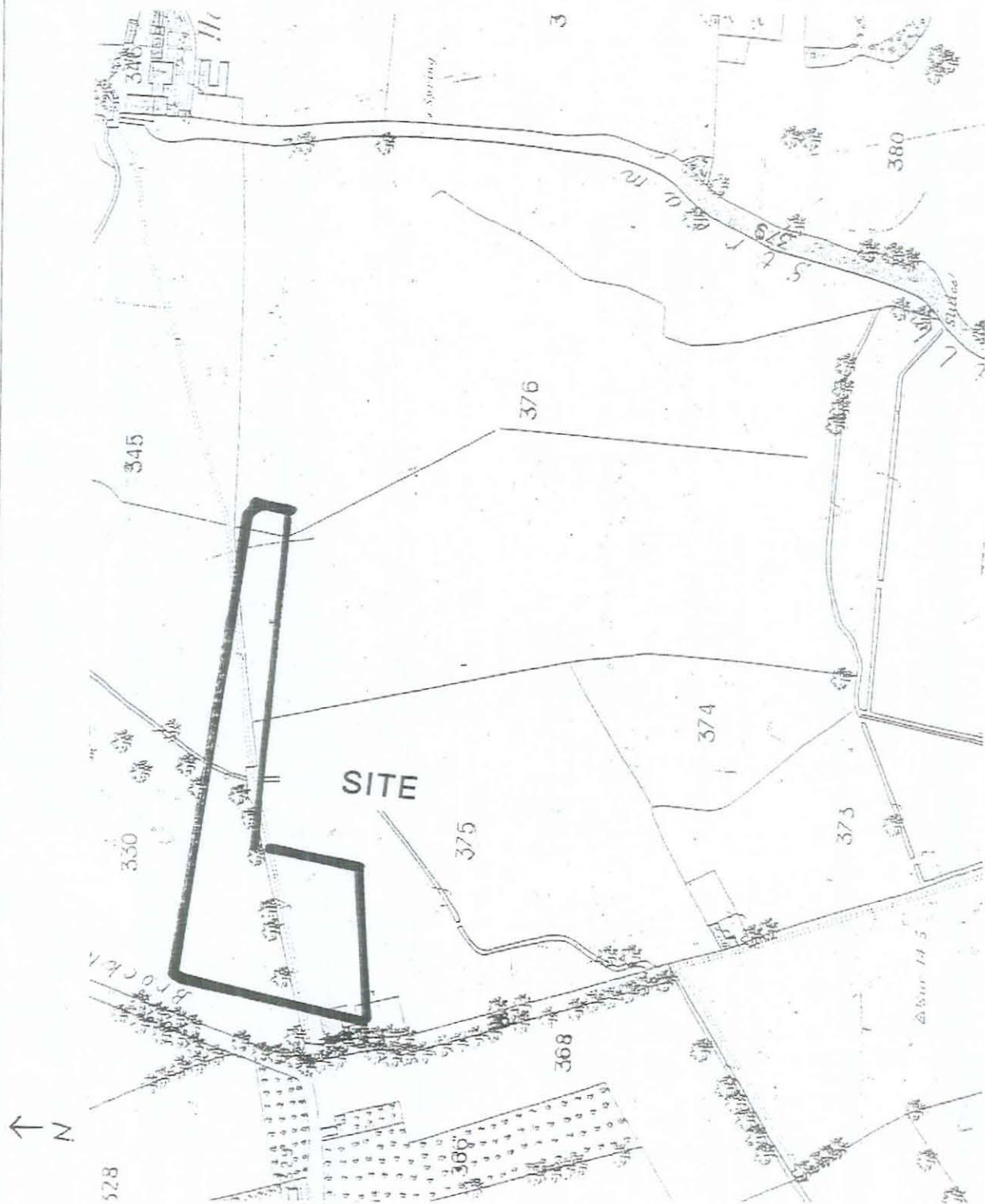
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By: JPD	Date: 16/10/03	Scale: NTS
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Site: Langstone Park, Havant

Client: Glanville Consultants Ltd.

Source: OS Map Hampshire Sheet 76.11

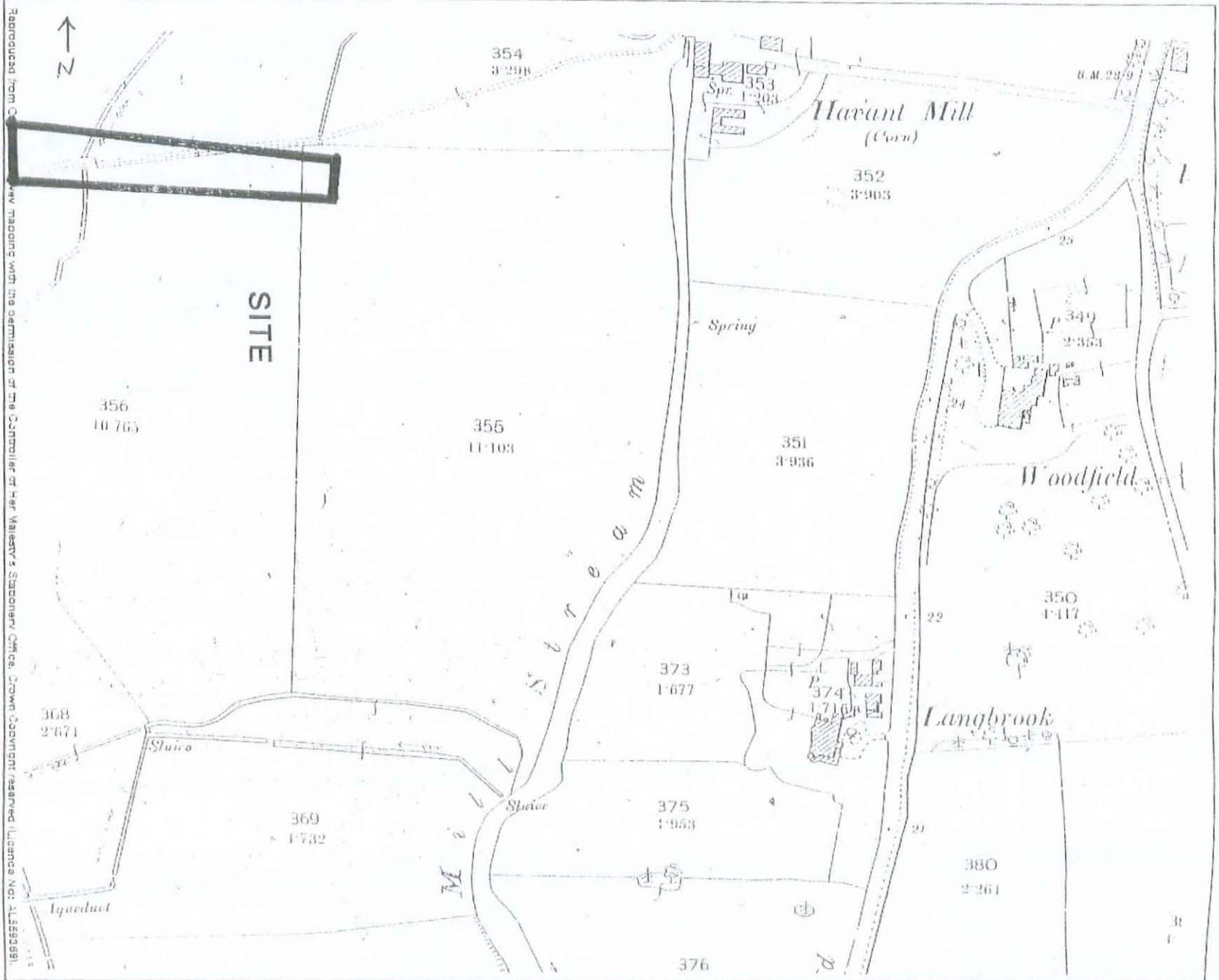
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EXTRACT FROM
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1866

Job No: 33893

Fig No: 3



Site: Langstone Park, Havant

Client: Glanville Consultants Ltd.

Source: OS Map Hampshire Sheet 76.11

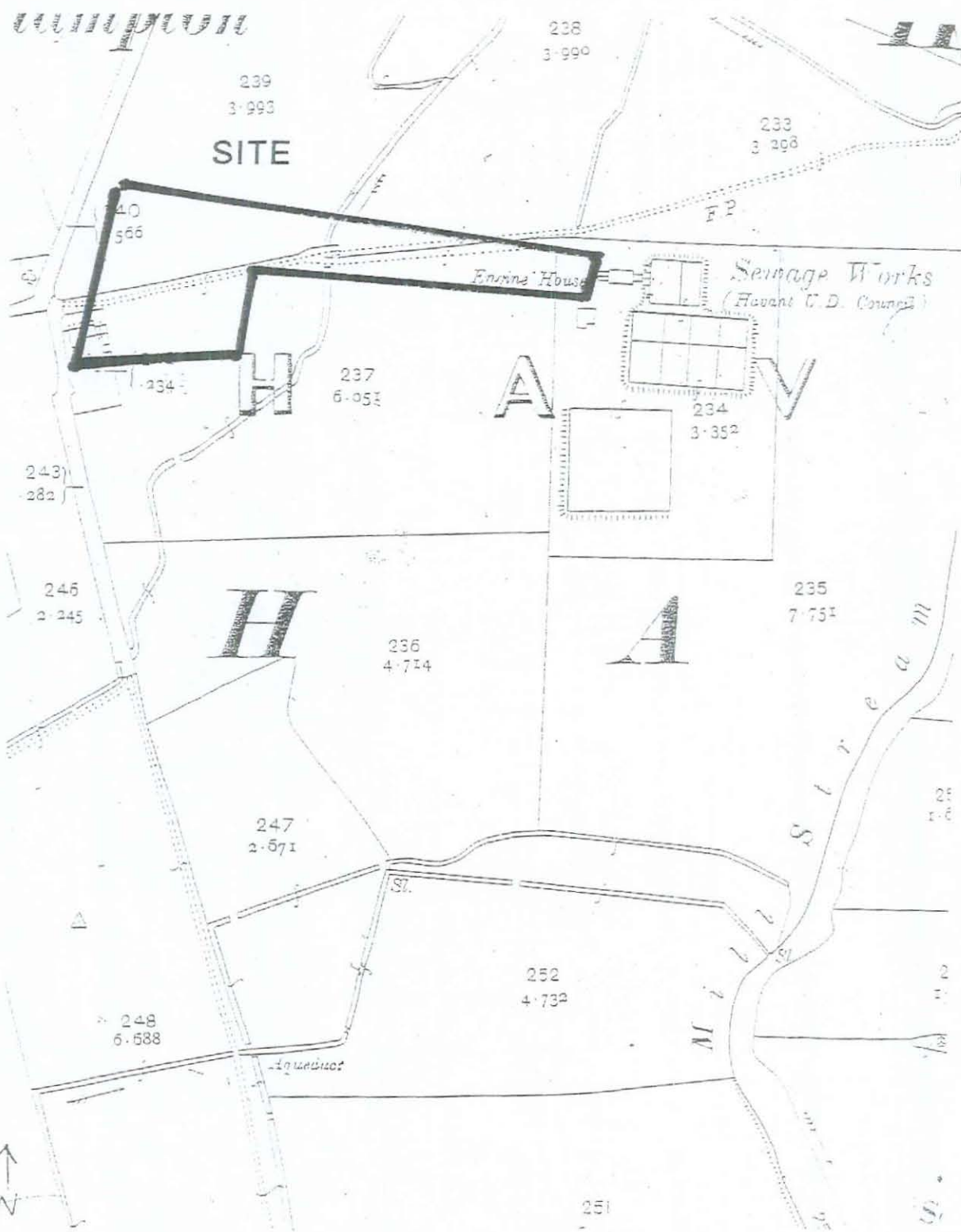
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Fig No: 4



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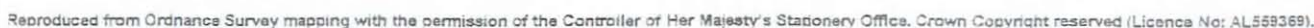
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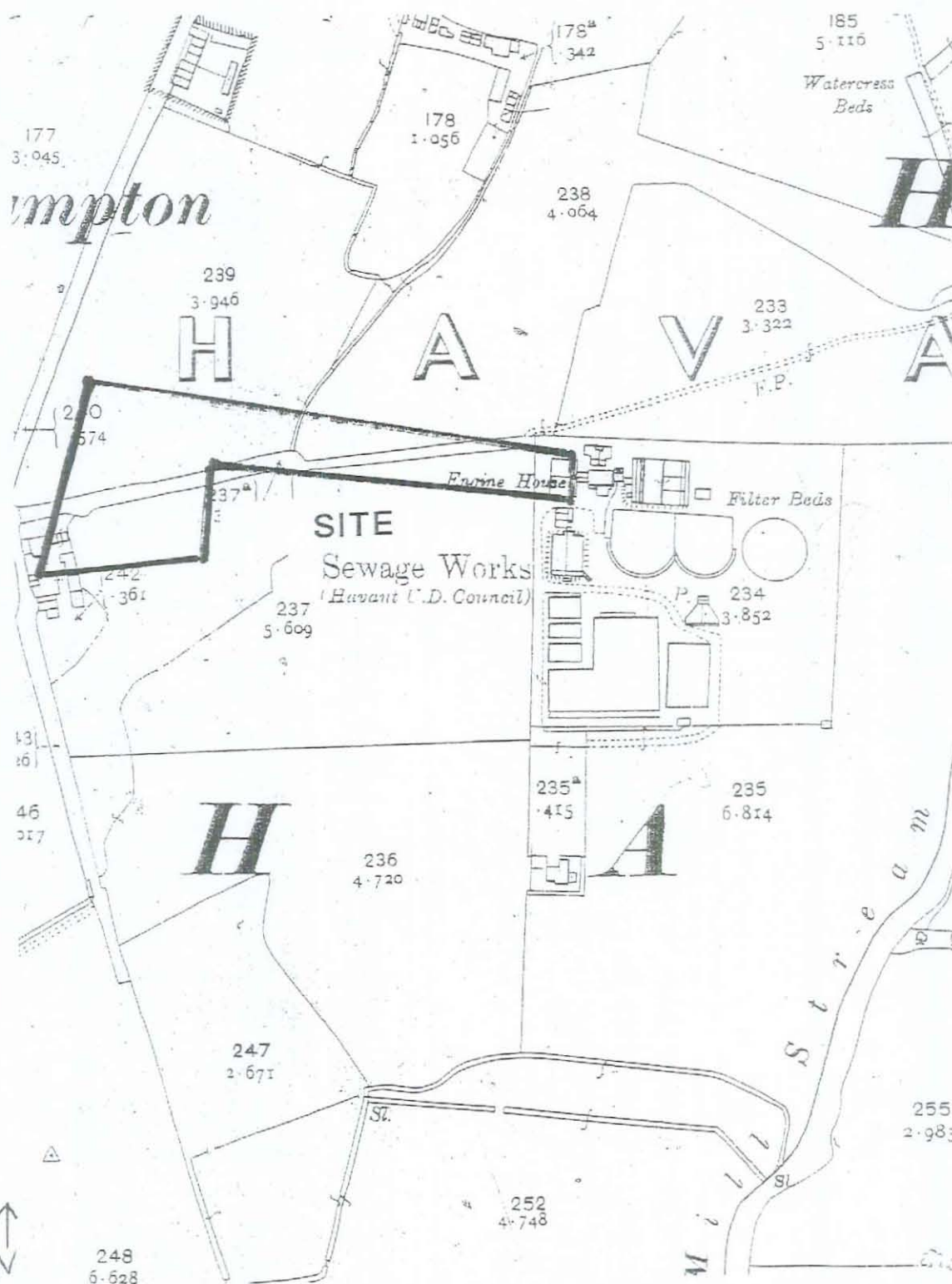
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Fig No: 6



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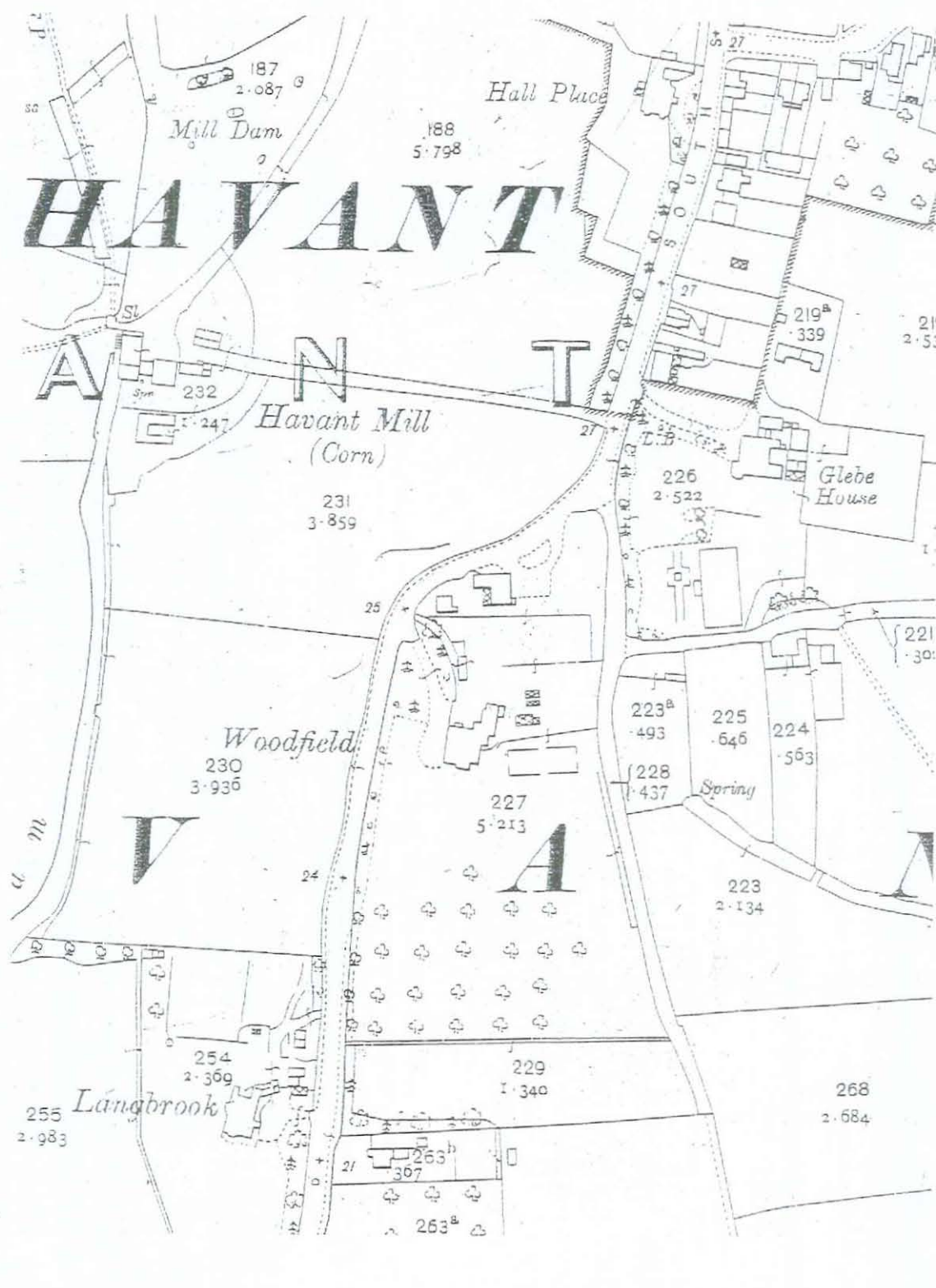
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Source: OS Map Hampshire Sheet 76.11 (1 of 2)	Scale: 1:2534

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Client: Glanville Consultants Ltd.

Source: OS Map Hampshire Sheet 76.11 (2 of 2)

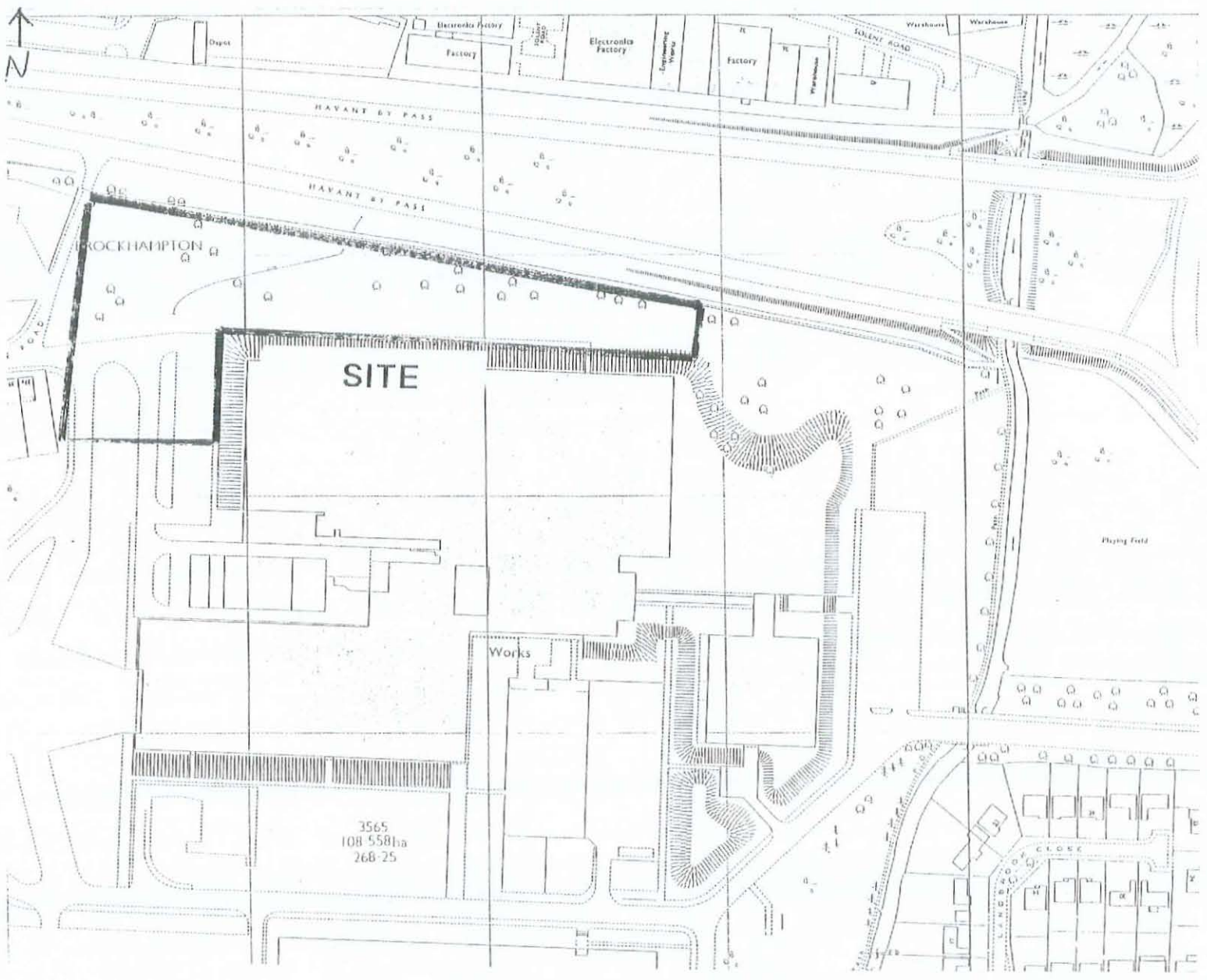
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Fig No: 8

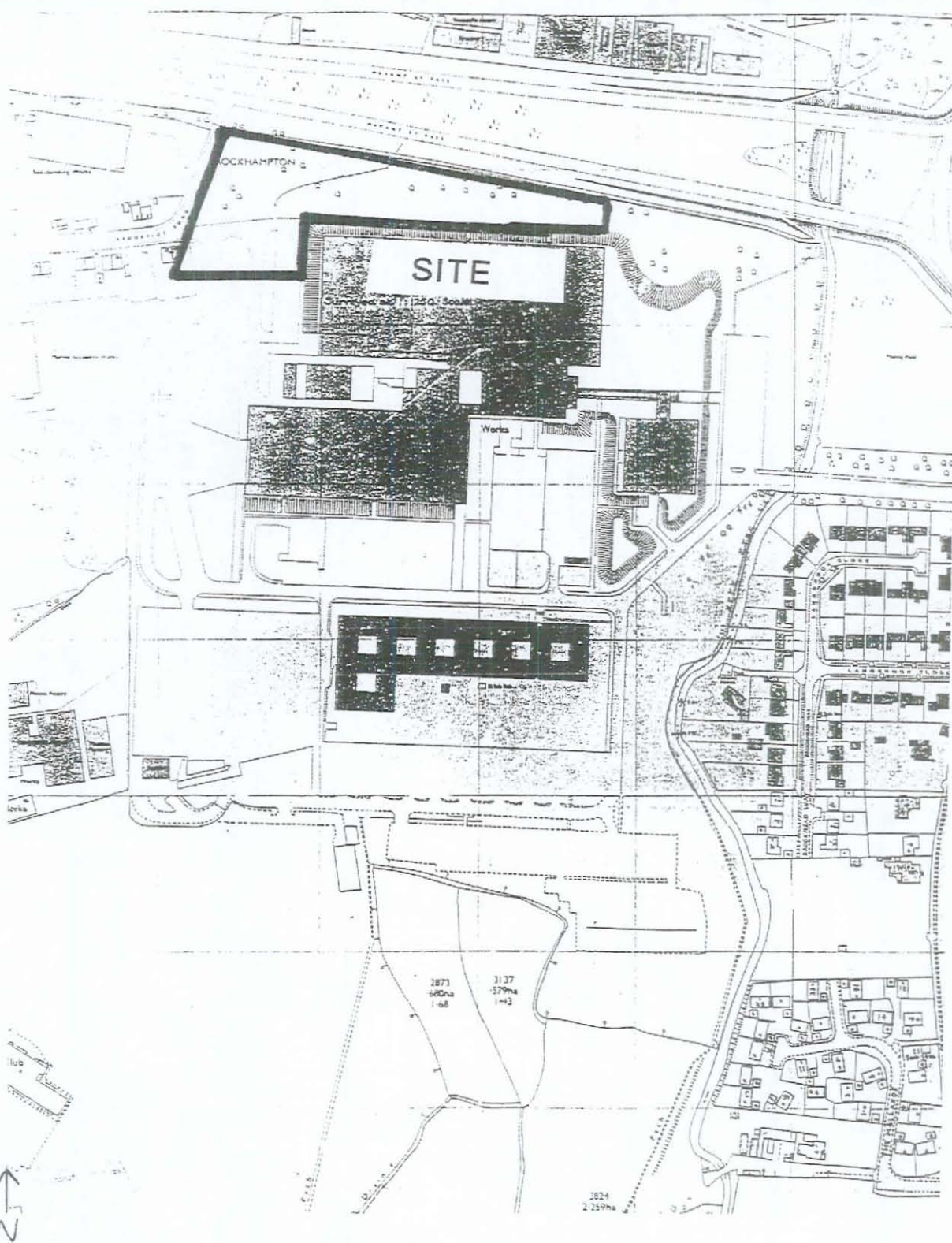


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Site: Langstone Park, Havant Client: Glanville Consultants Ltd.

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 1972
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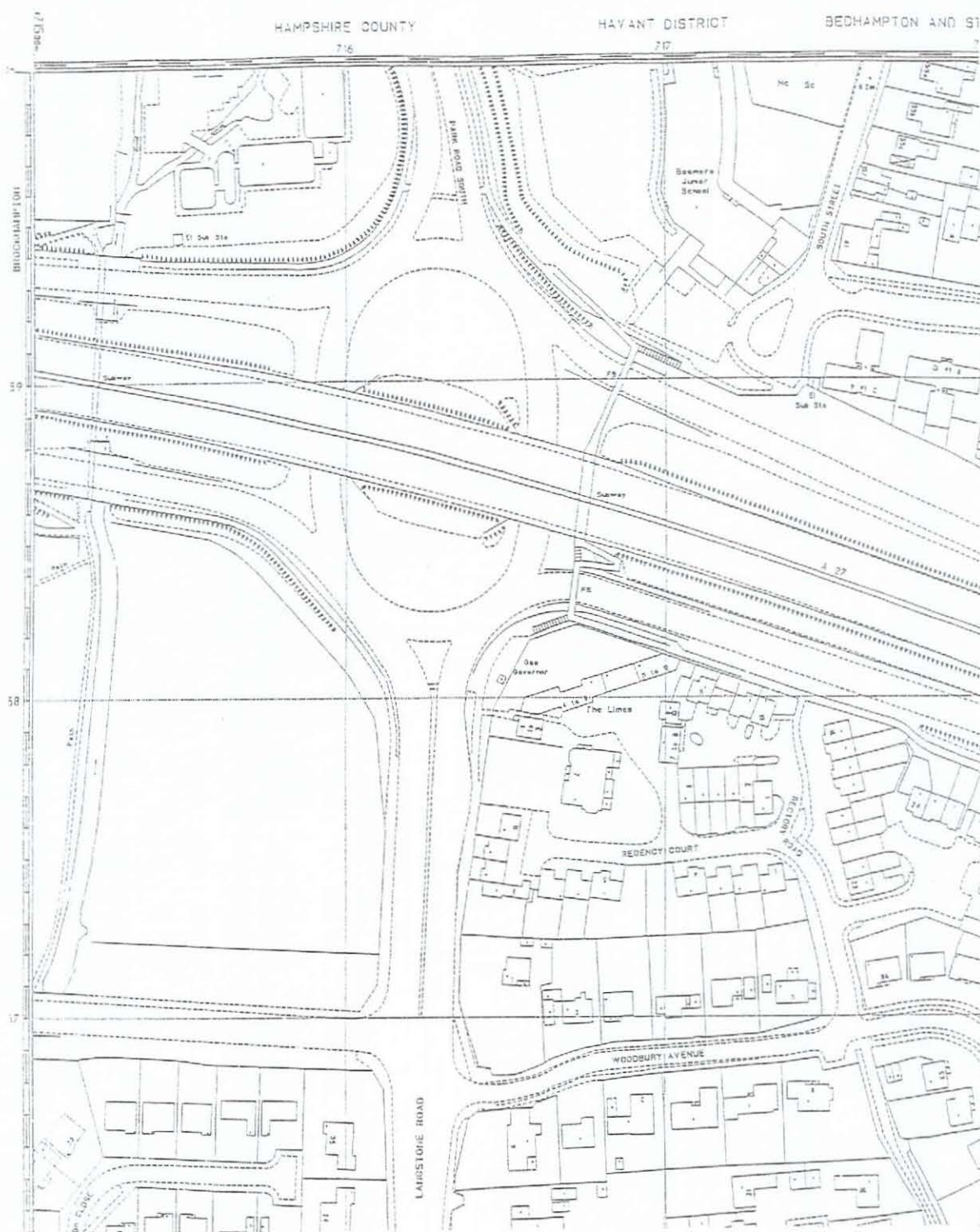
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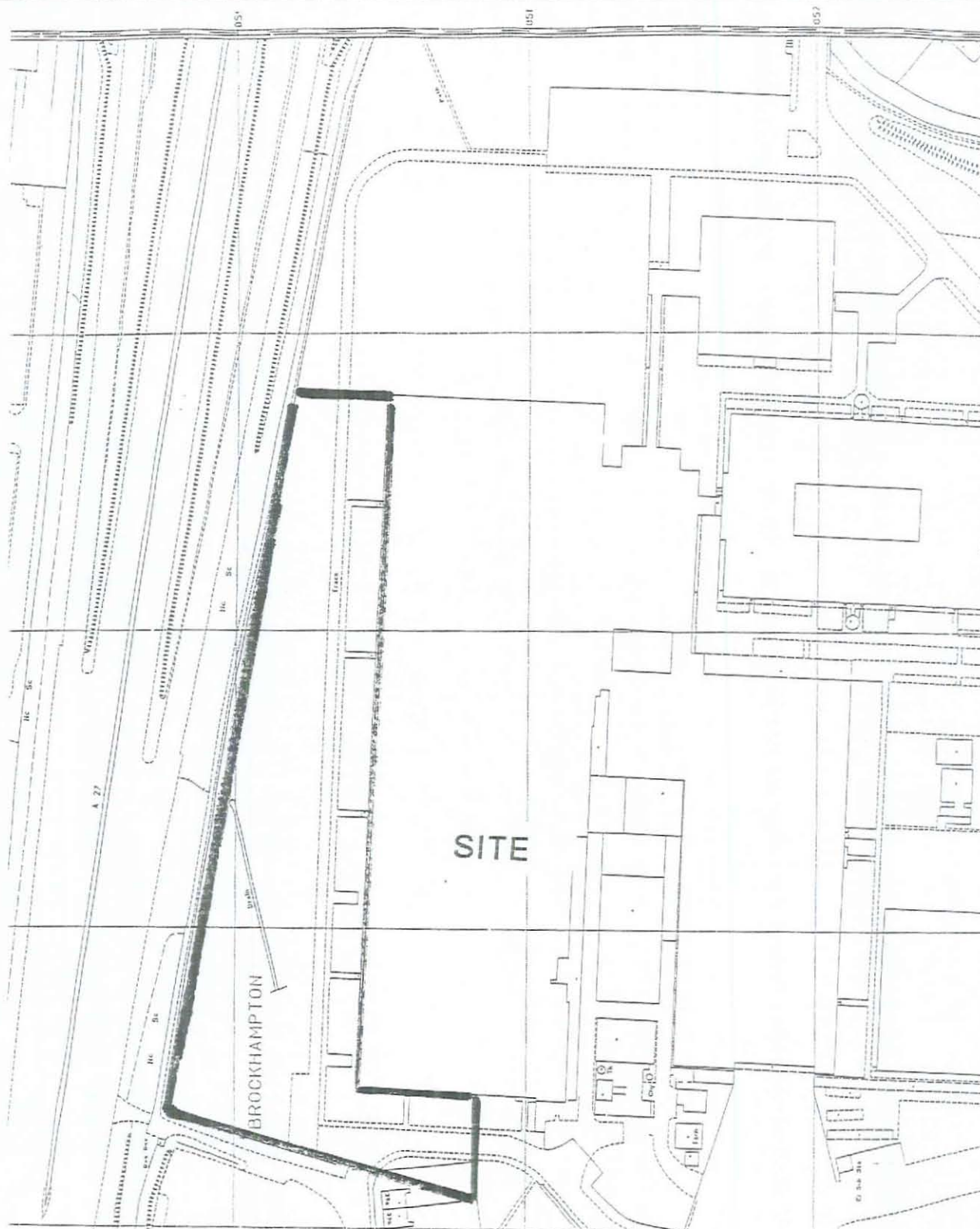
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Fig No: 11



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1997

Job No: 33893

Fig No: 12

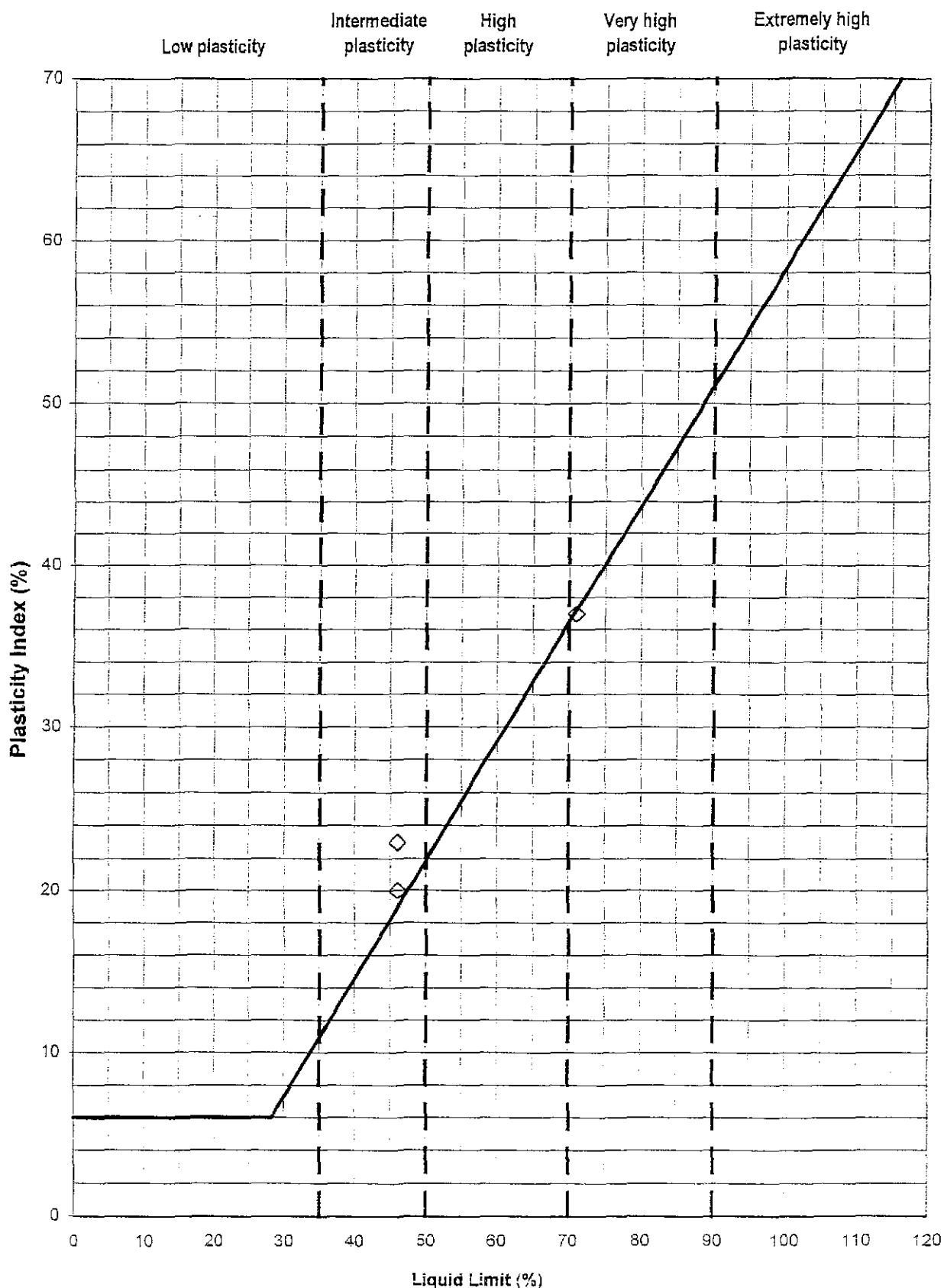
PLASTICITY CLASSIFICATION CHART

Site:
Langstone Technology Park

Client:
Glanville Consultants Limited

Job Number: 33893

Figure: 13



◇ Sandy Clay

APPENDIX A
FIELDWORK RECORDS

STATS

Specialist Engineering, Materials
and Environmental Consultants

TRIAL PIT RECORD

Trial Pit
Number:

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP1

Client:
Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
18 Sep 03

Job No.:
33893

GROUND WATER

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
		D1	0.00-0.10	0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
		D2	0.85 PP	0.85	0.80	0.70		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
	1	D3	1.40					Stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		D4	1.90					
	2	D5	2.05		2.05	1.25		
		D6	2.25					Light to dark brown clay-bound sandy GRAVEL. Gravel is angular to sub-rounded flint fragments. ... @ 2.25m white communited chalk mixed with sandy Gravel.
		D7	2.70		2.70	0.65		End of Trial Pit at 2.70 m
	3							
	4							

Remarks and Water Observations

Pit terminated at 2.7m depth, sandy Gravel is noticeably
damp.

Key for Insitu tests

Scale: 1:25

HV-Hand Vane (kN/m²)

Logged by: NAW

PP-Pocket Penetrometer (kN/m²)

Figure: A1

MP-Mackintosh Probe (N150)

*Specialist Engineering, Materials
and Environmental Consultants*

**Trial Pit
Number:**

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP2

Client: Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
18 Sep 03

Job No.:
33893

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Remarks and Water Observations

Pit terminated at 2.3m depth. No groundwater encountered.

Key for Insitu tests

Scale: 1:25

HV-Hand Vane (kN/m²)

Logged by: NAW

PP-Pocket Penotometer (kN/m²)

Figure: 42

MP-Mackintosh Prope (N150)

STATS

Specialist Engineering, Materials
and Environmental Consultants

TRIAL PIT RECORD

Trial Pit
Number:

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP3

Client:
Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
18 Sep 03

Job No.:
33893

GROUND WATER

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
		D1	0.00-0.10	0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
		D2	0.60	PP 0.65	0.65	0.55		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
		D3	0.75					Very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		D4	1.20					... @1.2m very frequent flints
		D5	1.60		1.60	0.95		Light to dark brown clay-bound sandy GRAVEL. Gravel is angular to sub-rounded flint fragments.
					2.10	0.50		... @ 1.9m communitied chalk appearing on flint surfaces
								End of Trial Pit at 2.10 m

Remarks and Water Observations

Pit terminated at 2.1m depth. No groundwater
encountered.

Key for Insitu tests

HV-Hand Vane (kN/m²)
PP-Pocket Penetrometer (kN/m²)
MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A3

STATS

Specialist Engineering, Materials
and Environmental Consultants

TRIAL PIT RECORD

Trial Pit
Number:

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP4

Client:
Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
18 Sep 03

Job No.:
33893

GROUND WATER

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
		D1	0.00-0.10	0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
		D2	0.40		0.30	0.20		MADE GROUND: Light brown sandy gravel. Gravel is sub-angular to sub-rounded flint fragments. Rare to occasional sand sized brick fragments and sub-angular chalk pieces to gravel size.
					0.65	0.35		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
		D3	1.20 PP	1.20	213			Stiff to very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		D4	1.80		1.70	1.05		Light to dark brown clay-bound sandy GRAVEL. Gravel is angular to sub-rounded flint fragments.
					2.00	0.30		End of Trial Pit at 2.00 m

Remarks and Water Observations

Pit terminated at 2m. No groundwater encountered.

Key for Insitu tests

Scale: 1:25

HV-Hand Vane (kN/m²)

Logged by: NAW

PP-Pocket Penetrometer (kN/m²)

Figure: A4

MP-Mackintosh Probe (N150)

**Specialist Engineering, Materials
and Environmental Consultants**

TRIAL PIT RECORD

**Trial Pit
Number:**

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP6

Client: Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
18 Sep 03

Job No.:
33893

GROUND WATER	SAMPLES/TESTS
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STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10	0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.40		0.65	0.55		MADE GROUND: Light brown sandy gravel. Gravel is sub-angular to sub-rounded flint fragments. Rare to occasional sand sized brick fragments and sub-angular chalk pieces to gravel size.
			D3 1.00		1.10	0.45		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
			D4 1.30	PP 1.20 225	1.80	0.70		Very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
					2.10	0.30		Light to dark brown clay-bound GRAVEL. Gravel is sub-angular to sub-rounded flint fragments. Occasional to frequent sand to fine gravel sized chalk fragments.
								<i>End of Trial Pit at 2.10 m</i>

Remarks and Water Observations

Pit terminated at 2.1m depth. No groundwater encountered.

Key for Insitu tests

Scale: 1:25

nV-Hand Vane (kN/m²) :

Logged by: NAW

pd-Focket Penotometer (kN/m2)

Figure: A6

MP-Mackintosh Probe (N150)

*Specialist Engineering, Materials
and Environmental Consultants*

**Trial Pit
Number:**

Location:
Langstone Road, Havant

TP7

Ground Level:
GL not measured

Dates:
18 Sep 03

Job No.:
33893

GROUND WATER	SAMPLES/TESTS
--------------	---------------

STRATA RECORD

Sheet 1 of 1

Remarks and Water Observations Pit terminated at 1.7m. No groundwater encountered.	Key for Insitu tests	Scale:	1:25
	HV-Hand Vane (kN/m2)	Logged by:	NAW
	PP-Pocket Penotometer (kN/m2)		
	MP-Mackintosh Probe (N150)	Figure:	A7

**Specialist Engineering, Materials
and Environmental Consultants**

Trial Pit
Number:

Location:
Langstone Road, Havant

TP8

Ground Level:
GL not measured

Dates:
18 Sep 03

Job No.:
33893

STRATA RECORD

Sheet 1 of 1

[illegible]

Key for Insitu tests

Scale: 1:25

HV-Hand Vane (kN/m²)
PP-Pocket Penetrometer (kN/m²)
MP-Mackintosh Probe (N/50)

Logged by: NAW

Figure: A8

STATS

Specialist Engineering, Materials
and Environmental Consultants

TRIAL PIT RECORD

Trial Pit
Number:

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP9

Client:
Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
19 Sep 03

Job No.:
33893

GROUND WATER

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
		D1 0.00-0.10 D2 0.10-0.30		0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
		D3 0.80-0.90			0.80	0.70		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
	1							Stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
	2	D4 1.80 PP 1.80		25	1.75	0.95		Soft light brown grey silty CLAY with occasional to frequent lenses of brown black organic material 150mm diameter.
					2.25	0.50		Light grey clay-bound sandy GRAVEL. Gravel is sub-angular to sub-rounded flint fragments.
	3	D5 2.50						... @2.75m no longer clay-bound, light orange brown in colour
					3.10	0.85		End of Trial Pit at 3.10 m
	4							

Remarks and Water Observations

Pit terminated at 3.1m depth. Groundwater struck at
2.25m depth. Inflow slow to fair at base of pit. Some
collapse of pit side walls from 2.2m. Trial pit 2.6m
long, 0.7m wide. 1 No soakaway test conducted in pit.

Key for Insitu tests

Scale: 1:25

HV-Hand Vane (kN/m²)

Logged by: NAW

PP-Pocket Penetrometer (kN/m²)

Figure: A9

MP-Mackintosh Probe (N150)

STATS

Specialist Engineering, Materials
and Environmental Consultants

TRIAL PIT RECORD

Trial Pit
Number:

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP10

Client:
Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
19 Sep 03

Job No.:
33893

GROUND WATER

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.30-0.50		0.50	0.40		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
			D3 0.70					Stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
			D4 1.90		1.80	1.30		Light grey clay-bound sandy GRAVEL. Gravel is sub-angular to sub-rounded flint fragments.
			D5 2.50		2.40	0.60		Light orange brown sandy GRAVEL. Gravel is sub angular to rounded flint fragments, damp. ... @2.40m no longer clay-bound, light orange brown in colour
					2.70	0.30		End of Trial Pit at 2.70 m

Remarks and Water Observations

Pit terminated at 2.7m depth. Groundwater struck at 2.4m depth. Inflow slow at base of pit. Some collapse of pit side walls from 2.4m. Trial pit 2.9m long, 0.7m wide. *No soakaway test conducted in pit.

Key for Insitu tests

HV-Hand Vane (kN/m²)

PP-Pocket Penetrometer (kN/m²)

MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A10

**Specialist Engineering, Materials
and Environmental Consultants**

TRIAL PIT RECORD

Trial Pit Number:

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP11

Client:
Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
19 Sep 03

Job No.:
33893

GROUND WATER

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
		D1	0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
		D2	0.30-0.35					MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
	1	D3	0.90-1.00		0.90	0.80		Medium dense (estimated) clayey SAND with occasional to frequent flints to cobble size.
					1.60	0.70		Dark brown clay-bound sandy GRAVEL. Gravel is sub-angular to sub-rounded flints, occasionally to cobble size. ...@1.8m becoming light brown due to presence of sand to fine gravel sized chalk pieces.
	2	D4	1.80					
		D5	2.20		2.35	0.75		
								<i>End of Trial Pit at 2.35 m</i>
	3							
	4							

Remarks and Water Observations

Pit terminated at 2.35m depth. No groundwater encountered.

Key for Insitu tests

Scale: 1:25

HV-Hand Vane (kN/m²)
PP-Pocket Penetrometer (kN/m²)
MP-Mackintosh Probe (N150)

Logged by: NAW

Figure: A11

STATS

Specialist Engineering, Materials
and Environmental Consultants

TRIAL PIT RECORD

Trial Pit
Number:

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP12

Client:
Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
19 Sep 03

Job No.:
33893

GROUND WATER

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.30-0.35					MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
					2.30	2.20		
			D3 2.40					Light to dark brown clay-bound GRAVEL. Gravel is sub-angular to sub-rounded flint fragments. Occasional sand to fine gravel sized chalk fragments.
			D4 2.90		3.00	0.70		... @2.8m becoming light brown white in colour due to increased presence of chalk pieces
								End of Trial Pit at 3.00 m

Remarks and Water Observations

Pit terminated at 3m depth. No groundwater encountered.

Key for Insitu tests

Scale: 1:25

HV-Hand Vane (kN/m²)

Logged by: NAW

PP-Pocket Penetrometer (kN/m²)

Figure: A12

MP-Mackintosh Probe (N150)

*Specialist Engineering, Materials
and Environmental Consultants*

TRIAL PIT RECORD

**Trial Pit
Number:**

Site:
Langstone Technology Park

Location:
Langstone Road, Havant

TP13

Client:
Glanville Consultants Ltd

Ground Level:
GL not measured

Dates:
19 Sep 03

Job No.:
33893

GROUND WATER

SAMPLES/TESTS

STRATA RECORD

Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.50-0.75					MADE GROUND: Brick fill mixed with dark brown clayey sand with frequent gravel sized concrete pieces. Frequent whole bricks and occasional metal work.
		1						
		2						
		3			2.90	2.90		End of Trial Pit at 2.90 m
		4						

Remarks and Water Observations

Pit terminated at 2.9m depth. No groundwater encountered. Sub-surface wall encountered down to 2.9m, base of wall not determined.

Key for Insitu tests

HIV-Hand Vane (kN/m²)PP-Pocket Penotometer (kN/m²)

MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A13

Site:

Langstone Techology Park, Langstone Road, Havant

Client:

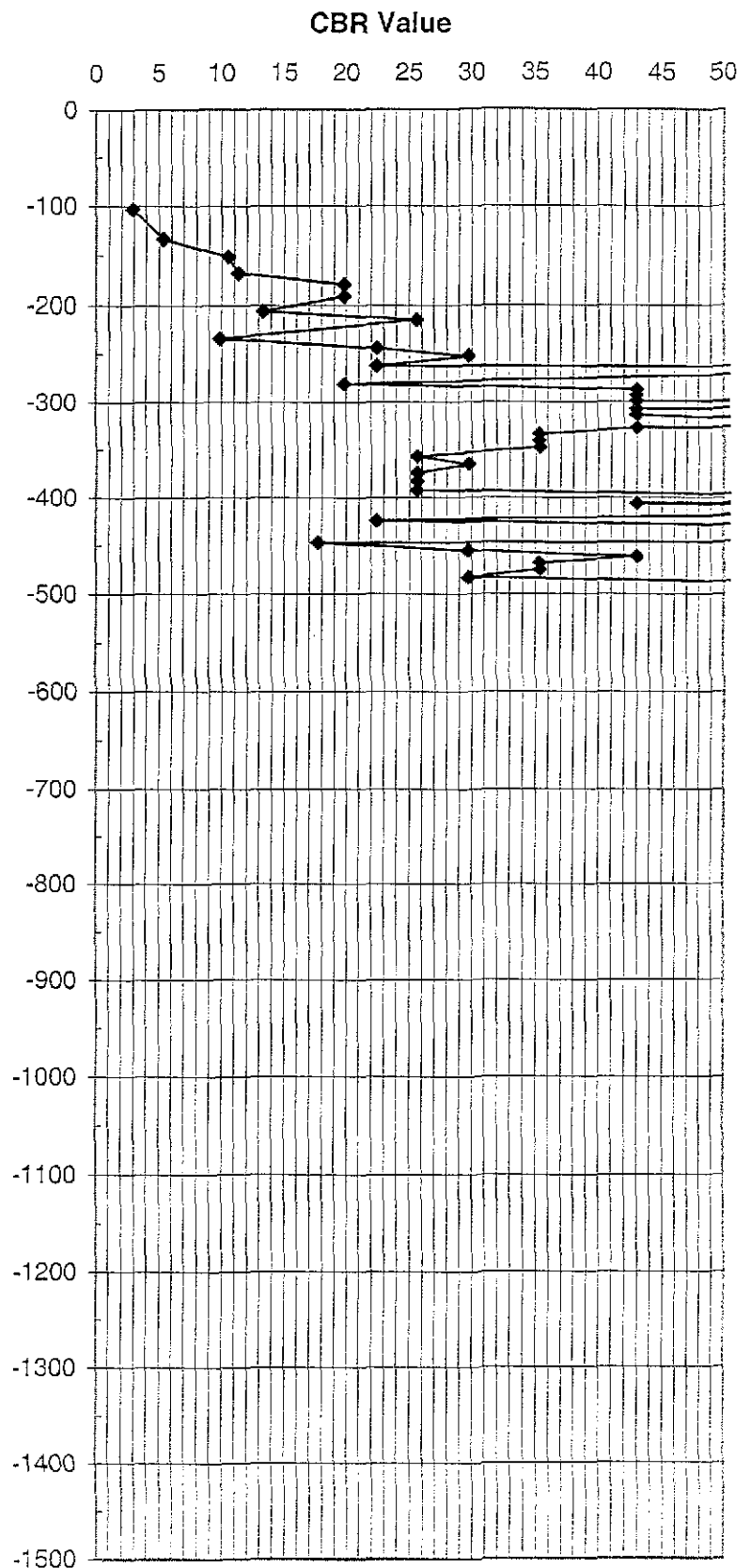
Glanville Consultants

Depth (mm)

-54

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
54	-54	0		
103	-103	1	49	3
134	-134	2	31	5
152	-152	3	18	11
169	-169	4	17	11
180	-180	5	11	20
191	-191	6	11	20
206	-206	7	15	13
215	-215	8	9	26
234	-234	9	19	10
244	-244	10	10	22
252	-252	11	8	30
262	-262	12	10	22
265	-265	13	3	104
270	-270	14	5	54
281	-281	15	11	20
287	-287	16	6	43
293	-293	17	6	43
299	-299	18	6	43
302	-302	19	3	104
308	-308	20	6	43
314	-314	21	6	43
319	-319	22	5	54
321	-321	23	2	175
327	-327	24	6	43
334	-334	25	7	35
341	-341	26	7	35
348	-348	27	7	35
357	-357	28	9	26
365	-365	29	8	30
374	-374	30	9	26
383	-383	31	9	26
392	-392	32	9	26
397	-397	33	5	54
400	-400	34	3	104
406	-406	35	6	43
410	-410	36	4	72
410	-410	37	0	426
414	-414	38	4	72
424	-424	39	10	22
429	-429	40	5	54
434	-434	41	5	54
435	-435	42	1	426
447	-447	43	12	18
455	-455	44	8	30
461	-461	45	6	43
468	-468	46	7	35
475	-475	47	7	35
483	-483	48	8	30
488	-488	49	5	54
492	-492	50	4	72
495	-495	51	3	104
499	-499	52	4	72

Depth Below Existing Ground Level (mm)



Comments:

Test complete to 500mm depth.

Job Number: 33893

Figure: A14

Site:

Langstone Techology Park, Langstone Road, Havant

Client:

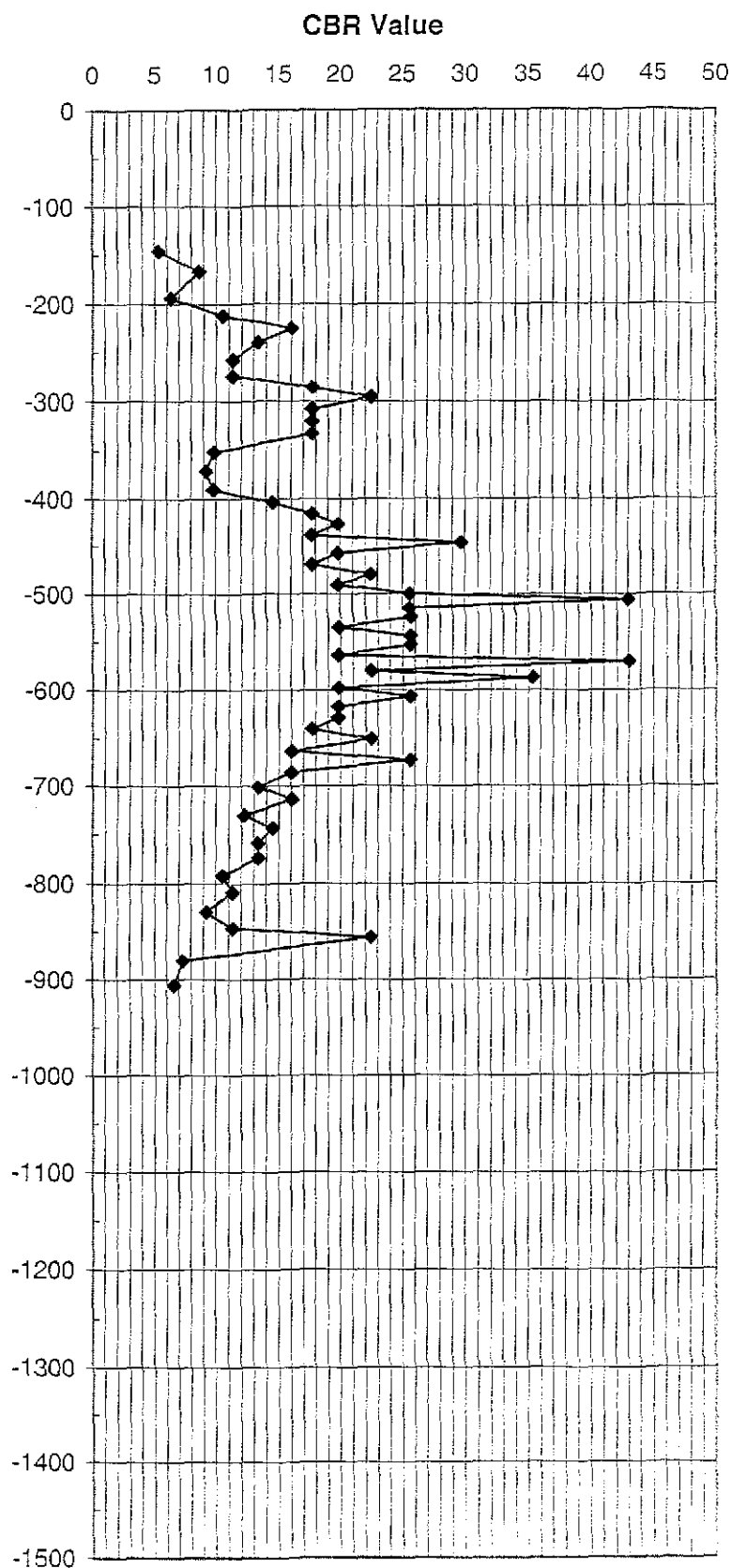
Glanville Consultants

Depth (mm)

-115

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
115	-115	0		
146	-146	1	31	5
167	-167	2	21	9
194	-194	3	27	6
212	-212	4	18	11
225	-225	5	13	16
240	-240	6	15	13
257	-257	7	17	11
274	-274	8	17	11
286	-286	9	12	18
296	-296	10	10	22
308	-308	11	12	18
320	-320	12	12	18
332	-332	13	12	18
351	-351	14	19	10
371	-371	15	20	9
390	-390	16	19	10
404	-404	17	14	15
416	-416	18	12	18
427	-427	19	11	20
439	-439	20	12	18
447	-447	21	8	30
458	-458	22	11	20
470	-470	23	12	18
480	-480	24	10	22
491	-491	25	11	20
500	-500	26	9	26
506	-506	27	6	43
515	-515	28	9	26
524	-524	29	9	26
535	-535	30	11	20
544	-544	31	9	26
553	-553	32	9	26
564	-564	33	11	20
570	-570	34	6	43
580	-580	35	10	22
587	-587	36	7	35
598	-598	37	11	20
607	-607	38	9	26
618	-618	39	11	20
629	-629	40	11	20
641	-641	41	12	18
651	-651	42	10	22
664	-664	43	13	16
673	-673	44	9	26
686	-686	45	13	16
701	-701	46	15	13
714	-714	47	13	16
730	-730	48	16	12
744	-744	49	14	15
759	-759	50	15	13
774	-774	51	15	13
792	-792	52	18	11
809	-809	53	17	11
829	-829	54	20	9
846	-846	55	17	11
856	-856	56	10	22
880	-880	57	24	7
906	-906	58	26	7

Depth Below Existing Ground Level (mm)



Comments:

Test complete to 906mm depth.

Job Number: 33893

Figure: A16

Site:

Langstone Techology Park, Langstone Road, Havant

Client:

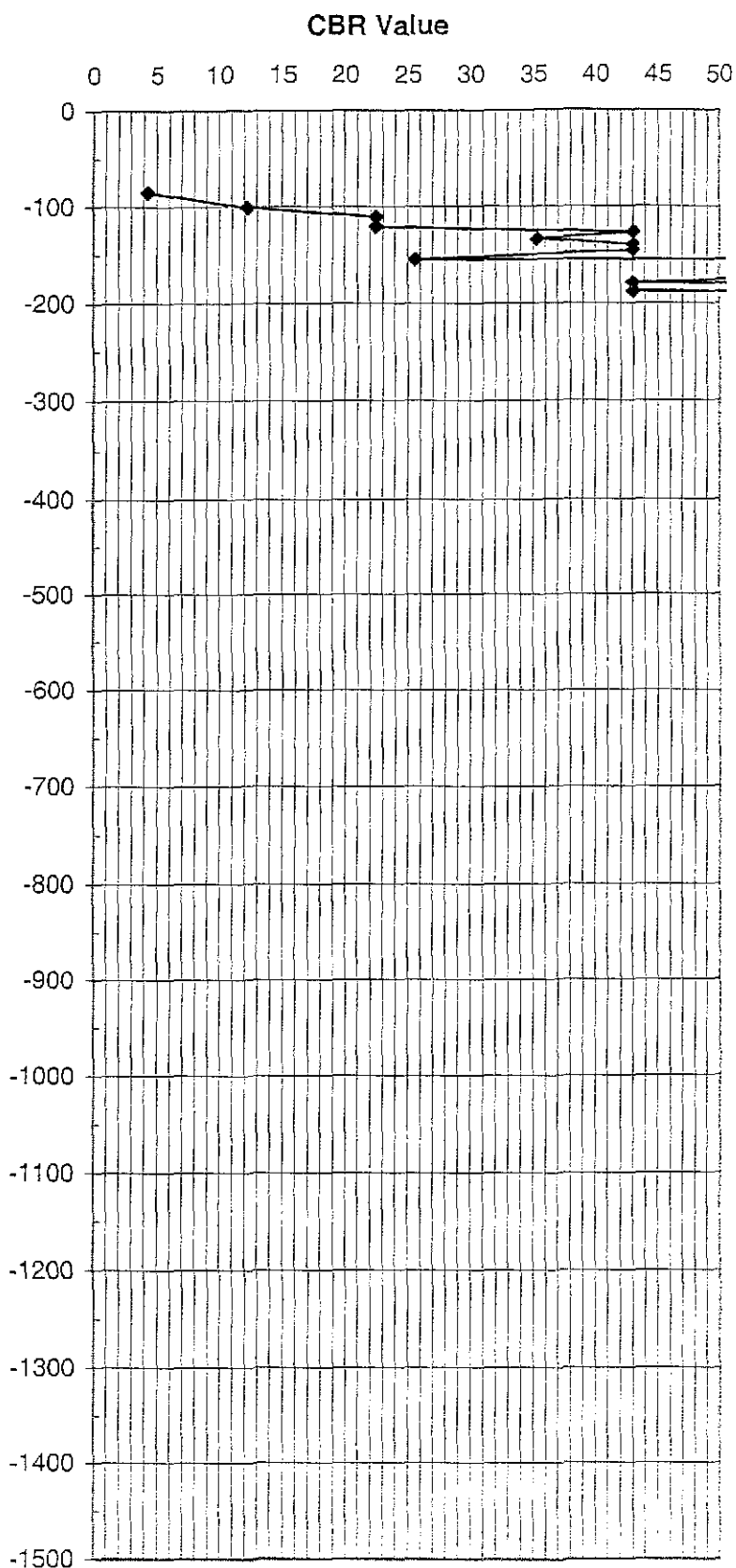
Glanville Consultants

Depth (mm)

-49

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
49	-49	0		
85	-85	1	36	4
101	-101	2	18	12
111	-111	3	10	22
121	-121	4	10	22
127	-127	5	6	43
134	-134	6	7	35
140	-140	7	8	43
146	-146	8	6	43
155	-155	9	9	26
157	-157	10	2	175
161	-161	11	4	72
165	-165	12	4	72
169	-169	13	4	72
174	-174	14	5	54
180	-180	15	6	43
181	-181	16	1	426
182	-182	17	1	426
188	-188	18	6	43
191	-191	19	3	104
195	-195	20	4	72
196	-196	21	1	426
200	-200	22	4	72
201	-201	23	1	426
204	-204	24	3	104
206	-206	25	2	175
209	-209	26	3	104
210	-210	27	1	426
211	-211	28	1	426
212	-212	29	1	426
213	-213	30	1	426

Depth Below Existing Ground Level (mm)



Comments:

Test refusal at 213mm depth due to flint fragments.

Job Number: 33893

Figure: A17

Site:

Langstone Techology Park, Langstone Road, Havant

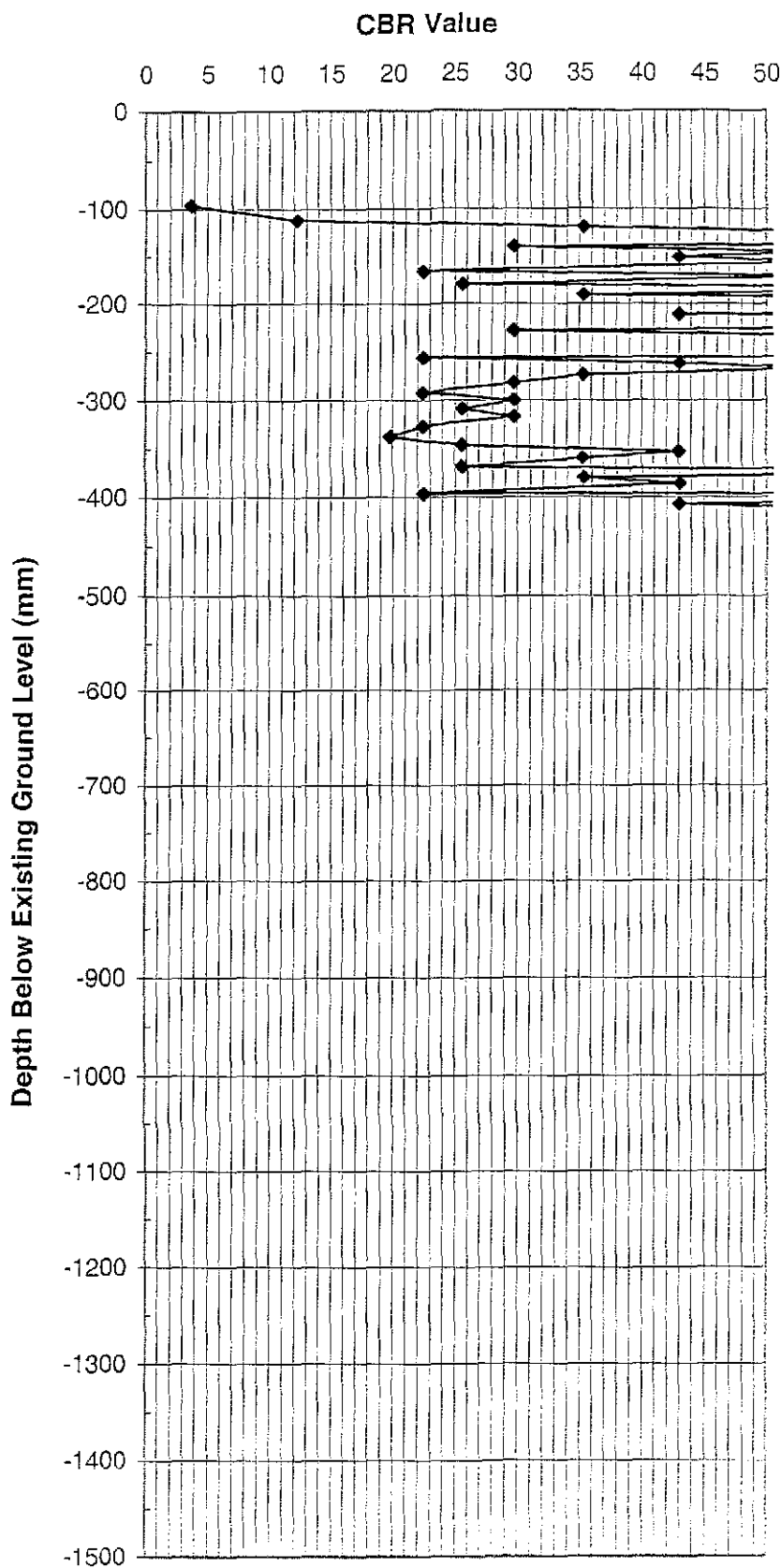
Client:

Glanville Consultants

Depth (mm)

-55

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
55	-55	0		
96	-96	1	41	4
112	-112	2	16	12
119	-119	3	7	35
124	-124	4	5	54
129	-129	5	5	54
132	-132	6	3	104
140	-140	7	8	30
145	-145	8	5	54
151	-151	9	6	43
156	-156	10	5	54
166	-166	11	10	22
171	-171	12	5	54
180	-180	13	9	26
184	-184	14	4	72
191	-191	15	7	35
195	-195	16	4	72
198	-198	17	3	104
201	-201	18	3	104
202	-202	19	1	426
205	-205	20	3	104
211	-211	21	6	43
214	-214	22	3	104
217	-217	23	3	104
220	-220	24	3	104
228	-228	25	8	30
233	-233	26	5	54
237	-237	27	4	72
242	-242	29	5	54
245	-245	29	3	104
246	-246	30	1	426
256	-256	31	10	22
262	-262	32	6	43
267	-267	33	5	54
274	-274	34	7	35
282	-282	35	8	30
292	-292	36	10	22
300	-300	37	8	30
309	-309	38	9	26
317	-317	39	8	30
327	-327	40	10	22
338	-338	41	11	20
347	-347	42	9	26
353	-353	43	6	43
360	-360	44	7	35
369	-369	45	9	26
373	-373	46	4	72
380	-380	47	7	35
386	-386	48	6	43
396	-396	49	10	22
398	-398	50	2	175
401	-401	51	3	104
407	-407	52	6	43
412	-412	53	5	54
417	-417	54	5	54
422	-422	55	5	54
425	-425	56	3	104
430	-430	57	5	54
435	-435	58	5	54
439	-439	59	4	72



Comments:

Test complete to 532mm depth.

Job Number:: 33893

Figure:: A18

Site:

Langstone Techology Park, Langstone Road, Havant

Client:

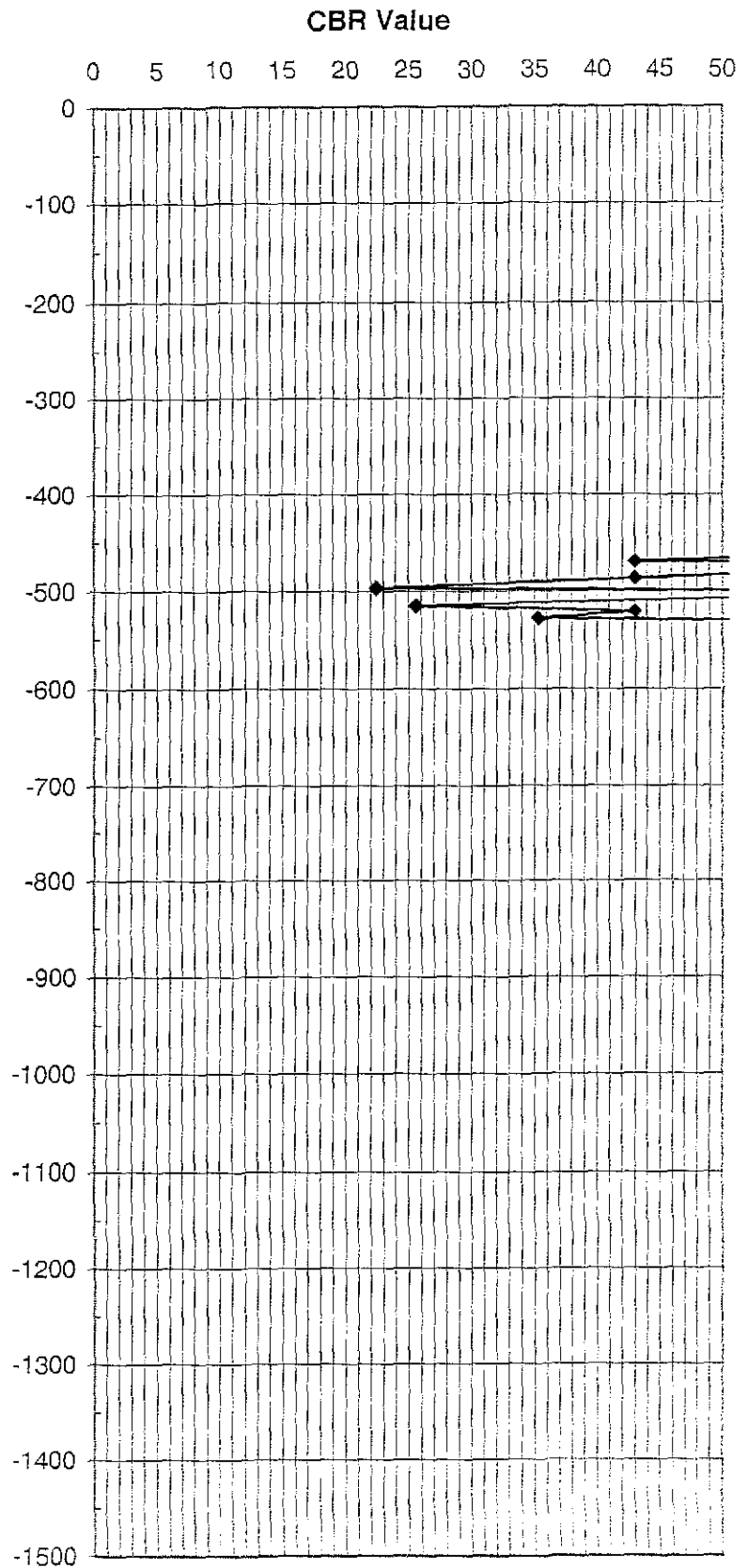
Glanville Consultants

Depth (mm)

-442

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
442	-442	60	3	104.4
444	-444	61	2	175
449	-449	62	5	54
454	-454	63	5	54
459	-459	64	5	54
464	-464	65	5	54
470	-470	66	6	43
472	-472	67	2	175
476	-476	68	4	72
481	-481	69	5	54
487	-487	70	8	43
497	-497	71	10	22
501	-501	72	4	72
506	-506	73	5	54
515	-515	74	9	26
521	-521	75	6	43
528	-528	76	7	35
532	-532	77	4	72

Depth Below Existing Ground Level (mm)



Comments:

Job Number: 133893

Figure: A18

Site:

Langstone Techology Park, Langstone Road, Havant

Client:

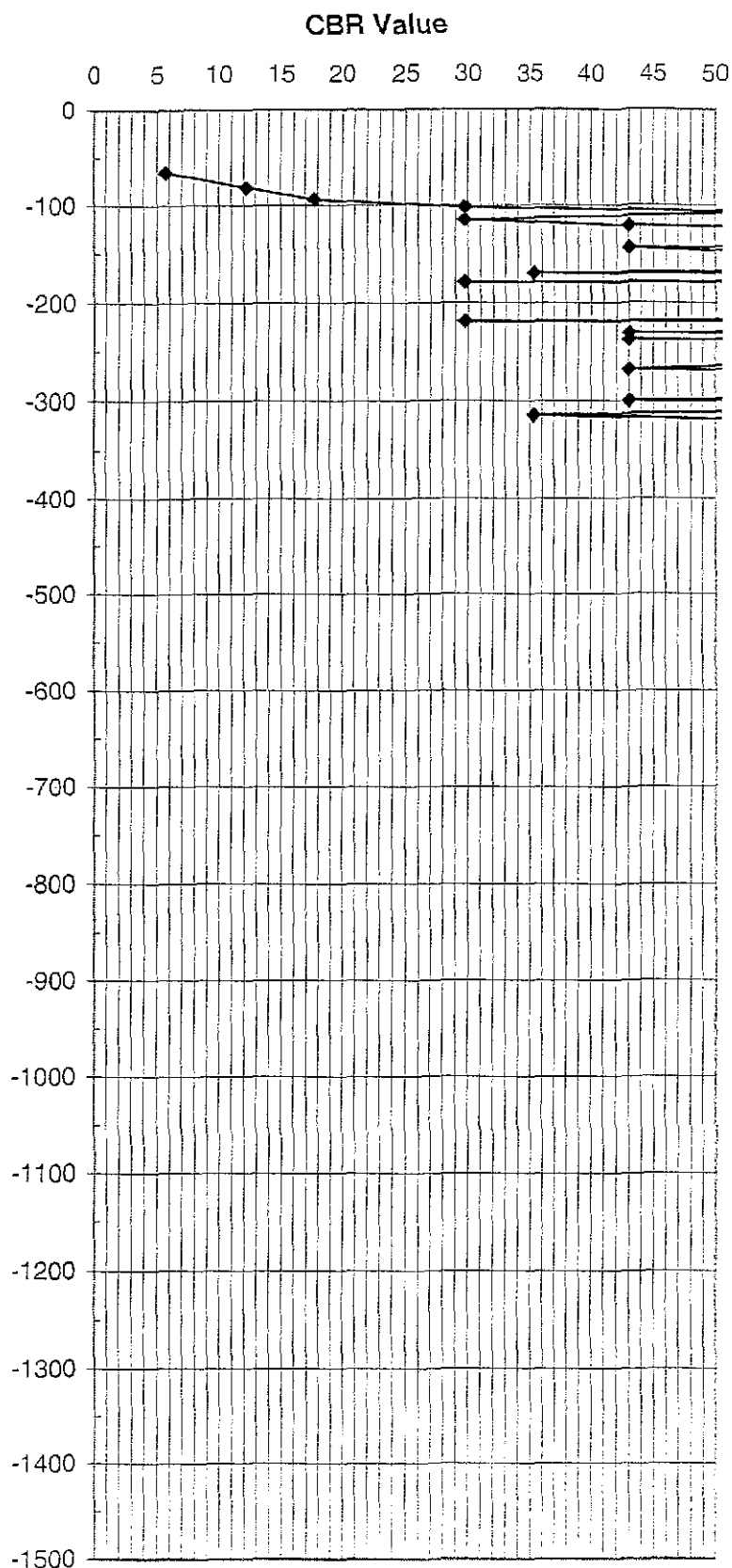
Glanville Consultants

Depth (mm)

-37

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
37	-37	0		
66	-66	1	29	6
82	-82	2	16	12
94	-94	3	12	18
102	-102	4	8	30
107	-107	5	5	54
115	-115	6	8	30
121	-121	7	6	43
125	-125	8	4	72
130	-130	9	5	54
135	-135	10	5	54
138	-138	11	3	104
144	-144	12	6	43
149	-149	13	5	54
151	-151	14	2	175
156	-156	15	5	54
160	-160	16	4	72
163	-163	17	3	104
170	-170	18	7	35
171	-171	19	1	426
171	-171	20	0	426
179	-179	21	8	30
181	-181	22	2	175
186	-186	23	5	54
188	-188	24	2	175
192	-192	25	4	72
195	-195	26	3	104
198	-198	27	3	104
202	-202	28	4	72
205	-205	29	3	104
209	-209	30	4	72
211	-211	31	2	175
219	-219	32	8	30
220	-220	33	1	426
222	-222	34	2	175
225	-225	35	3	104
231	-231	36	6	43
231	-231	37	0	426
232	-232	38	1	426
238	-238	39	6	43
240	-240	40	2	175
244	-244	41	4	72
247	-247	42	3	104
252	-252	43	5	54
257	-257	44	5	54
262	-262	45	5	54
268	-268	46	6	43
271	-271	47	3	104
275	-275	48	4	72
280	-280	49	5	54
285	-285	50	5	54
290	-290	51	5	54
294	-294	52	4	72
300	-300	53	6	43
303	-303	54	3	104
307	-307	55	4	72
314	-314	56	7	35
319	-319	57	6	54
323	-323	58	4	72
327	-327	59	4	72

Depth Below Existing Ground Level (mm)



Comments:

Test refusal at 331mm depth due to flint fragments.

Job Number: 33893

Figure: A19

Site:

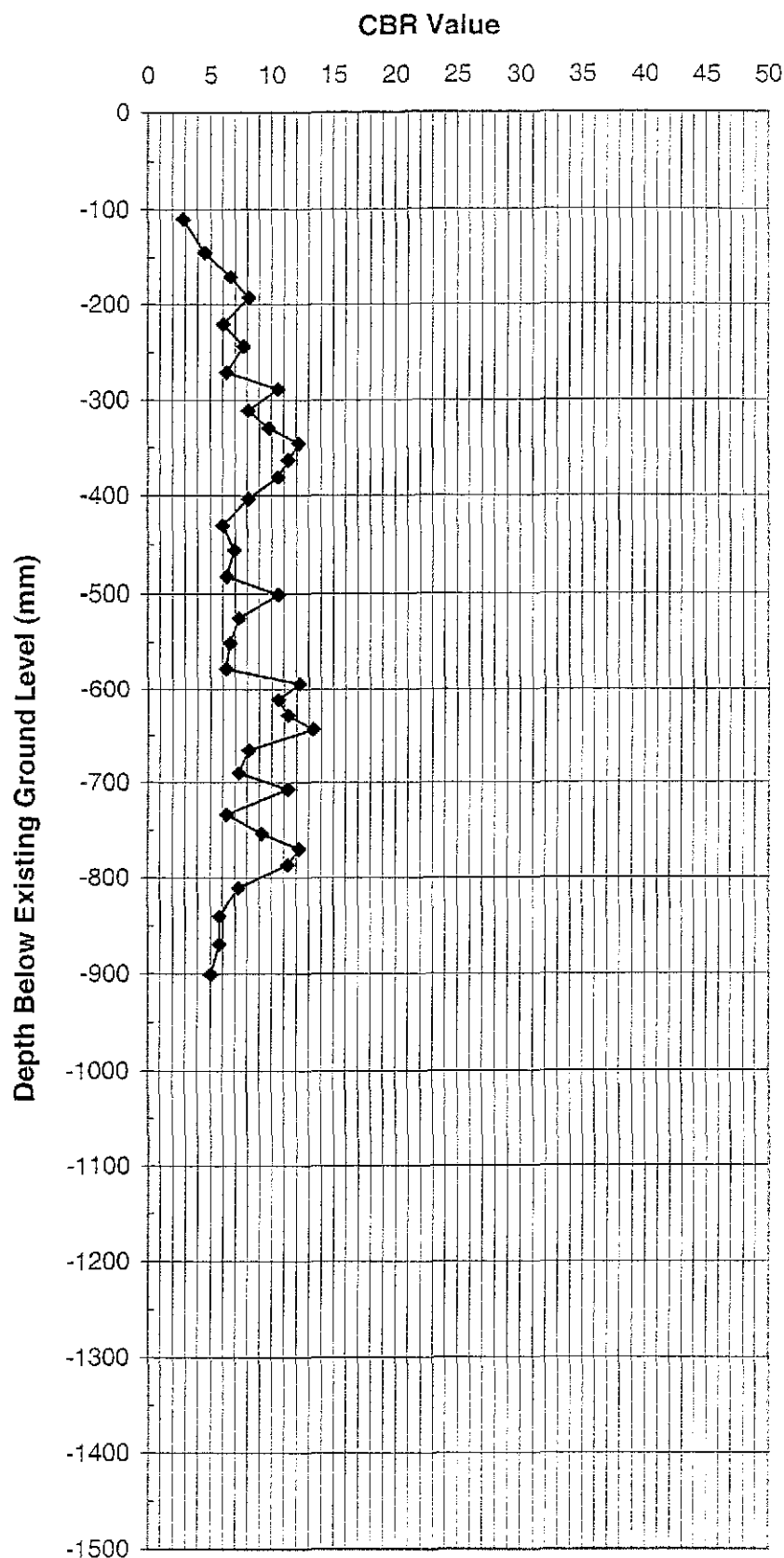
Langstone Technology Park, Langstone Road, Havant

Client:

Glanville Consultants

Depth (mm)

-59

[illegible]

Comments:

Test complete to 901mm depth.

Job Number: 33893

Figure: 1A20

Site:

Langstone Techology Park, Langstone Road, Havant

Client:

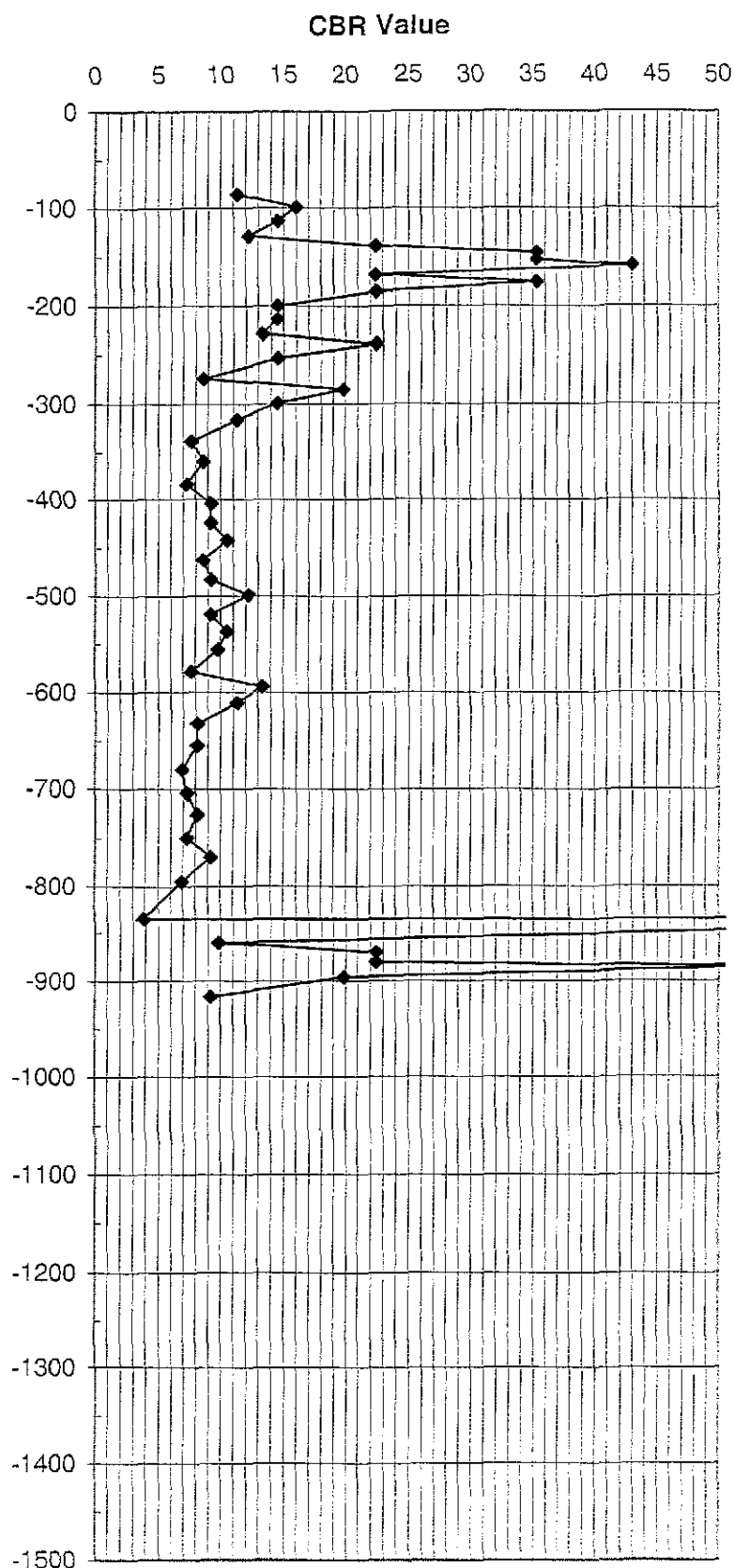
Glanville Consultants

Depth (mm)

-69

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
89	-89	0		
106	-86	1	17	11
119	-99	2	13	16
133	-113	3	14	15
149	-129	4	16	12
159	-139	5	10	22
166	-146	6	7	35
173	-153	7	7	35
179	-159	8	6	43
189	-169	9	10	22
196	-176	10	7	35
206	-186	11	10	22
220	-200	12	14	15
234	-214	13	14	15
249	-229	14	15	13
259	-239	15	10	22
273	-253	16	14	15
294	-274	17	21	9
305	-285	18	11	20
319	-299	19	14	15
336	-316	20	17	11
359	-339	21	23	8
380	-360	22	21	9
404	-384	23	24	7
424	-404	24	20	9
444	-424	25	20	9
462	-442	26	18	11
483	-463	27	21	9
503	-483	28	20	9
519	-499	29	16	12
539	-519	30	20	9
557	-537	31	18	11
576	-556	32	19	10
599	-579	33	23	8
614	-594	34	15	13
631	-611	35	17	11
653	-633	36	22	8
675	-655	37	22	8
700	-680	38	25	7
724	-704	39	24	7
746	-726	40	22	8
770	-750	41	24	7
790	-770	42	20	9
815	-795	43	25	7
855	-835	44	40	4
857	-837	45	2	175
861	-841	46	4	72
880	-860	47	19	10
890	-870	48	10	22
900	-880	49	10	22
905	-885	50	5	54
916	-896	51	11	20
936	-916	52	20	9

Depth Below Existing Ground Level (mm)



Comments:

Test complete to 936mm depth .

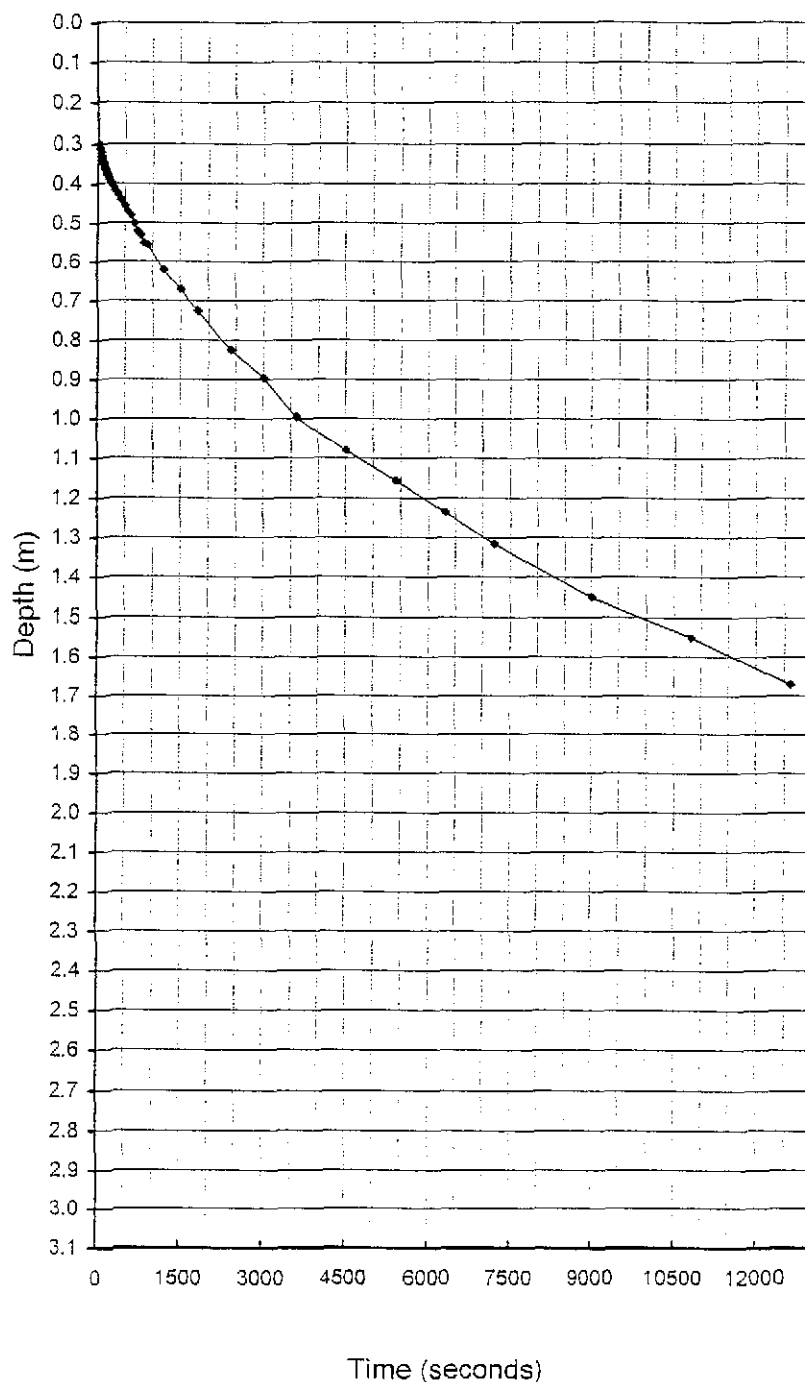
Job Number: 133893

Figure: A21

STATS**Trial Pit Soakaway Test**

Location	Langstone Technology Park, Havant	Test No	TP9, Test 1
Client	Havant International Limited	Length of Trial Pit (m)	2.6
Job Number	33893/01	Width of Trial Pit (m)	0.7
Date	19-Sep-03	Water level at start (mbgl)	0.3
Operator	Neil Whittell	Depth to Base of Trial Pit (m)	3.1

Time (Secs)	Water level (mbgl)
15	0.300
30	0.310
45	0.320
60	0.330
75	0.335
90	0.345
105	0.350
120	0.360
135	0.365
150	0.370
165	0.375
180	0.380
195	0.385
210	0.390
225	0.395
240	0.400
255	0.400
270	0.405
285	0.410
300	0.415
360	0.425
420	0.440
480	0.455
540	0.470
600	0.480
660	0.500
720	0.520
780	0.530
840	0.550
900	0.555
1200	0.620
1500	0.670
1800	0.725
2400	0.825
3000	0.895
3600	0.995
4500	1.080
5400	1.155
6300	1.235
7200	1.315
9000	1.450
10800	1.550
12600	1.670

Trial Pit Soakaway Test Results**Results**

Vp (m3)	2.49
ap Gravel (m2)	7.43
tp (s)	12600.00
Infiltration Rate (m/s)	2.66E-05

Value to be determined from graph

Trial Pit Soakaway Test

[illegible]

Figure 1 is a line graph showing Depth (m) versus Time (seconds). The y-axis represents Depth (m) and ranges from 0.0 to 2.7 with major grid lines every 0.1 units. The x-axis represents Time (seconds) and ranges from 0 to 12,000 with major grid lines every 1,500 units. The data points are connected by a smooth curve, showing a decreasing rate of descent over time.

Time (seconds)	Depth (m)
0	0.35
1000	0.55
2000	0.65
3000	0.75
4000	0.82
5000	0.92
6000	1.00
7000	1.05
8000	1.10
9000	1.15
10000	1.20

Vp (m3)	1.88
ap Gravel (m2)	8.75
tp (s)	10800.00
Infiltration Rate (m/s)	1.99E-06

A23

APPENDIX B
GEOTECHNICAL LABORATORY TEST RECORDS

CERTIFICATE OF TEST

MOISTURE CONTENT AND PLASTICITY INDEX OF SOIL

Your Ref: NAW/33893
Certificate: 82995/13398
Sheet 1 of 1
Site : **Langstone Technology Park**
Client : Glanville Consultants Limited
Corinthian Court
80 Milton Park
Abingdon
Oxon
OX14 4RY

Sampled by STATS Ltd
Date of:-
Receipt : 24/9/03
Test: 25-26/9/03
Tested by: DBG/MGC

METHOD

Moisture content was determined in accordance with BS 1377: Part 2:1990 Clause 3.2.
Plasticity Index was determined in accordance with BS 1377:Part 2:1990 Clause 4.2,4.4,5.2,5.3 & 5.4.

RESULTS

Batch No.	BH/TP No.	Depth (m)	Moisture Content %	Plasticity Index			% Retained 425Micron
				LL (%)	PL(%)	PI	
2059	TP4	1.20	12				
	TP6	1.30	13				
	TP9	0.80	13	46	26	20	0 N
	TP9	1.80	48	71	34	37	0 N
	TP10	0.70	21	46	23	23	0 N

REMARKS

N-Natural State
No soil description required

WS – Wet Sieve Preparation

For STATS

Date of issue: 16 October, 2003

CERTIFICATE OF TEST **PARTICLE SIZE DISTRIBUTION OF SOIL**

Your Ref :- NAW/33893
Certificate No :- 82995/13399
Sheet 1 of 4
Site :- Langstone Technology Park
Client :- Glanville Consultants Limited
Corinthian Court
80 Milton Park
Abingdon
Oxon
OX14 4RY

Sampled by STATS Ltd
Date of
Receipt :- 24/9/03
Test :- 1/10/03
Tested by :- MGC/MWC
Batch No :- 2059

METHOD

The particle size distribution test was carried out in accordance with BS1377: Part 2: 1990: Clause 9.2.

RESULTS

The particle size distribution curves are presented on sheets 2-4.

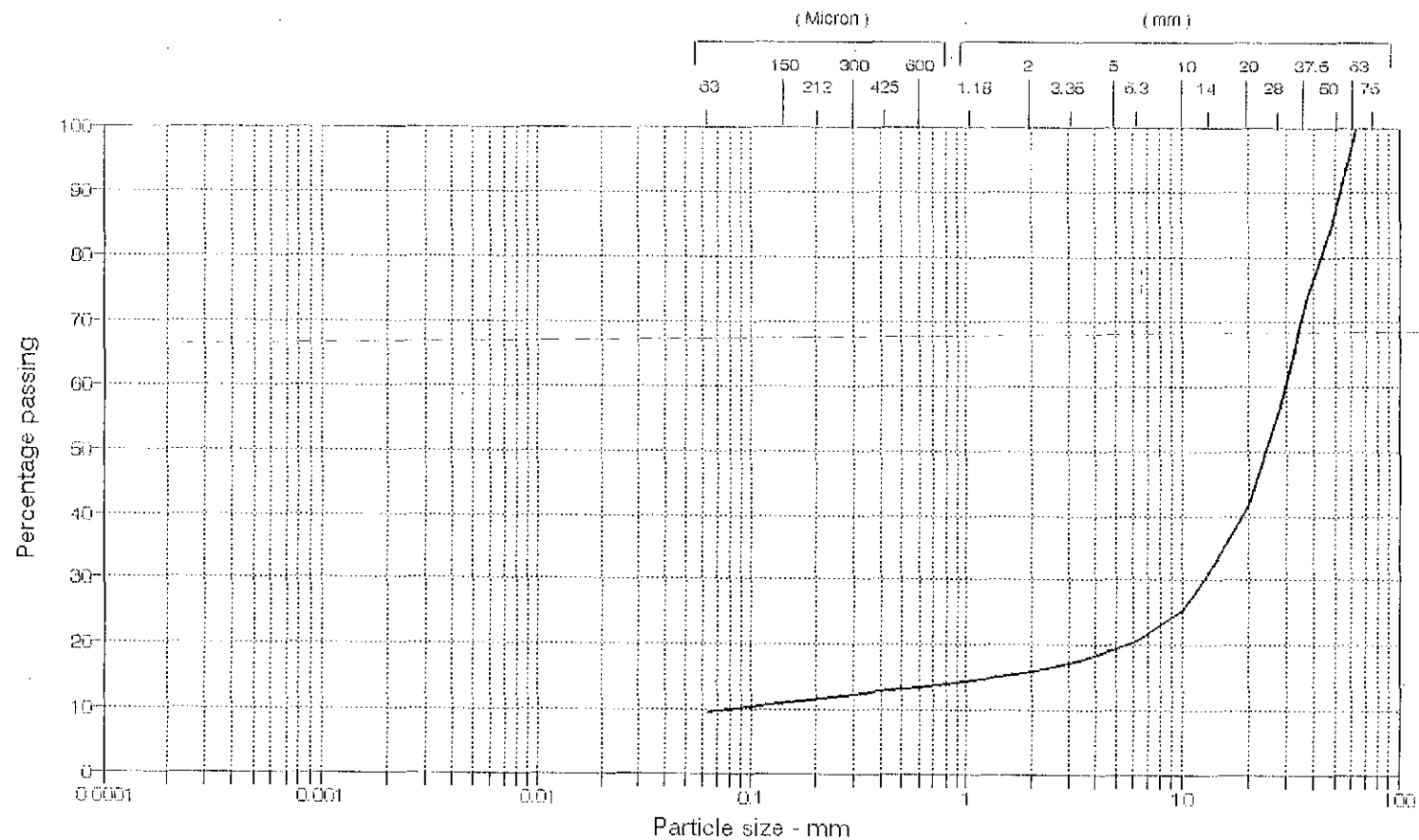
The mass of the test samples submitted for testing was less than the minimum mass specified in the test method.

No soil description required.

For STATS

Senior Geotechnical Engineer

Date of issue: 16 October, 2003



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

PARTICLE SIZE DISTRIBUTION

Your Ref: NAW/33893

Client: Glanville Consultants Ltd

Site: Langstone Park

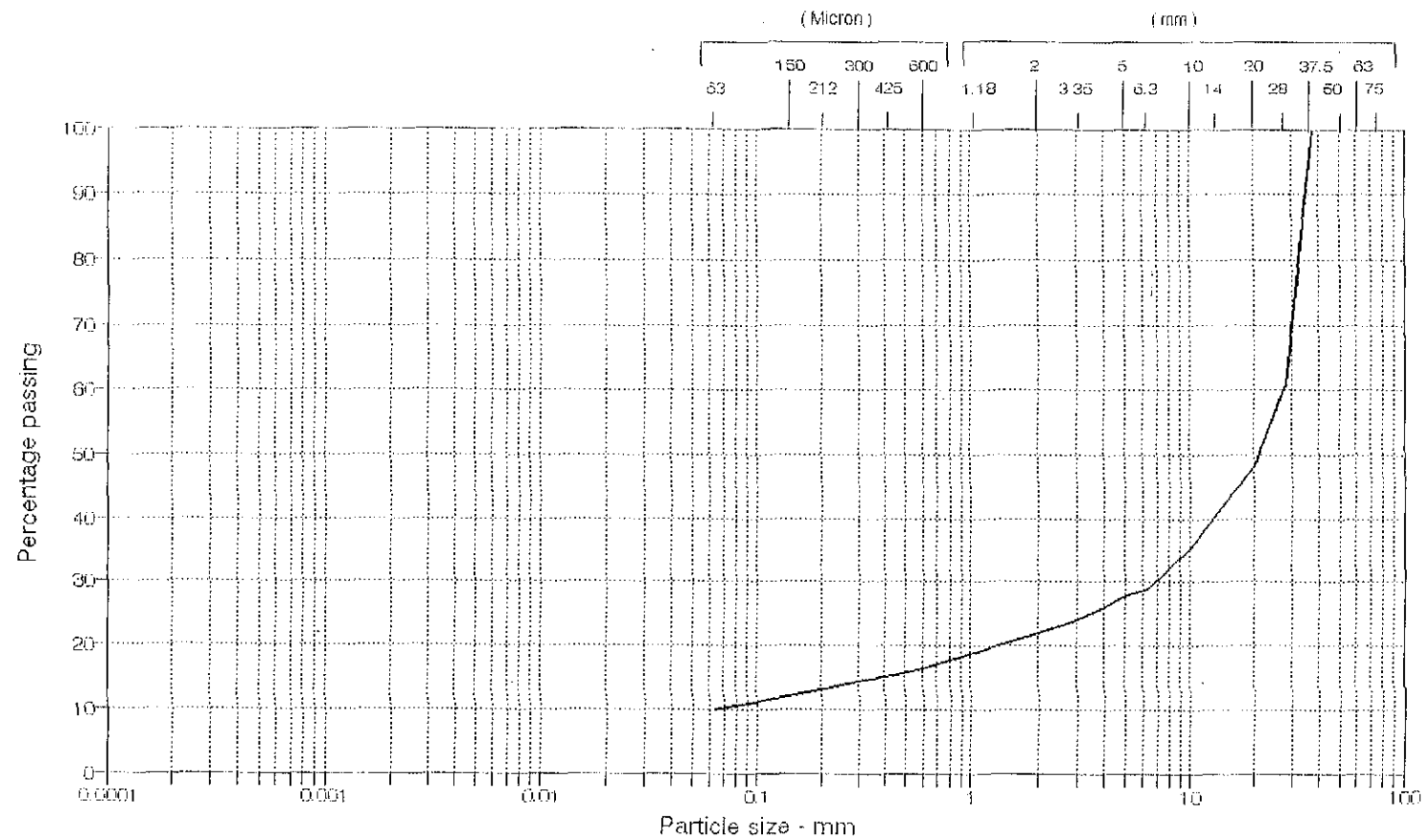
Certificate no: 82995/13399

TP no: 1

Batch no: 2059

Depth - m: 2.7

Sheet 2 of 4



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

PARTICLE SIZE DISTRIBUTION

Your Ref: NAW/33893

Client: Glanville Consultants Ltd

Site: Langstone Park

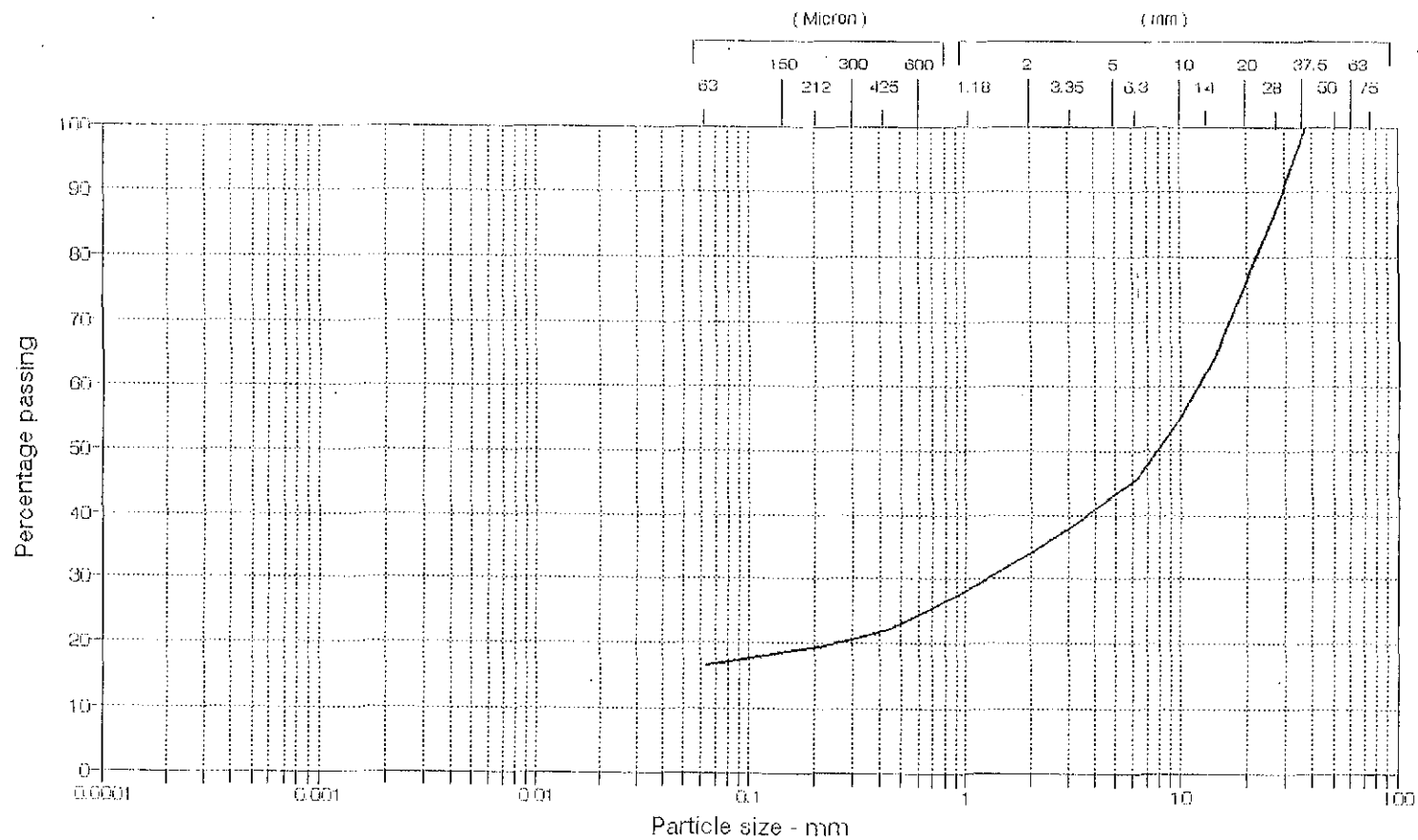
Certificate no: 82995/13399

TP no: 10

Batch no: 2059

Depth - m: 2.5

Sheet 3 of 4



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

PARTICLE SIZE DISTRIBUTION

Your Ref: NAW/33893

Client: Glanville Consultants Ltd

Site: Langstone Park

Certificate no: 82995/13399

TP no: 11

Batch no: 2059

Depth - m: 2.2

Sheet 4 of 4

Water-Soluble Sulfate Content and pH of Soil

BS 1377: Part 3: 1990

33893 Langstone Technical Park

Client Details

Glanville Consultants Limited
Corinthian Court
80 Milton Park
Abingdon
Oxon OX14 4RY

Contact Name Jay Chandarana

Order Reference NAW/33893

Order Date

24/9/03

Sample Details

Sample Type Soils

Sampled By STATS Ltd.

Sampling Date

19/9/03

STATS Batch No 2059

No of Samples

3

Receipt Date 24/9/03

Test Date/Period

30/9-3/10/03

Methods

Test

1. pH was determined in accordance with BS 1377:Part 3:1990:Clause 9.
2. Water soluble sulfate content of soil was determined in accordance with BS 1377:Part 3:1990:Clause 5.5. The test results are reported to the nearest 0.1g/l with the calculated value shown in parentheses.

Deviations

Test 2: The samples were initially dried at 45°C followed by 75-80°C. Clause 5.3.3.6 – a 25 ml aliquot of filtered extract was used for sample 2059/TP4 and a 50 ml aliquot of filtered extract was used for samples 2059/TP6 and 2059/TP10.

Results

Sample Reference	Depth [m]	% mass passing 2 mm	Sulfate as SO ₃ [g/l]	pH
2059/TP4	1.2	28	0.1 (0.06)	7.2
2059/TP6	1.3	97	<0.1 (0.01)	7.6
2059/TP10	0.7	100	<0.1 (0.01)	7.6

Certification

Certificate prepared by

Certificate reviewed by

Philippe Muelier
Construction Materials Scientist

Fergus A. Jones
Director

Testing by BJS/DGG/PM

Certificate Issue Date 7/10/03

The results given in this certificate relate only to those samples submitted and specimens tested and to any materials properly represented by those samples and specimens. Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

End of Certificate

APPENDIX C
CHEMICAL LABORATORY TEST RECORDS

Preliminary

Validated

ALcontrol Geochem Analytical Services

Table Of Results

Job Number: 03/12470/02/01

Client: Stats Limited

Date of Receipt: 26/09/03
(of first sample)

Sample Type: SOIL

Location: Langstone Technology Park

Client Contact: James Dennis

Client Ref. No.: 33893

	UKAS Accredited		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	pH Units	g/l	
	Detection Method		ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	Soxtec	Spectro	HPLC	IRIS	Meter	Spectro1	
	Method Detection Limit		<1	<1	<1	<1	<1	<1	<1	<1	<50	<1	<10	<5	<0.01	<0.3	<1.00	<0.003
Sample Number	Sample Identity	Depth (m)	Arsenic	Boron (Water Soluble)	Cadmium	Chromium	Copper	Nickel	Lead	Selenium	Total Sulphate by ICP	Zinc	Solvent Extractable Matter	Acid Soluble Sulphide	Total Phenols HPLC	Mercury by IRIS	pH Value In Soil	Soluble Sulphate as SO4 in 2:1 Extract
1	TP 2	0.00-0.10	6	1	>1	30	30	17	89	>1	851	133	357	>5	>0.01	>0.3	7.55	-
2	TP 5	0.00-0.10	>1	2	1	25	16	14	55	>1	1046	102	305	42	>0.01	>0.3	7.83	-
3	TP 6	0.40	10	>1	3	48	22	38	33	>1	746	104	180	>5	>0.01	>0.3	8.11	-
4	TP 7	0.25	13	2	1	35	63	21	281	>1	1128	267	614	>5	>0.01	>0.3	7.40	-
5	TP 8	0.00-0.10	5	2	>1	25	22	16	57	>1	1251	92	398	>5	>0.01	>0.3	7.62	-
6	TP 9	0.10-0.30	>1	>1	>1	22	14	12	33	>1	714	57	340	>5	>0.01	<0.3	7.92	-
7	TP 11	0.30-0.35	8	>1	2	42	15	23	14	>1	542	60	106	>5	0.01	<0.3	8.10	-
8	TP 12	0.30-0.35	2	>1	>1	20	11	11	17	2	700	48	153	>5	<0.01	<0.3	7.89	-
9	TP 13	0.50-0.75	2	>1	>1	16	34	9	387	<1	2822	155	289	>5	<0.01	0.3	8.08	0.101

Note: METHOD DETECTION LIMITS ARE NOT ALWAYS ACHIEVABLE DUE TO VARIOUS CIRCUMSTANCES BEYOND OUR CONTROL.

Checked By

William Williams

NDP = NO DETERMINATION POSSIBLE

NFP = NO FIBRES PRESENT

☐ Preliminary

☒ Validated

ALcontrol Geochem Analytical Services

Table Of Results

Job Number: 03/12470/02/01

Sample Type: SOIL

Client: Stats Limited

Location: Langstone Technology Park

Date of Receipt: 26/09/03
(of first sample)

Client Contact: James Dennis

Client Ref. No.: 33893

UKAS Accredited		✓															
Units		mg/kg															
Detection Method		Spectro2															
Method Detection Limit		<1															
Sample Number	Sample Identity	Depth (m)	Total Cyanide Soil														
1	TP 2	0.00-0.10	<1														
2	TP 5	0.00-0.10	<1														
3	TP 6	0.40	<1														
4	TP 7	0.25	<1														
5	TP 8	0.00-0.10	<1														
6	TP 9	0.10-0.30	<1														
7	TP 11	0.30-0.35	<1														
8	TP 12	0.30-0.35	<1														
9	TP 13	0.50-0.75	<1														

Note: METHOD DETECTION LIMITS ARE NOT ALWAYS ACHIEVABLE DUE TO VARIOUS CIRCUMSTANCES BEYOND OUR CONTROL.

NDP = NO DETERMINATION POSSIBLE

Checked By

William Williams

NFP = NO FIBRES PRESENT

APPENDIX D

STANDARD GROUND INVESTIGATION INFORMATION

General

The techniques STATS uses to investigate the geotechnical properties of the ground are generally in accordance with the Site Investigation Steering Group's Specification for Ground Investigations Part 3 and the British Standard Code of Practice for Site Investigations, BS5930: 1999. The descriptions of soils and rocks used in the report are generally in accordance with Section Eight of BS5930: 1999.

The techniques STATS uses to investigate the contamination of ground are generally in accordance with the British Standard Code of Practice for the Identification and Investigation of Potentially Contaminated Land, BS10175: 2001.

Exploratory Hole Records

The depths of the exploratory holes, descriptions of strata encountered, record of samples taken and comments on the groundwater conditions are given in the exploratory hole records in Appendix B.

The borehole records show at what depths disturbed and undisturbed samples (U100's) samples were taken. Taking undisturbed samples involves driving an open-tube sampler (with a nominal diameter of 100mm) into the ground by a drop weight or sliding hammer. The number of blows taken to drive the tube into the ground is recorded on the borehole logs. The quality of undisturbed samples can be reduced when the U100 blow counts are high; in this situation, U100 sampling is replaced by Standard Penetration Testing which is described below.

The borehole records show the 'N' values of any penetration resistance tests undertaken. These are the results of Standard Penetration Tests (SPT's) which are carried out in accordance with BS1377: Part 9: 1990, Clause 3.3, and similar penetration tests using a solid 60° cone point, SPT(C). These tests are carried out in strata to assess the density/consistency of the materials.

The exploratory hole records show the results of any hard shear vane tests and pocket penetrometer tests carried out with the results stated as equivalent undrained shear strength in kPa. The results of the hand vane tests carried out on soft, normally consolidated, clays have been corrected in relation to plasticity, after the recommendation of Bjerrum.

Details of groundwater strikes, seepage and any water level readings made during exploration are given in the exploratory hole records. Groundwater encountered in boreholes during the course of boring was allowed to approach an equilibrium level for a period of time. These observations may not give an accurate indication of the actual groundwater conditions obtaining within the ground. The reasons for this include that boreholes are rarely left standing at the relevant depth for a sufficient time for the water level to reach true equilibrium; that a permeable stratum may have been sealed off by the borehole casing; and that water may have been added to the borehole to facilitate progress. It should also be noted that groundwater levels fluctuate due to seasonal variations in rainfall.

Standpipe/Piezometer/Monitoring Well Installation and Monitoring

Details including the depth of installation of any piezometers or dual purpose soil-gas/water monitoring wells comprising 50mm ID casing and screen are given in the borehole records. Recorded water level readings obtained using an electronic dipmeter are included in the records where applicable.

Other Field Tests

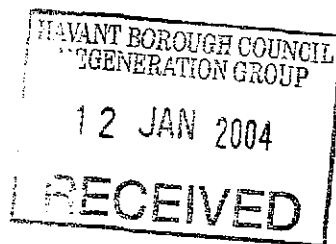
In situ Dynamic Probing tests are carried out with equipment conforming to the SRS 15 apparatus given in the German Standard DIN4094 and in all major aspects with the DPH apparatus given in BS1377 Part 9 1990. The results of the tests are presented as the blow count for every 100mm of penetration (N_{100}) against depth.

In situ Dynamic Cone Penetrometer tests are carried out to assess the in situ California Bearing Ratio (CBR) strength of the soils pertaining at the time of investigation. The tests were carried out in accordance with the method described by Kleyn et al, 1982, Proc. 2nd Euro Symp. Penetration Testing, pp 277-282, using a 60° test cone. The results of these tests are presented with the correlation between DCP and CBR.

Tests on Soils and Groundwaters for Civil Engineering Purposes

The test procedures used by STATS are generally in accordance with the methods described in BS1377: 1990. Details of the specific test methods are generally given on the test certificates.

Reports issued by STATS do not necessarily report the full comprehensive laboratory results required by BS1377: 1990 and the NAMAS Accreditation Standard, M10. However, they do report all the results necessary for design purposes, to the generally accepted industry format. The full laboratory results complying with BS1377: 1990 and the NAMAS Accreditation Standard, M10, are kept, and can be supplied upon request.



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Mrs J A Batchelor
Head of Development Control
Havant Borough Council
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PO9 2AX

AH/sf/99.P86
9 January 2003

Dear Mrs Batchelor

LANGSTONE TECHNOLOGY PARK

DH T1
03/50238

I refer to the above site and recent outline planning application for the erection of 4 no three storey buildings for employment class B1 and associated works as approved under your reference 02/50238/076. I refer also to the revised application for the variation of Conditions 3 and 5 of the approved scheme and to allow for a phased approach for the development as approved 8th September 2003, your reference 02/50238 and write to request the formal discharge of a number of the outstanding conditions attached to this consent as detailed within the following text.

Condition 11

No development shall take place until the developer has carried out adequate investigation to assess the degree of contamination of the site and to determine its water pollution potential. The methods and extent of the investigation shall be agreed with the Planning Authority before any work commences. Details of the appropriate measures to prevent pollution of ground water and surface water, including provisions for monitoring, shall be then be submitted to and approved in writing by the Planning Authority. Please find attached a copy of the contamination survey completed in line with the scope agreed with Hampshire County Council.

Condition 5

No development hereby permitted, other than shown as Phase 1 on drawing no 02/726/170 shall commence until a specification of materials to be used for the surfacing of all open parts of the site proposed to be hard surfaced have been submitted to and approved in writing by the Local planning Authority. The development shall not be brought into use until the implementation of all such hard surfacing has been completed in full accordance with the specification. I enclose copies of drawing reference 02726200B, 02726201C, 02726202B and 02726203B providing the require detail in accordance with Condition 5.

Condition 9

The development hereby permitted shall not commence until plans and particulars specifying the provision to be made for external lighting of the same have been submitted to and approved in writing by the Local Planning Authority. I enclose copies of plan reference 02726204B, 02726205B, 02726206B, 02726207B illustrating lighting and landscape detail in accordance with the requirements of Condition 9.

Directors:

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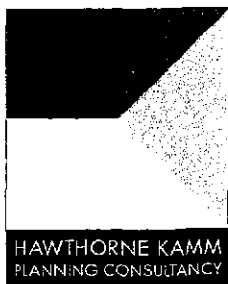
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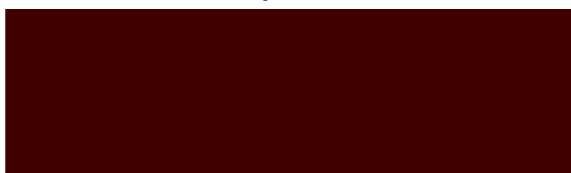
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I trust that the above detail is acceptable and will allow progress on the formal discharge of a number of the outstanding Conditions.

Should you require any additional information please do not hesitate to contact me at the above number.

Yours sincerely



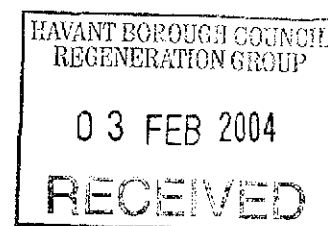
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Cc Dianne Heath, Havant International
Phil Parkinson, PLC Architects
John Birch, Glanville
Steve Connor, Langstone Technology Park



Report for
Havant International Limited
commissioned by
Glanville Consultants Limited

Site Investigation Report



**Langstone Technology Park,
Havant, Hampshire**

October 2003

Report No. 33893/01

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Figure 2	Exploratory Point Location Plan
Figures 3 to 12	Extracts from Historical Ordnance Survey Maps
Figure 13	Plasticity Classification Chart

APPENDICES**Appendix A Fieldwork Records**

Sheets A1 to A13	Trial Pit Records
Sheets A14 to A21	Results of Dynamic Cone Penetrometer tests for CBR
Sheets A22 & A23	Results of Trial Pit Soakaway Tests

Appendix B Geotechnical Laboratory Test Records

Sheet B1	Moisture Content and Plasticity Index of Soil
Sheets B2 to B5	Particle Size Distribution Results
Sheet B6	Sulphate and pH Analysis Test Results

Appendix C Chemical Laboratory Test Records

Sheet C1	Chemical Analysis of Soils
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Appendix D Standard Ground Investigation Information

DOCUMENT CONTROL

Document Title: Site Investigation Report for Langstone Technology Park,
Havant, Hampshire

The Client: Havant International Limited

STATS Geotechnical, a division of STATS Limited (STATS), has prepared this report in accordance with the instructions of Glanville Consultants Limited on behalf of Havant International ("the Client") by fax of 18th August 2003 under the terms of appointment for site investigation services. This report is for the sole and specific use of the Client, and STATS shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared and provided. Should the Client require to pass copies of the report to other parties for information, the whole of the report should be so copied, but no professional liability or warranty shall be extended to other parties by STATS in this connection without the explicit written agreement thereto by STATS.

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Report Reference 33893/01
Status of Report: Final
Date of Issue: 16th October 2003
Page No. 4 of 17
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SITE INVESTIGATION REPORT FOR SITE AT LANGSTONE TECHNOLOGY PARK

1. INTRODUCTION

1.1 Purpose of Investigation

On the instructions of Glanville Consultants Consulting Engineers on behalf of Havant International Limited, STATS Geotechnical has carried out a site investigation of an area within Langstone Technology Park. The project was commissioned in order to obtain information on the ground conditions in relation to the proposed new paved car park and roundabout on the site.

1.2 Project Brief

The project was carried out to an agreed brief, as set out in STATS proposal letter of 7th August 2003, and has included the following tasks:

Desk Study

- A study of local geology and hydrogeology
- A study of the land-use and development history of the site and its surroundings from archival Ordnance Survey mapping
- The identification of aquifer vulnerability rating beneath the site and local water abstraction points from Environment Agency records
- The identification of potential geotechnical hazards
- The identification of potential targets at risk from possible contamination

Site Investigation

- Machine excavation of 13No. trial pits.
- 8No. Dynamic Cone Penetration Tests to assess CBR values.
- Associated sampling and on-site testing.
- Laboratory chemical testing of 10No soil samples for common contaminants.
- Laboratory geotechnical testing of soil samples for classification purposes.
- Interpretative reporting

1.3 Limitations

The opinions and recommendations expressed in this report are based on the ground conditions encountered during the site work, the results of field and laboratory testing and interpretation between exploratory holes. The material encountered and samples obtained represent only a small proportion of the materials present on-site, therefore other conditions may prevail at the site which have not been revealed by this investigation.

The investigation itself was designed generally to meet the objectives of an exploratory investigation, as defined by BS 10175:2001 Code of Practice for the Investigation of Potentially Contaminated Site. As an exploratory investigation, the results may not provide sufficient data to make detailed estimates of the quantities involved in any remediation work, if required.

The results of laboratory tests are covered by UKAS (formerly NAMAS) accreditation, but opinions and interpretations expressed in the report and on the fieldwork records are outside the scope of this accreditation.

2. SITE DETAILS

2.1 Site Location

The site, which may be located by National Grid reference SU 712059, is situated just south of the A27, on Langstone Technology Park, Havant, Hampshire.

An extract of the 1:50 000 Ordnance Survey map showing the location of the site is included in Figure 1.

2.2 Site Description

The site, which covers approximately 0.65 hectares, encompasses a roughly rectangular grassed area running along the north side length of Building 1000 (occupied by Xyratex).

The site contains a number of mature and semi-mature trees predominantly of the Maple, Sycamore and Laburnum variety. The trees are scattered in a linear fashion running the length of the site. In addition to this there are a number of mature herbaceous shrubs as well as a 13m high closely planted row of conifers forming the western most boundary to the site.

The immediate boundaries to the site comprise:

- > North A 1.5m chain-link fence and a footpath running parallel with the A27 slip-road.
- > East Open grassed area with adjoining car park serving Building 1000.
- > South Grass-crete roadway and a 1.5m high grassed bank backing onto Building 1000.
- > West 13m high row of conifers, semi-detached residential housing and industrial units.

Ground levels at the site range from 5.28mAOD to 6.03mAOD approximately and with the general fall towards the west.

Some investigative work (excavation of 2No. trial pits) was carried out in the rear garden of the house on the corner of Brookside Road.

A site plan showing the main features of the site is given in Figure 2.

2.3 Local Geology and Hydrogeology

The published 1:63,360 scale geological map of the area (Sheet No 316 "Fareham") indicates the site to be underlain by Quaternary Brickearth and Alluvium deposits, overlying White Chalk (formerly the Upper Chalk) of the Cretaceous System.

The existing topography and history of development of the site suggests that, in addition to these natural strata, made ground may be present on the site.

The hydrogeology of the site is likely to be characterised by the presence of an unconfined shallow aquifer comprising Alluvial Deposits, overlying the Cretaceous Chalk, which is a major aquifer. Variability in the nature of the alluvial deposits may result in perched groundwater being present.

According to the Environment Agency Groundwater Vulnerability Classification (Sheet No.45 "West Sussex & Surrey"), the Alluvial Deposits are a Minor Aquifer and the underlying White Chalk is a major aquifer, both of High Vulnerability.

An abstraction well is located approximately 400m north of the site.

3. DEVELOPMENT HISTORY

The history of the site's land-use and development from Victorian times onwards has been researched from early Ordnance Survey (OS) maps.

Extracts of the OS maps and plans are presented in Figures 3 to 12.

Reference to historical maps provides invaluable information regarding the land use history of the site, but historical evidence will be incomplete for the period pre-dating the first edition and between successive maps.

OS Map, Sheet Hants. 76.11 Dated 1866 at Scale 1:2,534 (Figure 3)

The Ordnance Survey edition of 1866 shows the site to be undeveloped fields. Havant Mill is located approximately 1.6km to the east-north-east.

OS Map, Sheet Hants. 76.11 Dated 1896 at Scale 1:2,534 (Figure 4)

The site and surroundings remain unchanged.

OS Map, Sheet Hants. 76.11 Dated 1907 at Scale 1:2,534 (Figures 5 & 6)

A sewage works has been constructed immediately to the east of the site and an engine house on the western boundary of the sewage works appears to exist on the eastern margin of the site. Filter beds associated with the sewage works are shown immediately to the southeast.

OS Map, Sheet Hants. 76.11 Dated 1931 at Scale 1:2,534 (Figures 7 & 8)

The sewage works has extended so that associated buildings would have occupied the eastern part of the site, approximately 170m in from the east site boundary.

OS Map, Sheet SU 7105 Dated 1972 at Scale 1:2,500 (Figure 9)

The site is occupied by a landscaped area that contains some trees. The A27 Havant bypass is located along the northern site boundary and a large 'works' has been constructed immediately to the south of the site. The sewage works and associated buildings mentioned above have been removed.

OS Map, Sheet SU 7105 Dated 1984 (Figure 10 – not to scale)

The site is unchanged and the immediate surroundings remain essentially unchanged.

OS Map, Sheet SU 7105 Dated 1996-7 at Scale 1:2,000 (Figures 11 & 12)

The site is little changed, although an east-north-east, west-south-west running drain is shown near the centre of the site.

4. GROUND INVESTIGATION

4.1 Fieldwork

The fieldwork was carried out on 18th and 19th September 2003 and involved the following:-

Table 4.1 Summary of ground investigation fieldwork items

Investigation Type	Number	Location/ Designation	Appendix
Trial Pits - excavated by mechanical excavator	13	TP1 to TP13	A1 to A13
<i>In situ</i> Dynamic Cone Penetrometer	8	DCP1 to DCP8	A14 to A21
Trial Pit Soakaways	2	TP9 & TP10	A22 & A23

The location of all investigation points is shown on the site layout plan in Figure 2. The depths of boreholes, descriptions of strata encountered and comments on the groundwater conditions are given in the trial pit records in Appendix A.

The exploratory points were located approximately by reference to physical features present on the site at the time of investigation using the site plan provided by Glanville Consultants Ltd (drawing ref. ML 230287/101). The ground levels at the borehole locations have not been determined.

4.2 Laboratory Testing

A programme of geotechnical and chemical laboratory testing, scheduled by STATS, was carried out on selected samples taken from various strata. The results are presented in Appendices B and C, respectively.

The chemical analyses were carried out by ALcontrol Geochem (Geochem) under sub-contract to STATS. Geochem are an approved subcontractor in accordance with the requirements of STATS' quality system and are themselves UKAS accredited for a range of chemical analyses (UKAS Laboratory Testing No 1291).

5. GROUND CONDITIONS

5.1 Ground

5.1.1 General Succession of Strata

The exploratory holes revealed that the site is underlain by a variable thickness of made ground over alluvial deposits comprising sandy Clay over sandy Gravel. This appears to confirm the published geological records, although the White Chalk was not proven due to the shallow depth of investigation. For the purpose of discussion, the ground conditions are summarised in Table 5.1 below.

Table 5.1 General succession of strata

Brief Description	Depth to top of stratum m.bgl (mAOD)	Thickness (m)
Made Ground	Ground Level	0.35 to 2.9 (generally 0.65 to 0.8)
Sandy Clay (locally absent in TP11 and TP12)	0.35 to 1.1	Absent to 1.75
Sandy Gravel	1.1 to 2.3	0.9 Proven in TP10

5.1.2 Topsoil / Made Ground

The exploratory holes encountered a variable thickness of topsoil / made ground across the site. The maximum thickness of made ground was encountered in TP13 where a sub-surface concrete tank was uncovered, presumably related to the sewage works that were present on the site. The tank was found to be in-filled with a clayey sand Fill containing many whole bricks and occasional metalwork.

In general the made ground comprises a 0.1m thick superficial layer of topsoil over sandy gravelly clay with frequent sand sized brick and sand to gravel sized flint fragments with occasional chalk pieces.

5.1.3 Sandy CLAY

The sandy CLAY typically comprised stiff to very stiff light brown sandy clay with occasional to frequent sub-angular to sub-rounded gravel to cobble sized flints and flint fragments. A layer of soft silty CLAY with lenses of organic material was found to separate the sandy CLAY and sandy GRAVEL in TP9 between depths of 1.75m and 2.25m.

The measured and inferred soil parameters for the stratum are listed in Table 5.2 below.

Table 5.2 Summary of soil parameters for sandy Clay

Soil Parameters	Range	Results
Liquid Limit (%)	46% (71%)	Appendix B
Plastic Limit (%)	23% – 26% (34%)	Appendix B
Plastic Index (%)	20% – 23% (37%)	Appendix B
Plasticity Term	Intermediate plasticity (very high)	Figure 13
Shrinkage Potential (NHBC)	Medium	-
Moisture Content (%)	13% – 21%	-
Strength Term	Stiff to very stiff (soft)	-
Shear Strength Inferred by Pocket Penetrometer (kN/m ²)	158 – 225 (25)	-

Note: value in brackets refers to soft silty clay encountered in TP9 from 1.75m to 2.25m.

5.1.4 Sandy Gravel

The sandy GRAVEL typically comprised dark brown to light grey clay-bound sandy gravel. The gravel is sub-angular to sub-rounded flints and flint fragments with occasional sand sized chalk pieces. Within some of the trial pits (i.e. TP1, TP2, TP3 & TP8) white comminuted chalk is noted on the surface of the flints some 0.3m from the top of the unit. Further down the gravel sequence the clay is absent and the unit appears light orange brown in colour.

5.2 **Groundwater**

Groundwater was encountered in TP1, TP9 & TP10 at depths of between 2.25m and 2.7m depth. Groundwater was only seen to flow within trial pits TP9 & TP10 and the inflow was noted as slow.

It should be noted that groundwater levels might fluctuate for a number of reasons including seasonal variations. On-going monitoring would be required to establish both the full range of conditions and any trends in groundwater levels.

5.3 **Chemical Analysis of Soil Samples**

5.3.1 Introduction

Chemical analyses have been performed on a total of 10no. soil samples, including both fill materials and natural soils, down to a maximum depth of 0.75m below existing ground level. The test results are reported in Sheet C1.

5.3.2 Data Summary

With respect to the current CLEA Soil Guideline Values (SGV) and, where applicable, the former Dutch Guidelines the following summary can be made.

6. ENGINEERING CONSIDERATIONS

6.1 Details of Proposed Development

It is understood that the proposed development will comprise a new paved car park and roundabout (easing access to/from the west) to the side and rear of Building 1000.

6.2 Alleviation Measures in Respect of Ground Contamination

The results of the chemical analyses on the samples tested indicate that the materials on-site do not exceed the CLEA SGV's (and are acceptable within the Dutch guidelines) for commercial land use. Therefore, there is no evidence of significant ground contamination on the site in relation to the proposed end-use.

In view of the above findings, no special measures are required in terms of remediation, subject to ensuring that suitable topsoil is present in landscaped areas.

Suitable health and safety precautions should be adopted during the site works and care should be taken to minimise the amount of dust generated on-site. Site workers engaged in earthworks and working in trenches/excavations should, as a precautionary measure, minimise physical contact with the soil, and be rigorous in matters of personal hygiene.

With respect to off site disposal, the results of the chemical analyses indicate that the majority of soils will be classified as "uncontaminated". This is in accordance with the Environment Agency Interim Guidance on the Disposal of "Contaminated Soils".

6.3 Geotechnical Hazards

A summary of commonly occurring geotechnical hazards is given in Table 6.1 together with an assessment of whether the site may be affected by each of the stated hazards.

Table 6.1 Summary of main potential geotechnical hazards that may affect site

Hazard category: (excluding contamination issues)	Hazard status based on investigation findings and proposed development			Engineering considerations if hazard affects site
	Found to be present on site	Could be present but not found	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions		✓		Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓	Silty Clay and sandy Clay – medium potential		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)	✓	Soft Silty Clay with organic-rich lenses in TP9 only		Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓	Silty / Sandy Clay		Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)		✓		May affect ground engineering and foundation design and construction
Evaporite dissolution features and/or subsidence			✓	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides			✓	Likely to require special stabilisation measures

Ground subject to peri-glacial valley cambering with gulls possibly present			✓	Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion			✓	Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)		✓		May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area			✓	May affect deep foundations, basements and tunnels
Underground mining			✓	Likely to require special stabilisation measures
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓	Buried sub-structure found in TP13		Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	✓	Maximum of 2.9m of made ground present in TP13.		Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)			✓	May affect ground engineering and foundation design and construction

Seismicity is not included in Table 5.1 as this is not normally a design consideration in the UK.

The likely presence of chalk at shallow depth indicates that subsidence related to chalk dissolution features might be a possibility. Based on the Edmond's risk assessment model for natural dissolution features referred to in CIRIA Project Report II (1994), the site falls into the "moderately low subsidence risk" category. With reference to Edmond's data-base of known natural/man-made chalk solution features there are no such features in the immediate vicinity of the site.

6.4 Sub-grade Conditions for Road Pavements

Sub-grade materials present and groundwater levels

It is understood that the finished ground level of the proposed development will be at approximately the existing ground level.

In the 1m to 1.1m below the proposed finished ground level the exploratory holes have revealed a soil profile comprising made ground composed of clayey sand overlying sandy clay. The potentially poorest sub-grade material within this profile is the made ground due to its variable nature and unknown history of compaction.

The groundwater conditions are anticipated to comprise a low water-table, i.e. at least 1m below the pavement formation level. The ground investigation revealed the shallowest water strike to be 2.25m b.g.l, however, groundwater levels should be expected to be higher in the winter months

Estimated minimum CBR under long-term conditions

The estimated minimum, equilibrium soil-suction, CBR value for the soils (sandy clay) and groundwater conditions described above under a completed pavement is 4%, after Table C1 in TRRL Report LR1132 (1984).

CBR values determined under current conditions

The in situ sub-grade soils CBR values have been assessed under present conditions using the DCP test apparatus and the results are summarised in Table 6.2.

Table 6.2 Summary of CBR values derived from in situ DCP tests

Test Location	Material Type	Minimum CBR value determined at or just below anticipated formation level
TP1	Made Ground	5% (typically above 10%)
TP2	Made Ground Sandy Clay	6% 10%
TP3	Made Ground Sandy Clay	6% (typically above 10%) 9%
TP4	Made Ground	12%
TP5	Made Ground	12% (typically above 20%)
TP6	Made Ground	12% (typically above 30%)
TP7	Made Ground	5%
TP8	Made Ground Sandy Clay	7% 4%

The made ground materials in the vicinity of test locations may be susceptible to improvement by rolling with conventional compaction plant.

Recommended CBR value for road pavement design

The recommended sub-grade soil CBR value for road pavement design is therefore 6%. This value assumes that during construction the formation level will be carefully compacted and any soft spots dug out and replaced by compacted suitable fill material.

Frost-susceptibility of sub-grade soils

The sandy clay sub-grade soils can be regarded as non-frost-susceptible ($PI > 15\%$), after the criteria given in Appendix 1 of TRRL Report Road Note 29 (Ref). The made ground may be frost susceptible due to the presence of chalk gravel. When the sub-grade is frost-susceptible the thickness of sub-base must be sufficient to give a total thickness of non-frost-susceptible pavement construction over the soil of not less than 450mm.

6.5 Chemical Attack on Buried Concrete

The results of chemical tests carried out on soil samples indicate 2:1 water soil extract sulphate contents of up to 0.06g/l with generally near neutral pH values.

These results indicate that, in accordance with BRE Special Digest 1: 2001 *Concrete in aggressive ground*, the Aggressive Chemical Environment for Concrete (ACEC) Classification is **AC-1s** with a Design Sulfate Class for the site of **DS-1**. This assumes nominally static groundwater conditions and that no significantly disturbed clay comes into contact with concrete foundations or structures.

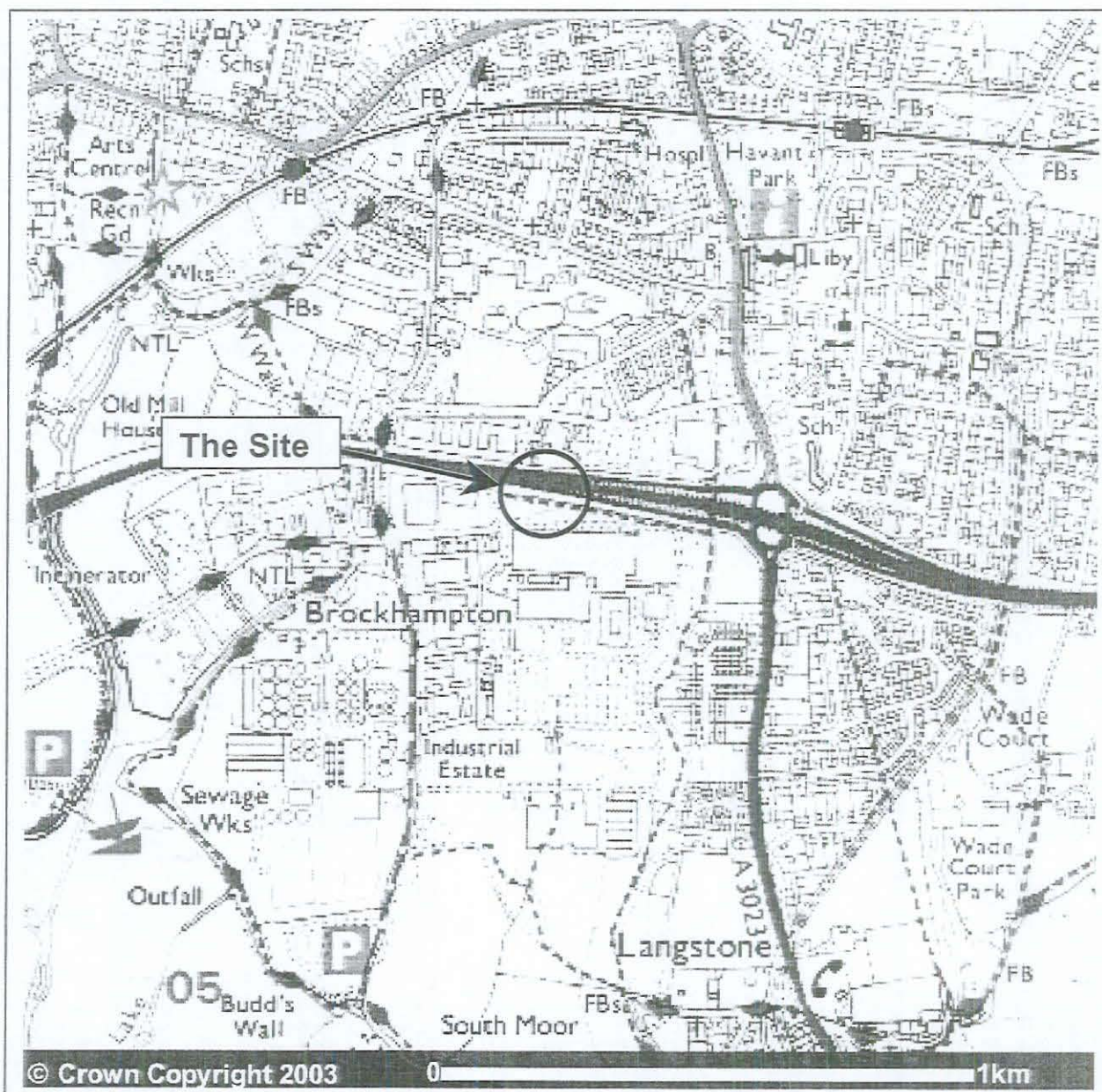
If significantly disturbed clay is likely to come into contact with concrete foundations or structures it will be necessary to carry out additional tests on the soil to investigate its total potential sulphate content. This will facilitate a revaluation of the ACEC Classification and Design Sulfate Class for the material, to take into consideration potential oxidation of available sulphides (e.g. pyrite), as defined in Table 2 BRE Special Digest 1: 2001.

6.6 Soakaways

Soakage tests were carried out in trial pits TP9 and TP10 in general accordance with BRE 365 and the results are given in Appendix A, Sheets A22 and A23.

The test results both show some infiltration. By adjusting the soakage calculations to consider infiltration through the permeable gravel horizontally, infiltration rates of 2.66×10^{-5} and 1.99×10^{-5} have been calculated for TP9 and TP10, respectively.

FIGURES



Extract of 1:50,000 Ordnance Survey Landranger Map

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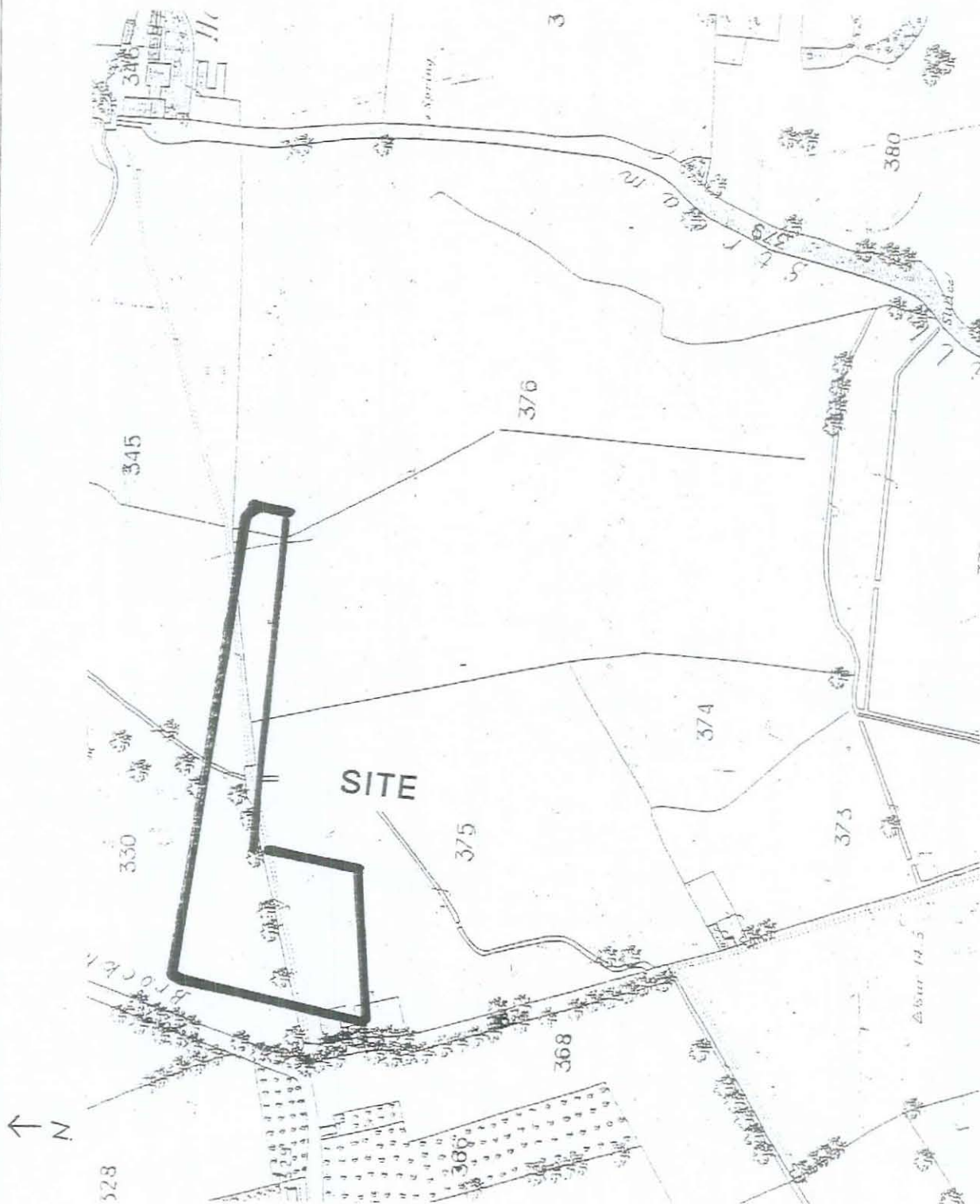
Site: Langstone Technology Park	Client: Havant International
National Grid Reference: SU 7105 NW	Scale: See attached scale

STATS

SITE LOCATION PLAN

Job No: 33893/01

Fig No: 1



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Site: Langstone Park, Havant

Client: Glanville Consultants Ltd.

Source: OS Map Hampshire Sheet 76.11

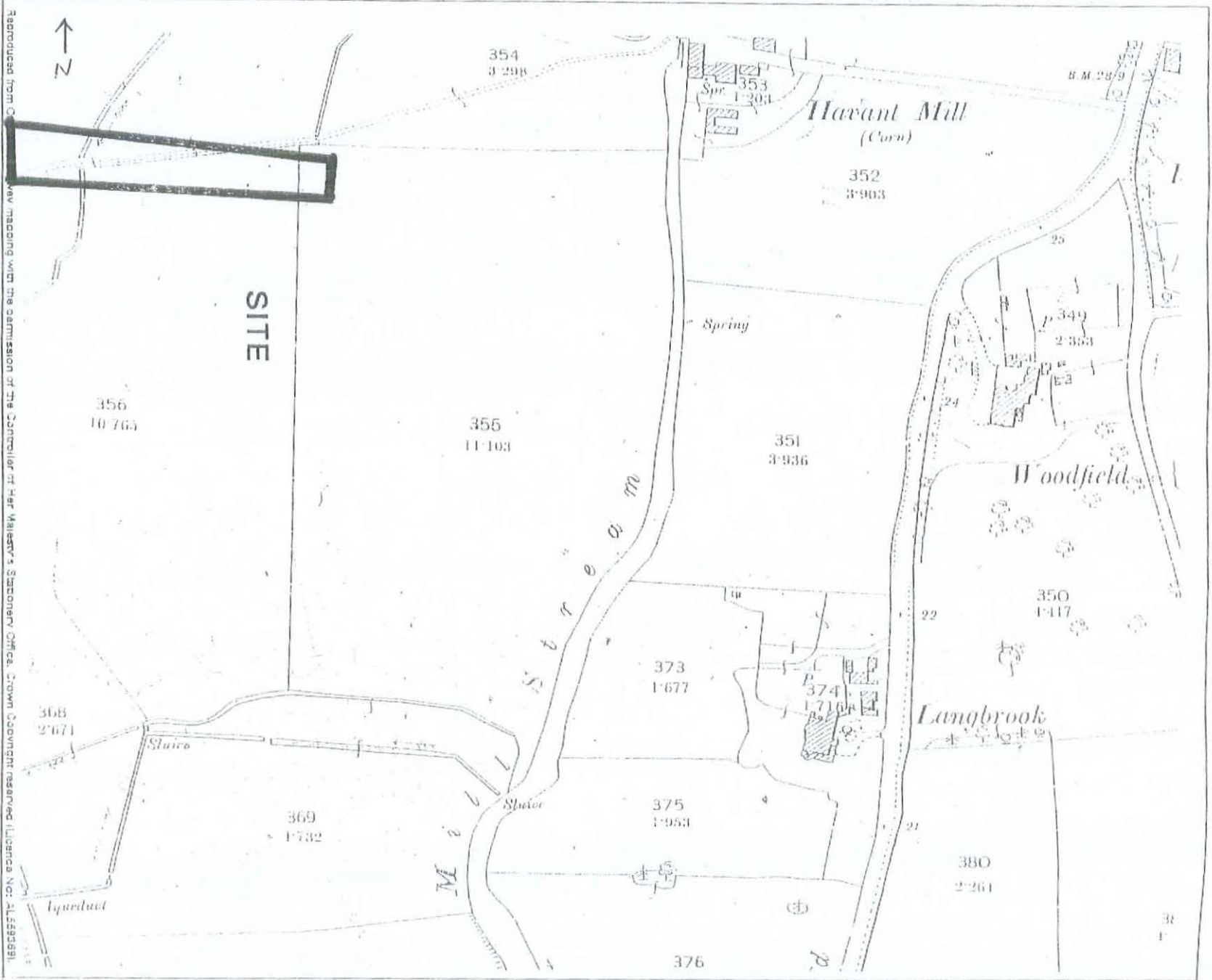
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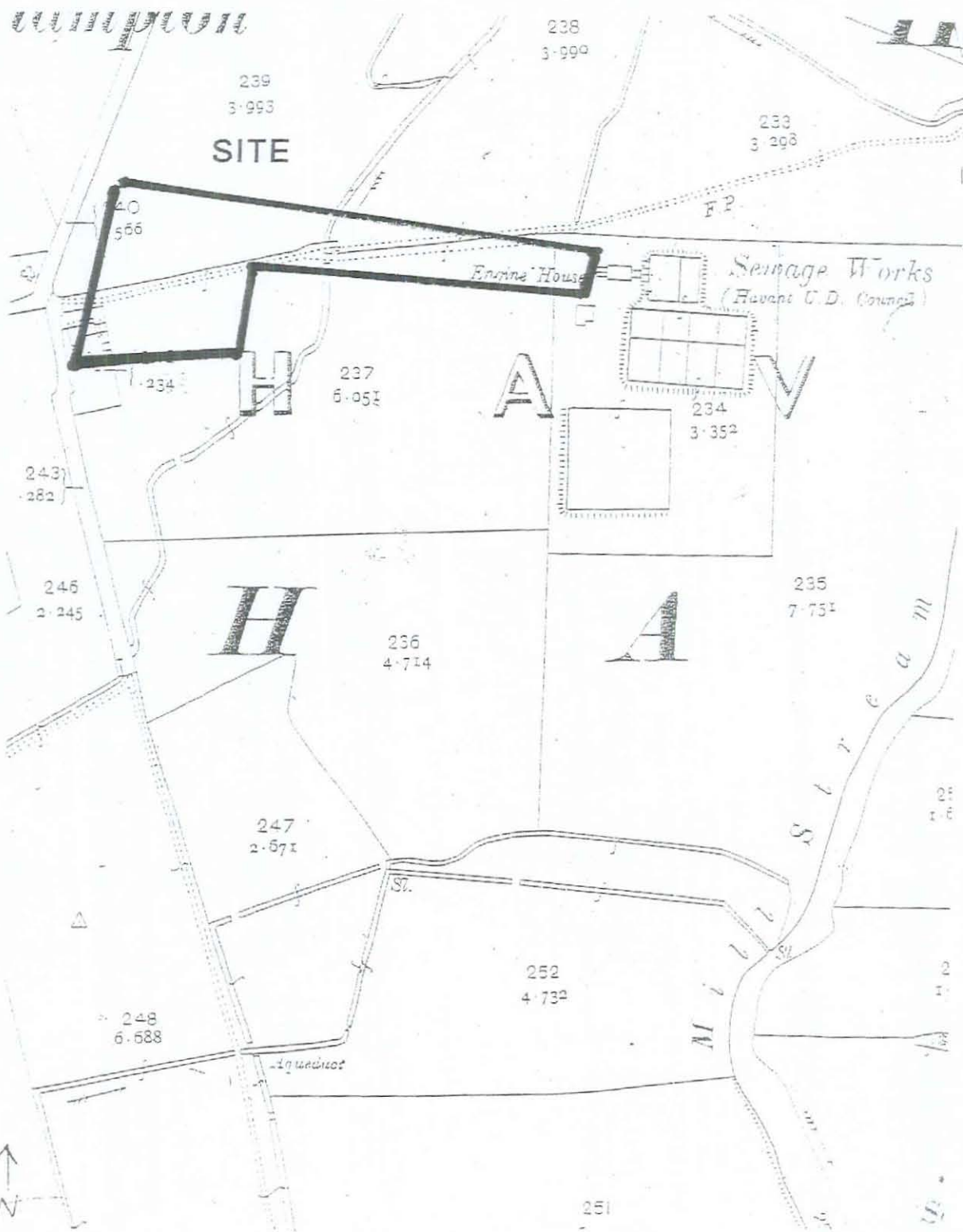
Job No: 33893

Fig No: 3



Site: Langstone Park, Havant
 Client: Glanville Consultants Ltd.
 Source: OS Map Hampshire Sheet 76.11
 Scale: 1:2534

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 HISTORICAL MAP DATED
 1897
 Job No: 33893
 Fig No: 4



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Site: Langstone Park, Havant

Client: Glanville Consultants Ltd.

Source: OS Map Hampshire Sheet 76.11 (1 of 2)

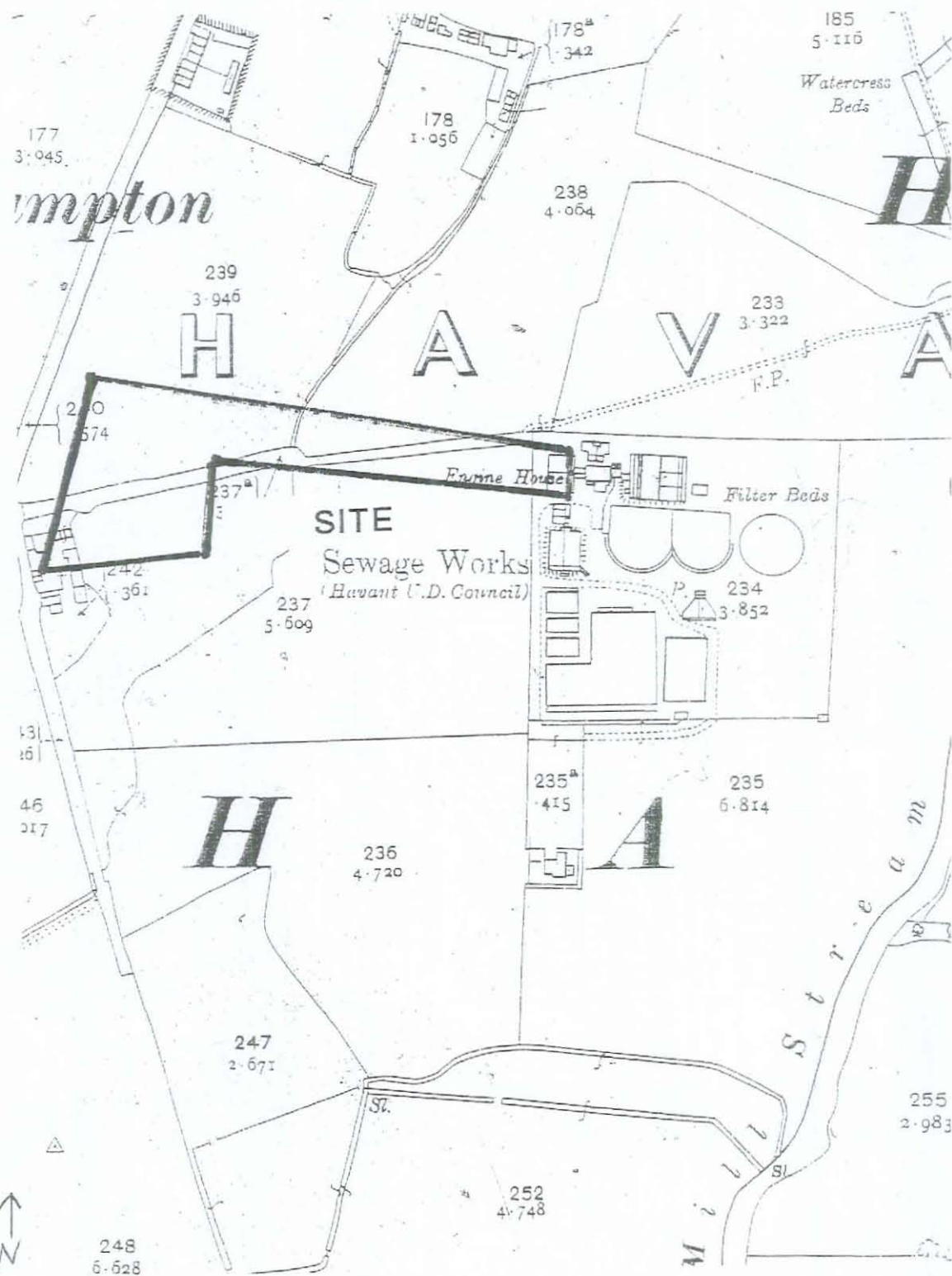
Scale: 1:2534

STATS

EXTRACT FROM
HISTORICAL MAP DATED
1907

Job No: 33893

Fig No: 5



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Site: Langstone Park, Havant

Client: Glanville Consultants Ltd.

Source: OS Map Hampshire Sheet 76.11 (1 of 2)

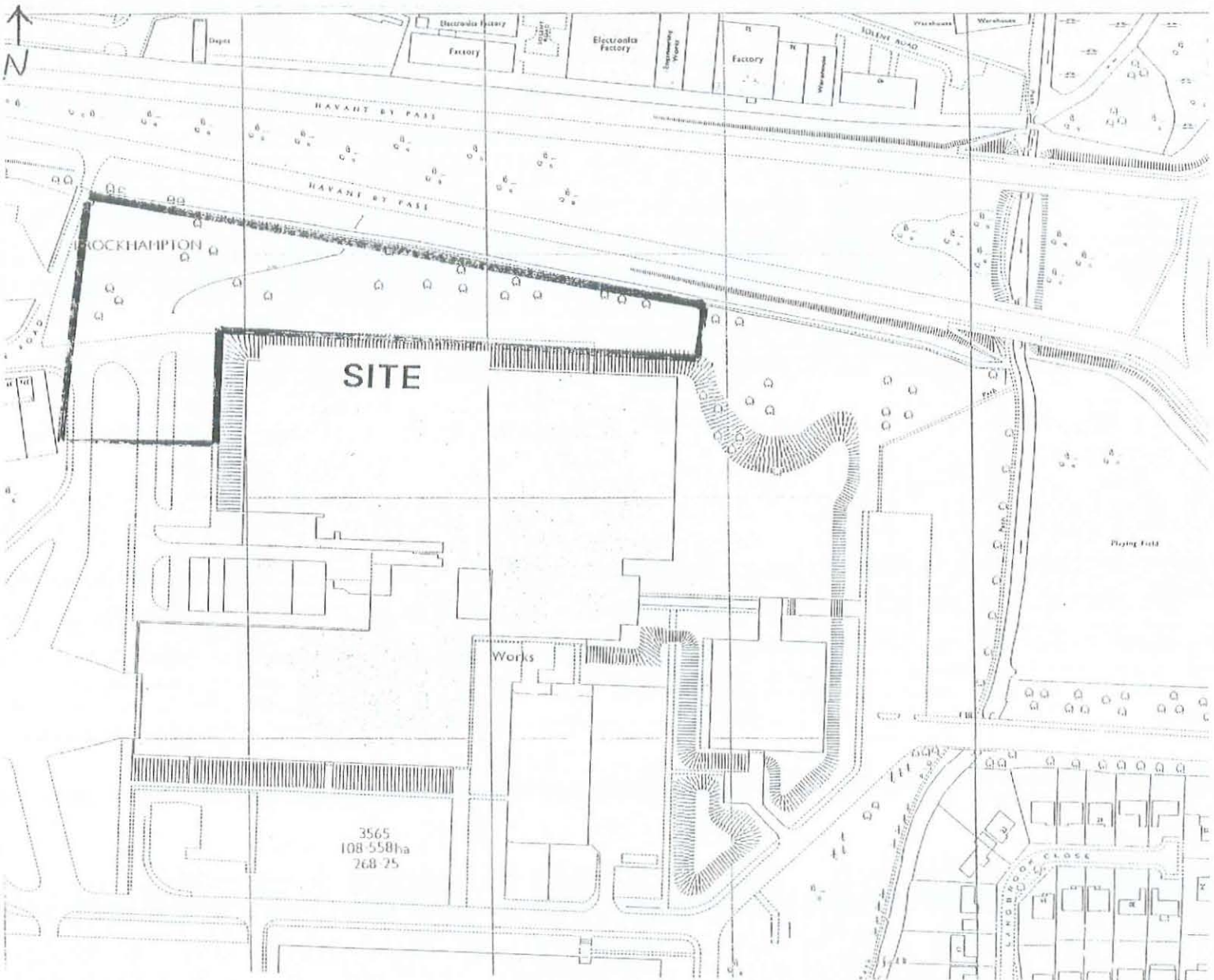
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STATS

EXTRACT FROM
HISTORICAL MAP DATED
1932

Job No: 33893

Fig No: 7



Site: Langstone Park, Havant

Client: Glanville Consultants Ltd.

Source: OS Map Sheet SU 7105

Scale: 1:2500

STATS

EXTRACT FROM
HISTORICAL MAP DATED
1972

Job No: 33893

Fig No: 9