EXPEDITE

DETAILED DRAINAGE DESIGN REPORT FOR PLANNING

PROPOSED RESIDENTIAL DEVELOPMENT

HEMPTON ROAD - PHASE 2, DEDDINGTON

EXPEDITE

Proposed Residential Development

Hempton Road - Phase 2 Deddington

DETAILED DRAINAGE DESIGN REPORT FOR PLANNING

Issued by:	Expedite 35 Southernhay East Exeter EX1 1NX
Client:	Burrington Estates Ltd
Project Reference:	ES20.020
Project Title:	Hempton Road – Phase 2, Deddington
Revision:	B
Date:	18th November 2022
Prepared by:	Sophie Canton
Checked by:	Kevin Ritter
Approved by:	Simon Lancaster

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Sections

Appendices

1 Introduction

1.1 In order to approve the drainage design submitted with the reserved matters planning application for the proposed residential development of 14 units at Hempton Road – Phase 2 , Deddington, the planning officer has requested that the following supporting design information is submitted:-

- A compliance report to demonstrate how the scheme complies with the "Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire
- Full microdrainage calculations for all events up to and including the 1 in 100 year plus 40% climate change
- Flood Exceedance Conveyance Plan
- Detailed Design Layout drawings of the drainage and SUDS proposals.
- Details of how water quality will be manged during construction:
- Ground Investigation
- Detailed maintenance management plan in accordance with Section 32 of CIRIA C753 including maintenance schedules for each drainage element.

1.2 Burrington Estates have appointed Expedite Engineering Services to complete the detailed design and compile the information required within this report.

1.3 The detailed design produced by Expedite is a development of the Outline Drainage Strategy contained in the "Technical Note -Drainage Statement March 2021" by Mewies Engineering Consultants. A copy of this document is contained within Appendix B.

1.4 The infiltration basin where final discharge takes place was approved by Oxfordshire LLFA under the Phase 1 reserved matters application. Planning Ref: 20/03660/REM Condition 10.

During the consultation process Oxfordshire LLFA also requested the addition of permeable paving within individual private drives and parking bays to minimise the pollutant loading on the infiltration basin, this has been replicated on Phase 2. The permeable paving will be provided with a geotextile at the base to permit infiltration. Due to possible soluble ground

conditions RWP's were not connected to the permeable paving to avoid point loading and possible erosion near footings.

2 Condition Satisfaction

2.1 A compliance report to demonstrate how the scheme complies with the "Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire"

Checklists from Appendix D and F of "Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire" are cross referenced with the design information provided to show the location of evidence of compliance with each item. See Appendix A

2.2 Full microdrainage calculations for all events up to and including the 1 in 100 year plus 40% climate change

Microdrainage Calculations for the combined Phase 1 and 2 Burrington developments are included in Appendix C along with the Surface Water Catchment Plan ES20.020-0311 Rev P5

2.3 Flood Exceedance Conveyance Plan:

Drawing Number ES20.020-0901 Rev P3 - Flood Exceedance Routing Layout contained within Appendix C shows the routes that exceedance flows would take should the main surface water drainage pipes become blocked, or capacity exceeded.

2.4 Detailed Design Layout drawings of the SUDS proposals:

The following drawings are included in Appendix D to provide detailed information of the SUDS and drainage proposals.

Drawing Number ES20.020-0206 Rev P5 - Road and Sewer Longitudinal Sections Sheet 1
Drawing Number ES20.020-0301 Rev P5 - Drainage Layout-Sheet 1
Drawing Number ES20.020-3002 Rev P1 - Private Drive Details
Drawing Number ES20.020-4000 Rev P3 - Drainage Construction Details- Sheet 1
Drawing Number ES20.020-4001 Rev P2 - Drainage Construction Details- Sheet 2
Drawing Number ES20.020-4002 Rev P2 - Drainage Construction Details- Sheet 3
Drawing Number ES20.020-4006 Rev P2 - Drainage Construction Details- Sheet 6

2.5 Details of how water quality will be manged during construction:

A Construction Surface Water Management Plan Drg. No. ES20.020-0902 Rev P3 identify water quality protection measures during construction is contained with Appendix E

2.6 Ground Investigation

A Phase 2 Ground Investigation by BRD Environmental dated January 2020 is contained within Appendix F

2.7 Detailed maintenance management plan in accordance with Section 32 of CIRIA C753 including maintenance schedules for each drainage element.

A SUDS Operation and Maintenance Schedule is contained with Appendix G

3 Conclusion

The information contained within this report provides a comprehensive submission to Oxfordshire LLFA which will allow planning permission to be granted without further condition.

Appendix A

EXPEDITE

REPORT ON COMPLIANCE WITH "LOCAL STANDARDS AND GUIDANCE FOR SURFACE WATER DRAINAGE ON MAJOR DEVELOPMENT IN OXFORDSHIRE"

PROPOSED RESIDENTIAL DEVELOPMENT

HEMPTON ROAD - PHASE 2, DEDDINGTON

Appendix D (Oxford Drainage Guidance)	Information Provided	Compliance
Non-Technical Summary of the Drainage System	"Technical Note -Drainage Statement March 2021" – Summary Page 4	Yes
Description of the type of development	"Technical Note -Drainage Statement March 2021" – Introduction Page 1	Yes
Location Plan	"Technical Note -Drainage Statement March 2021" – Site Location Plan Page 1	Yes
Topography Plan	"Technical Note -Drainage Statement March 2021" – Appendix C	Yes
Ground Investigation	Detailed Drainage Design Report for Planning - Appendix F	Yes
Assessment of all existing flooding risks to the site	"Technical Note -Drainage Statement March 2021" – Appendix A Page 1	Yes
Explanation of how each of these flood risks will be fully mitigated	"Technical Note -Drainage Statement March 2021" – Surface Water Drainage Page 2	Yes
Detailed Drainage Plans	Detailed Drainage Design Report for Planning – Appendix D	Yes
Full explanation of the forms of SuDS used on the site	"Detailed Drainage Design Report for Planning" – Section 5 page 12	Yes
Evidence that the site has an agreed point of discharge	Not Applicable - Infiltration	N/A
Calculations of current runoff from site	Not Applicable - Infiltration	N/A
Calculations of proposed discharge from site	Not applicable - Infiltration	N/A
Hydraulic calculations of the full drainage system	"Detailed Drainage Report for Planning"– Appendix C	Yes
Phasing	One Phase	Yes
Cross sections of the control chambers (including site specific levels mAOD) and manufacturers' hydraulic curves should be submitted for all hydrobrakes and other flow control devices	Not applicable - Infiltration	N/A
Full specification for any permeable paving.	Drg. No. ES20.020-3002 Rev P1 - Private Drive Details "Detailed Drainage Report for Planning"– Appendix C	Yes

Appendix F (Oxford Drainage Guidance)	Information Provided	Compliance
Maintenance responsibility	Drainage components within Burrington Estates Development will be maintained by either Private homeowners, Management Company of Social Housing Provider. Pipes and Manholes within adopted carriageways will be offered to Thames Water for Adoption	Yes
Details of which organisation or body will be the main maintaining body where the area is multifunctional	The infiltration basin and surrounding landscaping will be maintained by the Management Company appointed by Burrington Estates	N/A
A maintenance schedule	"Detailed Drainage Report for Planning" – Appendix G	Yes
A site plan including access points, maintenance access easements and outfalls.	"Detailed Drainage Report for Planning" – Appendix D	Yes
Details of expected design life of all assets with a schedule of when replacement assets may be required.	It is anticipated that with regular maintenance in accordance with the above schedule that the design life of all components should be in excess of 50 years	Yes

Appendix B

LAND OFF HEMPTON ROAD, DEDDINGTON
TECHNICAL NOTE: DRAINAGE STATEMENT
MARCH 2021
REF: 23933-01-TN-02 REV C

M-EC
Consulting Development Engineers

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Introduction

Mewies Engineering Consultants Ltd (M-EC) has been commissioned by Pembury Estates to produce a Drainage Statement in support of a proposed Phase 2 residential development at Hempton Road, Deddington. The Phase 2 site area is shown in red in Figure 1 below.

The land to the south of this site is shown in blue in Figure 1 below (Phase 1) and this area currently benefits from outline planning permission for 21 dwellings (application 18/02147/OUT).

Figure 1: Site location plan

The purpose of this technical note is to support an outline planning application for an additional 14 dwellings at Hampton Road, Deddington. The proposed residential development at Hampton Road, Deddington will consist of a total of 35 dwellings with associated infrastructure, parking and access to Hampton Road.

The submitted drainage design is in accordance with the principles set out in previous M-EC documents including:

- M-EC Flood Risk Technical Note (ref. 23933/05-18/6010 Rev C) dated June 2018
- M-EC Technical Note: Surface Water Drainage (ref. 23933-01-TN-01) dated June 2020

A copy of both statements can be found in Appendix A.

A proposed layout plan showing both phases of development are included in Appendix B and the site topographic survey is included in Appendix C.

Surface Water Drainage

It is essential that the proposed development does not increase flood risk to adjacent land or downstream of the site, as well as protecting the development from flooding itself. To ensure that the flood risk is minimised, the drainage design will incorporate the following flood mitigation measures:

- Finished floor levels will be designed to retain and direct all overland surface water flows away from the dwellings following the natural topography of the land.

- The proposed development will include a surface water drainage system that will intercept the runoff generated within the development. This will minimise the risk to the new buildings and also reduce the incidence of overland flows.

- The surface water drainage system will convey flows into an infiltration basin in the southeastern part of the site. This will store surface water flows generated from the development up to and including a 1 in 100-year return period, plus 40% climate change, and release runoff to the ground. This will ensure there is no increase in runoff from the site and provide betterment during critical storm events. The infiltration basin is sized to take flows from Phase 1 and Phase 2.

The flood risk and drainage route as approved under planning application 18/02147/OUT has considered the outfall options in accordance with the surface water runoff discharge hierarchy, Part H of the Building Regulations 2015. This assessment established that surface water run-off shall discharge via infiltration at source within the site boundary, in the south eastern corner. The proposed infiltration basin has been designed to accommodate the flows for 35 dwellings and forms part of this red line.

As established within the approved document, soakage testing was undertaken in June 2018 with two trial pits in the site's south-east corner. Both pits were found to infiltrate very well and the soakage results are included in Appendix D. The post-development land use for the site has been calculated using the proposed layout plan seen in Appendix B. The post-development land use calculations can be seen in Appendix E. Surface water flows for an impermeable area of 0.847ha including a 10% allowance for urban creep will be collected via a piped network running under the roads and conveyed towards an infiltration basin located in the southeastern corner of Phase 2.

A storage volume if 156.8m^3 is required to accommodate the flows generated from the Phase 2 development. A total storage volume of 364.8m^3 will be available for surface water storage within the infiltration basin. This is to allow sufficient time for all surface water to discharge at the proposed rates and cater for all events up to the 1 in 100-year return period with a 40% climate change allowance. Detailed Micro-Drainage Network calculations are included in Appendix F. Attenuated runoff from the site is to be discharged to the ground at the established soakage rate of 2.797m/hr.

In the event that there is a failure of the drainage system or an event exceeding the design storm any exceedance flows and overland flows will be routed away from dwelling houses to the areas of lowest risk on the site.

A detailed drainage strategy for all 35 dwellings based on the principles above is shown on drawing 23933_01_230_03b in Appendix G.

The CIRIA SuDS Manual, C753, indicates the minimum treatment indices appropriate for contributing pollution hazards for different land use classifications. Surface water runoff from the residential roofs has a very low pollution hazard, while the minor road and parking areas have a low pollution hazard. As shown in Table 1 from the CIRIA SuDS Manual, the Mitigation Indices provided by the infiltration basin are greater than or equal to the Pollution Hazard Indices for each component, ensuring the proposed system provides adequate water quality treatment for surface water runoff.

Table 1: CIRIA C753 Pollution Hazard Indices and SuDS Mitigation Indices

Pollution Hazard Indices				
Land use	**Pollution hazard level**	**Total suspended solids (TSS)**	**Metals**	**Hydro-carbons**
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day	Low	0.5	0.4	0.4
SuDS Mitigation indices for SuDS components for discharging surface water				
Detention/ Infiltration Basins		0.5	0.5	0.6

Maintenance and Management
The continued maintenance of any adopted sewer will be the responsibility of Thames Water, private drainage systems will be maintained by the landowners and a management company appointed on their behalf.

The detention basin will first be offered to bodies such as the Local Authority for adoption and future maintenance. Should this not be taken up, a management company will be employed. Full details will be provided of the responsible body to conduct the maintenance activities identified in Table 2.

Table 2: Proposed Maintenance Regime

Drainage Asset	Responsible Organisation	Maintenance Work	Frequency
Pipework / Manholes	Private Ownership / Management Company / Thames Water	Inspect pipework and clear blockages	Annually or after severe storms.
		Inspect manholes and clear blockages	
		Repair any defects in the network	
Headwalls	Local Authority/ Management Company	Inspect structure and remove any debris/litter on structure	Monthly or after severe storms.
Infiltration Basin	Local Authority/ Management Company	Amenity grass cutting of surrounding green spaces	As required
		Litter and debris removal	Monthly
		Inspect and clear inlets, outlets and overflows	6 Monthly

Foul Water Drainage
Foul sewage generated by Phase 2 will discharge via gravity into the proposed drainage network within the Phase 1 development area. Foul water within Phase 1 will be gathered by a gravity-based foul sewerage network and will outfall to an existing foul sewer in Wimborn Close to the east connecting at manhole ref. 0701. The connection will be subject to an S106 application with Thames Water. Details of the developer enquiry are included in Appendix H.

Summary
To summarise the key points outlined above:

- The proposed drainage strategy is in accordance with the principles set by the approved FRA and previously submitted details.
- All surface water drainage will be via a gravity system with no pumping of flows involved. The system will cater for 35 dwellings.
- Surface water runoff will be attenuated in an infiltration basin on-site and will be discharged to the ground at an infiltration rate of 2.797 m/hr. A total storage volume of 364.8m^3 will be available for surface water storage within the infiltration basin, this is to allow sufficient time for all surface water to discharge at the proposed rates and cater for all events up to the 1 in 100-year return period with a 40% climate change allowance.
- The development will not increase runoff or flood risk downstream by utilizing a sustainable drainage system to store and infiltrate any surface water generated to the ground.
- Foul water drainage will discharge to the existing sewer network and be offered for adoption to Thames Water.

Report Prepared By:

[redacted]

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Ryan Chafer BSc (Hons)

Report Checked By:

[redacted]

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Alexander Bennett BSc (Hons) MCIHT MTPS

Appendix:

A. M-EC Flood Risk and Drainage Technical Note (ref. 23933/05-18/6010 Rev C), June 2018
   M-EC Technical Note: Surface Water Drainage (ref. 23933-01-TN-01), June 2020
B. Proposed Site Layout Plan
C. Topographical Survey
D. Soakage Testing Results
E. EXPEDITE Land Use Calculations
F. REV A Micro-Drainage Network Calculations
G. Detailed Drainage Strategy Drawing – 23933_01_230_03b
H. Thames Water Developer Enquiry

Registration of Amendments

Revision	Comments	Prepared By:	Checked By:
- Dec 2020	Initial submission	RC	AB
A Dec 2020	Client amendments and updated site layout	AB	AB
B Mar 2021	Updates to site layout	RC	AB
C Mar 2021	Client comments and amendements	AB	AB

APPENDIX A

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PROPOSED RESIDENTIAL DEVELOPMENT AT HEMPTON ROAD, DEDDINGTON
FLOOD RISK AND DRAINAGE TECHNICAL NOTE
FEBRUARY 2019
REF. 23933/05-18/6010 - REV C

Introduction

Mewies Engineering Consultants Ltd (M-EC) has been instructed to produce this Technical Note to describe the drainage strategy designed for a proposed residential development of 21 units on land off Hempton Road, Deddington, Oxfordshire.

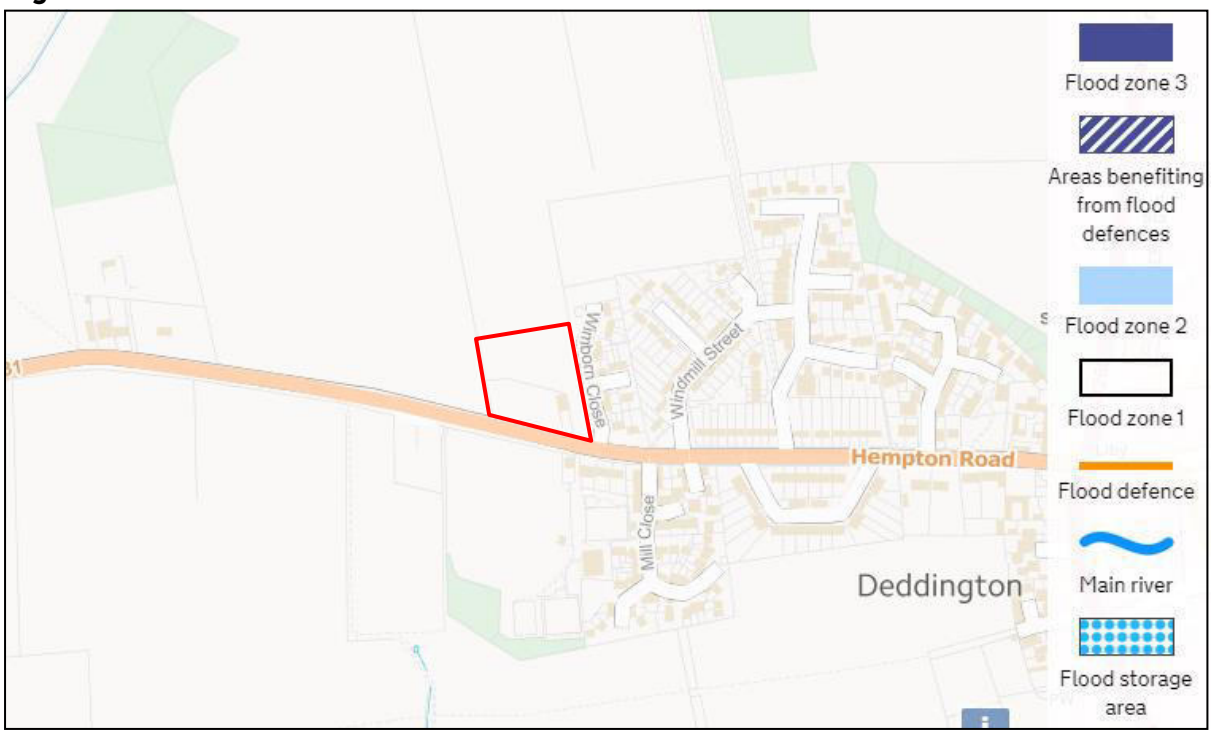
Site Location & Description

The site is mostly comprised of undeveloped agricultural land although its southern half is currently used as a vegetable garden. A single large corrugated iron shed is present on the site accessed from a gate in the south-east corner. The site measures approximately 1.177ha. The site falls from north to south towards Hempton Road with a fall of 2.5m from a high point around 139.2m AOD in its north-west corner to a low point of 136.7m AOD in the centre of its southern boundary.

Flood Risk

Based on the latest Flood Zone Mapping issued by the Environment Agency, the site area is located entirely in Flood Zone 1. The closest designated flood zones are over a kilometre to the north.

Figure 1: EA Flood Zones



Environment Agency Surface Water Flood Risk Mapping shows that there are no areas of designated surface water flood risk within the site's boundaries. There are small areas of low risk extending along Hempton Road further east. All development will be located a sufficient distance from these areas to negate any risk.

The proposed development area will be located wholly within Flood Zone 1 (less than 0.1% chance of flooding). In accordance with Table 3 of the Planning Practice Guidance the development is therefore "sequentially acceptable".

Geology & Ground Conditions

Geological mapping indicates that the site is underlain by two types of solid geology; the north of the site is underlain by Whitby Mudstone Formation while the south of the site is Marlstone Rock Formation – Ferruginous Limestone and Ironstone. No superficial deposits are present within the site's boundaries.

Soakage testing was undertaken in June 2018 with two trial pits in the site's south-east corner. Both pits were found to infiltrate very well (findings are summarised in Table 1). As a result of this the site's proposed drainage strategy has been revised to be based on infiltration.

Table 1: Soakage Test Summary

SA01		SA02	
m/s	m/hr	m/s	m/hr
1.27×10^{-3}	4.572	5.93×10^{-3}	21.348
9.55×10^{-4}	3.438	7.35×10^{-3}	26.460
7.77×10^{-4}	2.797	1.84×10^{-3}	6.624
		1.67×10^{-3}	6.012
		1.57×10^{-3}	5.652
		1.67×10^{-3}	6.012
		1.66×10^{-3}	5.976

Drainage Strategy

No ditches or significant drainage features are located within the site and therefore existing surface water runs off directly downhill towards Hempton Road along the southern boundary.

Given the confirmation of viable infiltration and the lack of nearby watercourses, surface water runoff from the site will be attenuated on-site and then discharged into the underlying ironstone bedrock. No existing public surface water sewers are present within the site's boundaries.

The proposed surface water strategy for the site will comprise of a single infiltration basin with a total storage capacity of 156m^3 based on an impermeable area of 0.74ha inclusive of 10% urban creep. This system will have sufficient capacity for the 1 in 100 year storm event (plus a 40% allowance of climate change).

The SUDS scheme will be offered to the Borough Council or other local bodies such as the Town or Parish Council for adoption and future maintenance. A proposed maintenance plan shown in Table 2 breaks down the maintenance responsibility of the various assets.

Table 2: Proposed Maintenance Regime

Drainage Asset	Responsible Organisation	Maintenance Work	Frequency
Pipework / Manholes	Private Ownership / Management Company / Water Authority / Developer	Inspect pipe work and clear blockages	Annually or after severe storms.
		Inspect manholes and clear blockages	
		Repair any defects in network	
Headwalls	Private Ownership / Water Authority / Management Company	Inspect structure and remove any debris/litter on structure	Monthly or after severe storms.
Infiltration Basin	Borough Council / Management Company	Amenity grass cutting of surrounding green spaces	As required
		Litter and Debris removal	Monthly
		Inspect and clear inlets, outlets and overflows	6 Monthly
Catch Pit	Private Ownership / Management Company	Inspect structure and remove excessive silt build up	Annually or after severe storms.

Foul Drainage
Foul sewage from the site will be gathered by a gravity based foul sewerage network and outfall to an existing foul sewer in Wimborn Close to the east connecting at manhole ref. 0701. Connection will be subject to a S106 application with Thames Water.

Summary
To summarise the key points outlined above:

- All development will be contained in Flood Zone 1 and is therefore sequentially acceptable. Other sources of flood risk to the site are considered to be low to very low.
- The site's surface water will be attenuated by a drainage network with an infiltration basin.
- The development will not increase runoff or flood risk downstream by utilising a sustainable drainage system to store runoff and discharge into the underlying bedrock.
- Foul drainage for the site will entail a gravity based system gathering to the existing foul sewer in Wimborn Close south-east of the site.

Overall it is considered there are no insurmountable Flood Risk and Drainage constraints to the development of this site for residential use.

Report Prepared By:

[redacted]

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Dave Moffatt

Report Checked By:

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Alexander Bennett BSc MCIHT, MTPS

APPENDICES

A. Site Location Plan
B. Proposed Site Layout
C. Topographical Survey
D. Water Authority Correspondence
E. Microdrainage Calculations
F. Strategy Drawing
G. Soakage Testing Results

HAMPTON ROAD, DEDDINGTON, OXFORDSHIRE
TECHNICAL NOTE: SURFACE WATER DRAINAGE
JUNE 2020
REF: 23933-01-TN-01

M-EC Consulting Development Engineers

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Introduction

Mewies Engineering Consultants Ltd (M-EC) has been commissioned by Pembury Estates to produce a drainage statement in support of a proposed residential development at Hampton Road, Deddington. The site location is shown in Figure 1.

Figure 1: Site location plan

Part of the site currently benefits from outline planning permission for 21 dwellings (application 18/02147/OUT) and this technical note responds to Condition 10 of this permission. Condition 10 states:

Development shall not begin until a surface water drainage scheme for the site, based on sustainable drainage principles and an assessment of the hydrological and hydro-geological context of the development, has been submitted to and approved in writing by the local planning authority. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed and prior to the first occupation of the development. The scheme shall also include:

- *Discharge Rates*
- *Discharge Volumes*
- *SUDS (Permeable Paving, Soakaway Tanks)*
- *Maintenance and management of SUDS features (To include provision of a SuDS Management and Maintenance Plan)*
- *Infiltration in accordance with BRE365*
- *Detailed drainage layout with pipe numbers*
- *Network drainage calculations*
- *Phasing*

- *Flood Flow Routing in exceedance conditions (to include provision of a flood exceedance route plan)*

Reason: To ensure that sufficient capacity is made available to accommodate the new development and in order to avoid adverse environmental impact upon the community and to ensure compliance with Policy ESD 7 of the Cherwell Local Plan 2011-2031 Part 1 and Government guidance within the National Planning Policy Framework. This information is required prior to commencement of the development as it is fundamental to the acceptability of the scheme.

The purpose of this technical note is to support an application for the discharge of Condition 10 of the approved application of 21 dwellings while also incorporating a proposed phase 2 development area (additional 14 dwellings) in to the drainage design.

The submitted drainage design is in accordance with the principles set by the previously approved Flood Risk Assessment (FRA) and should be read in conjunction with the original M-EC Flood Risk Technical Note (ref. 23933/05-18/6010 Rev C) dated June 2018, M-EC Ltd. A copy of this statement is included in Appendix A.

A proposed layout plan showing both phases of development are included in Appendix B and the site topographic survey is included in Appendix C.

Surface Water Drainage
It is essential that the proposed development does not increase flood risk to adjacent land or downstream of the site, as well as protecting the development from flooding itself. To ensure that the flood risk is minimised, the drainage design will incorporate the following flood mitigation measures:

- Finished floor levels will be designed to retain and direct all overland surface water flows away from the dwellings following the natural topography of the land.

- The proposed development will include a surface water drainage system that will intercept runoff generated within the development. This will minimise the risk to the new buildings and also reduce the incidence of overland flows.

- The surface water drainage system will convey flows to an infiltration basin. This will store surface water flows generated from the development up to and including a 1 in 100-year return period, plus 40% climate change, and release runoff to the ground. This will ensure there is no increase in runoff from the site and provide betterment during critical storm events.

The approved FRA, 23933/05-18/6010 Rev C, has considered the outfall options in accordance with the surface water runoff discharge hierarchy, Part H of the Building Regulations 2015, this assessment established that surface water run-off shall discharge via infiltration at source within the site boundary.

As established within the approved document Soakage testing was undertaken in June 2018 with two trial pits in the site's south-east corner. Both pits were found to infiltrate very well and the soakage results are included in Appendix D. Runoff from the development will be collected via a piped network running under the roads within the site. These shall then be conveyed towards an infiltration basin.

The infiltration basin will manage surface water for all storm events up to the 1 in 100-year return period, plus a 40% allowance for climate change. This will provide adequate storage for the 100-year plus 40% climate change event. Detailed Micro-Drainage – Network calculations are included in Appendix E. Attenuated runoff from the site is to be discharged to the ground at the established soakage rate of 2.797m/hr.

In the event that there is a failure of the drainage system or an event exceeding the design storm it will be ensured that any exceedance flows and overland flows are routed away from dwelling houses to the areas of lowest risk on the site.

The above principles are shown on the drainage strategy drawing 23933_01_230_01 in Appendix F.

The CIRIA SuDS Manual, C753, indicates the minimum treatment indices appropriate for contributing pollution hazards for different land use classifications. Surface water runoff from the residential roofs

has a very low pollution hazard, while the minor road and parking areas have a low pollution hazard. As shown in Table 1 from the CIRIA SuDS Manual, the Mitigation Indices provided by the infiltration basin are greater than or equal to the Pollution Hazard Indices for each component, ensuring the proposed system provides adequate water quality treatment for surface water runoff.

Table 1: CIRIA C753 Pollution Hazard Indices and SuDS Mitigation Indices

Pollution Hazard Indices				
Land use	**Pollution hazard level**	**Total suspended solids (TSS)**	**Metals**	**Hydro-carbons**
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day	Low	0.5	0.4	0.4
SuDS Mitigation indices for SuDS components for discharging surface water				
Detention/ Infiltration Basins		0.5	0.5	0.6

Maintenance and Management

The continued maintenance of any adopted sewer will be the responsibility of Thames Water, private drainage systems will be maintained by the land owners and a management company appointed on their behalf.

The detention basin will first be offered to bodies such as the Local Authority for adoption and future maintenance. Should this not be taken up, a management company will be employed. Full details will be provided of the responsible body to conduct the maintenance activities identified in Table 2.

Table 2: Proposed Maintenance Regime

Drainage Asset	Responsible Organisation	Maintenance Work	Frequency
Pipework / Manholes	Private Ownership / Management Company / Thames Water	Inspect pipe work and clear blockages	Annually or after severe storms.
		Inspect manholes and clear blockages	
		Repair any defects in network	
Headwalls	Local Authority/ Management Company	Inspect structure and remove any debris/litter on structure	Monthly or after severe storms.
Infiltration Basin	Local Authority/ Management Company	Amenity grass cutting of surrounding green spaces	As required
		Litter and debris removal	Monthly
		Inspect and clear inlets, outlets and overflows	6 Monthly

Foul Water Drainage

Foul sewage from the site will be gathered by a gravity based foul sewerage network and outfall to an existing foul sewer in Wimborn Close to the east connecting at manhole ref. 0701. Connection will be subject to a S106 application with Thames Water. Details of the developer enquiry are included in

Appendix G.

Summary
To summarise the key points outlined above:

- The proposed drainage strategy is in accordance with the principles set by the approved FRA and previously submitted details.
- All surface water drainage will be via a gravity system with no pumping of flows involved.
- Surface water runoff will be attenuated in an infiltration basin on site and will be discharged to the ground, soakage testing confirmed a rate of 2.797 m/hr, the storage volume on site will cater for the 1 in 100 year +40% Climate Change storm event.
- The development will not increase runoff or flood risk downstream by utilizing a sustainable drainage system to store and infiltrate any surface water generated to the ground.
- Foul water drainage will discharge to the existing sewer network and be offered for adoption to Thames Water.

Report Prepared By:

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Report Checked By:

[redacted]

.....
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Appended Documents

A. Flood Risk and Drainage Technical Note, 23933, June 2018, M-EC Ltd.
B. Proposed Site Layout Plan
C. Topographical Survey
D. Soakage Testing Results
E. Micro-Drainage Network Calculations
F. Drainage Strategy Drawing - 23933-01-230-01
G. Thames Water Developer Enquiry

APPENDIX B

Hempton Road

Wimborne Close

136.89

N

0 5 10 15 20 25m

REV.	DATE	DESCRIPTION

CLIENT:
BURRINGTON ESTATES

PROJECT TITLE:
HEMPTON ROAD, DEDDINGTON, PHASE 1

DRAWING TITLE:
SITE PLAN - PHASE 2
RED LINE PLAN AS PROPOSED

SCALE:	1:500 @A3	DATE:	February 21
DWG NO.:	201-305	REVISION:	B

PLOT 9
PLOT 8
PLOT 7
PLOT 6
PLOT 10
PLOT 11
PLOT 12
PLOT 13
PLOT 14
*A PLOT 5
*A PLOT 4
*A PLOT 3
*A PLOT 2
*A PLOT 1
5,5
9,0
pedestrian link
Wimborne Close
SUDS
TCL: 146.83
TCL: 146.62
136.89
Hempton Road

REV.	DATE	DESCRIPTION

CLIENT:
BURRINGTON ESTATES

PROJECT TITLE:
HEMPTON ROAD, DEDDINGTON, PHASE 1

DRAWING TITLE:
SITE PLAN - PHASE 2
RED LINE PLAN AS PROPOSED

SCALE:	1:500 @A3	DATE:	February 21
DWG NO.:	201-304	REVISION:	E

KEY:

*A - Affordable housing

N

0 5 10 15 20 25m

APPENDIX C

445900E
445950E
446000E
446050E
231950N
231900N
231850N
231800N
231750N
N
Hempton Rd
Shed
Stone Crop
Crouch
23
19
15
13
5
MH CL:137.45 IL:136.03
MH CL:137.33 IL:136.45
MH CL:137.26 IL:135.65
MH CL:137.17 IL:135.97
MH CL:137.07 IL:134.45
MH CL:136.88 IL:135.41
MH CL:136.86 IL:134.21
MH CL:136.64 IL:135.14
MH CL:136.45 IL:135.09
MH CL:136.47 IL:134.00
MH CL:136.96 IL: 135.01
MH CL:136.66 IL:134.86
MH CL:136.92 Unable to lift
CVR CL:137.36 IL: 136.98
GH1 138.730
GH2 137.023
PiR Fence ht 1.1m
PiR Fence ht 1.2m
C/L Fence ht 1m
P/W Fence ht 1m
Hedge average ht 9m
Hedge average ht 7m
Hedge average ht 5m
Hedge average ht 8m
Hedge ht 2.3m
Hedge ht 2.2m
Hedge ht 1.4m
Hedge ht 1.7m
Wall ht 0.5m

Station Information:

Station	Easting (m)	Northing (m)	Level (m)
GH1	445923.387	231775.714	138.730
GH2	446024.264	231764.244	137.023
GH3	446098.551	231744.779	135.773

OS Note:

Some services may have been omitted due to parked vehicles. The Ordnance Survey tile is to be used as a guide only.

OS Buildings *Surveyed Buildings*

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36(15) via Global Navigational Satellite Systems (GNSS) and the O.S. Active Network (OS Net).

A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGM15GB transformation models.

The survey has been correlated to this point and a further one or more OSGB36 (15) points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.

Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

Legend:

Buildings; Wall; Kerb line; Line marking; Drop kerb; Centre line; Top of bank; Overhead Cable; Concrete edge; Tarmac edge; Grass verge; Canopy/Overhang; Verge; Bottom of bank; Station and Name; Station Level; Tree / Bush / Sapling; Area of Undergrowth; Woodland; R: Ridge Level; E: Eaves Level; F: Flat Roof Level; Gate

Fence types: IW Interwoven; IR Iron Railings; WM Wire Mesh; PJR Post & Rail; PW Post & Wire; CL Chain Link; WP Wooden Panels; CB Close Boarded; SP Steel Palisade

IC Inspection chamber; IP Pipe invert; Gy Gully; Bg Back gully; Dp Down pipe; Pipe Pipe above ground; MH Manhole; WL Water level; Fl Flood light; Lp Lamp post; Tp Telegraph post; Ep Electricity post; Tl Traffic light; Bus Bus stop; Sv Stop valve; St Stop tap; Er Earth rod; Wm Water meter; Gas Gas valve; Av Air valve; ICU Unidentified inspection; Wo Wash out; Re Rodding eye; BB Bellisha beacon; CTV Cable tv; Mkr Marker post; Gmkr Gas marker post; So Soffit; Fh Fire hydrant; Bo Bollard; IB Illuminated bollard; Rbin Rubbish bin; Vp Vent pipe; Grl Ground light; Lbox Letter box; Stmp Tree Stump; Sty Stile; IFL Internal floor level; THL Threshold level; Sp Sign post; TH Trialhole; BH Borehole; ELC Electric; BT British Telecom; C'box Control box; TT Tactile; BP Brick paved; CPS Concrete paving slabs; CVR Cover; R/wall Retaining wall; TWL Top of Wall Level; TCL Tree canopy level; G: Girth; MG Multi girth; IC Inspection chamber; CL: Cover level; IL: Invert level; UTL Unable to lift

Rev	Date	Description	Drawn	Q. Ref.

greenhatch group

- Topographical Surveys
- Site Engineering
- Utility / CCTV Surveys
- Measured Building Surveys
- 3D Laser Scanning
- Revit & BIM Models

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Newcastle: 24 Riverside Studios, Amethyst Road, Newcastle Bus. Park, Newcastle-U-Tyne, NE4 7YL, t. (01912) 736391
London: 27, Cornwall Terrace Mews, Regents Park, London, NW1 5LL, t. (02072) 241806

CLIENT
Webb Developments Ltd

PROJECT
Hempton Road Deddington, Banbury

TITLE
Topographical Survey

SCALE	DATE
A2@ 1: 500	23/03/18
DRAWN: LUP	QUALITY REF: GH2683

Level datum	See note
Grid orientation	See note
Job number	29833

Drawing No.: *29833_T* Rev.: *0*

Comments

This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

APPENDIX D

M-EC
The Old Chapel
Station Road
Hugglescote
Leicestershire
LE67 2GB

SOAKAGE PIT LOCATION PLAN

Project:	**LAND AT HEMPTON ROAD, DEDDINGTON**
File Ref:	**23933**
O.S. Grid Ref:	**445952, 231916**
Postcode:	**OX15 0QJ**

Basin requested in south-east corner
Geology – Marlstone Rock Formation – Limestone and Ironstone
Look into Highways Drainage in Wimborn Close (implied to be Soakage, any evidence of this)

Mewies Engineering Consultants Ltd
The Old Chapel, Station Road, Hugglescote, Leicestershire, LE67 2GB
Telephone 01530 264753 email group@m-ec.co.uk

Scheme	**Hempton Road, Deddington**	Page No.	1
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	1

Soil infiltration test

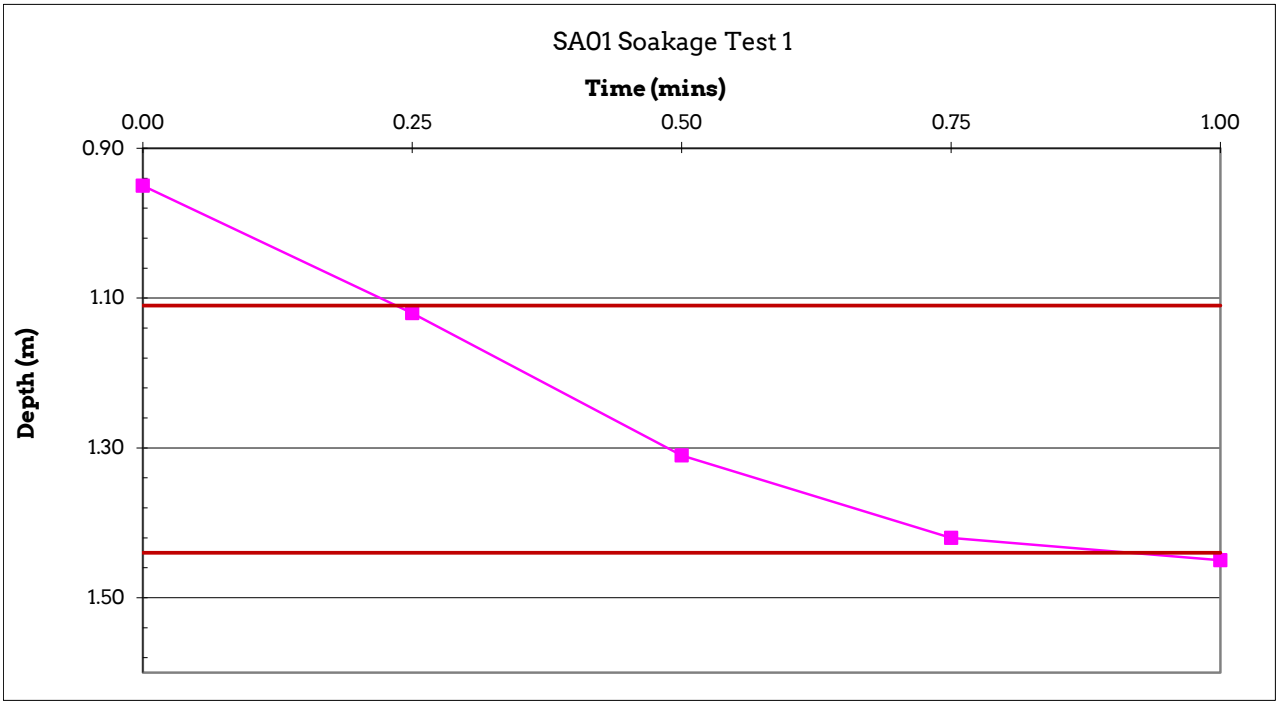
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA01**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**1.60**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.50	**Reddish brown, gravelly SAND with a low cobble content.**
	0.50 - 1.60	**Reddish brown, sandy, fine to coarse angular GRAVEL with high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.95
0.25	1.12
0.50	1.31
0.75	1.42
1.00	1.45

Effective storage depth =	0.65	m
75% effective storage depth =	0.49	m
(ie depth below GL) =	1.11	m
25% effective storage depth =	0.16	m
(ie depth below GL) =	1.44	m
effective storage depth 75%-25% =	0.33	m
Time to fall to 75% effective depth =	0.24	mins
Time to fall to 25% effective depth =	0.85	mins
Void Ratio =	40%	
V (75%-25%) =	0.1053	m3
a (50%) =	2.2725	m2
t (75%-25%) =	0.61	mins
SOIL INFILTRATION RATE =	**1.27E-03**	**m/s**



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Scheme	**Hempton Road, Deddington**	Page No.	2
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	2

Soil infiltration test

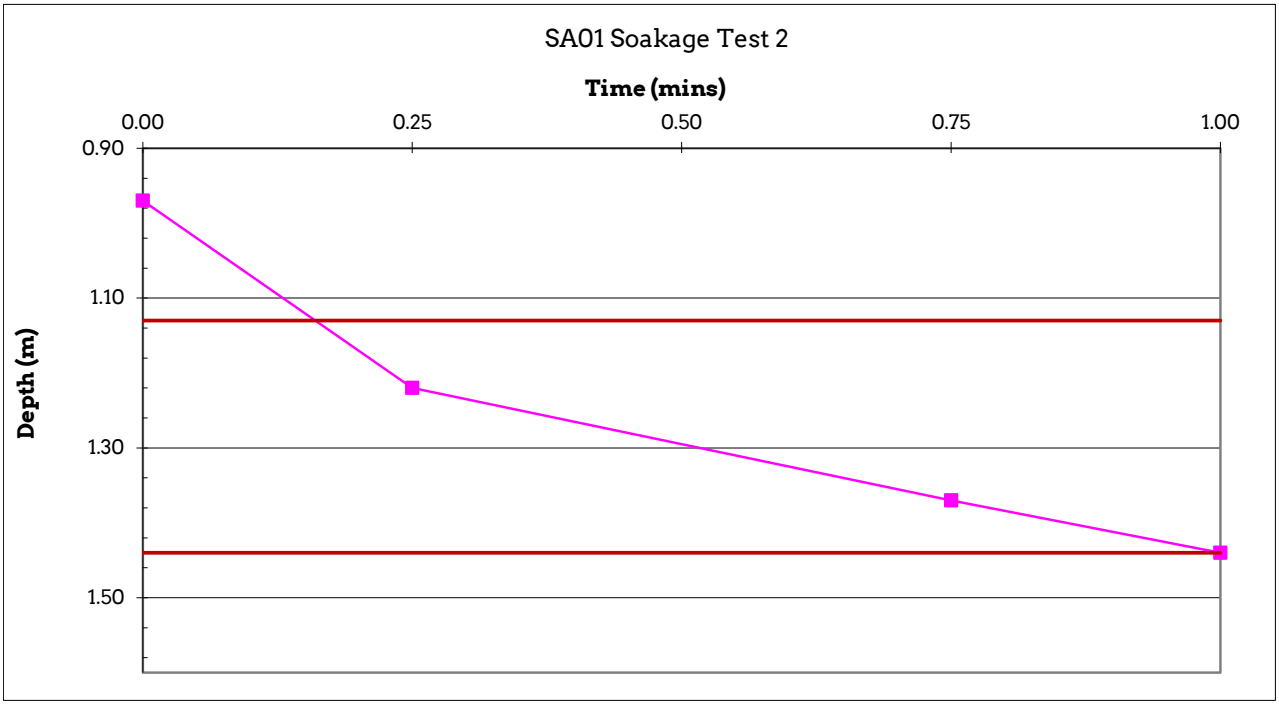
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA01**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**1.60**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.50	**Reddish brown, gravelly SAND with a low cobble content.**
	0.50 - 1.60	**Reddish brown, sandy, fine to coarse angular GRAVEL with high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.97
0.25	1.22
0.75	1.37
1.00	1.44

Effective storage depth =	0.63	m
75% effective storage depth =	0.47	m
(ie depth below GL) =	1.13	m
25% effective storage depth =	0.16	m
(ie depth below GL) =	1.44	m
effective storage depth 75%-25% =	0.32	m
Time to fall to 75% effective depth =	0.20	mins
Time to fall to 25% effective depth =	1.00	mins
Void Ratio =	40%	
V (75%-25%) =	0.1021	m3
a (50%) =	2.2275	m2
t (75%-25%) =	0.80	mins
SOIL INFILTRATION RATE =	**9.55E-04**	**m/s**



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Scheme	**Hempton Road, Deddington**	Page No.	3
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	3

Soil infiltration test

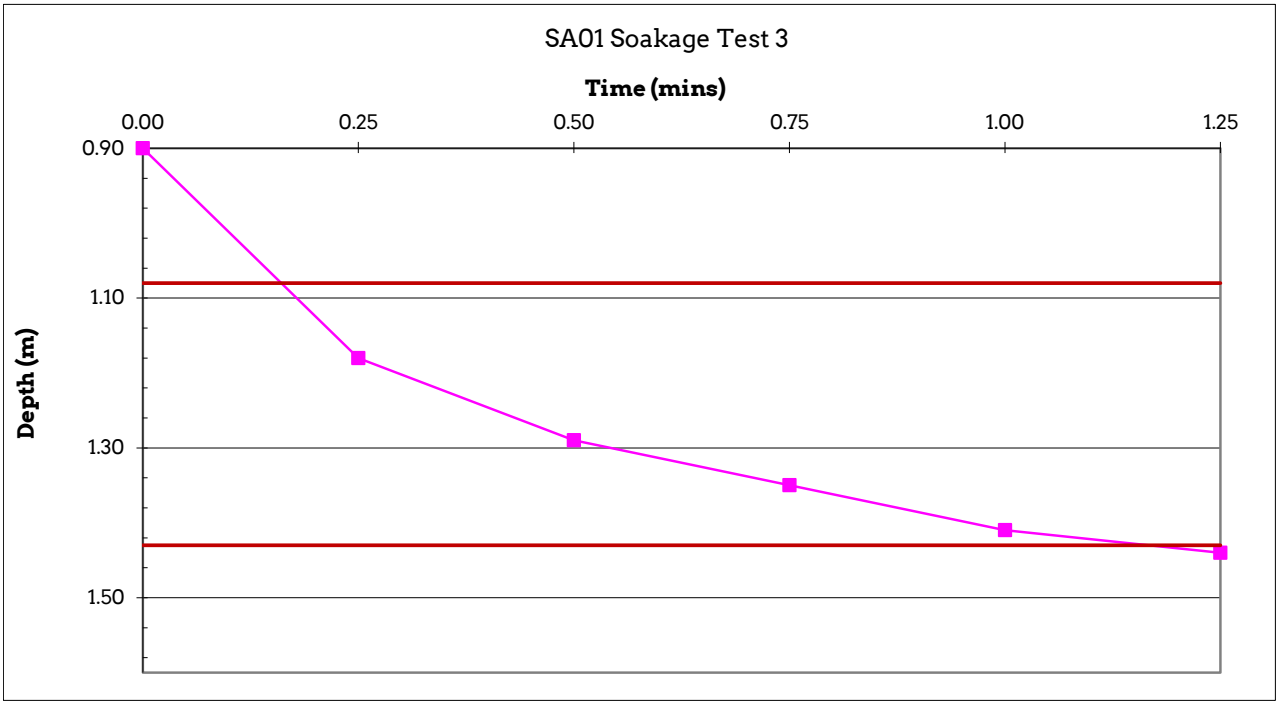
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA01**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**1.60**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.50	**Reddish brown, gravelly SAND with a low cobble content.**
	0.50 - 1.60	**Reddish brown, sandy, fine to coarse angular GRAVEL with high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.90
0.25	1.18
0.50	1.29
0.75	1.35
1.00	1.41
1.25	1.44

Effective storage depth =	0.70	m
75% effective storage depth =	0.53	m
(ie depth below GL) =	1.08	m
25% effective storage depth =	0.18	m
(ie depth below GL) =	1.43	m
effective storage depth 75%-25% =	0.35	m
Time to fall to 75% effective depth =	0.13	mins
Time to fall to 25% effective depth =	1.15	mins
Void Ratio =	40%	
V (75%-25%) =	0.1134	m3
a (50%) =	2.3850	m2
t (75%-25%) =	1.02	mins
SOIL INFILTRATION RATE =	**7.77E-04**	**m/s**



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Scheme	**Hempton Road, Deddington**	Page No.	1
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	1

Soil infiltration test

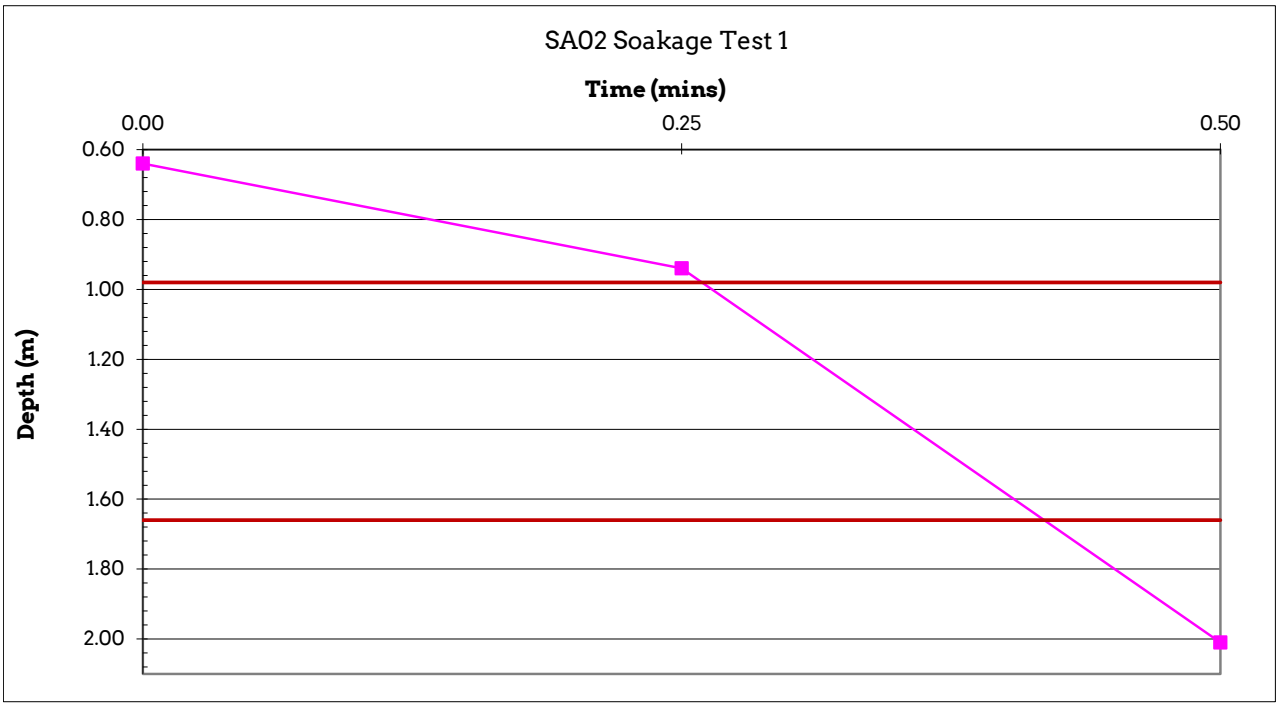
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA02**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**2.00**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.60	**Reddish brown, clayey, gravelly SAND with a low cobble content.**
	0.60 - 0.90	**Reddish brown, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**
	0.90 - 2.00	**Reddish brown, clayey, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.64
0.25	0.94
0.50	2.01

Effective storage depth =	1.36	m
75% effective storage depth =	1.02	m
(ie depth below GL) =	0.98	m
25% effective storage depth =	0.34	m
(ie depth below GL) =	1.66	m
effective storage depth 75%-25% =	0.68	m
Time to fall to 75% effective depth =	0.26	mins
Time to fall to 25% effective depth =	0.42	mins
Void Ratio =	40%	
V (75%-25%) =	0.2203	m3
a (50%) =	3.8700	m2
t (75%-25%) =	0.16	mins
SOIL INFILTRATION RATE =	**5.93E-03**	**m/s**



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Scheme	**Hempton Road, Deddington**	Page No.	2
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	2

Soil infiltration test

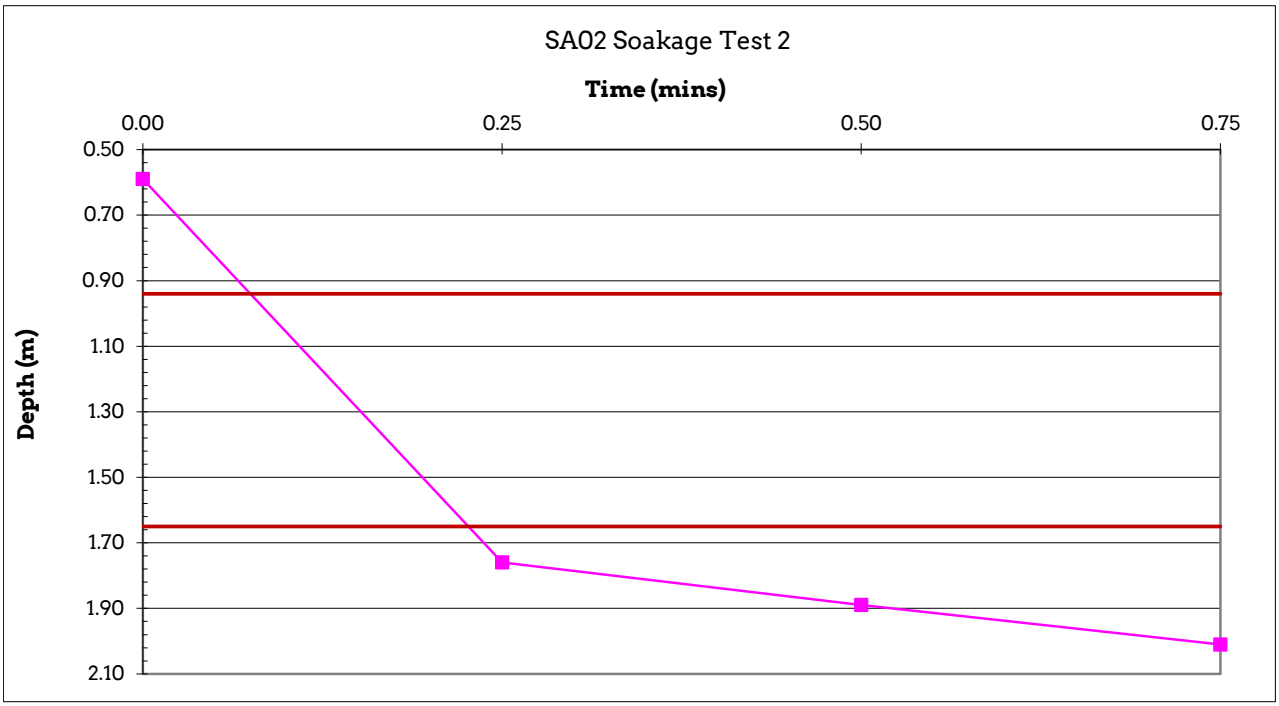
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA02**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**2.00**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.60	**Reddish brown, clayey, gravelly SAND with a low cobble content.**
	0.60 - 0.90	**Reddish brown, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**
	0.90 - 2.00	**Reddish brown, clayey, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.59
0.25	1.76
0.50	1.89
0.75	2.01

Effective storage depth =	1.41	m
75% effective storage depth =	1.06	m
(ie depth below GL) =	0.94	m
25% effective storage depth =	0.35	m
(ie depth below GL) =	1.65	m
effective storage depth 75%-25% =	0.71	m
Time to fall to 75% effective depth =	0.08	mins
Time to fall to 25% effective depth =	0.21	mins
Void Ratio =	40%	
V (75%-25%) =	0.2284	m3
a (50%) =	3.9825	m2
t (75%-25%) =	0.13	mins
SOIL INFILTRATION RATE =	**7.35E-03**	**m/s**



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Scheme	**Hempton Road, Deddington**	Page No.	3
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	3

Soil infiltration test

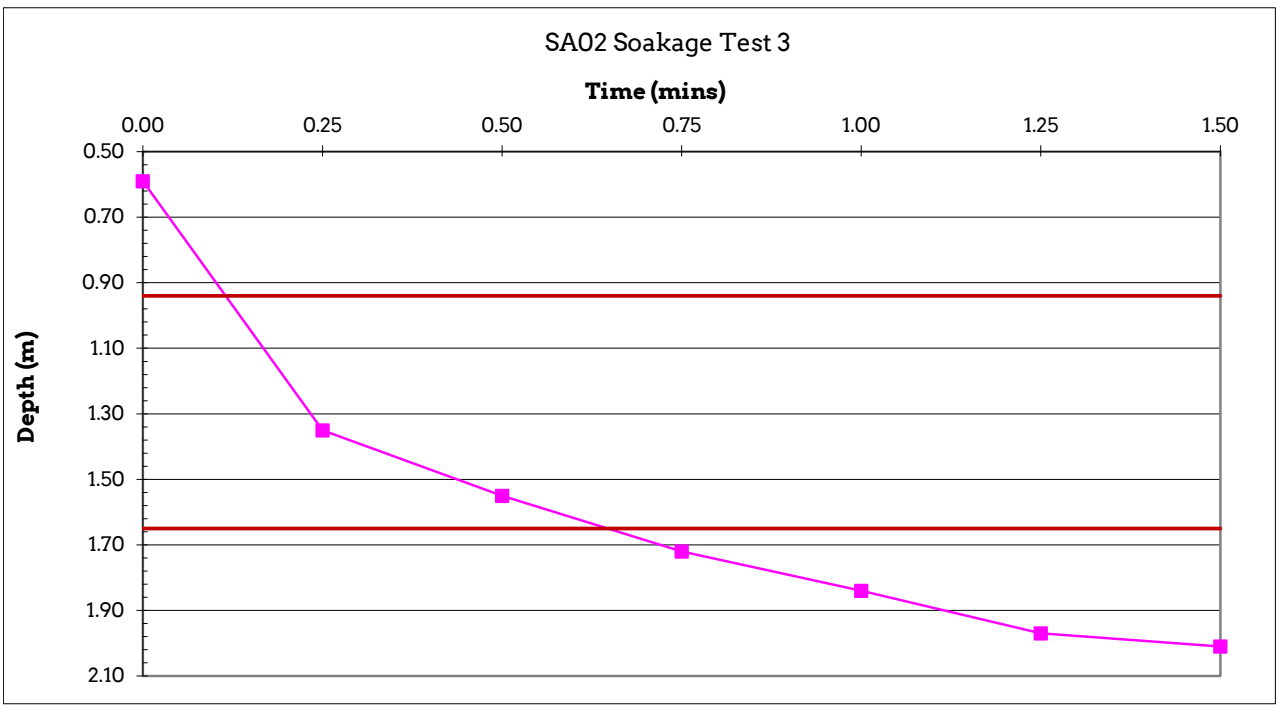
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA02**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**2.00**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.60	**Reddish brown, clayey, gravelly SAND with a low cobble content.**
	0.60 - 0.90	**Reddish brown, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**
	0.90 - 2.00	**Reddish brown, clayey, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.59
0.25	1.35
0.50	1.55
0.75	1.72
1.00	1.84
1.25	1.97
1.50	2.01

Effective storage depth =	1.41	m
75% effective storage depth =	1.06	m
(ie depth below GL) =	0.94	m
25% effective storage depth =	0.35	m
(ie depth below GL) =	1.65	m
effective storage depth 75%-25% =	0.71	m
Time to fall to 75% effective depth =	0.12	mins
Time to fall to 25% effective depth =	0.64	mins
Void Ratio =	40%	
V (75%-25%) =	0.2284	m3
a (50%) =	3.9825	m2
t (75%-25%) =	0.52	mins
SOIL INFILTRATION RATE =	**1.84E-03**	**m/s**



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Telephone 01530 264753 email group@m-ec.co.uk

Scheme	**Hempton Road, Deddington**	Page No.	4
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	4

Soil infiltration test

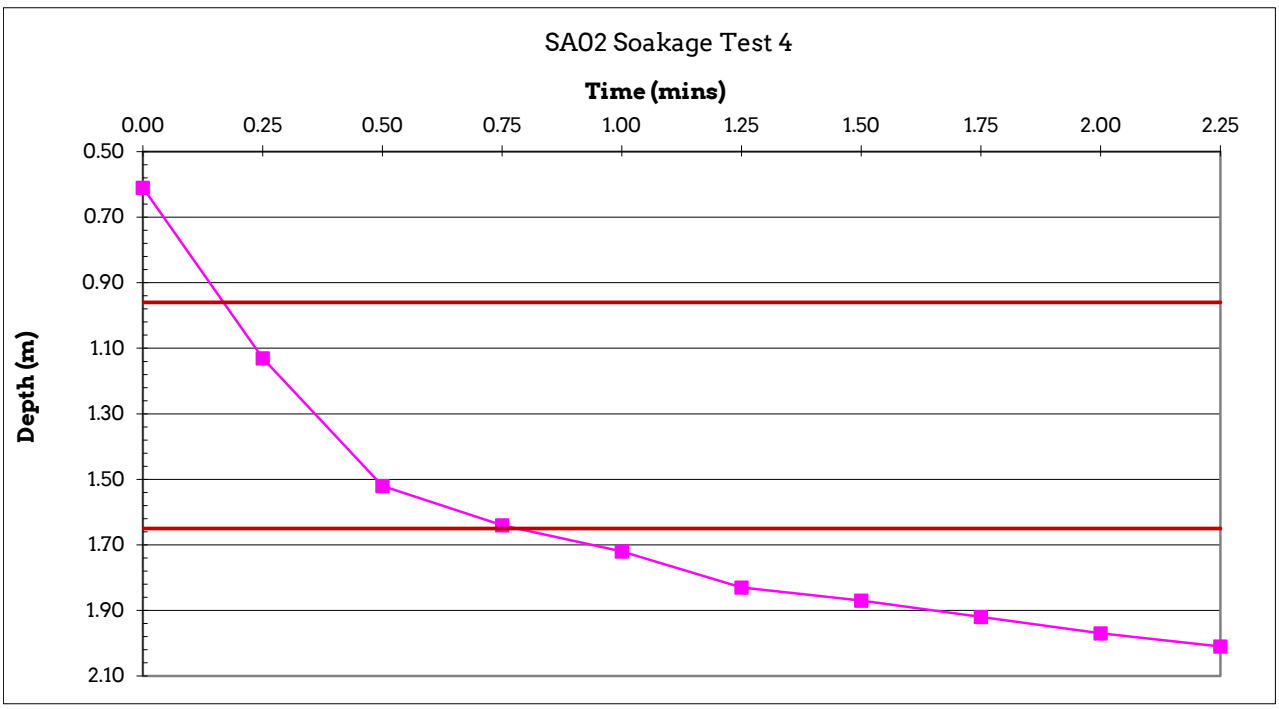
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA02**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**2.00**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.60	**Reddish brown, clayey, gravelly SAND with a low cobble content.**
	0.60 - 0.90	**Reddish brown, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**
	0.90 - 2.00	**Reddish brown, clayey, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.61
0.25	1.13
0.50	1.52
0.75	1.64
1.00	1.72
1.25	1.83
1.50	1.87
1.75	1.92
2.00	1.97
2.25	2.01

Effective storage depth =	1.39	m
75% effective storage depth =	1.04	m
(ie depth below GL) =	0.96	m
25% effective storage depth =	0.35	m
(ie depth below GL) =	1.65	m
effective storage depth 75%-25% =	0.70	m
Time to fall to 75% effective depth =	0.19	mins
Time to fall to 25% effective depth =	0.76	mins
Void Ratio =	40%	
V (75%-25%) =	0.2252	m3
a (50%) =	3.9375	m2
t (75%-25%) =	0.57	mins
SOIL INFILTRATION RATE =	**1.67E-03**	**m/s**



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Scheme	**Hempton Road, Deddington**	Page No.	5
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	5

Soil infiltration test

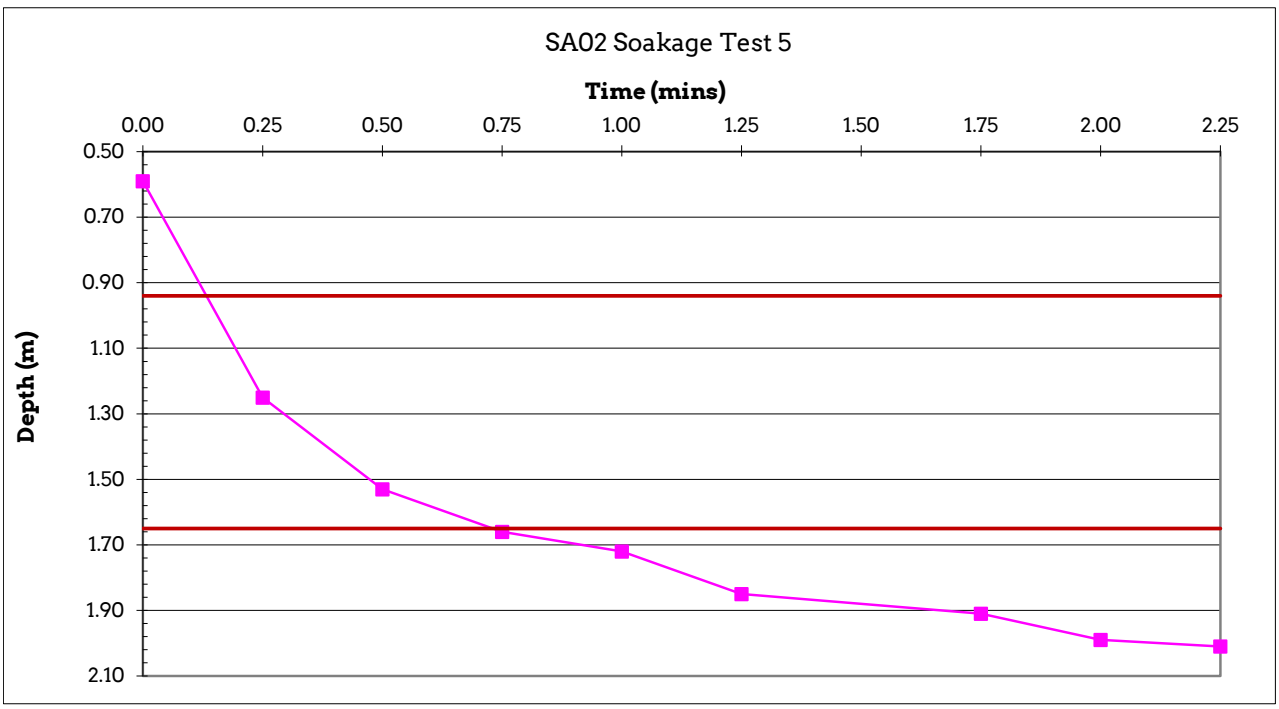
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA02**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**2.00**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.60	**Reddish brown, clayey, gravelly SAND with a low cobble content.**
	0.60 - 0.90	**Reddish brown, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**
	0.90 - 2.00	**Reddish brown, clayey, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.59
0.25	1.25
0.50	1.53
0.75	1.66
1.00	1.72
1.25	1.85
1.75	1.91
2.00	1.99
2.25	2.01

Effective storage depth =	1.41	m
75% effective storage depth =	1.06	m
(ie depth below GL) =	0.94	m
25% effective storage depth =	0.35	m
(ie depth below GL) =	1.65	m
effective storage depth 75%-25% =	0.71	m
Time to fall to 75% effective depth =	0.13	mins
Time to fall to 25% effective depth =	0.74	mins
Void Ratio =	40%	
V (75%-25%) =	0.2284	m3
a (50%) =	3.9825	m2
t (75%-25%) =	0.61	mins
SOIL INFILTRATION RATE =	**1.57E-03**	**m/s**



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Telephone 01530 264753 email group@m-ec.co.uk

Scheme	**Hempton Road, Deddington**	Page No.	6
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	6

Soil infiltration test

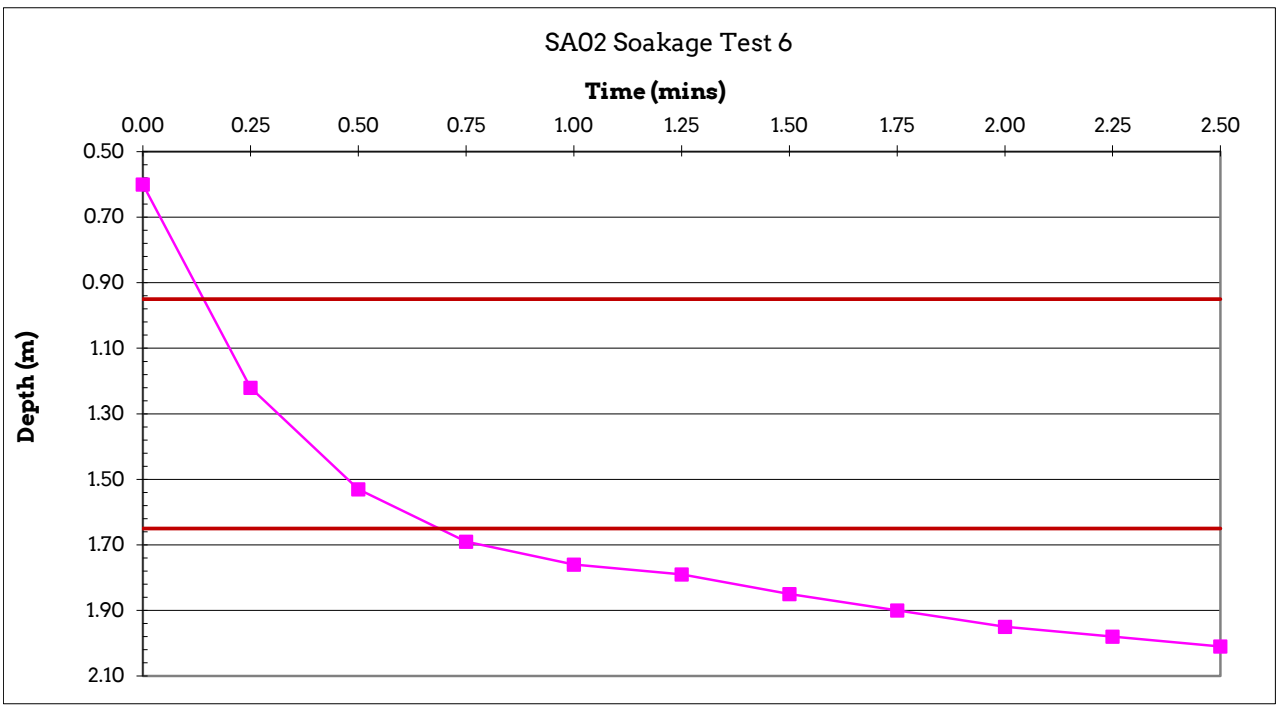
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA02**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**2.00**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.60	**Reddish brown, clayey, gravelly SAND with a low cobble content.**
	0.60 - 0.90	**Reddish brown, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**
	0.90 - 2.00	**Reddish brown, clayey, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.60
0.25	1.22
0.50	1.53
0.75	1.69
1.00	1.76
1.25	1.79
1.50	1.85
1.75	1.90
2.00	1.95
2.25	1.98
2.50	2.01

Effective storage depth =	1.40	m
75% effective storage depth =	1.05	m
(ie depth below GL) =	0.95	m
25% effective storage depth =	0.35	m
(ie depth below GL) =	1.65	m
effective storage depth 75%-25% =	0.70	m
Time to fall to 75% effective depth =	0.13	mins
Time to fall to 25% effective depth =	0.70	mins
Void Ratio =	40%	
V (75%-25%) =	0.2268	m3
a (50%) =	3.9600	m2
t (75%-25%) =	0.57	mins
SOIL INFILTRATION RATE =	**1.67E-03**	**m/s**



Mewies Engineering Consultants Ltd
The Old Chapel, Station Road, Hugglescote, Leicestershire, LE67 2GB
Telephone 01530 264753 email group@m-ec.co.uk

Scheme	**Hempton Road, Deddington**	Page No.	7
Client	**Robert Webb**	Calcs by	CN
Job ref.	**23933**	Date	14/06/18
		Test Number	7

Soil infiltration test

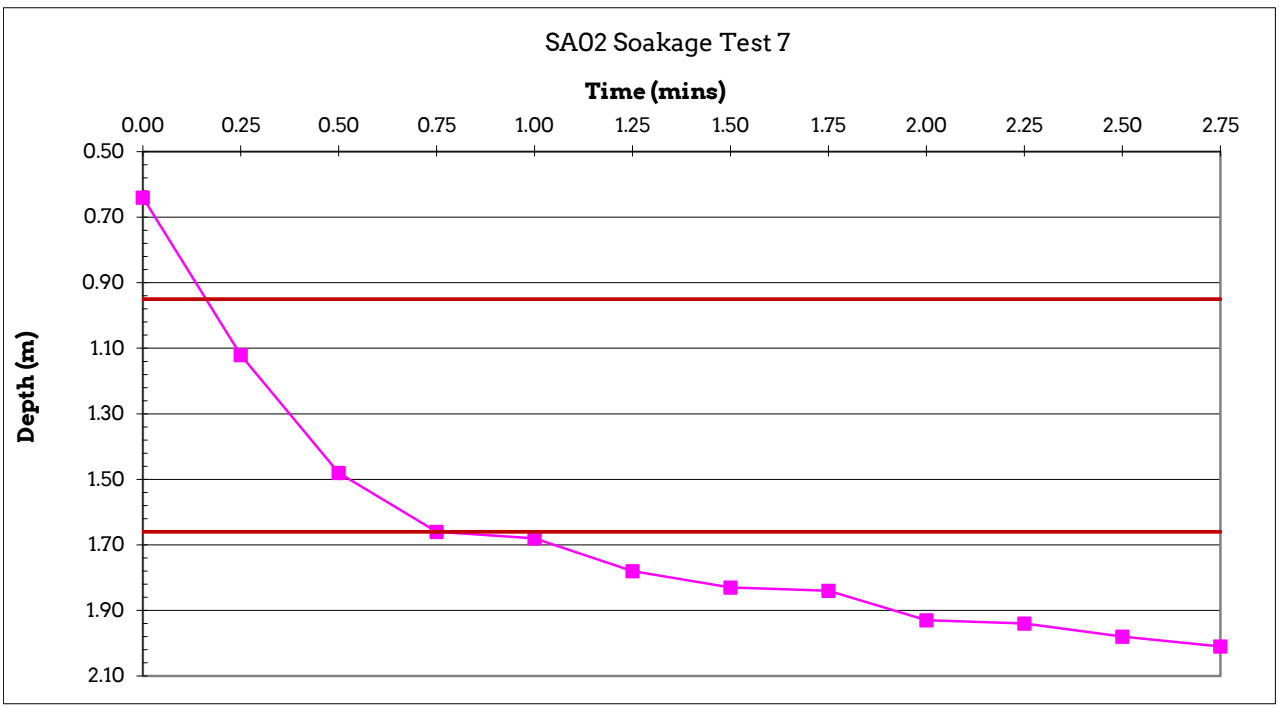
(In general accordance with BRE Digest 365, 2016, Soakaway Design)

Trial pit ref.	**SA02**	
Length	**1.80**	m
Width	**0.45**	m
Depth	**2.00**	m
Ground water level	**N/A**	
Ground conditions	**0.00 - 0.20**	**TOPSOIL comprising reddish brown, clayey, gravelly, SAND.**
	0.20 - 0.60	**Reddish brown, clayey, gravelly SAND with a low cobble content.**
	0.60 - 0.90	**Reddish brown, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**
	0.90 - 2.00	**Reddish brown, clayey, sandy, fine to coarse angular GRAVEL with a high cobble and low boulder content.**

Weather Conditions: Overcast

Time mins	Depth to water
0.00	0.64
0.25	1.12
0.50	1.48
0.75	1.66
1.00	1.68
1.25	1.78
1.50	1.83
1.75	1.84
2.00	1.93
2.25	1.94
2.50	1.98
2.75	2.01

Effective storage depth =	1.36	m
75% effective storage depth =	1.02	m
(ie depth below GL) =	0.98	m
25% effective storage depth =	0.34	m
(ie depth below GL) =	1.66	m
effective storage depth 75%-25% =	0.68	m
Time to fall to 75% effective depth =	0.18	mins
Time to fall to 25% effective depth =	0.75	mins
Void Ratio =	40%	
V (75%-25%) =	0.2203	m3
a (50%) =	3.8700	m2
t (75%-25%) =	0.57	mins
SOIL INFILTRATION RATE =	**1.66E-03**	**m/s**



APPENDIX E

EXPEDITE

SURFACE WATER DRAINAGE STATEMENT

PROPOSED RESIDENTIAL DEVELOPMENT

LAND AT HEMPTON ROAD, DEDDINGTON

20/03660/REM

Proposed Residential Development

Surface Water Drainage Statement

Issued by:	Expedite 35 Southernhay East Exeter EX1 1NX
Client:	Burrington Estates Ltd
Project Reference:	ES20.060
Project Title:	Land at Hempton Road, Deddington
Revision:	-
Date:	2nd February 2020
Prepared by:	Drew McGilchrist
Checked by:	Kris Tovey
Approved by:	Simon Lancaster

1.0 Introduction

1.1 This Drainage Statement has been prepared on behalf of Burrington Estates Ltd by Expedite Engineering Services Ltd to describe the proposed surface water drainage strategy for the proposed residential development at Hempton Road, Deddington.

2.0 Proposed Drainage Strategy

Method of Discharge

2.1 The underlying soil of the development site has good infiltration characteristics and therefore infiltration is proposed to be the method of surface water discharge for the development.

2.2 Infiltration testing was carried out in June 2018 by M-EC within two trial pits in the south-eastern corner of the site, at the location of the proposed infiltration feature. Encountered rates were between $7.35x10^{-3}$m/s and $7.77x10^{-4}$m/s.

2.3 An infiltration rate of $7.77x10^{-4}$m/s was taken forward for design as this was the lowest tested infiltration rate.

Infiltration Basin Sizing

2.4 The basin has been sized using the MicroDrainage software package. The modelled basin uses the design infiltration rate of $7.77x10^{-4}$m/s, a safety factor of 2.0, and assumes that there is no infiltration through the base of the basin (to account for a possible long-term reduction in infiltration performance due to sedimentation).

2.5 A catchment area of 8470m^2 was used to account for the proposed development in addition to the possible future addition of 14 dwellings in the plot of land to the north of the development, with the total area increased by 10% to account for urban creep. The breakdown of areas is as follows:

This Development (21 dwellings)

Impermeable area	4920m^2

Potential Future Development (14 dwellings)

Impermeable area	2780m^2
Total impermeable area	7700m^2
+10% urban creep	**8470m^2**

2.6 The above information gives a conservative infiltration basin design with capacity to safely store excess flows in the 1 in 100yr (+40% climate change) design storm.

2.7 The proposed basin shall have a maximum water depth of 1.4 metres and maximum side slopes of 1:3.

2.8 Due to the favourable infiltration rates the modelled basin achieves a half-drain time of 21 minutes, well within the generally specified 24-hour half-drain time target.

2.9 MicroDrainage calculations are included within **Appendix A**.

Appendix A – MicroDrainage Calculations

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.670	4-8	0.177

Total Area Contributing (ha) = 0.847

Total Pipe Volume (m^3) = 2.165

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.125	40.0	0.847	5.00	0.0	0.600	o	525	Pipe/Conduit	
1.001	5.000	0.125	40.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.02	10.000	0.847	0.0	0.0	0.0	3.55	768.3	114.7
1.001	50.00	5.05	9.875	0.847	0.0	0.0	0.0	3.55	768.3	114.7

Storage Structures for Storm

Infiltration Basin Manhole: 2, DS/PN: 1.001

Invert Level (m) 9.875 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 2.79700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	15.0	0.300	63.0	0.600	129.0	0.900	216.0	1.200	319.0
0.100	30.0	0.400	82.0	0.700	156.0	1.000	249.0	1.300	357.0
0.200	45.0	0.500	105.0	0.800	185.0	1.100	283.0	1.400	396.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.022	D3 (1km)	0.262	Cv (Summer)	0.750
FEH Rainfall Version	1999	D1 (1km)	0.328	E (1km)	0.292	Cv (Winter)	0.840
Site Location		D2 (1km)	0.286	F (1km)	2.480		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Infil. Flow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	30 minute 1 year Winter I+0%	12.000	10.407	-0.118	0.29			79.4	OK
1.001	2	30 minute 1 year Winter I+0%	12.000	10.392	-0.008	0.00	36.8	17	0.0	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.022	D3 (1km)	0.262
FEH Rainfall Version	1999	D1 (1km)	0.328	E (1km)	0.292
Site Location		D2 (1km)	0.286	F (1km)	2.480

		Cv (Summer)	0.750
		Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Infil. Flow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	30 minute 30 year Winter I+0%	12.000	10.936	0.411	0.86			232.9	SURCHARGED
1.001	2	15 minute 30 year Winter I+0%	12.000	10.832	0.432	0.00	86.1	17	0.0	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.022	D3 (1km)	0.262	Cv (Summer)	0.750
FEH Rainfall Version	1999	D1 (1km)	0.328	E (1km)	0.292	Cv (Winter)	0.840
Site Location		D2 (1km)	0.286	F (1km)	2.480		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Infil. Flow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	1	15 minute 100 year Winter I+40%	12.000	11.808	1.283	2.49			676.4
1.001	2	15 minute 100 year Winter I+40%	12.000	11.257	0.857	0.00	147.0	21	0.0

PN	US/MH Name	Status
1.000	1	FLOOD RISK
1.001	2	SURCHARGED

APPENDIX F

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	40
Ratio R	0.401	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.512	4-8	0.258

Total Area Contributing (ha) = 0.770

Total Pipe Volume (m³) = 19.634

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	26.420	0.300	88.1	0.069	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	31.618	0.200	158.1	0.087	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	21.710	0.400	54.3	0.037	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	13.724	0.100	137.2	0.048	0.00	0.0	0.600	o	250	Pipe/Conduit	
1.003	26.385	0.200	131.9	0.040	0.00	0.0	0.600	o	250	Pipe/Conduit	
3.000	25.420	0.450	56.5	0.054	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	22.788	0.150	151.9	0.038	0.00	0.0	0.600	o	400	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.41	137.300	0.069	0.0	0.0	3.7	1.07	18.9	13.1
1.001	50.00	5.92	136.925	0.156	0.0	0.0	8.4	1.04	41.2	29.6
2.000	50.00	5.35	136.800	0.037	0.0	0.0	2.0	1.05	8.2	7.0
1.002	50.00	6.11	136.250	0.241	0.0	0.0	13.1	1.19	58.5	45.7
1.003	50.00	6.47	136.150	0.281	0.0	0.0	15.2	1.22	59.7	53.3
3.000	50.00	5.32	136.500	0.054	0.0	0.0	2.9	1.34	23.7	10.2
1.004	50.00	6.72	135.800	0.373	0.0	0.0	20.2	1.53	192.1	70.7

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.005	24.482	0.150	163.2	0.110	0.00	0.0	0.600	o	400	Pipe/Conduit	
1.006	22.471	0.385	58.4	0.050	0.00	0.0	0.600	o	400	Pipe/Conduit	
4.000	16.884	0.285	59.2	0.030	5.00	0.0	0.600	o	100	Pipe/Conduit	
4.001	17.992	0.200	90.0	0.035	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	16.162	0.115	140.5	0.020	0.00	0.0	0.600	o	400	Pipe/Conduit	
5.000	19.131	0.300	63.8	0.053	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.001	24.799	0.700	35.4	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.002	21.070	0.200	105.4	0.031	0.00	0.0	0.600	o	175	Pipe/Conduit	
5.003	24.676	0.200	123.4	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.004	17.038	0.550	31.0	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.008	9.025	0.100	90.3	0.000	0.00	0.0	0.600	o	400	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.005	50.00	7.00	135.650	0.483	0.0	0.0	26.2	1.47	185.3	91.6
1.006	50.00	7.15	135.500	0.533	0.0	0.0	28.9	2.47	311.0	101.0
4.000	50.00	5.28	135.900	0.030	0.0	0.0	1.6	1.00	7.9	5.7
4.001	50.00	5.56	135.565	0.065	0.0	0.0	3.5	1.06	18.7	12.3
1.007	50.00	7.32	135.115	0.618	0.0	0.0	33.5	1.59	199.8	117.2
5.000	50.00	5.25	137.200	0.053	0.0	0.0	2.9	1.26	22.3	10.0
5.001	50.00	5.50	136.900	0.078	0.0	0.0	4.2	1.70	30.0	14.8
5.002	50.00	5.82	136.175	0.109	0.0	0.0	5.9	1.08	26.0	20.7
5.003	50.00	6.17	135.925	0.139	0.0	0.0	7.5	1.18	46.8	26.4
5.004	50.00	6.29	135.725	0.152	0.0	0.0	8.2	2.36	93.8	28.8
1.008	50.00	7.39	135.000	0.770	0.0	0.0	41.7	1.99	249.8	146.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	138.800	1.500	Open Manhole	1200	1.000	137.300	150				
2	138.700	1.775	Open Manhole	1200	1.001	136.925	225	1.000	137.000	150	
3	138.300	1.500	Open Manhole	1200	2.000	136.800	100				
4	138.300	2.050	Open Manhole	1200	1.002	136.250	250	1.001	136.725	225	450
								2.000	136.400	100	
5	138.200	2.050	Open Manhole	1200	1.003	136.150	250	1.002	136.150	250	
6	138.000	1.500	Open Manhole	1200	3.000	136.500	150				
7	137.950	2.150	Open Manhole	1350	1.004	135.800	400	1.003	135.950	250	
								3.000	136.050	150	
8	137.860	2.210	Open Manhole	1350	1.005	135.650	400	1.004	135.650	400	
9	137.100	1.600	Open Manhole	1350	1.006	135.500	400	1.005	135.500	400	
10	137.100	1.200	Open Manhole	1200	4.000	135.900	100				
11	137.100	1.535	Open Manhole	1200	4.001	135.565	150	4.000	135.615	100	
12	136.950	1.835	Open Manhole	1350	1.007	135.115	400	1.006	135.115	400	
								4.001	135.365	150	
13	138.550	1.350	Open Manhole	1200	5.000	137.200	150				
14	138.340	1.440	Open Manhole	1200	5.001	136.900	150	5.000	136.900	150	
15	138.000	1.825	Open Manhole	1200	5.002	136.175	175	5.001	136.200	150	
16	137.600	1.675	Open Manhole	1200	5.003	135.925	225	5.002	135.975	175	
17	137.100	1.375	Open Manhole	1200	5.004	135.725	225	5.003	135.725	225	
18	136.600	1.600	Open Manhole	1350	1.008	135.000	400	1.007	135.000	400	
								5.004	135.175	225	
	136.600	1.700	Open Manhole	0		OUTFALL		1.008	134.900	400	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	445918.980	231891.833	445918.980	231891.833	Required	
2	445944.994	231896.445	445944.994	231896.445	Required	
3	445976.033	231924.138	445976.033	231924.138	Required	
4	445976.033	231902.428	445976.033	231902.428	Required	
5	445978.830	231888.992	445978.830	231888.992	Required	
6	445994.837	231869.685	445994.837	231869.685	Required	
7	445970.035	231864.116	445970.035	231864.116	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
8	445967.643	231841.454	445967.643	231841.454	Required	
9	445973.555	231817.697	445973.555	231817.697	Required	
10	446010.156	231800.987	446010.156	231800.987	Required	
11	445993.538	231798.000	445993.538	231798.000	Required	
12	445975.745	231795.333	445975.745	231795.333	Required	
13	445918.183	231838.032	445918.183	231838.032	Required	
14	445921.631	231819.214	445921.631	231819.214	Required	
15	445928.826	231795.482	445928.826	231795.482	Required	
16	445948.204	231787.210	445948.204	231787.210	Required	
17	445972.708	231784.299	445972.708	231784.299	Required	
18	445989.544	231786.918	445989.544	231786.918	Required	
	445997.567	231782.786			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	1	138.800	137.300	1.350	Open Manhole	1200
1.001	o	225	2	138.700	136.925	1.550	Open Manhole	1200
2.000	o	100	3	138.300	136.800	1.400	Open Manhole	1200
1.002	o	250	4	138.300	136.250	1.800	Open Manhole	1200
1.003	o	250	5	138.200	136.150	1.800	Open Manhole	1200
3.000	o	150	6	138.000	136.500	1.350	Open Manhole	1200
1.004	o	400	7	137.950	135.800	1.750	Open Manhole	1350
1.005	o	400	8	137.860	135.650	1.810	Open Manhole	1350
1.006	o	400	9	137.100	135.500	1.200	Open Manhole	1350
4.000	o	100	10	137.100	135.900	1.100	Open Manhole	1200
4.001	o	150	11	137.100	135.565	1.385	Open Manhole	1200
1.007	o	400	12	136.950	135.115	1.435	Open Manhole	1350
5.000	o	150	13	138.550	137.200	1.200	Open Manhole	1200
5.001	o	150	14	138.340	136.900	1.290	Open Manhole	1200
5.002	o	175	15	138.000	136.175	1.650	Open Manhole	1200
5.003	o	225	16	137.600	135.925	1.450	Open Manhole	1200
5.004	o	225	17	137.100	135.725	1.150	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	26.420	88.1	2	138.700	137.000	1.550	Open Manhole	1200
1.001	31.618	158.1	4	138.300	136.725	1.350	Open Manhole	1200
2.000	21.710	54.3	4	138.300	136.400	1.800	Open Manhole	1200
1.002	13.724	137.2	5	138.200	136.150	1.800	Open Manhole	1200
1.003	26.385	131.9	7	137.950	135.950	1.750	Open Manhole	1350
3.000	25.420	56.5	7	137.950	136.050	1.750	Open Manhole	1350
1.004	22.788	151.9	8	137.860	135.650	1.810	Open Manhole	1350
1.005	24.482	163.2	9	137.100	135.500	1.200	Open Manhole	1350
1.006	22.471	58.4	12	136.950	135.115	1.435	Open Manhole	1350
4.000	16.884	59.2	11	137.100	135.615	1.385	Open Manhole	1200
4.001	17.992	90.0	12	136.950	135.365	1.435	Open Manhole	1350
1.007	16.162	140.5	18	136.600	135.000	1.200	Open Manhole	1350
5.000	19.131	63.8	14	138.340	136.900	1.290	Open Manhole	1200
5.001	24.799	35.4	15	138.000	136.200	1.650	Open Manhole	1200
5.002	21.070	105.4	16	137.600	135.975	1.450	Open Manhole	1200
5.003	24.676	123.4	17	137.100	135.725	1.150	Open Manhole	1200
5.004	17.038	31.0	18	136.600	135.175	1.200	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.008	o	400	18	136.600	135.000	1.200	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.008	9.025	90.3		136.600	134.900	1.300	Open Manhole	0

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
1.000	1	150	1.350	1.550	Unclassified	1200	0	1.350	Unclassified
1.001	2	225	1.350	1.550	Unclassified	1200	0	1.550	Unclassified
2.000	3	100	1.400	1.800	Unclassified	1200	0	1.400	Unclassified
1.002	4	250	1.800	1.800	Unclassified	1200	0	1.800	Unclassified
1.003	5	250	1.750	1.809	Unclassified	1200	0	1.800	Unclassified
3.000	6	150	1.350	1.750	Unclassified	1200	0	1.350	Unclassified
1.004	7	400	1.718	1.810	Unclassified	1350	0	1.750	Unclassified
1.005	8	400	1.200	1.810	Unclassified	1350	0	1.810	Unclassified
1.006	9	400	1.200	1.435	Unclassified	1350	0	1.200	Unclassified
4.000	10	100	1.100	1.763	Unclassified	1200	0	1.100	Unclassified
4.001	11	150	1.375	1.435	Unclassified	1200	0	1.385	Unclassified
1.007	12	400	1.200	1.435	Unclassified	1350	0	1.435	Unclassified
5.000	13	150	1.200	1.363	Unclassified	1200	0	1.200	Unclassified
5.001	14	150	1.290	1.650	Unclassified	1200	0	1.290	Unclassified
5.002	15	175	1.450	1.650	Unclassified	1200	0	1.650	Unclassified
5.003	16	225	1.150	1.450	Unclassified	1200	0	1.450	Unclassified
5.004	17	225	1.150	1.326	Unclassified	1200	0	1.150	Unclassified
1.008	18	400	1.200	1.776	Unclassified	1350	0	1.200	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008		136.600	134.900	135.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.401		

Online Controls for Storm

Pump Manhole: 18, DS/PN: 1.008, Volume (m³): 4.8

Invert Level (m) 135.000

Storage Structures for Storm

Infiltration Basin Manhole: 18, DS/PN: 1.008

Invert Level (m) 135.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 2.79700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	266.0	1.600	700.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.262
FEH Rainfall Version	1999	E (1km)	0.292
Site Location	GB 446100 232550 SP 46100 32550	F (1km)	2.480
C (1km)	-0.022	Cv (Summer)	0.750
D1 (1km)	0.328	Cv (Winter)	0.840
D2 (1km)	0.286		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1	15 Winter	1	+0%	30/15 Summer	100/15 Summer			137.377	-0.073
1.001	2	15 Winter	1	+0%	30/15 Summer	100/15 Summer			137.038	-0.112
2.000	3	15 Winter	1	+0%	30/15 Summer	100/15 Summer			136.858	-0.042
1.002	4	15 Winter	1	+0%	30/15 Summer	100/15 Summer			136.389	-0.111
1.003	5	15 Winter	1	+0%	30/15 Summer				136.294	-0.106
3.000	6	15 Winter	1	+0%	100/15 Summer	100/15 Summer			136.559	-0.091
1.004	7	15 Winter	1	+0%	100/15 Summer				135.944	-0.256
1.005	8	15 Winter	1	+0%	100/15 Summer				135.817	-0.233
1.006	9	15 Winter	1	+0%	100/15 Summer				135.632	-0.268
4.000	10	15 Winter	1	+0%	30/15 Summer	100/15 Summer			135.953	-0.047
4.001	11	15 Winter	1	+0%	30/15 Summer				135.637	-0.078
1.007	12	15 Winter	1	+0%	30/15 Summer				135.309	-0.206
5.000	13	15 Winter	1	+0%	30/15 Summer	100/15 Summer			137.261	-0.089
5.001	14	15 Winter	1	+0%	30/15 Summer	100/15 Summer			136.962	-0.088
5.002	15	15 Winter	1	+0%	30/15 Summer				136.269	-0.081
5.003	16	15 Winter	1	+0%	30/15 Summer				136.023	-0.127
5.004	17	15 Winter	1	+0%	100/15 Winter				135.796	-0.154
1.008	18	60 Winter	1	+0%	30/30 Winter				135.176	-0.224

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	0.51			9.2	OK	4
1.001	2	0.000	0.50			19.4	OK	2
2.000	3	0.000	0.62			5.0	OK	4
1.002	4	0.000	0.60			29.8	OK	2

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.003	5	0.000	0.62			33.9	OK	
3.000	6	0.000	0.32			7.2	OK	2
1.004	7	0.000	0.28			44.9	OK	
1.005	8	0.000	0.36			56.9	OK	
1.006	9	0.000	0.24			62.2	OK	
4.000	10	0.000	0.53			4.0	OK	4
4.001	11	0.000	0.46			8.1	OK	
1.007	12	0.000	0.48			71.9	OK	
5.000	13	0.000	0.34			7.2	OK	4
5.001	14	0.000	0.35			10.0	OK	2
5.002	15	0.000	0.56			13.6	OK	
5.003	16	0.000	0.39			16.9	OK	
5.004	17	0.000	0.22			18.2	OK	
1.008	18	0.000	0.00		52	0.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.262
FEH Rainfall Version	1999	E (1km)	0.292
Site Location	GB 446100 232550 SP 46100 32550	F (1km)	2.480
C (1km)	-0.022	Cv (Summer)	0.750
D1 (1km)	0.328	Cv (Winter)	0.840
D2 (1km)	0.286		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1	15 Winter	30	+0%	30/15 Summer	100/15 Summer			137.947	0.497
1.001	2	15 Winter	30	+0%	30/15 Summer	100/15 Summer			137.395	0.245
2.000	3	15 Winter	30	+0%	30/15 Summer	100/15 Summer			137.700	0.800
1.002	4	15 Winter	30	+0%	30/15 Summer	100/15 Summer			137.001	0.501
1.003	5	15 Winter	30	+0%	30/15 Summer				136.755	0.355
3.000	6	15 Winter	30	+0%	100/15 Summer	100/15 Summer			136.618	-0.032
1.004	7	15 Winter	30	+0%	100/15 Summer				136.119	-0.081
1.005	8	15 Winter	30	+0%	100/15 Summer				136.034	-0.016
1.006	9	15 Winter	30	+0%	100/15 Summer				135.766	-0.134
4.000	10	15 Winter	30	+0%	30/15 Summer	100/15 Summer			136.373	0.373
4.001	11	15 Winter	30	+0%	30/15 Summer				135.906	0.191
1.007	12	15 Winter	30	+0%	30/15 Summer				135.592	0.077
5.000	13	15 Winter	30	+0%	30/15 Summer	100/15 Summer			137.507	0.157
5.001	14	15 Winter	30	+0%	30/15 Summer	100/15 Summer			137.264	0.214
5.002	15	15 Winter	30	+0%	30/15 Summer				136.661	0.311
5.003	16	15 Winter	30	+0%	30/15 Summer				136.189	0.039
5.004	17	15 Winter	30	+0%	100/15 Winter				135.855	-0.095
1.008	18	60 Winter	30	+0%	30/30 Winter				135.432	0.032

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	1.36			24.5	SURCHARGED	4
1.001	2	0.000	1.43			55.4	SURCHARGED	2
2.000	3	0.000	1.35			10.7	SURCHARGED	4
1.002	4	0.000	1.58			79.3	SURCHARGED	2

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.003	5	0.000	1.66			91.0	SURCHARGED	
3.000	6	0.000	0.96			21.6	OK	2
1.004	7	0.000	0.76			123.3	OK	
1.005	8	0.000	1.00			158.1	OK	
1.006	9	0.000	0.67			175.2	OK	
4.000	10	0.000	1.33			10.0	SURCHARGED	4
4.001	11	0.000	1.24			21.7	SURCHARGED	
1.007	12	0.000	1.35			203.4	SURCHARGED	
5.000	13	0.000	0.89			18.6	SURCHARGED	4
5.001	14	0.000	0.94			26.7	SURCHARGED	2
5.002	15	0.000	1.52			37.0	SURCHARGED	
5.003	16	0.000	1.11			47.8	SURCHARGED	
5.004	17	0.000	0.63			52.5	OK	
1.008	18	0.000	0.00		54	0.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.262
FEH Rainfall Version	1999	E (1km)	0.292
Site Location	GB 446100 232550 SP 46100 32550	F (1km)	2.480
C (1km)	-0.022	Cv (Summer)	0.750
D1 (1km)	0.328	Cv (Winter)	0.840
D2 (1km)	0.286		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

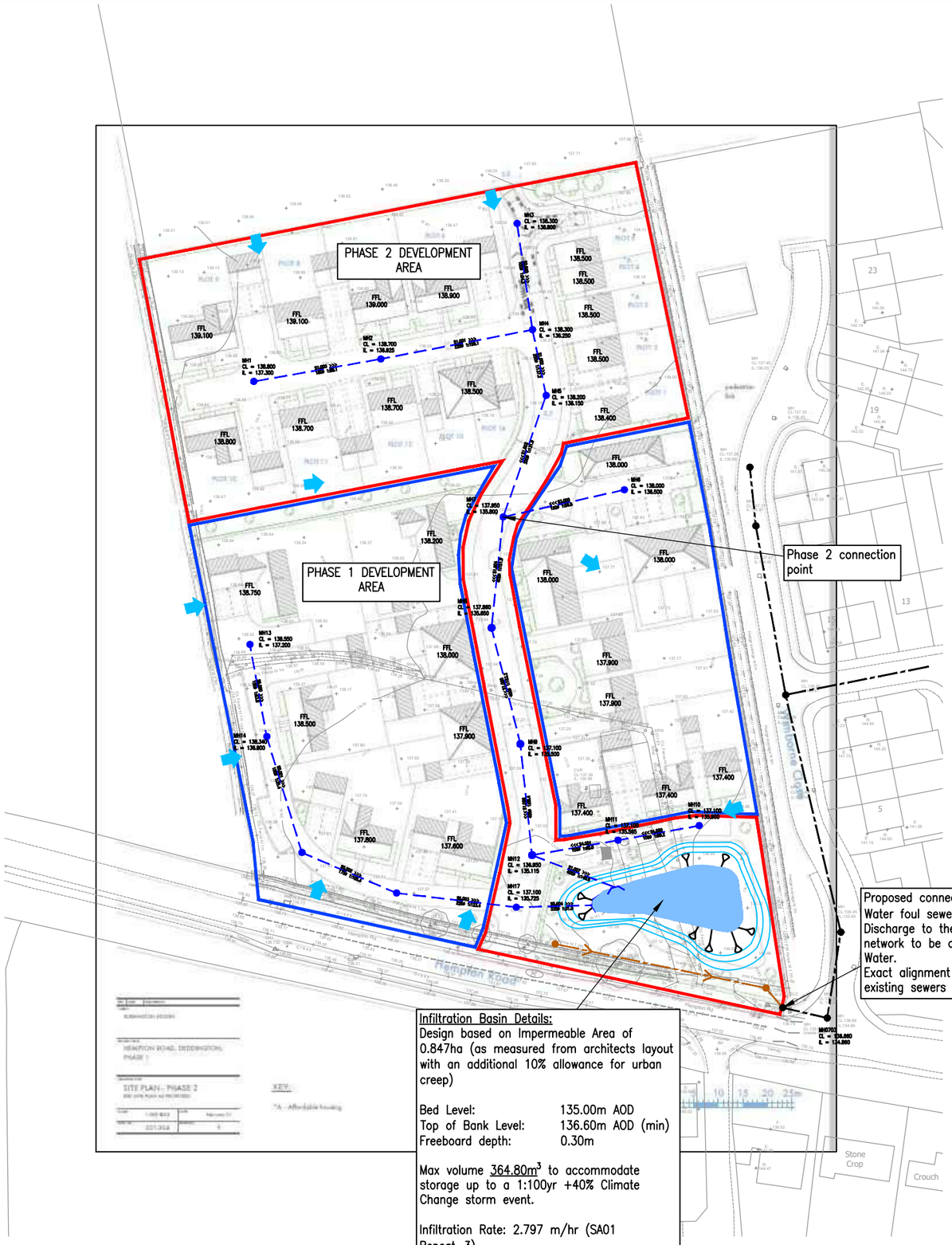
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1	15 Winter	100	+40%	30/15 Summer	100/15 Summer			138.811	1.361
1.001	2	15 Winter	100	+40%	30/15 Summer	100/15 Summer			138.704	1.554
2.000	3	15 Winter	100	+40%	30/15 Summer	100/15 Summer			138.307	1.407
1.002	4	15 Winter	100	+40%	30/15 Summer	100/15 Summer			138.301	1.801
1.003	5	15 Winter	100	+40%	30/15 Summer				138.039	1.639
3.000	6	15 Winter	100	+40%	100/15 Summer	100/15 Summer			138.001	1.351
1.004	7	15 Winter	100	+40%	100/15 Summer				137.100	0.900
1.005	8	15 Winter	100	+40%	100/15 Summer				136.920	0.870
1.006	9	15 Winter	100	+40%	100/15 Summer				136.507	0.607
4.000	10	15 Winter	100	+40%	30/15 Summer	100/15 Summer			137.103	1.103
4.001	11	15 Winter	100	+40%	30/15 Summer				136.798	1.083
1.007	12	15 Winter	100	+40%	30/15 Summer				136.001	0.486
5.000	13	15 Winter	100	+40%	30/15 Summer	100/15 Summer			138.555	1.205
5.001	14	15 Winter	100	+40%	30/15 Summer	100/15 Summer			138.341	1.291
5.002	15	15 Winter	100	+40%	30/15 Summer				137.595	1.245
5.003	16	15 Winter	100	+40%	30/15 Summer				136.595	0.445
5.004	17	15 Winter	100	+40%	100/15 Winter				135.959	0.009
1.008	18	60 Winter	100	+40%	30/30 Winter				135.774	0.374

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	11.377	2.32			41.9	FLOOD	4
1.001	2	3.966	1.92			74.0	FLOOD	2
2.000	3	6.738	2.11			16.8	FLOOD	4
1.002	4	1.141	2.00			99.9	FLOOD	2

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.003	5	0.000	2.22			121.3	FLOOD RISK	
3.000	6	0.653	1.64			37.0	FLOOD	2
1.004	7	0.000	1.10			178.7	SURCHARGED	
1.005	8	0.000	1.65			261.4	SURCHARGED	
1.006	9	0.000	1.14			298.1	SURCHARGED	
4.000	10	2.909	1.98			14.9	FLOOD	4
4.001	11	0.000	2.00			35.1	SURCHARGED	
1.007	12	0.000	2.29			346.3	SURCHARGED	
5.000	13	4.583	1.53			31.9	FLOOD	4
5.001	14	0.865	1.28			36.6	FLOOD	2
5.002	15	0.000	2.22			54.0	SURCHARGED	
5.003	16	0.000	1.79			76.9	SURCHARGED	
5.004	17	0.000	1.01			84.1	SURCHARGED	
1.008	18	0.000	0.00		56	0.0	SURCHARGED	

APPENDIX G



GENERAL NOTES

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SPECIALIST DESIGN DRAWINGS AND DETAILS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
4. THIS DRAWING IS FOR STRATEGY PURPOSES ONLY AND IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

KEY

- PHASE 2 SITE BOUNDARY
- PHASE 1 SITE BOUNDARY
- EXISTING FOUL WATER DRAIN
- PROPOSED FOUL WATER DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED HEADWALL
- EXISTING FOUL WATER MANHOLE
- PROPOSED FOUL WATER MANHOLE
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED INFILTRATION BASIN AND BANKING (MAXIMUM 1 : 3 GRADIENT)
- INDICATIVE OVERLAND FLOW DIRECTION

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
B	UPDATE TO SITE LAYOUT	RC	AB	AB	05.03.21
A	UPDATED SITE LAYOUT	AB	AB	AB	22.12.20
-	FIRST ISSUE	RC	HR	AB	18.12.20

PROJECT: HAMPTON ROAD DEDDINGTON

DRAWING TITLE: DETIALED PHASE 1 AND 2 DRAINAGE STRATEGY

CLIENT: PEMBURY ESTATES LIMITED (MORTIMER)

DRAWING NUMBER: 23933_01_230_03

REVISION: B | SHEET SIZE: A3 | SCALE: 1:1000

STATUS: FOR INFORMATION / APPROVAL

M-EC Consulting Development Engineers
Telephone: 01530 264 753
Email: group@m-ec.co.uk
Website: www.m-ec.co.uk

File Location: T:\M-EC Job Book\23933\drawings\01 series - hydrology\23933_01_230_03 drainage strategy phase 2.dwg
Printed 08.03.2021

APPENDIX H

Asset location search

Property Searches

Infrastructure Gateway Ltd
Kettering Parkway Kettering V
Vantage House
KETTERING
NN15 6XR

Search address supplied

Hepmton Road
Hempton Road
Deddington
Oxfordshire
OX15 0QH

Your reference w18-3231

Our reference ALS/ALS Standard/2018_3774307

Search date 13 April 2018

Keeping you up-to-date

Knowledge of features below the surface is essential in every development. The benefits of this not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility for any commercial or residential project.

An asset location search provides information on the location of known Thames Water clean and/or wastewater assets, including details of pipe sizes, direction of flow and depth. Please note that information on cover and invert levels will only be provided where the data is available.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

searchcode

Asset location search

Property Searches

Search address supplied: Hepmton Road, Hempton Road, Deddington, Oxfordshire, OX15 0QH

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and

pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

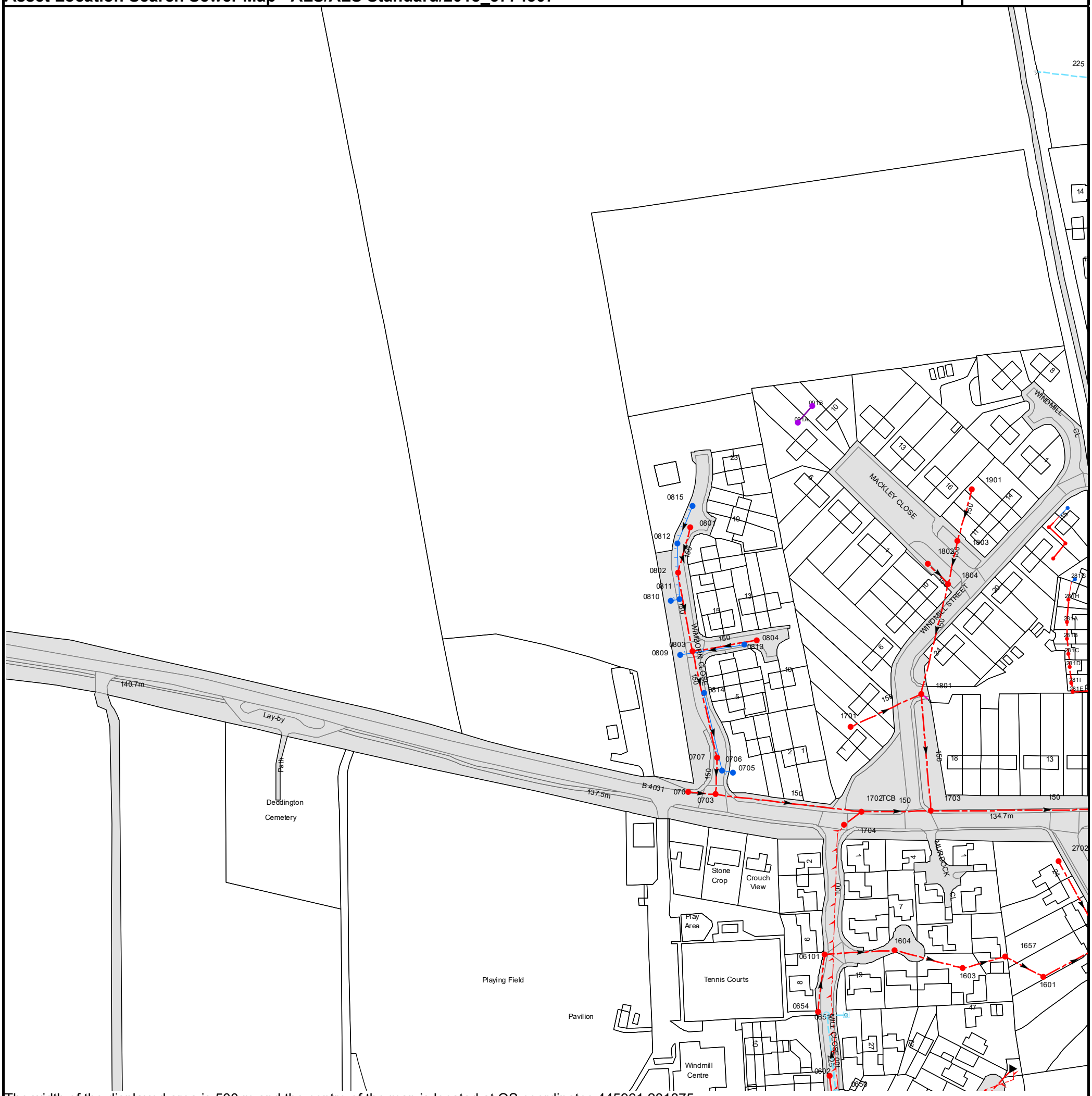
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2018_3774307



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 445961,231875

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
281H	n/a	n/a
281G	n/a	n/a
281K	n/a	n/a
281A	n/a	n/a
281C	n/a	n/a
281D	n/a	n/a
281I	n/a	n/a
281E	n/a	n/a
0810	n/a	n/a
0812	n/a	n/a
0802	137.22	135.98
0811	n/a	n/a
0809	n/a	n/a
0701	n/a	n/a
0801	137.37	136.47
0803	n/a	n/a
0815	n/a	n/a
0814	n/a	n/a
0703	n/a	n/a
0707	136.45	135.05
0706	n/a	n/a
0705	n/a	n/a
0813	n/a	n/a
0804	136.79	135.87
091A	n/a	n/a
091B	n/a	n/a
1701	135.86	134.66
1801	135.68	133.97
1802	136.23	134.66
1804	136.13	134.47
1803	136.03	134.67
1901	136.31	134.94
181A	n/a	n/a
181B	n/a	n/a
281L	n/a	n/a
281B	n/a	n/a
0654	134.88	133.97
06101	134.65	n/a
0651	134.84	132.52
0602	134.5	132.69
1704	135.89	134.06
1653	n/a	132.81
1702	135.88	133.95
1604	134.17	n/a
1703	135.41	133.36
1603	133.87	n/a
1657	133.82	132.94
1601	n/a	n/a
2702	134.08	132.84

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2018_3774307

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 445961, 231875.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Mr Shyam Joshi
The Old Chapel
Station Road
Hugglescote
LE67 2GB

Wastewater pre-planning
Our ref DS6048759

26 May 2018

Pre-planning enquiry: Confirmation of sufficient capacity

Dear Mr Joshi

Thank you for providing information on your development at **Land off Hempton Road, Deddignton, OX15 0NA, OS grid ref. 445962, 231842.**

Residential development comprising 20 dwellings. Foul water to be discharged by gravity into foul water sewer in Hempton Road. Surface Water to be disposed via suds.

We're pleased to confirm that there will be sufficient foul and surface water capacity in our sewerage network to serve your development, so long as your phasing follows the timescale you've suggested.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 0203 577 8082.

Yours sincerely

Artur Jaroma

Thames Water

Civil Engineering

Transport

Road Safety

Flood Risk & Drainage

Structures

Geo-Environmental

M-EC Acoustic Air

Utilities

M-EC Geomatics

Street Lighting

Expert Witness

M-EC

Brighton | Leicester

T: 01530 264 753
group@m-ec.co.uk
www.m-ec.co.uk

Consulting Development Engineers

Appendix C

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW Network

Pipe Sizes CTP Manhole Sizes CTP

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	10
Ratio R	0.409	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for SW Network

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.388	4-8	0.203

Total Area Contributing (ha) = 0.591

Total Pipe Volume (m³) = 19.110

Network Design Table for SW Network

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	28.106	0.432	65.1	0.052	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	12.296	0.118	104.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	15.735	0.200	78.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	25.466	0.525	48.5	0.035	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	10.119	0.583	17.4	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	19.525	0.243	80.3	0.095	5.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	15.954	0.549	29.1	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	20.782	0.260	79.9	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	9.103	0.114	79.9	0.014	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.38	137.350	0.052	0.0	0.0	0.7	1.25	22.1	7.7
1.001	50.00	5.58	136.918	0.052	0.0	0.0	0.7	0.98	17.4	7.7
1.002	50.00	5.81	136.800	0.052	0.0	0.0	0.7	1.13	20.0	7.7
1.003	50.00	6.11	136.600	0.087	0.0	0.0	1.2	1.45	25.6	13.0
1.004	50.00	6.16	136.000	0.100	0.0	0.0	1.4	3.16	125.5	14.9
2.000	50.00	5.19	136.417	0.095	0.0	0.0	1.3	1.76	124.1	14.2
3.000	50.00	5.14	136.848	0.028	0.0	0.0	0.4	1.87	33.1	4.2
2.001	50.00	5.38	136.149	0.140	0.0	0.0	1.9	1.76	124.4	20.9
2.002	50.00	5.47	135.889	0.154	0.0	0.0	2.1	1.76	124.5	22.9

Network Design Table for SW Network

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.003	20.078	0.135	148.7	0.113	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.004	42.445	0.283	150.0	0.082	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.005	20.985	0.140	149.9	0.077	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	23.673	0.118	200.6	0.013	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.006	10.680	0.053	201.5	0.052	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.007	4.287	0.043	100.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.003	50.00	5.69	135.725	0.267	0.0	0.0	3.6	1.48	163.8	39.8
2.004	50.00	6.17	135.590	0.349	0.0	0.0	4.7	1.48	163.2	52.0
2.005	50.00	6.41	135.307	0.426	0.0	0.0	5.8	1.48	163.2	63.5
1.005	50.00	6.72	135.167	0.539	0.0	0.0	7.3	1.28	140.9	80.3
1.006	50.00	6.86	135.149	0.591	0.0	0.0	8.0	1.27	140.6	88.0
1.007	50.00	6.90	134.900	0.591	0.0	0.0	8.0	1.81	200.1	88.0

Simulation Criteria for SW Network

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.409		

Online Controls for SW Network

Weir Manhole: S12, DS/PN: 1.007, Volume (m³): 3.0

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 136.600

Storage Structures for SW Network

Infiltration Basin Manhole: S12, DS/PN: 1.007

Invert Level (m) 134.900 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 2.79700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	66.0	0.400	126.0	0.800	205.0	1.200	309.0	1.600	444.0
0.100	80.0	0.500	144.0	0.900	229.0	1.300	340.0	1.700	560.0
0.200	94.0	0.600	166.0	1.000	254.0	1.400	373.0		
0.300	109.0	0.700	184.0	1.100	281.0	1.500	407.0		

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Network

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000
Region	England and Wales	Ratio R	0.410
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S2	15 Winter	1	+0%	100/15 Summer				137.414	-0.086	0.000
1.001	S3	15 Winter	1	+0%	30/15 Summer				136.994	-0.074	0.000
1.002	S4	15 Winter	1	+0%	30/15 Summer				136.869	-0.081	0.000
1.003	S5	15 Winter	1	+0%	30/15 Summer				136.676	-0.074	0.000
1.004	S6	15 Winter	1	+0%	100/15 Summer				136.055	-0.170	0.000
2.000	S200	15 Winter	1	+0%	100/15 Summer				136.491	-0.226	0.000
3.000	S201	15 Winter	1	+0%	100/15 Summer				136.885	-0.113	0.000
2.001	S202	15 Winter	1	+0%	30/15 Summer				136.239	-0.210	0.000
2.002	S203	15 Winter	1	+0%	30/15 Summer				135.996	-0.193	0.000
2.003	S7	15 Winter	1	+0%	30/15 Summer				135.859	-0.241	0.000
2.004	S8	15 Winter	1	+0%	30/15 Summer				135.736	-0.229	0.000
2.005	S8A	15 Winter	1	+0%	30/15 Summer				135.489	-0.193	0.000
1.005	S9	15 Winter	1	+0%	30/15 Summer				135.440	-0.102	0.000
1.006	S11	15 Winter	1	+0%	30/15 Summer				135.387	-0.137	0.000
1.007	S12	60 Winter	1	+0%	30/15 Summer				135.268	-0.007	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Level Status	Level Exceeded
1.000	S2	0.37			7.9	OK	
1.001	S3	0.50			8.0	OK	
1.002	S4	0.43			8.0	OK	
1.003	S5	0.51			12.4	OK	
1.004	S6	0.13			14.0	OK	
2.000	S200	0.14			14.6	OK	
3.000	S201	0.14			4.3	OK	
2.001	S202	0.19			21.0	OK	
2.002	S203	0.27			23.0	OK	
2.003	S7	0.27			37.8	OK	
2.004	S8	0.32			47.5	OK	
2.005	S8A	0.41			56.1	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Network

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	S9	0.58			70.2	OK	
1.006	S11	0.72			75.6	OK	
1.007	S12	0.00		31	0.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Network

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 20.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R 0.410	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S2	15 Winter	30	+0%	100/15 Summer				137.485	-0.015	0.000
1.001	S3	15 Winter	30	+0%	30/15 Summer				137.175	0.107	0.000
1.002	S4	15 Winter	30	+0%	30/15 Summer				137.032	0.082	0.000
1.003	S5	15 Winter	30	+0%	30/15 Summer				136.871	0.121	0.000
1.004	S6	15 Winter	30	+0%	100/15 Summer				136.085	-0.140	0.000
2.000	S200	15 Winter	30	+0%	100/15 Summer				136.543	-0.174	0.000
3.000	S201	15 Winter	30	+0%	100/15 Summer				136.909	-0.089	0.000
2.001	S202	15 Winter	30	+0%	30/15 Summer				136.511	0.062	0.000
2.002	S203	15 Winter	30	+0%	30/15 Summer				136.377	0.188	0.000
2.003	S7	15 Winter	30	+0%	30/15 Summer				136.262	0.162	0.000
2.004	S8	15 Winter	30	+0%	30/15 Summer				136.142	0.177	0.000
2.005	S8A	15 Winter	30	+0%	30/15 Summer				136.004	0.322	0.000
1.005	S9	15 Winter	30	+0%	30/15 Summer				135.881	0.339	0.000
1.006	S11	15 Winter	30	+0%	30/15 Summer				135.666	0.142	0.000
1.007	S12	30 Winter	30	+0%	30/15 Summer				135.570	0.295	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S2	0.91			19.1	OK	
1.001	S3	1.10			17.3	SURCHARGED	
1.002	S4	0.97			18.0	SURCHARGED	
1.003	S5	1.11			27.0	SURCHARGED	
1.004	S6	0.30			31.4	OK	
2.000	S200	0.33			36.0	OK	
3.000	S201	0.35			10.6	OK	
2.001	S202	0.48			52.0	SURCHARGED	
2.002	S203	0.60			50.6	SURCHARGED	
2.003	S7	0.65			89.4	SURCHARGED	
2.004	S8	0.68			101.1	SURCHARGED	
2.005	S8A	0.92			127.1	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Network

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	S9	1.33			160.6	SURCHARGED	
1.006	S11	1.69			177.3	SURCHARGED	
1.007	S12	0.00		31	0.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Network

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 20.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R 0.410	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S2	15 Winter	100	+40%	100/15 Summer				138.687	1.187	0.000
1.001	S3	15 Winter	100	+40%	30/15 Summer				138.170	1.102	0.000
1.002	S4	15 Winter	100	+40%	30/15 Summer				137.927	0.977	0.000
1.003	S5	15 Winter	100	+40%	30/15 Summer				137.657	0.907	0.000
1.004	S6	15 Winter	100	+40%	100/15 Summer				136.695	0.470	0.000
2.000	S200	15 Winter	100	+40%	100/15 Summer				137.939	1.222	0.000
3.000	S201	15 Winter	100	+40%	100/15 Summer				137.925	0.927	0.000
2.001	S202	15 Winter	100	+40%	30/15 Summer				137.815	1.366	0.000
2.002	S203	15 Winter	100	+40%	30/15 Summer				137.674	1.485	0.000
2.003	S7	15 Winter	100	+40%	30/15 Summer				137.561	1.461	0.000
2.004	S8	15 Winter	100	+40%	30/15 Summer				137.416	1.451	0.000
2.005	S8A	15 Winter	100	+40%	30/15 Summer				136.977	1.295	0.000
1.005	S9	15 Winter	100	+40%	30/15 Summer				136.619	1.077	0.000
1.006	S11	30 Winter	100	+40%	30/15 Summer				136.107	0.583	0.000
1.007	S12	60 Winter	100	+40%	30/15 Summer				135.928	0.653	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S2	1.17			24.8	FLOOD RISK	
1.001	S3	1.43			22.6	FLOOD RISK	
1.002	S4	1.32			24.6	FLOOD RISK	
1.003	S5	1.40			34.1	FLOOD RISK	
1.004	S6	0.39			41.0	SURCHARGED	
2.000	S200	0.50			53.4	FLOOD RISK	
3.000	S201	0.55			16.9	FLOOD RISK	
2.001	S202	0.71			77.3	SURCHARGED	
2.002	S203	1.00			84.8	SURCHARGED	
2.003	S7	1.01			139.5	SURCHARGED	
2.004	S8	1.22			181.4	SURCHARGED	
2.005	S8A	1.59			219.4	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Network

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	S9	2.17			262.9	SURCHARGED	
1.006	S11	2.36			248.2	SURCHARGED	
1.007	S12	0.00		37	0.0	SURCHARGED	

KEY

950m²	CATCHMENT AREA PIPE 2.000
280m²	CATCHMENT AREA PIPE 3.000
170m²	CATCHMENT AREA PIPE 2.001
140m²	CATCHMENT AREA PIPE 2.002
1130m²	CATCHMENT AREA PIPE 2.003 INCLUDES 272m2 OF PHASE 1 ROAD

NOTE
10% URBAN CREEP ADDED IN MICRODRAINAGE CALCULATIONS THROUGH GLOBAL ADDITIONAL FLOW VALUE WITHIN THE DESIGN CRITERIA

N

Wimborne Close

REV:	DESCRIPTION:	BY:	DATE:
P5	Urban Creep Note added	SC	18.11.22
P4	Minor amendments to planning layout	SC	08.11.22
P3	Minor amendments to planning layout	SR	04.05.22
P2	Layout Updated	DM	21.04.22
P1	First Issue	DM	26.01.22

STATUS: PLANNING

EXPEDITE
Exeter
The Design Studio
Dean Clarke House
Southernhay East
Exeter
EX1 1AP
t: 01392 691 631
www.expediteps.com

CLIENT: BURRINGTON HOMES (MIDLANDS)

SITE: LAND AT HEMPTON ROAD DEDDINGTON - PHASE 2

TITLE: SURFACE WATER CATCHMENT PLAN

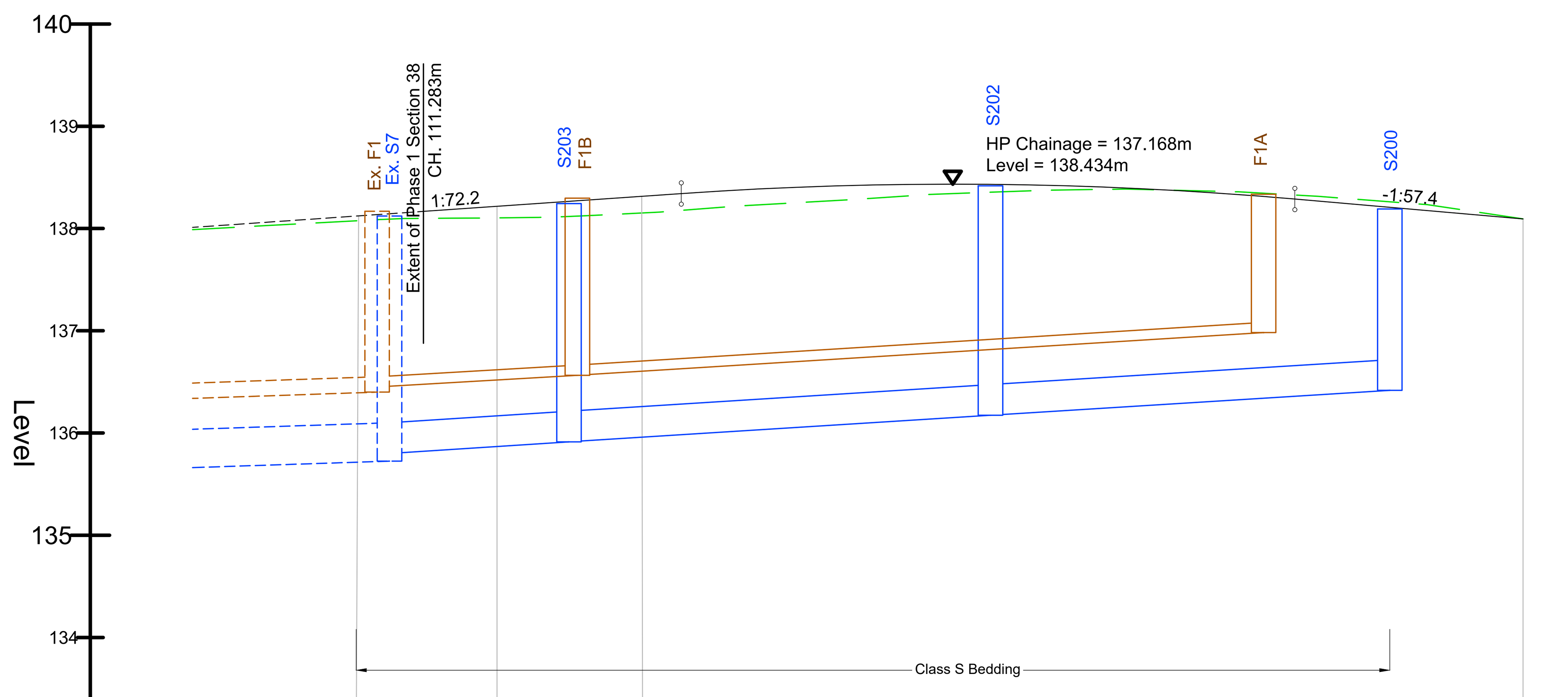
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:250	JAN 2022	SR	KSR

PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	03.11	P5

Appendix D

KEY:

- EXISTING GROUND PROFILE
- PROPOSED CENTRELINE PROFILE
- PROPOSED SURFACE WATER SEWER
- PROPOSED FOUL SEWER



ROAD 1- PHASE 2
SCALE H 1:250,V 1:50.

Chainage	Proposed Levels	Existing Levels
96.000	137.956	137.941
98.000	137.983	137.967
100.000	138.011	137.989
102.000	138.039	138.011
104.000	138.066	138.033
106.000	138.094	138.054
108.000	138.122	138.075
110.000	138.149	138.095
112.000	138.177	138.100
114.000	138.205	138.102
116.000	138.233	138.106
118.000	138.260	138.114
120.000	138.288	138.133
122.000	138.316	138.152
124.000	138.343	138.179
126.000	138.369	138.210
128.000	138.390	138.235
130.000	138.407	138.257
132.000	138.420	138.280
134.000	138.428	138.306
136.000	138.433	138.333
138.000	138.433	138.348
140.000	138.430	138.362
142.000	138.422	138.375
144.000	138.409	138.381
146.000	138.393	138.384
148.000	138.373	138.374
150.000	138.348	138.364
152.000	138.319	138.349
154.000	138.286	138.326
156.000	138.251	138.300
158.000	138.216	138.270
160.000	138.181	138.239
162.000	138.147	138.185
164.000	138.112	138.125
165.051	138.093	138.093

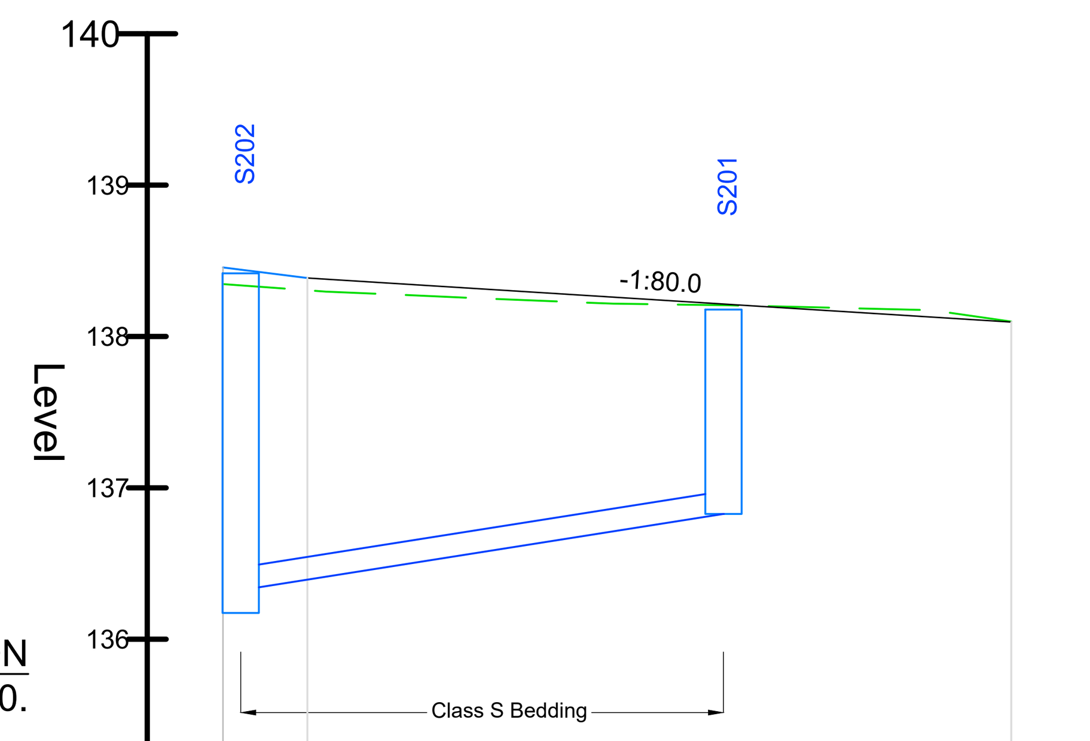
Horizontal Geometry: 9.438m | R=22.750 6.769m | R=15.000 7.078m | 43.090m

Vertical Geometry: R=959.195 K=9.592 30.000m | -1:57.4 11.163m

Proposed Cover Levels: 138.168 138.122 | 138.244 138.291 | 138.417 | 138.335 | 138.191

Stormwater Invert: EX. 2.002 375Ø 1:149.9 20.242m | 135.725 | 2.002 300Ø Ultrarib 1:80.0 9.103m | 135.914 | 2.001 300Ø Ultrarib 1:79.9 20.782m | 136.174 | 2.000 300Ø Ultrarib 1:80.3 19.524m | 136.417

Foul Invert: EX. 1002 150Ø 1:149.7 19.457m | 136.400 | 1.001 100Ø UPVC 1:80.0 9.986m | 136.565 | 1.000 100Ø UPVC 33.372m | 136.982



ROAD 1TH - LONGSECTION
SCALE H 1:250,V 1:50.

Chainage	Proposed Levels	Existing Levels
0.000		138.346
2.000		138.317
4.000	138.371	138.292
6.000	138.346	138.274
8.000	138.321	138.257
10.000	138.296	138.240
12.000	138.271	138.224
14.000	138.246	138.214
16.000	138.221	138.208
18.000	138.196	138.200
20.000	138.171	138.191
22.000	138.146	138.181
24.000	138.121	138.158
26.000	138.096	138.100
26.050	138.095	138.099

Horizontal Geometry: 26.050m

Vertical Geometry: -1:80.0 23.257m

Proposed Cover Levels: 138.417 | 138.178

Stormwater Invert: 136.174 | 3.000 150Ø 1:31.7 15.954m | 136.828

NOTES:

1. ALL DRAINAGE WORKS SUBJECT TO A SECTION 104 AGREEMENT SHALL BE IN ACCORDANCE WITH SEWER SECTOR GUIDANCE - APPENDIX C, "DESIGN AND CONSTRUCTION GUIDANCE FOR FOUL AND SURFACE WATER SEWERS" VERSION 2 MARCH 2020.
2. ALL WORKS TO BE ADOPTED UNDER A SECTION 38 AGREEMENT SHALL BE CARRIED OUT IN ACCORDANCE WITH OXFORDSHIRE COUNTY COUNCIL HIGHWAY SPECIFICATION
3. DO NOT SCALE FROM THIS DRAWING
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH AND CHECKED AGAINST ALL OTHER DRAWINGS, ENGINEERING DETAILS, SPECIFICATION AND ANY STRUCTURAL, GEOTECHNICAL OR OTHER SPECIALIST DOCUMENT PROVIDED.
5. PIPE SIZES ARE SHOWN IN MILLIMETRES AND LEVELS SHOWN IN METRES AOD.
6. ALL PIPES TO HAVE FLEXIBLE JOINTS WITH GRANULAR BED AND SURROUND (CLASS S HAVING A MIN OF 150mm GRANULAR BED AND SIDEFILL WITH 300mm MIN ABOVE PIPE) UNLESS OTHERWISE STATED. WHERE COVER UNDER ROADS OR VEHICULAR ACCESS AREAS IS LESS THAN 1200mm A 150mm THICK CONCRETE SURROUND SHOULD BE PROVIDED.
7. ALL PIPE RUNS INCLUDING CONNECTIONS TO EXISTING SEWERS ARE TO BE SOFFIT TO SOFFIT, UNLESS OTHERWISE NOTED.
8. ALL PIPES TO BE EITHER:
   a) WAVIN SOLIDWALL UPVC PIPES TO BS EN 1401-1 (UP TO AND INCLUDING 100mm DIAMETER). MAX LENGTH 3m
   b) WAVIN 'ULTRARIB' PIPES TO BS EN 13476-3 (UP TO AND INCLUDING 300mm DIAMETER)
9. THE CONTRACTOR IS TO CHECK THE LEVEL OF EXISTING SEWERS BEING USED AS OUTFALLS OR CROSSING PROPOSED DRAINAGE RUNS PRIOR TO LAYING ANY PIPES. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER
10. ALL DRAINAGE SHALL BE LAID UPSTREAM AND EACH RUN BETWEEN MANHOLES SHALL BE LAID COMPLETE PRIOR TO BACKFILLING.

Foul Manhole Schedule

MANHOLE NUMBER / COORDINATES	COVER LEVEL / DEPTH TO INVERT	CODE	INVERT LEVELS	PIPE DIA	MANHOLE SIZE AND TYPE	COVER CLASS
MH32 E: 445972.808 N: 231917.573	138.335 1.353	1.000	136.982	100	Type C - 1350mm dia.	D400
MH33 E: 445979.020 N: 231884.785	138.291 1.726	1.000 1.001	136.565 136.565	100 100	Type B - 1200mm dia.	D400

Surface Water Manhole Schedule

MANHOLE NUMBER / COORDINATES	COVER LEVEL / DEPTH TO INVERT	CODE	INVERT LEVELS	PIPE DIA	MANHOLE SIZE AND TYPE	COVER CLASS
S200 E: 445973.103 N: 231923.917	138.191 1.774	2.000	136.417	300	Type B - 1200mm dia.	D400
S201 E: 445992.433 N: 231907.989	138.178 1.350	3.000	136.828	150	Type C - 1350mm dia.	D400
S202 E: 445976.812 N: 231904.748	138.417 2.243	2.000 3.000 2.001	136.174 136.324 136.174	300 150 300	Type B - 1200mm dia.	D400
S203 E: 445980.653 N: 231884.324	138.244 2.330	2.001 2.002	135.914 135.914	300 300	Type B - 1200mm dia.	D400

REV:	DESCRIPTION:	BY:	DATE:
P5	Road 1TH Extended	SC	27.10.22
P4	Bedding and Pipe Material added	SC	26.08.22
P3	Manhole schedules added	SC	26.06.22
P2	Updated to latest planning layout	SR	21.04.22
P1	First Issue	SR	26.01.22

STATUS: PLANNING

EXPEDITE
Exeter
The Design Studio
Dean Clarke House
Southernhay East
Exeter
EX1 1AP
t: 01392 691 631
www.expediteps.com

CLIENT: BURRINGTON HOMES (MIDLANDS)

SITE: LAND AT HEMPTON ROAD DEDDINGTON - PHASE 2

TITLE: ROAD AND SEWER LONGITUDINAL SECTIONS AND MANHOLE SCHEDULES

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:50Vert. 1:250Horz.	JAN 2022	SR	KSR

PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	02.06	P5

MANHOLES F1, F1B, S7 & S203 TO BE PROVIDED WITH GRIP TOP COVERS WITH THE AGREEMENT OF THAMES WATER, COVERS TO BE LOCATED MINIMUM OF 1m FROM CARRIAGEWAY EDGE

N

KEY

- ADOPTABLE FOUL SEWER AND MANHOLE
- ADOPTABLE SURFACE WATER SEWER AND MANHOLE
- EXISTING FOUL SEWER
- EXISTING SURFACE WATER SEWER
- HIGHWAY GULLY AND CONNECTION
- PRIVATE FOUL INSPECTION CHAMBER <3.0m DEEP WITH RESTRICTED ACCESS DEPTHS OVER 1.2m, AND ADOPTED SEWER
- FOUL SHALLOW ACCESS CHAMBER <0.6m DEEP
- PRIVATE SURFACE WATER INSPECTION CHAMBER <3.0m DEEP WITH RESTRICTED ACCESS DEPTHS OVER 1.2m
- PRIVATE SURFACE WATER RODDING EYE
- RAINWATER DOWNPIPE AND 100/150Ø DRAIN
- INTERNAL FOUL CONNECTION POINT AND 100Ø DRAIN
- AREA OF PERMEABLE PAVING - INFILTRATION OF PARKING ONLY

NOTES

1. ALL WORKS FOR ADOPTION UNDER A SECTION 38 AGREEMENT SHALL BE CARRIED OUT TO THE OXFORDSHIRE COUNTY COUNCIL SPECIFICATION FOR ROAD CONSTRUCTION IN RESIDENTIAL AREAS AND TO THE APPROVAL OF THE AREA HIGHWAY AUTHORITY.
2. ALL WORKS FOR ADOPTION UNDER A SECTION 104 AGREEMENT ALL SHALL BE IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE - APPENDIX G, "DESIGN AND CONSTRUCTION GUIDANCE FOR FOUL AND SURFACE WATER SEWERS" VERSION 2 MARCH 2020.
3. STREETLIGHTING POSITIONS TO BE PEGGED ON SITE AND AGREED BY THE LOCAL AUTHORITY PRIOR TO ERECTION COMMENCING.
4. ALL PRIVATE DRAINAGE SHALL BE IN ACCORDANCE WITH BS8301 AND RELEVANT SECTIONS OF APPROVED DOCUMENT H OF THE BUILDING REGULATIONS.
5. THE CONTRACTOR IS TO CHECK THE LEVEL OF EXISTING SEWERS BEING USED AS OUTFALLS OR CROSSING PROPOSED DRAINAGE RUNS PRIOR TO LAYING ANY PIPES. ANY DISCREPENCIES ARE TO BE REPORTED TO THE ENGINEER
6. PRIVATE HOUSE DRAINAGE WILL BE FLEXIBLY JOINTED PLASTIC OR CLAY PIPEWORK. DIAMETER 100mm UNLESS SHOWN OTHERWISE.
7. ALL CONNECTIONS FOR HOUSE DRAINAGE SHALL BE 100mm DIA. FOUL & 150mm DIA. SURFACE WATER UNLESS NOTED OTHERWISE AND MUST EXTEND 500mm BEHIND THE BACK OF FOOTWAY/HOMEZONE ROAD. ALL CONNECTIONS WHEN LAID SHALL BE PLUGGED, PROTECTED AS NECESSARY AND MARKED WITH A STAKE FOR FUTURE USE.
8. FOR PRIVATE DRAINS WHERE COVER TO PIPES IS LESS THAN 900mm IN VEHICULAR AREAS OR 600mm IN OTHER AREAS PROTECTION IN THE FORM OF A 100mm THICK CONCRETE PAD SHALL BE PROVIDED OVER THE PIPE GRANULAR SURROUND.
9. WHERE PIPES PASS THROUGH SCREEN WALLS, FOOTINGS OR RETAINING WALLS LINTELS ARE TO BE PROVIDED OVER. UNDER BUILDINGS PIPES SHALL BE SURROUNDED WITH 150mm THICKNESS OF GRANULAR MATERIAL. WHERE DRAINS PASS WITHIN 1M OF BUILDINGS THE WALL FOUNDATION SHALL BE TAKEN DOWN BELOW THE INVERT OF THE PIPE.
10. WHERE DRAINS DO NOT EXCEED 600mm DEEP, PLASTIC OR CLAY ACCESS FITTINGS MINIMUM DIAMETER 225mm SHALL BE USED. ELSEWHERE PROPRIETARY PLASTIC OR PRECAST CONCRETE INSPECTION CHAMBERS SHALL BE USED, UNLESS SHOWN OTHERWISE FW INSPECTION CHAMBERS ARE TO BE 750mm BELOW DPC LEVEL AND SW CHAMBERS AND RODDING EYES TO BE 600mm BELOW DPC.
11. ALL GULLIES AND RAINWATER DOWNPIPES CONNECTED DIRECTLY TO DRAINS ARE TO BE RODDABLE.
12. DRAINAGE RUNS SHOULD BE LAID AT A MINIMUM OF 5.0M FORM THE REAR OF PROPERTIES WHERE PRACTICAL TO ALLOW FOR FUTURE EXTENSIONS.
13. ALL DRAINAGE SHALL BE LAID UPSTREAM AND EACH RUN BETWEEN MANHOLES SHALL BE LAID COMPLETE PRIOR TO BACKFILLING. WHERE THIS IS NOT PRACTICAL TRIAL HOLES OR OTHER MEANS OF IDENTIFYING THE LINE AND LEVEL OF SERVICES SHALL BE CARRIED OUT PRIOR TO WORKS COMMENCING.
14. ALL BRANCH DRAINS, OR CONNECTIONS, ARE TO DISCHARGE TO THE COLLECTORS OBLIQUELY, AND IN THE DIRECTION OF THE MAIN FLOW.

REV:	DESCRIPTION:	BY:	DATE:
P6	Private drainage details added	SC	18.11.22
P5	Updated to latest planning layout housetypes and road safety audit	SC	08.11.22
P4	Additional detail added	SC	09.06.22
P3	Minor amendments to planning layout	SR	04.05.22

STATUS: PLANNING

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CLIENT: BURRINGTON HOMES (MIDLANDS)

SITE: LAND AT HEMPTON ROAD DEDDINGTON - PHASE 2

TITLE: DRAINAGE LAYOUT

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:250	JAN 2022	SR	KSR

PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	03.01	P6

SURFACE WATER INFILTRATION BASIN

BED LEVEL	134.850mAOD
BANK LEVEL	136.500mAOD
MAX. ATTENUATED WATER LEVEL	135.929mAOD
MAX. ATTENUATED VOLUME	180.300m³
MAX. VOL. AVAILABLE 300mm FREEBOARD	238.300m³
SIDE SLOPES	1:4
DESIGN INFILTRATION RATE	2.797m/hr
SAFETY FACTOR	2.0

NOTES:

1. DO NOT SCALE FROM THIS DRAWING
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH AND CHECKED AGAINST ALL OTHER DRAWINGS, ENGINEERING DETAILS, SPECIFICATION AND ANY STRUCTURAL, GEOTECHNICAL OR OTHER SPECIALIST DOCUMENT PROVIDED.

KEY

SURFACE WATER OVERLAND FLOW ROUTE

REV:	DESCRIPTION:	BY:	DATE:
P3	Minor amendments to planning layout	SR	18.11.22
P2	Minor amendments to planning layout	SR	04.05.22
P1	First issue	DM	21.04.22

STATUS: INFORMATION

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CLIENT: BURRINGTON HOMES (MIDLANDS)

SITE: LAND AT HEMPTON ROAD DEDDINGTON - PHASE 2

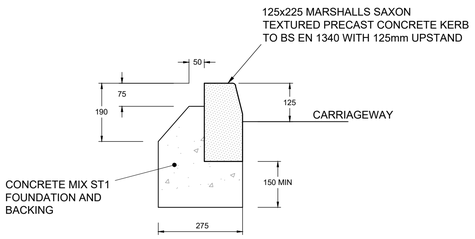
TITLE: EXCEEDANCE FLOW PLAN

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:250	Apr 2022	SR	KSR

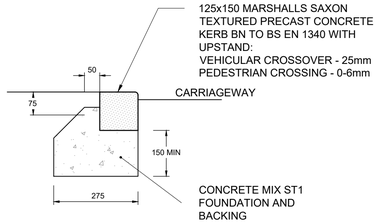
PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	09.01	P3

NOTES:

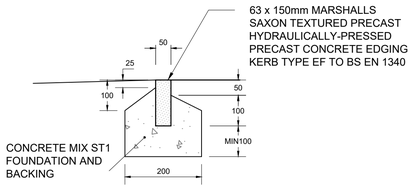
1. DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS STATED OTHERWISE.



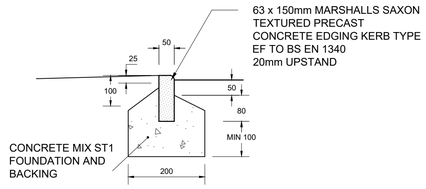
TYPE HB2 HALF BATTER KERB
SCALE 1:10



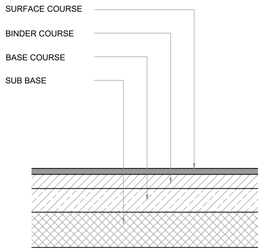
DROPPED KERB TYPE BN
SCALE 1:10



EDGING (EF)
SCALE 1:10

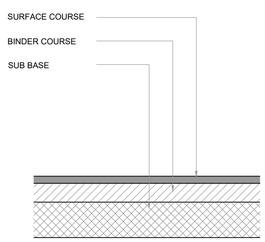


EDGING (EF)
SCALE 1:10



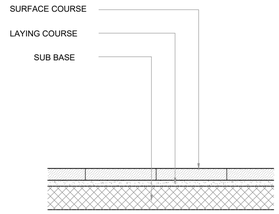
LAYER	SPECIFICATION	THICKNESS (mm)
SURFACE COURSE	DENSE BITUMEN SURFACE COURSE MACADAM, (0/10mm NOMINAL SIZE). TO CLAUSE 7.4, BS 4987. 100/150 PEN BINDER.	30
BINDER COURSE	DENSE BITUMEN BINDER COURSE MACADAM, (0/20mm NOMINAL SIZE). TO CLAUSE 6.5, BS 4987. 100/150 PEN BINDER.	60
BASE COURSE	DENSE BITUMEN BASE COURSE MACADAM, (0/32mm NOMINAL SIZE). TO CLAUSE 6.2, BS 4987. 100/150 PEN BINDER.	100
SUB BASE	TYPE 1 GRANULAR MATERIAL TO CLAUSE 803 TABLE 8/2 MCHW VOLUME I SERIES 800	SEE TABLE 1

SHARED PRIVATE DRIVE CONSTRUCTION (BITMAC)
(Frequent Use by Commercial Vehicles) NHBC 10.2.6



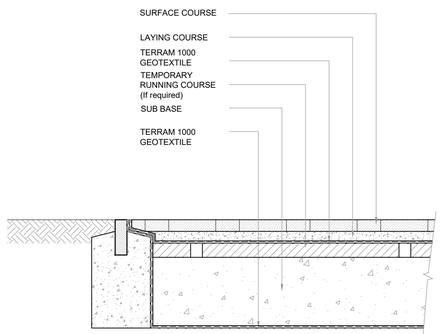
LAYER	SPECIFICATION	THICKNESS (mm)
SURFACE COURSE	DENSE BITUMEN SURFACE COURSE MACADAM, (0/10mm NOMINAL SIZE). TO CLAUSE 7.4, BS 4987. 100/150 PEN BINDER.	30
BINDER COURSE	DENSE BITUMEN BINDER COURSE MACADAM, (0/20mm NOMINAL SIZE). TO CLAUSE 6.5, BS 4987. 100/150 PEN BINDER.	80
SUB BASE	TYPE 1 GRANULAR MATERIAL TO CLAUSE 803 TABLE 8/2 MCHW VOLUME I SERIES 800	SEE TABLE 1

SHARED PRIVATE DRIVE CONSTRUCTION (BITMAC)
(Infrequent Use by Commercial Vehicles) NHBC 10.2.6



LAYER	SPECIFICATION	THICKNESS (mm)
SURFACE COURSE	MARSHALLS SAXON PRECAST CONCRETE PAVING SLAB	50
LAYING COURSE	GRIT SAND	25
SUB BASE	TYPE 1 GRANULAR MATERIAL TO CLAUSE 803 TABLE 8/2 MCHW VOLUME I SERIES 800	100

FOOTPATH AND PATIO CONSTRUCTION (PC PAVING)
(Pedestrian) NHBC 10.2.6



LAYER	SPECIFICATION	THICKNESS (mm)
SURFACE COURSE	PERMEABLE CONCRETE BLOCK PAVIORS TO BS EN 1338:2003 WITH JOINTING GRIT BRUSHED IN	80
LAYING COURSE	2/6.3mm OPEN GRADED CRUSHED ROCK TO BS EN 13242 AGGREGATE (mm)	50
TEMPORARY RUNNING COURSE (If required)	DENSE BITUMEN BINDER COURSE MACADAM, (0/20mm NOMINAL SIZE AGGREGATE). TO CLAUSE 6.5, BS 4987. 100/150 PEN BINDER. TO BE PUNCTURED WITH 50mm DIA. HOLES AT 1.0m CENTRES PRIOR TO RECIEVING LAYING COURSE	60
SUB BASE	10/20mm OPEN GRADED CRUSHED ROCK TO BS EN 13242 AGGREGATE (mm)	250

PRIVATE DRIVE CONSTRUCTION (PERMEABLE PAVING)

1. ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH "INTERPAVE PERMEABLE PAVEMENT MANUAL" 7th EDITION

TABLE 1

	Minimum thickness (mm) of sub-base [1]	
	Without Geotextile underneath	With Geotextile underneath [2]
Less than 2%	N/A	300
2% - 3%	325	225
3% - 5%	250	150
5% - 7%	150	
7% - 20%	100	

1. Sub-base consolidated in accordance with MCHW Volume 1 clause 801, table 8/1
2. Terram 1000 or equivalent

REV:	DESCRIPTION:	BY:	DATE:
P1	First Issue	DM	28.07.21

STATUS: FOR APPROVAL

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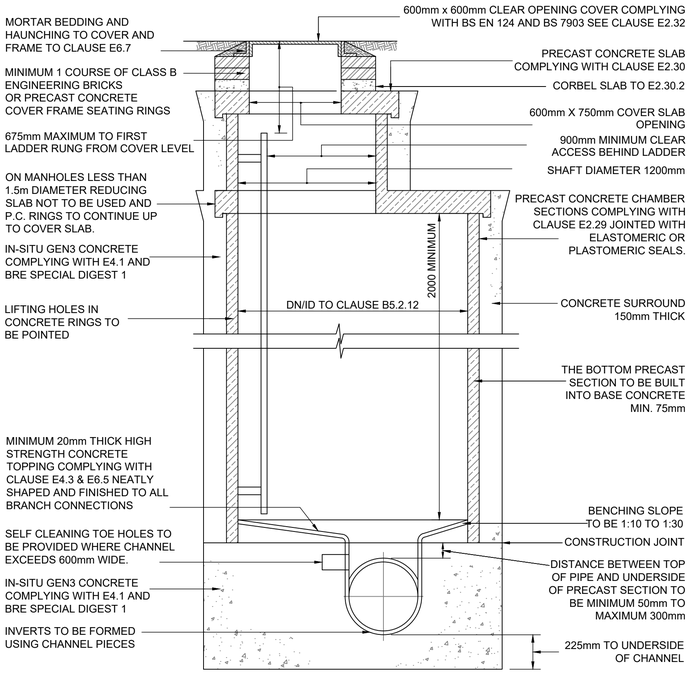
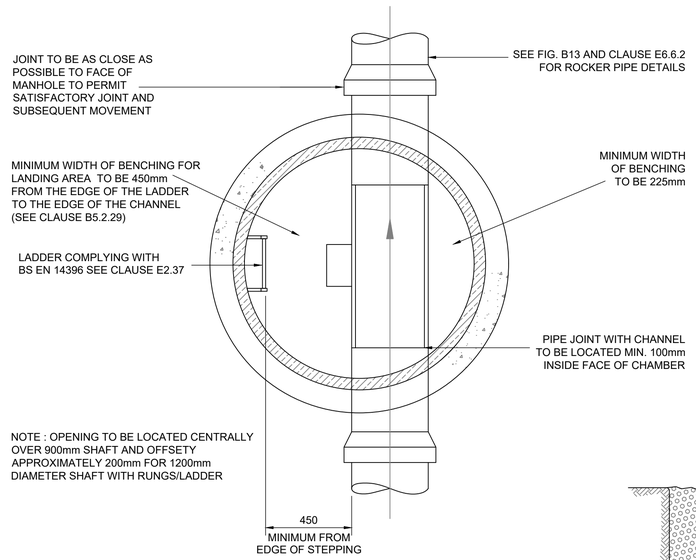
CLIENT:
BURRINGTON HOMES (MIDLANDS)

SITE:
LAND AT HEMPTON ROAD, DEDDINGTON

TITLE:
PRIVATE DRIVE CONSTRUCTION DETAILS

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
NTS	Jan 2021	PG	KSR
PROJECT NO:	DRAWING NO:		REVISION:
ES20.020	30.02		P1





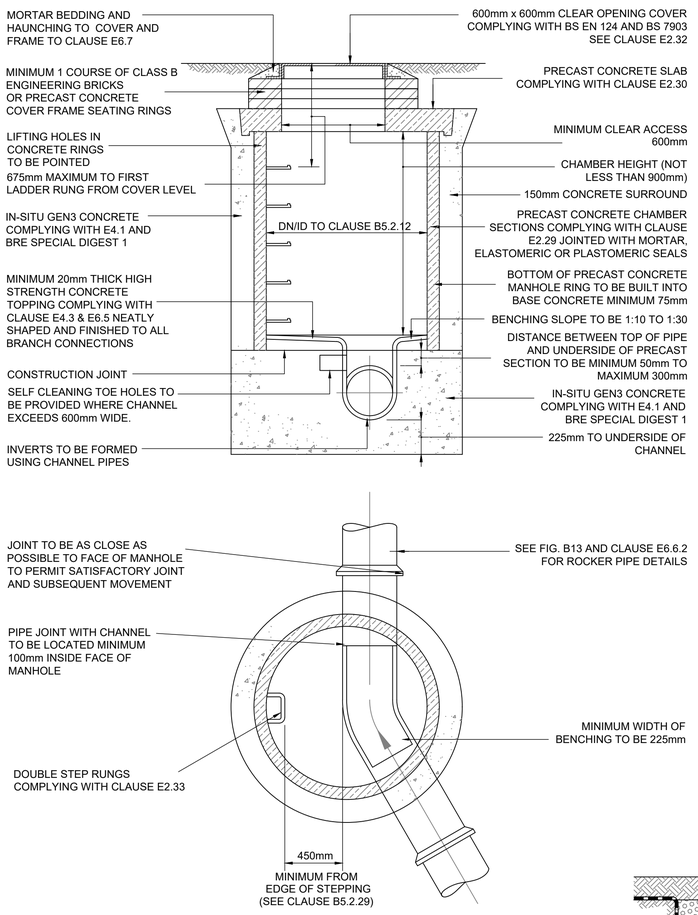
TYPICAL MANHOLE DETAIL - TYPE A1

DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 3m TO 6m
RIGID MATERIAL CONSTRUCTION WITH CONCRETE SURROUND
NOT TO SCALE

Nominal Internal Diameter of Largest Pipe in manhole (mm)	Minimum Nominal Internal Dimension of Manhole (mm)
Less than 375	1200
375 - 450	1350
500 - 700	1500
750 - 900	1800
Greater than 900	Pipe diameter + 900

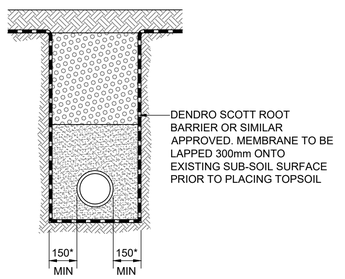
WHERE NECESSARY THE MINIMUM MANHOLE DIAMETER SHOULD BE INCREASED TO PROVIDE THE MINIMUM BENCHING DIMENSIONS REQUIRED

Table B1 Clause B5.2.12

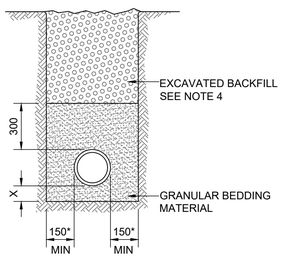


TYPICAL MANHOLE DETAIL - TYPE B

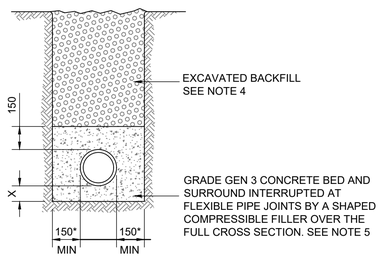
DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 1.50 TO 3.0m
RIGID MATERIAL CONSTRUCTION WITH CONCRETE SURROUND
NTS



ROOT BARRIER DETAIL



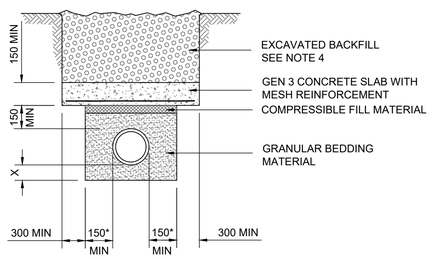
CLASS S BEDDING



CLASS Z BEDDING

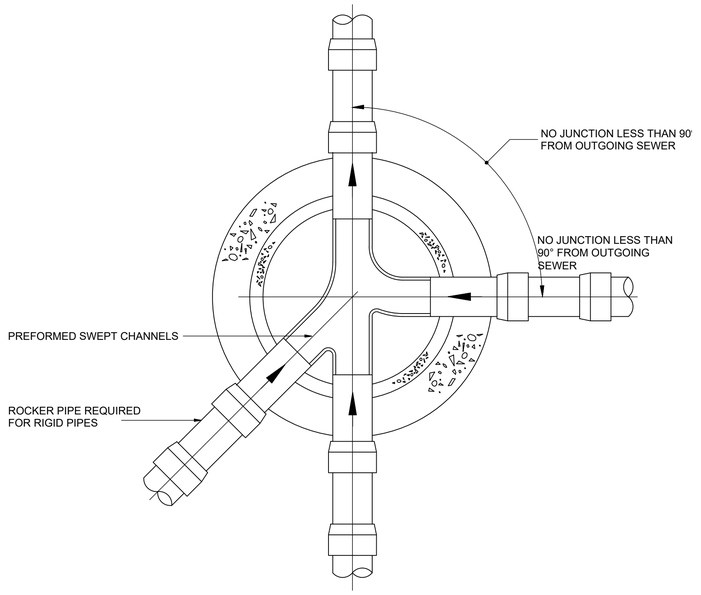
TYPICAL PIPE BEDDING FOR PIPES UP TO 800mm DIA

SCALE 1:10



CONCRETE SLAB PROTECTION

REINFORCEMENT IN SLAB TO SUIT LOADING CONDITION



SECTIONAL PLAN

FIG B13 TYPICAL ARRANGEMENT OF PIPE JUNCTIONS WITHIN MANHOLES

RIGID PIPES BUILT INTO MANHOLES SHOULD HAVE A FLEXIBLE JOINT AS CLOSE AS FEASIBLE TO THE EXTERNAL FACE OF THE STRUCTURE AND THE LENGTH OF OF THE NEXT ROCKER PIPE SHOULD BE AS SHOWN.

Nominal diameter (mm)	Effective length (m)
150 - 600	0.6
601 - 750	1.00
over 750	1.25

ALL PIPES ENTERING THE BOTTOM OF THE MANHOLE TO HAVE SOFFITS LEVEL.
NOT TO SCALE

Table E13 Clause E6.6.2

BEDDING NOTES:

1. * = 150 FOR PIPES DIAMETER UP TO 300mm,
   * = 200mm FOR PIPE DIAMETERS OVER 300mmØ
   BASED ON NARROW TRENCH THEORY: DESIGNER TO CONFIRM FOR SPECIFIC PIPELINE.
2. BACKFILL MATERIAL TO BE SELECTED EXCAVATED MATERIAL WHERE THIS MATERIAL COMPLIES WITH CESWI. ADDITIONAL MATERIAL TO MAKE UP ANY DEFICIENCY TO BE GRANULAR SUB-BASE TYPE 1 UNLESS STATED OTHERWISE.

NOMINAL BORE OF PIPE (min)	AGGREGATE SIZE (mm)	
	SINGLE SIZED	GRADED
100	10	-
150	10 OR 14	14 TO 5
225-300	10,14 OR 20	14 TO 5 OR 20 TO 5
375-525	14 OR 20	14 TO 5 OR 20 TO 5
EXCEEDING 525	14,20 OR 40	14 TO 5 OR 20 TO 5 40 TO 5

DIM X ≥ 100mm FOR PIPES ≤ 100mmØ
DIM X ≥ 150mm FOR PIPES > 100mmØ
DIM X ≥ 200mm FOR PIPES TRENCHES IN ROCK

3. IN WET, SOFT, OR SILTY SOILS, WHERE LATERAL SUPPORT IS NOT OBTAINED OR WHERE FINES MAY MIGRATE, THE GRANULAR BEDDING MATERIAL SHALL BE SURROUNDED BY GEOTEXTILE FABRIC WITH MIN 200 OVERLAP.
4. TRENCH BACKFILL TO MEET HIGHWAY SPECIFICATION WHEN LAID IN ROAD OR FOOTPATH.
5. COMPRESSIBLE FILLER SHALL BE BITUMEN-IMPREGNATED INSULATING BOARD TO BS 622-1. THICKNESS AS TABLE.

NOMINAL DIAMETER OF PIPE (mm)	THICKNESS OF COMPRESSIBLE FILLER (mm)
LESS THAN 450mm	18
450-1200mm	36
EXCEEDING 1200mm	54

CONTRACTORS MUST CHECK ALL DIMENSIONS ON SITE. ONLY FIGURED DIMENSIONS ARE TO BE WORKED FROM. DISCREPANCIES MUST BE REPORTED TO THE DESIGN TEAM BEFORE PROCEEDING. © THIS DRAWING IS COPYRIGHT.

NOTES:

The planning, design and construction of sewers shall be in accordance with Sewerage Sector Guidance - Appendix C, "Design and Construction Guidance for Foul and Surface Water Sewers" version 2 March 2020

The minimum size of sewer where guide bars, safety chains, or other safety devices are required in Manholes shall be 375mm diameter.

All manholes / inspection chambers should have a concrete surround. Concrete rings shall be sealed using "Tokstrip" and lifting eyes pointed with resin modified mortar

Compliance with Health & Safety matters on any trench/manhole is obligatory and a permit to enter a confined space is required when connecting site drainage to the existing public sewerage system.

MH covers & frames shall be ductile iron with a minimum square opening of 600 x 600mm. Covers shall be double triangle for 675mm square openings and be provided with loose bolted connections

The use of ladders or steps in manholes, wet wells and valve chambers shall comply with the following: Steel plastic encapsulated MH single steps shall not be used in MHs of a greater depth than 1.0m. Steel plastic encapsulated double steps may be provided in MHs up to 3.0m in depth. Ladders shall be provided in accordance with BS 4211 in MHs between 3.0 & 6.0m deep. MHs greater than 6.0m deep shall be specially designed and have intermediate landings. Access holes in intermediate landings shall be provided with galvanised mild steel gratings to prevent persons falling through. The design of deep MHs shall permit the use of a winch or lifting gear mounted at ground level in case of emergencies

Only low carbon steel or stainless steel ladders for vertical fixing to MHs will be acceptable

Proposed adoptable sewers are only permitted to have other sewer/gully connections and other services laid at an angle of between 45 degrees and 90 degrees across the line with a vertical clearance in excess of 300mm

All ironwork to be kite marked by BSI or certified by equal inspection authority

Red coloured plastic marker tape at least 150mm wide shall be laid at a minimum of 200mm above the soffit of the pipe. The tape shall be printed with the words gravity sewer in bold capital letters throughout its length and at intervals not exceeding 700mm and shall incorporate a corrosion resistant tracing system for non-metallic pipes

Minimum backdrop height shall be 1m

B3.2 - Access

12. Manhole diameters (Types A and B only) should be in accordance with Table B.1.

E2.29 - Precast Concrete Manholes

1. Precast concrete manhole units shall comply with the relevant provisions of BS EN 1917 and BS 5911-3 and shall be manufactured from concrete with a Design Chemical Class DC-4 unless the sewerage company can be satisfied that a lower class can resist attack from soils and goundwater. Units which bed into bases shall be manufactured so that imposed vertical loads are transmitted directly via the full wall thickness of the unit. The profiles of joints between units and the underside of slabs shall be capable of withstanding applied loadings from such slabs and spigot-ended sections shall only be used where the soffit of the slab is recessed to receive them.

2. Precast concrete chamber sections for valves and meters shall be interlocking and comply with BS EN 1917 and BS 5911-3.

3. Precast concrete corbel slabs shall comply to BS5911-3 Table 5 and Figure 8

E2.32 - Manhole Covers and Frames

1. Manhole covers and frames shall comply with the relevant provisions of BS EN 124, BS 7903 and 'Design Manual for Roads and Bridges 4.2 Part 5' HA 104/09. They shall be of a non-rocking design. Covers that transfer the load to the frame at concentrated points (e.g. at the corners of covers) shall not use cushion inserts between the cover and the frame. Aluminium covers shall not be used.

2. Manhole covers on foul-only sewers shall be of low leakage types in order to prevent excessive surface water ingress.

3. As a minimum, Class D 400 covers shall be used in carriageways of roads (including pedestrian streets), hard shoulders, agricultural or recreational land and parking areas used by unrestricted types of road or pneumatic tyred agricultural vehicles.

4. Minimum frame depths for NRSWA road category Types 0 to 4 shall be as Table E 6. Manhole covers in shared driveways that could be subject to occasional loads from heavy vehicles (e.g., refuse vehicles) should meet the requirements for Type 4 roads.

5. Class B 125 shall be used in footways, pedestrian areas, driveways serving a single house and comparable locations.

6. In situations where traffic loading is anticipated to be heavier than would occur on a typical residential estate distributor road (i.e., braking or turning near a junction), a higher specification (E600) shall be used. This should comprise either a Class E600 cover or a D400 of a type that has been assessed and approved by the sewerage company as having sufficient additional ruggedness to ensure durability.

7. All manhole covers shall be the non-ventilating type and shall have closed keyways.

8. All manhole covers and frames shall be provided with a prising slot to facilitate their removal.

9. Covers with a clear opening greater than 1m shall comply with BS 9124. Aluminium covers shall not be used.

10. Safety grids, where supplied, shall comply with the requirements of BS 9124. When lifted they shall be secure in the upright position. Aluminium safety grids shall not be used.

E2.33 - Manhole Steps

1. Steps for manholes and other chambers shall be Type D Class 1, complying with the requirements of BS EN 13101.

2. Galvanized mild steel and plastic encapsulated steps are preferred.

E6.6 - Pipes and Joints Adjacent to Structures

1. Where rigid pipes are used, a flexible joint shall be provided as close as feasible to the outside face of any structure into which a pipe is built, within 150mm for pipe diameters less than 300mm. The design of the joints shall be compatible with any subsequent movement.

2. The recommended length of the next pipe (rocker pipe) away from the structure shall be as shown in Table E.13.

3. Stub pipes into structures shall be of rigid material.

E6.7 - Setting Manhole Covers and Frames

1. Manhole frames shall be set to level, bedded and haunched externally over the base and sides of the frame in mortar, in accordance with the manufacturer's instructions. The frame shall be seated on at least one course of Class B engineering bricks, on precast concrete masonry units or on precast concrete cover frame seating rings to regulate the distance between the top of the cover and the top rung to no greater than 675 mm. A mortar fillet shall be provided where the corners to an opening in a slab are chamfered and the brickwork is not flush with the edges of the opening.

2. Frames for manhole covers shall be bedded in a bedding mortar in all situations where covers are sited in NRSWA Road Categories 0, 1, 2 or 3 (i.e., all except residential cul-de-sacs).

STATUS: TENDER

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REV:	DESCRIPTION:	BY:	DATE:
P3	Root barrier detail added	DM	06.12.21
P2	Issued for Tender	DM	25.05.21
P1	First Issue	DM	25.02.21

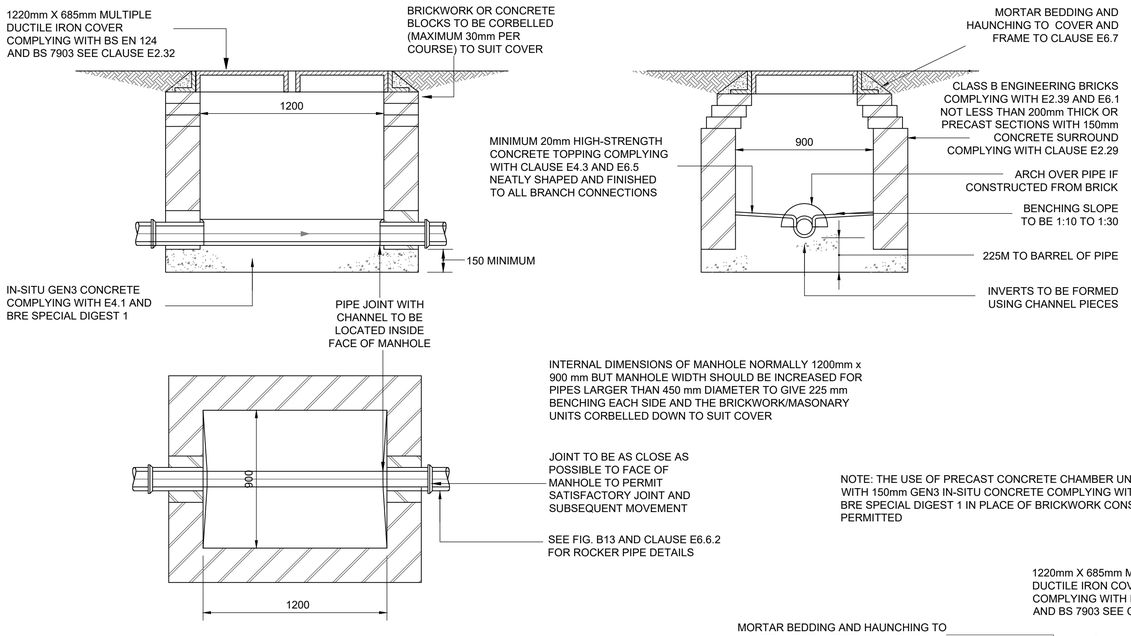
CLIENT: BURRINGTON HOMES (MIDLANDS)

SITE: LAND AT HEMPTON ROAD DEDDINGTON

TITLE: DRAINAGE CONSTRUCTION DETAILS - SHEET 1

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
N.T.S	FEB 2021	DM	KR

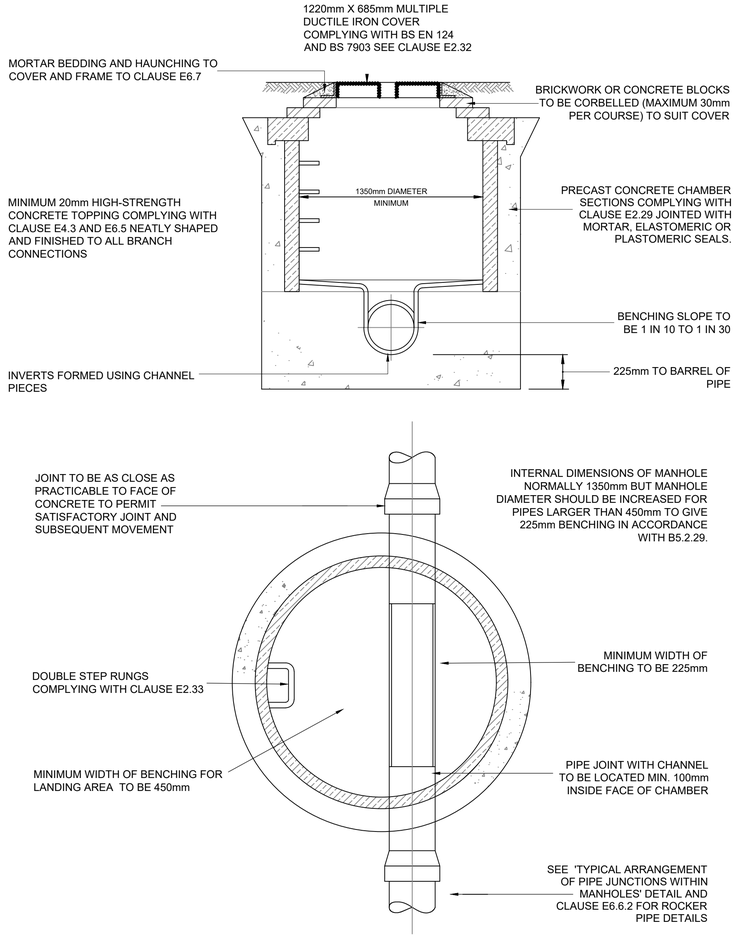
PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	40.00	P3



TYPICAL MANHOLE DETAIL - TYPE 'C'

DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE LESS THAN 1.5m
MAXIMUM PIPE SIZE 450mm DIAMETER
RIGID MATERIAL CONSTRUCTION
NOT TO SCALE

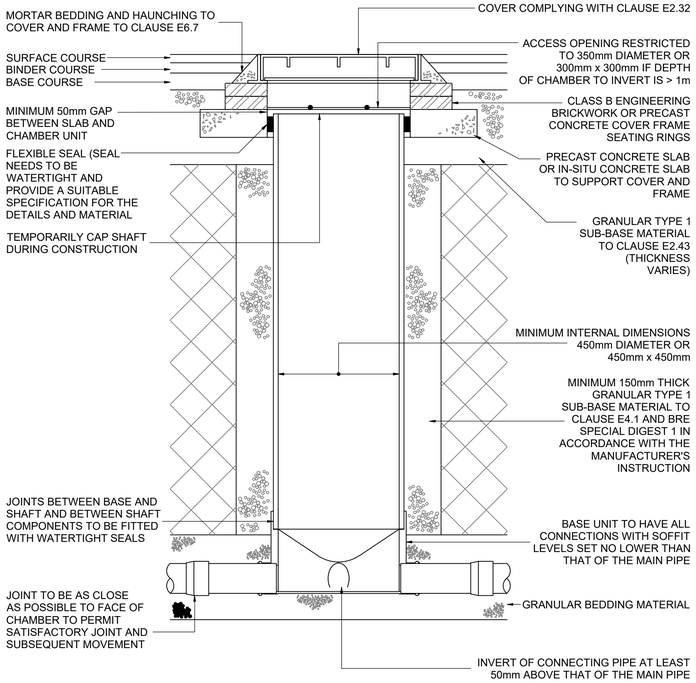
NOTE: THE USE OF PRECAST CONCRETE CHAMBER UNITS TO E2.29 WITH 150mm GEN3 IN-SITU CONCRETE COMPLYING WITH E4.1 AND BRE SPECIAL DIGEST 1 IN PLACE OF BRICKWORK CONSTRUCTION IS PERMITTED



TYPICAL MANHOLE DETAIL - TYPE C

DEPTH FORM COVER TO SOFFIT OF PIPE LESS THAN 1.5m
MINIMUM RIGID PIPE SIZE 450mm DIAMETER. RIGID MATERIAL CONSTRUCTION.
NOT TO SCALE

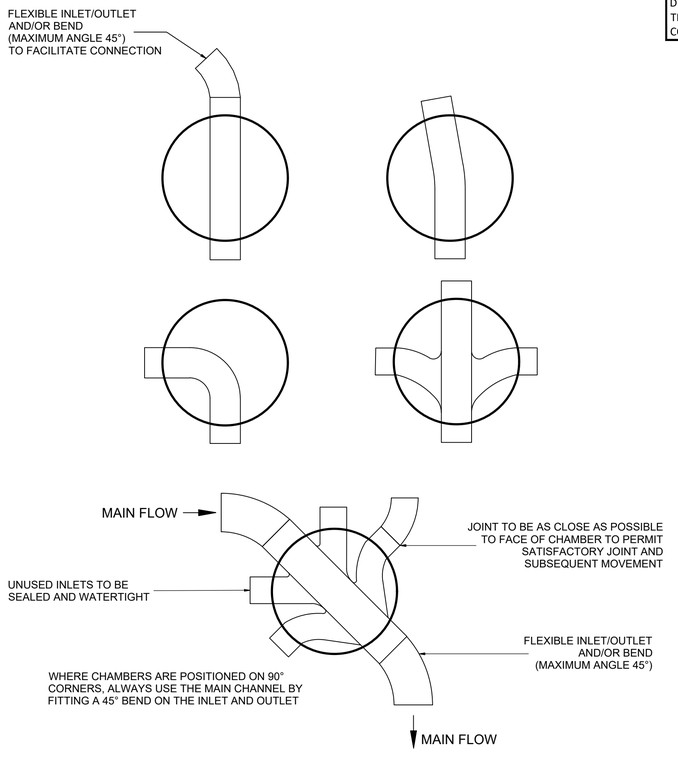
PLASTIC CHAMBERS AND RINGS SHALL COMPLY WITH CLAUSE E2.31



NOTE: WHERE THE ACCESS CHAMBER IS IN THE HIGHWAY THE HIGHWAY AUTHORITY CAN HAVE SPECIFIC REQUIREMENTS

TYPICAL INSPECTION CHAMBER DETAIL - TYPE D

DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE UP TO 2m
FLEXIBLE MATERIAL CONSTRUCTION FOR USE IN AREAS SUBJECT TO VEHICLE LOADING
NOT TO SCALE

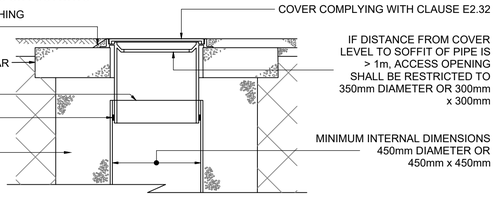


NOTE: WHERE A BEND IS USED IMMEDIATELY OUTSIDE THE MANHOLE, THIS MAY BE USED AS THE ROCKER PIPE

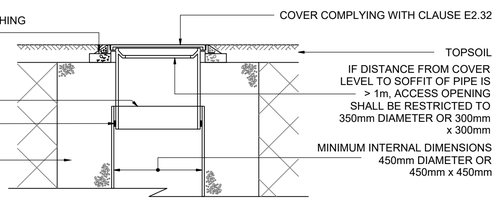
TYPICAL BASE LAYOUTS FOR TYPE D CHAMBERS

NOT TO SCALE

SITED IN DOMESTIC DRIVEWAYS OR FOOTWAYS



SITED IN DOMESTIC GARDENS



TYPICAL INSPECTION CHAMBER DETAIL - TYPE D

FLEXIBLE MATERIAL CONSTRUCTION FOR USE IN AREAS OF LIGHT VEHICLE LOADING OR LANDSCAPED AREAS
NOT TO SCALE
PLASTIC CHAMBERS AND RINGS SHALL COMPLY WITH CLAUSE E2.31

NOTES:

The planning, design and construction of sewers shall be in accordance with Sewerage Sector Guidance - Appendix C, "Design and Construction Guidance for Foul and Surface Water Sewers" version 2 March 2020

The minimum size of sewer where guide bars, safety chains, or other safety devices are required in Manholes shall be 375mm diameter

All manholes / inspection chambers should have a concrete surround. Concrete rings shall be sealed using "Tokstrip" and lifting eyes pointed with resin modified mortar

Compliance with Health & Safety matters on any trench/manhole is obligatory and a permit to enter a confined space is required when connecting site drainage to the existing public sewerage system.

MH covers & frames shall be ductile iron with a minimum square opening of 600 x 600mm. Covers shall be double triangle for 675mm square openings and be provided with loose bolted connections

The use of ladders or steps in manholes, wet wells and valve chambers shall comply with the following: Steel plastic encapsulated MH single steps shall not be used in MHs of a greater depth than 1.0m. Steel plastic encapsulated double steps may be provided in MHs up to 3.0m in depth. Ladders shall be provided in accordance with BS 4211 in MHs between 3.0 & 6.0m deep. MHs greater than 6.0m deep shall be specially designed and have intermediate landings. Access holes in intermediate landings shall be provided with galvanised mild steel gratings to prevent persons falling through. The design of deep MHs shall permit the use of a winch or lifting gear mounted at ground level in case of emergencies

Only low carbon steel or stainless steel ladders for vertical fixing to MHs will be acceptable

Proposed adoptable sewers are only permitted to have other sewer/gully connections and other services laid at an angle of between 45 degrees and 90 degrees across the line with a vertical clearance in excess of 300mm

All ironwork to be kite marked by BSI or certified by equal inspection authority

Red coloured plastic marker tape at least 150mm wide shall be laid at a minimum of 200mm above the soffit of the pipe. The tape shall be printed with the words gravity sewer in bold capital letters throughout its length and at intervals not exceeding 700mm and shall incorporate a corrosion resistant tracing system for non-metallic pipes

Minimum backdrop height shall be 1m

B3.2 - Access

12. Manhole diameters (Types A and B only) should be in accordance with Table B.1.

E2.29 - Precast Concrete Manholes

1. Precast concrete manhole units shall comply with the relevant provisions of BS EN 1917 and BS 5911-3 and shall be manufactured from concrete with a Design Chemical Class DC-4 unless the sewerage company can be satisfied that a lower class can resist attack from soils and goundwater. Units which bed into bases shall be manufactured so that imposed vertical loads are transmitted directly via the full wall thickness of the unit. The profiles of joints between units and the underside of slabs shall be capable of withstanding applied loadings from such slabs and spigot-ended sections shall only be used where the soffit of the slab is recessed to receive them.

2. Precast concrete chamber sections for valves and meters shall be interlocking and comply with BS EN 1917 and BS 5911-3.

3. Precast concrete corbel slabs shall compy to BS5911-3 Table 5 and Figure 8

E2.32 - Manhole Covers and Frames

1. Manhole covers and frames shall comply with the relevant provisions of BS EN 124, BS 7903 and 'Design Manual for Roads and Bridges 4.2 Part 5' HA 104/09. They shall be of a non-rocking design. Covers that transfer the load to the frame at concentrated points (e.g. at the corners of covers) shall not use cushion inserts between the cover and the frame. Aluminium covers shall not be used.

2. Manhole covers on foul-only sewers shall be of low leakage types in order to prevent excessive surface water ingress.

3. As a minimum, Class D 400 covers shall be used in carriageways of roads (including pedestrian streets), hard shoulders, agricultural or recreational land and parking areas used by unrestricted types of road or pneumatic tyred agricultural vehicles.

4. Minimum frame depths for NRSWA road category Types 0 to 4 shall be as Table E 6. Manhole covers in shared driveways that could be subject to occasional loads from heavy vehicles (e.g., refuse vehicles) should meet the requirements for Type 4 roads.

5. Class B 125 shall be used in footways, pedestrian areas, driveways serving a single house and comparable locations.

6. In situations where traffic loading is anticipated to be heavier than would occur on a typical residential estate distributor road (i.e., braking or turning near a junction), a higher specification (E600) shall be used. This should comprise either a Class E600 cover or a D400 of a type that has been assessed and approved by the sewerage company as having sufficient additional ruggedness to ensure durability.

7. All manhole covers shall be the non-ventilating type and shall have closed keyways.

8. All manhole covers and frames shall be provided with a prising slot to facilitate their removal.

9. Covers with a clear opening greater than 1m shall comply with BS 9124. Aluminium covers shall not be used.

10. Safety grids, where supplied, shall comply with the requirements of BS 9124. When lifted they shall be secure in the upright position. Aluminium safety grids shall not be used.

E2.33 - Manhole Steps

1. Steps for manholes and other chambers shall be Type D Class 1, complying with the requirements of BS EN 13101.

2. Galvanized mild steel and plastic encapsulated steps are preferred.

E6.6 - Pipes and Joints Adjacent to Structures

1. Where rigid pipes are used, a flexible joint shall be provided as close as feasible to the outside face of any structure into which a pipe is built, within 150mm for pipe diameters less than 300mm. The design of the joints shall be compatible with any subsequent movement.

2. The recommended length of the next pipe (rocker pipe) away from the structure shall be as shown in Table E.13.

3. Stub pipes into structures shall be of rigid material.

E6.7 - Setting Manhole Covers and Frames

1. Manhole frames shall be set to level, bedded and haunched externally over the base and sides of the frame in mortar, in accordance with the manufacturer's instructions. The frame shall be seated on at least one course of Class B engineering bricks, on precast concrete masonry units or on precast concrete cover frame seating rings to regulate the distance between the top of the cover and the top rung to no greater than 675 mm. A mortar fillet shall be provided where the corners to an opening in a slab are chamfered and the brickwork is not flush with the edges of the opening.

2. Frames for manhole covers shall be bedded in a bedding mortar in all situations where covers are sited in NRSWA Road Categories 0, 1, 2 or 3 (i.e., all except residential cul-de-sacs).

STATUS: TENDER

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REV:	DESCRIPTION:	BY:	DATE:
P2	Issued for Tender	DM	25.02.21
P1	First Issue	DM	25.02.21

CLIENT: BURRINGTON HOMES (MIDLANDS)

SITE: LAND AT HEMPTON ROAD DEDDINGTON

TITLE: DRAINAGE CONSTRUCTION DETAILS - SHEET 2

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
N.T.S	FEB 2021	DM	KR

PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	40.01	P2

FIGURE B.6
CONNECTIONS TO SEWER

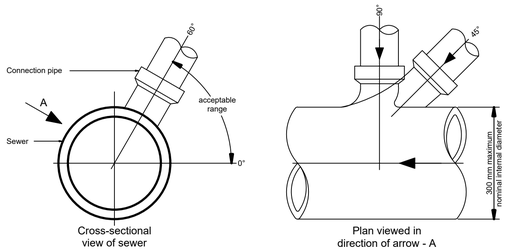


FIGURE B.28
JOINTS FOR CONCRETE ENCASED PIPES

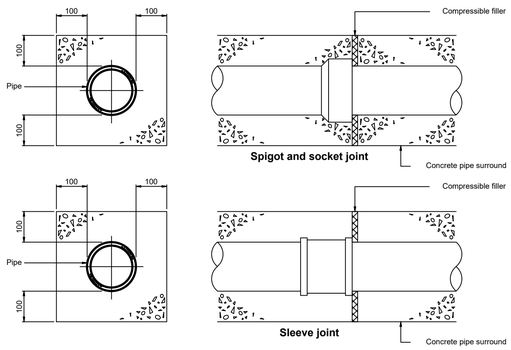


FIGURE B.27
PROTECTION OF PIPES LAID AT SHALLOW DEPTHS

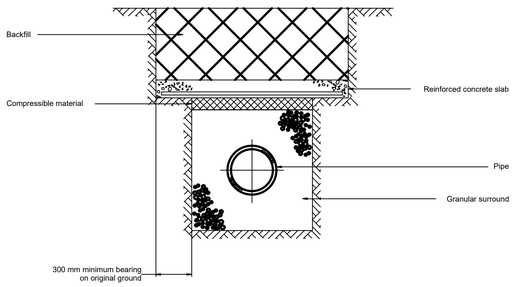
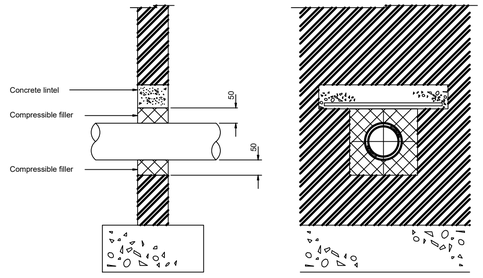
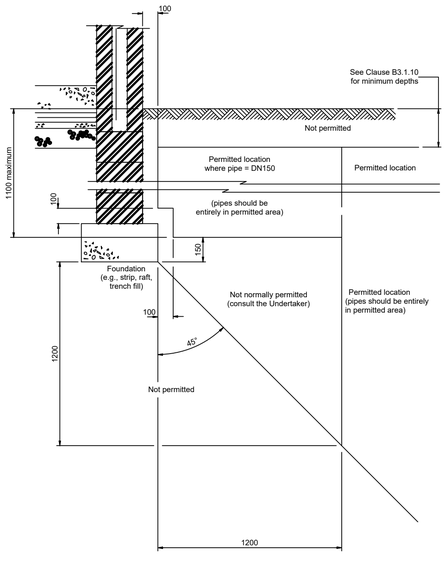


FIGURE B.29
PROTECTION OF PIPES PENETRATING SINGLE LEAF BOUNDARY WALLS



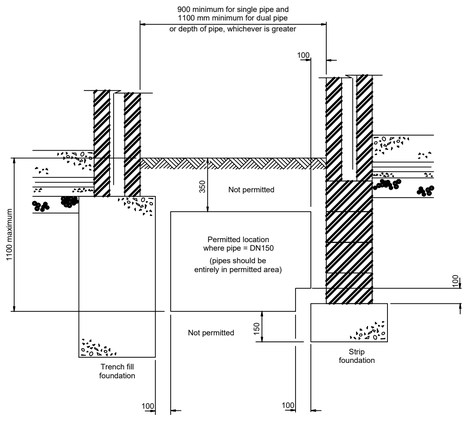
Not to scale, dimensions in millimetres
(all dimensions are minimum sizes)

FIGURE B.1
PERMITTED LOCATION OF SEWERS AND LATERAL DRAINS IN PROXIMITY TO BUILDINGS



Not to scale, dimensions in millimetres

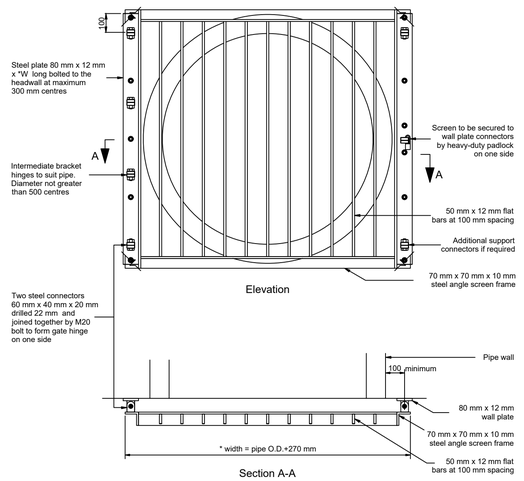
FIGURE B.2
ADDITIONAL DETAIL - PERMITTED LOCATION OF SEWERS AND LATERAL DRAINS BETWEEN BUILDINGS (where Figure B.1 is not applicable only)

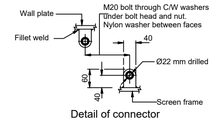


Not to scale, dimensions in millimetres

FIGURE C.3
TYPICAL OUTFALL SAFETY GRILLE

For outfalls of 350 mm diameter or greater



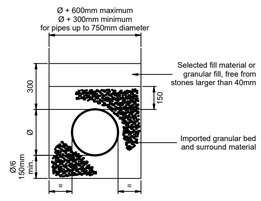


Notes:
1. * width (W) to suit pipe outside diameter.
2. Mild steel fabrication to be hot dip galvanised to BS EN 1461.

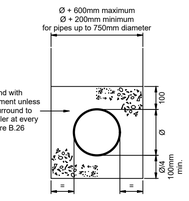
Not to scale, dimensions in millimetres

TYPICAL PIPE BED & SURROUND DETAILS

Type S - Granular Bed and Surround



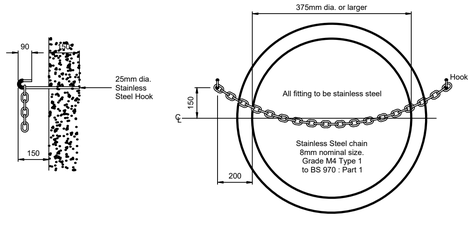
Type Z - Concrete Bed and Surround



Not to scale

TYPICAL SAFETY CHAIN DETAILS

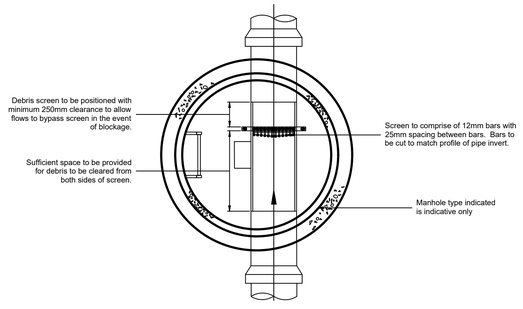
The minimum size of sewer where guide bars, safety chains, or other safety devices are required in manholes shall be 375mm diameter



Typical Section

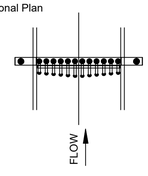
Typical Elevation

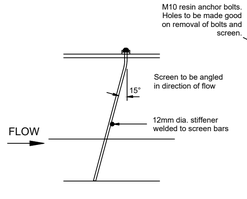
TYPICAL DEBRIS SCREEN DETAILS

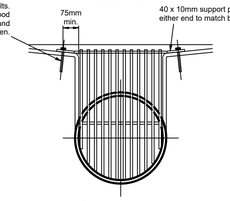


Debris Screen should not be removed until immediately prior to the occupation of premises to be served by the sewer. The screen should be checked on a regular basis and cleaned, as required, to prevent the build-up of construction debris.

Temporary Debris Screen to be fitted in proposed manhole, immediately upstream of the existing public sewer, into which the proposed sewers will connect.







Not to scale

Not to scale

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NOTES:

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Minimum backdrop height shall be 1m

B3.2 - Access

12. Manhole diameters (Types A and B only) should be in accordance with Table B.1.

E2.29 - Precast Concrete Manholes

1. Precast concrete manhole units shall comply with the relevant provisions of BS EN 1917 and BS 5911-3 and shall be manufactured from concrete with a Design Chemical Class DC-4 unless the sewerage company can be satisfied that a lower class can resist attack from soils and goundwater. Units which bed into bases shall be manufactured so that imposed vertical loads are transmitted directly via the full wall thickness of the unit. The profiles of joints between units and the underside of slabs shall be capable of withstanding applied loadings from such slabs and spigot-ended sections shall only be used where the soffit of the slab is recessed to receive them.

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3. Precast concrete corbel slabs shall compy to BS5911-3 Table 5 and Figure 8

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2. Manhole covers on foul-only sewers shall be of low leakage types in order to prevent excessive surface water ingress.

3. As a minimum, Class D 400 covers shall be used in carriageways of roads (including pedestrian streets), hard shoulders, agricultural or recreational land and parking areas used by unrestricted types of road or pneumatic tyred agricultural vehicles.

4. Minimum frame depths for NRSWA road category Types 0 to 4 shall be as Table E 6. Manhole covers in shared driveways that could be subject to occasional loads from heavy vehicles (e.g., refuse vehicles) should meet the requirements for Type 4 roads.

5. Class B 125 shall be used in footways, pedestrian areas, driveways serving a single house and comparable locations.

6. In situations where traffic loading is anticipated to be heavier than would occur on a typical residential estate distributor road (i.e., braking or turning near a junction), a higher specification (E600) shall be used. This should comprise either a Class E600 cover or a D400 of a type that has been assessed and approved by the sewerage company as having sufficient additional ruggedness to ensure durability.

7. All manhole covers shall be the non-ventilating type and shall have closed keyways.

8. All manhole covers and frames shall be provided with a prising slot to facilitate their removal.

9. Covers with a clear opening greater than 1m shall comply with BS 9124. Aluminium covers shall not be used.

10. Safety grids, where supplied, shall comply with the requirements of BS 9124. When lifted they shall be secure in the upright position. Aluminium safety grids shall not be used.

E2.33 - Manhole Steps

1. Steps for manholes and other chambers shall be Type D Class 1, complying with the requirements of BS EN 13101.

2. Galvanized mild steel and plastic encapsulated steps are preferred.

E6.6 - Pipes and Joints Adjacent to Structures

1. Where rigid pipes are used, a flexible joint shall be provided as close as feasible to the outside face of any structure into which a pipe is built, within 150mm for pipe diameters less than 300mm. The design of the joints shall be compatible with any subsequent movement.

2. The recommended length of the next pipe (rocker pipe) away from the structure shall be as shown in Table E.13.

3. Stub pipes into structures shall be of rigid material.

E6.7 - Setting Manhole Covers and Frames

1. Manhole frames shall be set to level, bedded and haunched externally over the base and sides of the frame in mortar, in accordance with the manufacturer's instructions. The frame shall be seated on at least one course of Class B engineering bricks, on precast concrete masonry units or on precast concrete cover frame seating rings to regulate the distance between the top of the cover and the top rung to no greater than 675 mm. A mortar fillet shall be provided where the corners to an opening in a slab are chamfered and the brickwork is not flush with the edges of the opening.

2. Frames for manhole covers shall be bedded in a bedding mortar in all situations where covers are sited in NRSWA Road Categories 0, 1, 2 or 3 (i.e., all except residential cul-de-sacs).

STATUS: TENDER

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REV:	DESCRIPTION:	BY:	DATE:
P2	Issued for Tender	DM	25.05.21
P1	First Issue	DM	25.02.21

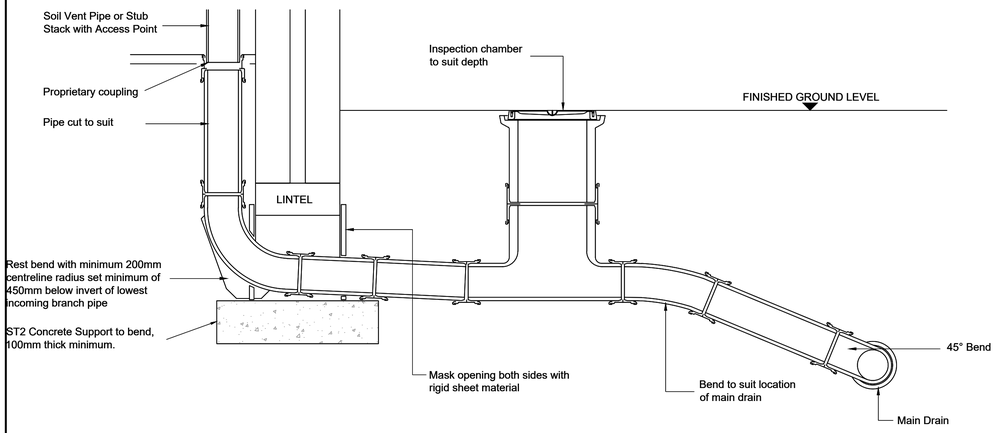
CLIENT: BURRINGTON HOMES (MIDLANDS) LTD

SITE: LAND AT HEMPTON ROAD DEDDINGTON

TITLE: DRAINAGE CONSTRUCTION DETAILS - SHEET 3

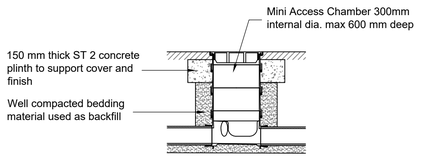
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
N.T.S	FEB 2021	DM	KR

PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	40.02	P2



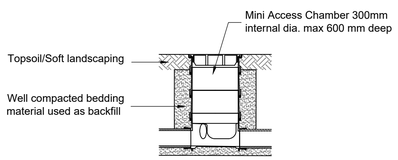
TYPICAL SECTION THROUGH HOUSE OUTLET ARRANGEMENT

MAX DEPTH 600mm
SCALE 1:20



SHALLOW INSPECTION CHAMBER DETAIL DEPTH NOT EXCEEDING 0.6m

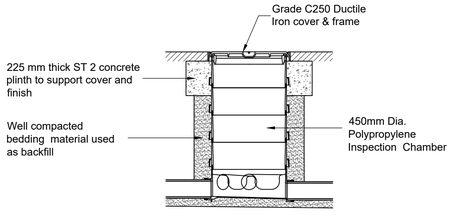
(Hard landscape Areas)



SHALLOW INSPECTION CHAMBER DETAIL DEPTH NOT EXCEEDING 0.6m

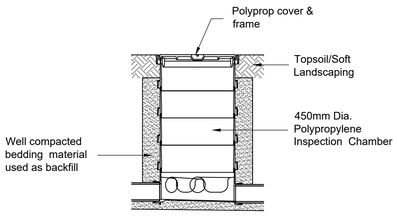
(Soft landscape Areas)

NOTE
WHERE DEPTH EXCEEDS 1.2m THE CLEAR OPENING IS TO BE REDUCED TO 350mm



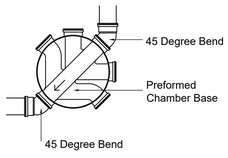
POLYPROPOLYENE INSPECTION CHAMBER DETAIL DEPTH NOT EXCEEDING 3.0m

(Trafficed Areas)



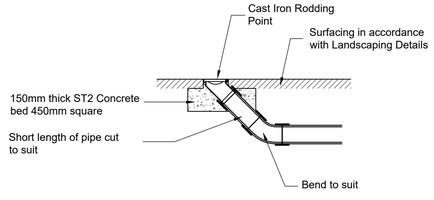
POLYPROPOLYENE INSPECTION CHAMBER DETAIL DEPTH NOT EXCEEDING 3.0m

(Non-trafficed/ landscape Areas)



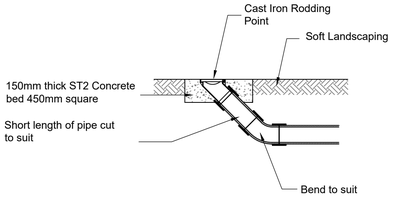
IC. - 90 DEG. CHANGE OF DIRECTION

SCALE 1:10



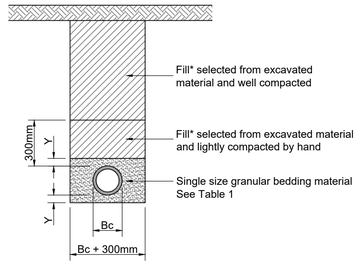
RODDING EYE DETAIL

(Hard landscape Areas)



RODDING EYE DETAIL

(Soft landscape Areas)



CLASS S BED AND SURROUND

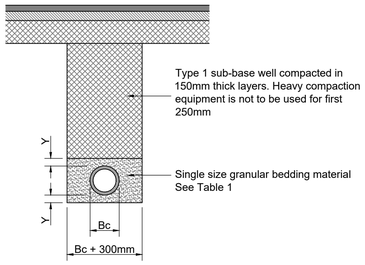
(Fields and Gardens)

TABLE 1: PROCESSED GRANULAR BEDDING AND SIDEFILL MATERIALS FOR FLEXIBLE PIPES

Pipe nominal bore (mm)	Aggregate Size	
	Graded	Single Sized
Not exceeding 140	-	4/10
Exceeding 140 but not exceeding 400	2/14 or 4/20	4/10, 6/10 or 10/20
Exceeding 400	2/14, 4/20 or 4/40	4/10, 6/14, 10/20 or 20/40

NOTES

1. Table in accordance with BS EN 13242 Coarse aggregate for pipe bedding, haunching and surrounding material.
2. Coarse aggregate materials shall be in accordance with the relevant provisions of MCHW Volume 1, Series 500, Clause 503



CLASS S BED AND SURROUND

(Trafficked Areas)

Dimension Y

In machine-dug uniform soils:

Y = For sleeve jointed pipes a minimum of 50mm or ⅜ Bc whichever is the greater; for socketed pipes a minimum of 100mm or ⅜ Bc,whichever is the greater under barrels but not less than 50mm under sockets.

In rock or mixed soils containing rock bands, boulders, large flints or stones or other irregular hard spots:

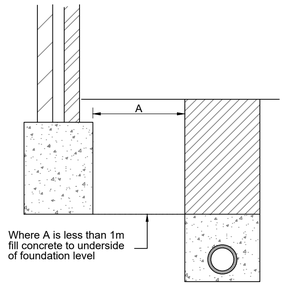
Y = For sleeve jointed pipes a minimum of 150mm or ⅜ Bc whichever is the greater; for socketed pipes a minimum of 200mm or ⅜ Bc,whichever is the greater under barrels but not less than 150mm under sockets.

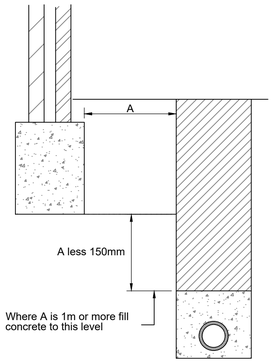
* Selected Fill:

Selected fill, whether selected from locally excavated material or imported, shall consist of uniform, readily compactable material, free from vegetable matter, building rubbish and frozen material, or materials susceptible to spontaneous combustion, and excluding clay of liquid limit greater than 80 and/or plastic limit greater than 55 and materials of excessively high moisture content. Clay lumps and stones retained on 75mm and 37.5mm sieves respectively shall be excluded from the backfill material.

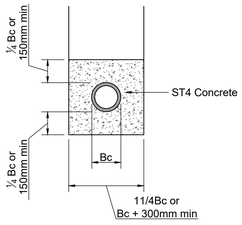
NOTES:

1. DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS STATED OTHERWISE.
2. ALL PRIVATE DRAINAGE WORKS SHALL BE IN ACCORDANCE WITH BRITISH STANDARD EN 752 AND RELEVANT SECTIONS OF APPROVED DOCUMENT H OF THE BUILDING REGULATIONS.
3. ALL PIPES TO BE CLAY TO BS EN 295 OR UPVC TO BS EN 1401 UNLESS OTHERWISE NOTED.
4. WHERE COVER TO CROWN OF PIPES IS LESS THAN 900mm IN TRAFFICKED AREAS AND 600mm IN NON-TRAFFICKED AREAS THEN BED AND SURROUND TYPE Z SHALL BE USED.
5. PIPE CONNECTIONS NOT TO INSPECTION CHAMBERS SHALL BE Y BRANCHES SWEPT IN THE DIRECTION OF FLOW, WITH RODDING ACCESS TO THE HEAD OF THE PIPE.
6. SVP AND WC CONNECTIONS SHOULD BE TO THE MAIN CHANNEL CONNECTION OF INSPECTION CHAMBERS WHERE PRACTICABLE



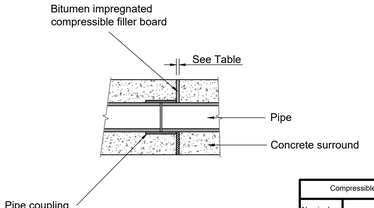


PIPE RUNS NEAR BUILDINGS



CLASS Z CONCRETE SURROUND

THIS DETAIL IS TO BE USED WHERE DEPTH TO PIPE SOFFIT IS LESS THAN: ROADS 1.2m, DRIVEWAYS 0.9m AND SOFT LANDSCAPING 0.6m



Compressible Filler Material		
Nominal Pipe Dia.	Hydrocell	Bitumen Impregnated Board
100 - 300	15mm	18mm
350 - 450	20mm	24mm
465 - 750	35mm	36mm

CLASS Z SURROUND DETAIL AT EACH PIPE JOINT

REVISION NOTES:
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

STATUS: TENDER

EXPEDITE
Exeter
The Design Studio
35 Southernhay East
Exeter
EX1 1NX
t: 01392 691 631
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REV:	DESCRIPTION:	BY:	DATE:
P2	Issued for Tender	DM	25.05.21
P1	First Issue	DM	25.02.21

CLIENT: BURRINGTON HOMES (MIDLANDS) LTD

SITE: LAND AT HEMPTON ROAD, DEDDINGTON

TITLE: DRAINAGE CONSTRUCTION DETAILS - SHEET 6 PRIVATE DRAINAGE

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
N.T.S	FEB 2021	DM	KR

PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	40.06	P2

Appendix E

Report Title:

Phase 2 Geo-Environmental Site Investigation

Project Name:

Hempton Road, Deddington

Report Reference: **BRD3567-OR2-A**

Date: **January 2020**

BRD Environmental Ltd
Hawthorne Villa, 1 Old Parr Road,
Banbury, Oxfordshire, OX16 5HT
01295 272244 info@brduk.com
www.brduk.com

REPORT CONTROL SHEET

REPORT TITLE	**PHASE 2 GEO-ENVIRONMENTAL SITE INVESTIGATION**
PROJECT	**HEMPTON ROAD, DEDDINGTON**
CLIENT	**PEMBURY ESTATES LIMITED**

REPORT REFERENCE	ISSUE DETAIL	DATE	PREPARED BY	CHECKED BY
BRD3567-OR2-A	First Issue	31/01/2020	J Hand & A Leon	B Devonshire

BRD Environmental Limited

Geotechnical and Environmental Services

- Ground Investigation
- Japanese Knotweed Removal
- Soil, Water and Gas Testing
- Contamination Assessment
- Geotechnical Advice
- Remediation Solutions

Hawthorne Villa, 1 Old Parr Road, Banbury, Oxfordshire. OX16 5HT
T: 01295 272244 www.brduk.com info@brduk.com

REPORT LAYOUT

This report is divided into the following four sections: Summary Report, Technical Report, Supporting Information and Appendices.

SUMMARY REPORT

This expanded executive summary provides the main findings of the work undertaken in brief non-technical language. This section provides an overview of the key outcomes for the benefit of non-specialists and concludes with the main recommendations. This section should only be relied upon in the context of the whole report and the Technical Report should be referred to with respect to any design decisions.

TECHNICAL REPORT

The main report section is intended to provide the technical detail of the investigation and is intended to provide the level of information required by current guidance documents and practice. The Technical Report is written in a language that, in part, assumes knowledge of subject matter so that it can be written in as concise a form as possible. Its intended audience is peers, regulators and other professionals in related disciplines.

SUPPORTING INFORMATION

This section of the report provides background details of a generic nature together with specific technical approaches adopted by BRD and details of the guidance documents that are commonly referenced in the report. The section also includes explanations of technical terms to assist non-specialist readers in understanding the Technical Report. It should be noted that not all the information within this section is necessarily applicable to this specific report.

APPENDICES

The final section of the report presents the factual data collected and employed as part of the investigation.

APPENDIX 1	**SITE PLANS**	
	Site Location Plan	Ref. BRD3567-OP2-A
	Revised Conceptual Site Model	Ref. BRD3567-OP7-A
	Proposed Development Layout	AT Architecture, 'Illustrative Concept Plan', ref. A_1807 P100 rev. D, date: 14.05.2019
	Exploratory Point Plan	Ref. BRD3567-OD1-A
	Foundation Zoning Plan	Ref. BRD3576-OD3-A
APPENDIX 2	**EXPLORATORY HOLE**	
	Logs of trial pits	Ref. TP01 - TP17
	Photographic records of trial pits	Ref. BRD3567-OP5-A
	TP12 Cross section	Ref. BRD3567-OD2-A
APPENDIX 3	**LABORATORY TEST RESULTS**	
	DETS reports 19-14862, 19-17332 & 19-17333	18 x A4 pages
	CLEA Model – Arsenic Assessment worksheet	16 x A4 pages
	SPT reports 36020 & 36282	14 x A4 pages

SUMMARY REPORT - GENERAL INFORMATION

SUBJECT	COMMENTS
CURRENT SITE CONDITION	The site currently comprises two fields with an access track. The southern most field (Field A) containing a barn in the north east corner and the field is slightly overgrown, the field to the north (Field B) is accessed by a grassy track and is currently in use agriculturally.
PROPOSED DEVELOPMENT	It is proposed that the site will be developed with 21No. residential properties, together with associated gardens access, garages and landscaping.
HISTORICAL SUMMARY	The earliest available map indicates the south west corner of the site was previously used as an old quarry. The timeline of the backfilling of the quarry is ambiguous as the mapping indicates this has been completed by 1974, but some anecdotal evidence would suggest that it was later. Throughout the 20th Century the site appears to have primarily been used agriculturally. A farm building was constructed by 1974 but subsequently demolished and another building constructed by 1994. The site has remained relatively unchanged since.
PUBLISHED GEOLOGY	The site is shown to be devoid of superficial deposits. The shallowest bedrock unit is shown to be Marlstone Rock Formation in the southern extent of the site and the Whitby Mudstone Formation in the northern extent of the site.
ACTUAL GROUND CONDITIONS	The investigation has proved a large proportion of the site, underlying the topsoil is backfilled material comprising reworked ironstone to a significant depth. Beneath the fill, the Marlstone Rock Formation was identified as the underlying bedrock in majority of the site other than two locations in the southern extent of the site, where the clays of the Dyrham Formation were encountered.
HYDROGEOLOGY	The underlying bedrock geology is designated a Secondary A Aquifer. The site is not located within a groundwater Source Protection Zone.
HYDROLOGY	The closest water feature to the site is a drainage ditch approximately 270m south west of the site. The site is not in an area indicated to be at risk of flooding.
PREVIOUS GROUND REPORTS	Mewies Engineering Consultants Ltd (M-EC) conducted infiltration tests within two trial pits in the south east corner of the site during June 2018. Additionally, BRD has undertaken geo-environmental desk study research and this has been reported separately.

SUMMARY REPORT - GEOTECHNICAL

SUBJECT	COMMENTS
EXCAVATIONS	It should be possible to forward excavations employing normal equipment. Specific groundwater control unlikely to be required at this site. It is unlikely that requirements of the Party Wall Act will apply to the development.
SLOPE STABILITY	It is considered that slope stability is unlikely to be a concern at this site.
SUB-SURFACE CONCRETE	Design Sulphate Class of DS-1 and Aggressive Chemical Environment for Concrete class of AC-1s applies.
SOAKAWAYS	An infiltration basin is proposed for the south eastern corner. Other forms of soakaways are not suitable for the site.
PAVEMENT DESIGN	A preliminary design California Bearing Ratio (CBR) of less than 2% has been recommended. In areas of deep Made Ground, the use of geo-grid should be used to re-inforce the sub-base
FOUNDATIONS	
LIKELY FOUNDATION TYPE	Extreme South & Eastern site boundaries: these parts of the site should be suitable for the adoption of shallow strip/trench fill footings with foundations taken through Made Ground/topsoil to bear upon the Marlstone Rock Formation and/or Dyrham Formation. Majority of the site: Due to the presence of deep Made Ground across most of the site a foundation solution incorporating piles or ground improvement will be required.
VOLUME CHANGE POTENTIAL	Made Ground: Non shrinkable soils. Marlstone Rock Formation: Non shrinkable soils (assumed as is recorded as a coarse soil). Dyrham Formation: Medium i.e. moderate swelling or shrinking with moisture content changes.
ESTIMATED FOUNDATION DEPTHS	Extreme South & Eastern site boundaries • Marlstone Rock Formation: The minimum foundation depth required is to found below the Topsoil/Made Ground. • Dyrham Formation: the minimum footing depth required is 0.90m, but 1.25m where required to allow for restricted new tree planting. Majority of the site; Pile lengths or ground treatment depths to be determined by specialist piling contractor.
HEAVE PROTECTION	Will be required for a minimum number of plots located in the southern boundary in close proximity to the existing hedge.

SUMMARY REPORT – CONTAMINATION ISSUES

SUBJECT	COMMENTS
SOIL RISKS TO HUMAN HEALTH	No unacceptable contamination in respect of human health has been identified by this investigation. However there is a localised area of buried ashy soils in the south western corner which may present a risk if future residents become exposed to it. In addition, there remains the potential for low levels of contamination beneath the existing building.
LANDFILL GAS	No plausible sources of landfill gas have been identified.
RADON GAS	Full radon gas protection measures are required.
RISKS TO THE WATER ENVIRONMENT	No unacceptable contamination risks to water resources have been identified by this investigation.
RISKS TO BUILDING MATERIALS AND SERVICES	No unacceptable contamination risks to building materials and services have been identified by this investigation.
REMEDIATION	No remedial works are considered necessary to facilitate the development at this stage. However, subject to the proposed additional investigation, localised remedial measures, such as capping layers, may be required.
ASBESTOS	No asbestos has been detected in the soil samples tested. However, parts of the asbestos cement sheeting on the lean-to structure of the barn was in poor condition and it is anticipated that some asbestos cement fragments may be present on the surface in this area. All asbestos fragments will be required to be removed off-site during the preliminary site clearance works.
WASTE SOIL DISPOSAL	It is considered that the any natural sub-soils disposed of from the site would be classified as 'non-hazardous waste' and would be characterised for disposal to landfill as 'inert waste'. A localised area of buried ashy soils in the south western corner of the site will be classified as hazardous waste.

SUMMARY REPORT – KEY RECOMMENDATIONS

RECOMMENDATIONS
It is recommended that this report is submitted to the planning department of the Local Authority, the organisation undertaking the Building Control function and warranty providers to confirm that the investigation completed to date is satisfactory. If required, in order to confirm deeper ground conditions for pile design further ground investigation comprising deep combined rotary cable percussive boreholes is recommended. It is suggested that 2No. boreholes are drilled to depths of 18m. Monitoring wells should be included in the boreholes and at least one post work monitoring visit should be undertaken to record groundwater levels. Insitu Standard Penetration Tests should be conducted during forwarding of the boreholes and collected soil samples submitted for appropriate geotechnical laboratory testing. It is also recommended that additional ground investigation in the form of trial pits is undertaken around the position of TP03 to further assess the extent and depth of the buried ashy material in this location and undertake additional lead testing from the soils to confirm if any risk is presented to future residents. In addition, following the demolition of the existing building, further exploratory holes should be completed in this area to determine whether or not there are any contamination risks.

1. INTRODUCTION TO TECHNICAL REPORT

1.1. CONTRACT DETAILS

CLIENT	Pembury Estates Limited.
SITE	Land situated north of Hempton Road in the village of Deddington, Oxfordshire.
CLIENT'S ADVISORS	BRD Environmental Limited (BRD) has been commissioned by Webb Developments Ltd on behalf of the Client.
REPORT CONTEXT	It is understood that the Client intends to develop the site for residential housing.
REPORT TYPE	Geo-environmental site investigation (i.e. combined geotechnical ground investigation and Phase 2 contamination assessment).
REPORT OBJECTIVES	The purpose of the report is to undertake a Phase 2 contamination assessment to meet the requirements of Condition 6 of the Planning Permission issued by Cherwell District Council referenced 18/2147/OUT. The site has been the subject of a desk study referenced as follows: • 'Phase 1 Environmental Desk Study – Hempton Road, Deddington', BRD Environmental Ltd, report ref. BRD2567-OR1-A, dated October 2019. The purpose of the report is to present the findings of a ground investigation, and to present both geotechnical and contamination assessments of the ground conditions revealed.

1.2. SCOPE OF WORKS

1.2.1. Initial Investigation works

The agreed scope of works was:

- Mobilisation to site and production of health and safety documentation.
- One day of trial pitting using a mechanical excavator to provide approximately 8-10No. trial pits to a nominal depth of 3m, ground conditions permitting. We have allowed for the provision of a hydraulic breaker to confirm the consistency of any exposed intact bedrock.
- All exploratory points will be logged and sampled in general accordance with BS5930:2015 by supervising Geo-Environmental Consultant. In-situ geotechnical testing of fine soils using a Hand Shear Vane and/or Pocket Penetrometer.
- A photo-ionisation detector (PID) will be used during the site works to assist in identifying and delineating any volatile organic contamination.
- Determination of the location of exploratory points by tape measurements or the use of a handheld recreational GPS unit.

- Chemical testing of soil samples with the budget based on the following testing schedule:

    - 8No. Metals Suite - As, Cd, Cr, CrVI, Hg, Pb, Se, Cu, Ni and Zn.
    - 6No. Additional As tests (as the geology is naturally elevated in Arsenic).
    - 8No. Inorganics Suite – water soluble sulphate, pH, organic matter.
    - 8No. Speciated Polycyclic Aromatic Hydrocarbons (PAH).
    - 4No. Banded aliphatic/aromatic Total Petroleum Hydrocarbons (TPH).
    - 4No. Benzene, Toluene, Ethylbenzene, Xylene (BTEX) and Methyl Tertiary Butyl Ether (MTBE) compounds.
    - 2No. Semi-Volatile Organic Compounds (SVOC) suite.
    - 4No. Asbestos quantification.

- Geotechnical testing as appropriate to the nature of the ground conditions encountered, but the budget is based on the following testing schedule:

    - 4No. Moisture content.
    - 4No. Plasticity indices.
    - 2No. Particle size distribution by wet sieve.
    - 5No. pH and water soluble sulphate analysis.
    - 5No. Total sulphate and sulphur analysis.

- Provision of a combined factual and interpretative investigation report. Factual findings to include all exploratory point records and test results. Interpretative reporting to include a summary of information from desk study research, a Generic Quantitative Contamination Risk Assessment (GQRA), waste classification and a preliminary Geotechnical Assessment providing comments on pavement design, concrete classification, soakaway feasibility, foundation design recommendations.

1.2.2. Additional Investigation Works

The trial pitting conducted as part of the initial scope identified backfill comprising reworked soils extending to depth across a large proportion of the site and did not fully expose the underlying bedrock. Additionally the site soils were found to be naturally elevated in arsenic due to the underlying Marlstone Rock Formation. To address these outstanding issues a further scope of works was proposed and is outlined below:

- Mobilisation to site and production of health and safety documentation.

- One day of trial pitting using a larger 13T tracked mechanical excavator. The exact number of pits will depend on the depth of backfill and whether any benching of excavations is required or not.

- All exploratory points will be logged and sampled in general accordance with BS5930:2015 by supervising Geo-Environmental Consultant. In-situ geotechnical testing of fine soils using a Hand Shear Vane and/or Pocket Penetrometer.

- Determination of the location of exploratory points by tape measurements or the use of a handheld recreational GPS unit.

- Additional geotechnical testing as appropriate to the nature of the ground conditions encountered, but the budget is based on the following testing schedule:

    - 3No. Moisture content.
    - 3No. Plasticity indices.
    - 2No. pH and water soluble sulphate analysis.
    - 2No. Total sulphate and sulphur analysis.
    - Incorporate findings into main initial investigation report.

- Chemical testing of soil samples with the budget based on the following testing schedule:
    - 2No. BARGE tests to determine arsenic bioavailability.
    - Undertake a bioaccessibility assessment in respect of arsenic to determine site specific assessment criteria (SSAC).
- Incorporate findings into existing investigation report.

1.3. REPORT LIMITATIONS

Any site boundary lines depicted on plans included within this report are approximate only and do not imply legal ownership of land. Any observations of tree species, asbestos containing materials within structures or invasive weeds, does not constitute a formal survey of such features. The identification of such features is therefore tentative only. In the case of Japanese Knotweed, BRD can undertake separate surveys for this plant undertaken by a Property Care Association qualified surveyor.

The report does not consider whether sensitive ecology or archaeology is present as these require consideration by professionals specialising in these matters. It should be recognised that the collection of desk study information may not be exhaustive and that other information pertinent to the site may be available.

The recommendations, interpretations and conclusions of this report are based solely on the ground conditions found at the exploratory holes. Due to the variability in the nature of ground, conditions between exploratory holes can only be interpreted and not defined. The description of the site and the ground conditions is accurate only for the dates of the field works. In particular, groundwater levels can vary due to seasonal and other effects.

The assessment and interpretation of contamination risks is based on the scope of works agreed with the Client together with the budgetary and programme constraints imposed. Further investigation, analysis and assessment of contamination may be required by regulators or other third parties with an interest in the site. An ecological risk assessment of contaminated soils is beyond the scope of this report. This report is concerned with assessing those contamination risks which apply to the future use of the site through the proposed development as part of the planning regime. The assessment does not consider the risk to current site users or continued future use of the site in its current state. If development of the site should occur that differs from that proposed, then the findings of the contamination assessment would need to be re-evaluated.

At the time of writing, detailed information on the proposed structure, such as detailed layout, loadings and serviceability limits, was not available. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules. The scope of this investigation excludes a formal slope stability study and any observations made regarding slopes are for information only.

2. SITE CHARACTERISTICS

2.1. SITE SETTING

SITE ADDRESS AND POST CODE	Hempton Road, Deddington, Oxfordshire.
NATIONAL GRID REFERENCE	445970E, 231830N.

2.2. SITE DESCRIPTION

SUBJECT	COMMENTS
CURRENT SITE DESCRIPTION	For the purpose of this report in discerning difference in characteristics, the site has been divided into two areas Field A and Field B. Field A is located in the south west extent of the site. A barn with a lean-to is located in the north east corner of Field A and is used for storage. The remaining field area has not been in use recently and therefore slightly overgrown. Field B is in use agriculturally and located to the north of Field A, with an access track covered in grass along the eastern boundary of Field A. Field B continues north beyond outlined boundary for planning.
SURROUNDING LAND USE	The site is set in a rural area of agricultural fields but residential areas are present to the south and east.
PROPOSED DEVELOPMENT	It is proposed that the site will be developed with 21No. residential properties, together with associated gardens, access, garages and landscaping.
HISTORICAL SUMMARY	The earliest available map indicates the south west corner of the site was previously used as a quarry. The timeline of the backfilling of the quarry is ambiguous as the mapping indicates this has been completed by 1974, but some anecdotal evidence would suggest that it was later. Throughout the 20th Century the site appears to have primarily been used agriculturally. A farm building was constructed by 1974, which was later demolished and a new farm building is shown in the north east corner of Field A in 1994. The site has remained relatively unchanged since.
PUBLISHED GEOLOGY	The site is shown to be devoid of superficial deposits. The shallowest bedrock unit is shown to be the Marlstone Rock Formation in the southern extent of the site and the Whitby Mudstone Formation in the northern extent of the site.
RADON	Full radon protection measures are required.
HYDROGEOLOGY	The site is situated upon a Secondary A aquifer. The site is not located within a groundwater Source Protection Zone.

SUBJECT	COMMENTS
HYDROLOGY	The closest water feature to the site is a drainage ditch approximately 270m south west of the site. The nearest river is the River Cherwell located approximately 4km east of the site. The site is not in an area indicated to be at risk of flooding.

2.3. PREVIOUS INVESTIGATIONS

Mewies Engineering Consultants Ltd (M-EC) conducted infiltration testing during June 2018. The site has also been the subject of geo-environmental desk study research by BRD in and this has been reported separately. The relevant investigations are referenced as follows:

- 'Phase 1 Geo-Environmental Desk Study – Hempton Road, Deddington', BRD Environmental Ltd, ref. BRD3567, dated October 2019.
- 'Infiltration Test Results – Hempton Road Deddington Oxfordshire', Mewies Engineering Consultants Ltd, ref. 23933/06-18/6075, date: 18/06/2018.

2.3.1. Phase 1 Geo-Environmental Desk Study – Hempton Road, Deddington

The Desk Study of the comprised desk based research and site walk over. The primary finding was that part of the site was historically used as an old quarry and has since been backfilled.

At the time of the Desk Study the nature of the fill was unknown, and it was determined that potentially contaminative material may have been present and pose a possible risk to human health, the water environment, building structures and water pipes. Additionally, it was considered that complications may arise when designing and constructing foundations for the proposed development. Furthermore, potential limited contamination was identified as a result of the debris observed on the site within the vicinity of the barn and through the process of burning of material previously conducted on the site. The vast majority of site used agriculturally was considered unlikely to be significantly contaminated, however the underlying soils were identified to have potential to be naturally elevated in arsenic, chromium and nickel.

The published geology of the site indicated that there may be a transition in the bedrock in the northern extent of the site from the Marlstone Rock Formation to the Whitby Mudstone Formation.

This current report should be read in conjunction with the previous desk study report.

2.3.2. Infiltration Test Results – Hempton Road, Deddington, Oxfordshire

Mewies Engineering Consultants Ltd (M-EC) conducting infiltration testing in the south east corner of the site during June 2018. The investigation comprised the excavation of two trial pits, SA01 and SA02, to depths of 1.60m and 2.00m respectively. 10No. soakaway tests were completed within the Marlstone Rock Formation, where 3No. tests were undertaken at SA01 and 7No. tests were undertaken at SA02.

The ground conditions recorded from the excavations identified topsoil to a maximum depth of 0.2m bgl comprising reddish brown clayey, gravelly sand with occasional cobble sized pockets of soft brown clay. The topsoil was recorded to be underlain by the Marlstone Rock Formation comprising reddish brown, gravely sand, with an increased gravel component of ironstone cobbles and boulders from 0.6m bgl to the base of the pit.

The investigation identified the Marlstone Rock Formation on the site to be of high permeability with measured rates between 7.77×10^{-4} and 7.35×10^{-3} m/s.

3. GROUND INVESTIGATION

3.1. INVESTIGATION DESIGN

METHODOLOGY	Trial pits were selected as the appropriate technique for the site to expose more of the soils, and as such provide a greater indication of the ground conditions. The trial pits were positioned to determine the nature and extent of the historic quarry. Several trial pits were also undertaken in Field B to identify any naturally occurring elevated metals, and provide geotechnical information of the natural ground in this area. A change in the geological bedrock was anticipated within this area of the site from the desk based research. The initial part of the investigation identified backfill comprising reworked ironstone to depth over a large proportion of the site and failed to expose the bedrock In several locations. To determine the full extent of the backfill and the depth of the underlying bedrock, further trial pitting was conducted with a larger 360º excavator. Where Field B continues north beyond outlined boundary for planning, two trial pits (TP16 & TP17), were conducted to determine if the underlying soils in this area were natural bedrock or reworked ironstone. The trial pits undertaken provided a sufficient number of soil samples to be tested for contamination and geotechnical assessment purposes.	
DATES OF SITE WORKS	The main field works were undertaken on 16th October 2019 and 10th December 2019.	
CONSTRAINTS TO EXPLORATORY HOLE LAYOUT	The storage building is currently located in the north east corner of Field A with hardstanding from the front of the building to the road. No trial pits were conducted in this part of the site.	
EXPLORATORY HOLE SPACING	Approximately 20m spacing.	
LAYOUT RATIONALE	**SOURCE / FEATURE**	**EXPLORATORY HOLE**
CONTAMINATION SOURCES TARGETED	Old quarry	TP01-TP05
	Naturally elevated metals	TP06-TP10
GROUND FEATURES TARGETED	Old quarry	TP01-TP05, TP11-TP17
	Change in bedrock	TP06-TP08

CONTAMINATION SAMPLING PLAN	Based on the proposed end use, the sampling and analysis plan is more positively biased towards near surface and shallow sub-soil samples as these represent the soils most likely to be available to future site users. Where applicable, the sampling has been focussed on soils displaying evidence of contamination as well as soils below or adjacent to such contamination to confirm the degree of migration, if any. The analytical frequency has been increased for samples around the anticipated location of the old quarry as these represent the most likely area for contamination.
ANALYSIS PLAN	Given the history of the site as a quarry within the Phase 1 contamination assessment, testing for a range of contaminants including semi-volatile organic compounds (SVOCs) was undertaken in samples at a range of depths primarily within Field A. As the site has shown to be underlain by the Marlstone Rock Formation associated with elevated arsenic, additional testing for arsenic hase been included to identify any naturally occurring contamination across the area of the site. Furthermore, tests were conducted to assess the bioavailability of the naturally occurring elevated arsenic.

3.2. BRD FIELDWORK

TRIAL PITS	
REFERENCES	TP01 to TP10.
DEPTH RANGE	From 2.30m to 3.10m.
EXCAVATOR	JCB 3CX style wheeled backactor.
BACKFILL	All the trial pits were backfilled with arisings upon completion and compacted with rams of the excavator bucket.

ADDITIONAL TRIAL PITS	
REFERENCES	TP11 to TP17.
DEPTH RANGE	From 2.95m to 3.50m
EXCAVATOR	Tracked 13 Tonne 360° excavator.
BACKFILL	All the trial pits were backfilled with arisings upon completion and compacted by the excavator driving back and forth over the pit locations.

3.3. LABORATORY TESTING

GEOTECHNICAL TESTING	
The soil samples for geotechnical testing were forwarded to the laboratory of Soil Property Testing Ltd with pH and sulphate analysis undertaken at the laboratory of DETS Ltd. The geotechnical testing suite is detailed below. The UKAS accreditation of the individual test methods is shown on the laboratory test report included in the Appendices.	
TEST	**NUMBER OF SAMPLES TESTED**
Moisture content	5
Liquid and plastic limits	5
Particle size distribution by wet sieve	3
pH and Water soluble Sulphate	7
Total Sulphur and Sulphate	7

SOIL CHEMICAL TESTING	
The soil samples for contamination and/or chemical geotechnical testing were forwarded to the laboratory of DETS Ltd and the testing suite is detailed below. The UKAS or MCERTS accreditation of the individual test methods is shown on the laboratory test report included in the Appendices.	
SOIL TESTS	**NUMBER OF SAMPLES TESTED**
Arsenic, Cadmium, Chromium, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Zinc	8
Additional Arsenic testing	6
Speciated Polycyclic Aromatic Hydrocarbons (PAH)	8
Total Petroleum Hydrocarbons (TPH) with full carbon banding and aliphatic/aromatic split	4
Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) plus Methyl Tert Butyl Ether (MTBE)	4
Organic Matter, Water soluble Sulphate and pH	8
Asbestos Identification	4
Semi-Volatile Organic Compounds (SVOCs)	2
Arsenic bioavailability	2

4. GROUND CONDITIONS

4.1. OVERVIEW

The published geology indicated that the site was largely underlain by the Marlstone Rock Formation, and an area in the north of the site was underlain directly by the Whitby Mudstone Member. However, the Whitby Mudstone Member was not encountered during the investigation of the site.

Across a large proportion of the site, underlying the topsoil is backfilled material comprising reworked ironstone to a significant depth of typically around 3m. These loose deposits extended further north than anticipated and extending beneath part of the field. Beneath the Made Ground, the Marlstone Rock Formation was identified as the underlying bedrock in majority of the site other than two locations in the southern extent of the site, where the clays of the Dyrham Formation were encountered.

Details of the various stratigraphic units encountered are given in the following sections.

4.2. ARTIFICIAL GROUND

Hard standing is present at the surface in the eastern area of Field A leading from the access gate to the barn, comprising a concrete drive. No exploratory holes were completed in this area at this time.

A disused water tank is present adjacent to the west of the barn, and is present to a depth of approximately 2m below ground level.

4.3. TOPSOIL

A layer of topsoil or reworked topsoil is present across all of the open field areas of the site and extends to depths in the range 0.20m to 0.35m. It typically comprised 'dark brown sandy, gravelly clay with gravel of fine to coarse limestone and ironstone with frequent rootlets'.

In the south western section of the site the reworked topsoil was noted to be slightly thinner and poorer quality.

4.4. MADE GROUND

In the south western section of the site Made Ground was encountered to depths ranging from 1.2m along the southern boundary to 3.0m in the central and northern area. This soil comprised predominantly reworked ironstone material with typically a clayey upper layer (<1.0m) overlying loose gravel and cobbles of ironstone until the solid bedrock was encountered.

The exception was In TP03 a layer of dark grey to black gravelly sand of ash and clinker was identified from 0.7m to 1.3m bgl including several glass bottles, ceramic and bone.

In the field to the north, loose backfill was also encountered in TP06, TP07 and TP08 to depths of 3.0m. However, given the age of the former quarry, it would seem unlikely that it would have extended to this scale. It is therefore possible that this could be representative of heavily weathered Marlstone Rock, but behaving in the same manner as the backfilled soils elsewhere.

To determine the outer edge of the quarry area a long trial pit (TP12) was undertaken identifying a change from loose reworked ironstone in the west of the pit to layered natural bedrock in the eastern extent of the pit. The transition here from bedrock to the loose Made Ground indicates the edge of the former quarry or loose ground, and at this location, approximately aligns with the eastern boundary of Field A.

4.5. BEDROCK

4.5.1. Marlstone Rock Formation

The Marlstone Rock Formation was encountered at shallow depths in the range 0.30m to 0.7m in the eastern strip of the site. In TP02 towards the south eastern corner it was encountered at 1.20m.

TP11 and TP16 also encountered what is considered to be natural Marlstone but in a loose heavily weathered state and this was encountered at beneath the topsoil.

Elsewhere, the Marlstone was encountered as a layer of competent bedrock at the base of the backfill at depths of 2.90m to 3.0m.

Where encountered at shallow depth in the eastern sections, the Marlstone was described as 'medium dense to dense brown sandy clayey GRAVEL and COBLES of fine to coarse angular tabular ironstone'. With depth the soils became increasingly difficult to excavate. In TP11 and TP16 the soils were similar in makeup but loose and prone to collapse. Increasing boulders were encountered at depth in both cases.

The solid bedrock was not possible to excavate very far, but was described as 'strong light brown ironstone bedrock present as a continuous slab'.

4.5.2. Dyrham Formation

At locations of trial pits TP03 and TP14 within Field A the bedrock encountered was identified as the Dyrham Formation comprising 'firm, greyish brown, slightly gravelly clay' at depths of 1.3m and 3.0m, respectively. This is where the Marlstone Rock Formation thins and the underlying formation is exposed.

4.6. GEOTECHNICAL COMMENTS

The deep Made Ground present across a large part of the site was prone to large scale collapse of the gravel and cobbles of ironstone. In addition, the heavily weathered Marlstone Rock identified in TP11 and TP16 was also noted to be loose and prone to some collapse.

The underlying Marlstone Rock Formation is at depths of approximately 3.0m bgl and greater within the central and northern areas of the site, comprising at depth a strong, ironstone rock slab.

4.7. CONTAMINATION OBSERVATIONS

The layer of Made Ground within TP03 was visibly black in colour containing ash and clinker.

No visual or olfactory evidence of contamination was noted during the forwarding of all other exploratory holes.

4.8. GROUNDWATER BEHAVIOUR

Groundwater was not encountered whilst forwarding the exploratory holes.

5. GEOTECHNICAL PROPERTIES

5.1. COARSE SOIL PARAMETERS

5.1.1. Particle Size Distribution

The grading curves of the three samples of Made Ground subject to PSD determination revealed the soil to be poor graded, clayey, sandy gravel with a fines content ranging from 6% to 16%.

5.2. FINE SOIL PARAMETERS

5.2.1. Index Property Testing

SOIL TYPE	Made Ground.
PLASTICITY INDEX (PI)	Oversize particles present.
MODIFIED PI	7% - 8% (Three samples: Non-shrinkable). 12% (One sample: Low volume change potential).
NHBC CLASS	Non shrinkable soil type.

SOIL TYPE	Dyrham Formation.
PLASTICITY INDEX (PI)	27%
MODIFIED PI	Not applicable – no oversize particles.
NHBC CLASS	Medium volume change potential.

5.3. SULPHATE AND pH

	MADE GROUND AND MARLSTONE ROCK FORMATION			
	Sulphate		pH	
Characteristic Value	100 mg/l		7.6 units	
Justification	Mean of highest 20% results rounded to nearest 100mg/l.		Mean of lowest 20% results.	
	No. of tests	Results Range	No. of tests	Results Range
Soil	15	<10 – 84 mg/l	15	7.3 – 8.0 units
Groundwater	-	N/A	-	N/A
Total Potential Sulphate	7	Not applicable as pyrite unlikely in the samples tested.		

The Dyrham Formation was not tested for sulphate and pH as part of this ground investigation.

6. GEOTECHNICAL ASSESSMENT

6.1. INTRODUCTION

The following advice and recommendations are based on the construction of 21No. residential properties. The proposed development layout plan is included in Appendix 1. From assessment of the nature of the ground conditions and the type of proposed structures, it is considered that the situation falls within EC7 Geotechnical Category 1.

Should the nature of the development be changed then the results of this investigation would need to be reviewed and reassessed.

6.2. EXCAVATIONS

STABILITY	Any excavation requiring man entry should be battered back to a safe angle, supported by an appropriate proprietary trench support system or adequately shored to provide safe working conditions. Shoring to any excavation requiring man entry must be designed by a suitably qualified and experienced engineer. Any support system will require regular inspection as detailed in published guidelines to ensure the excavation support is adequate and appropriate for the ground conditions present. Most of the site has a cover of deep Made Ground and it is anticipated that excavations will be prone to sidewall collapse and will require temporary support to remain open. Excavations within the Marlstone Rock Formation may suffer from the catching of boulders with the excavator bucket then pulling in the trench sides. The presence of rock bands or large boulders within this formation may make it necessary to employ a larger excavator or hydraulic breaker equipment on occasions. Narrow trench excavations in the clay soils of the Dyrham Formation will remain relatively stable and open for short periods, but minor spalling of side walls could still occur.
EQUIPMENT	It should be possible to progress excavations with conventional equipment. The removal of sub-surface structures following demolition will require the use of hydraulic breaking equipment. Rock is present beneath the site at a depth which is envisaged that it will not cause a construction difficulty for excavators grater that 13T in size. If exceptionally deep excavations are required, e.g. for drains, then the use of hydraulic breaking equipment may be required to forward excavations.
GROUNDWATER CONTROL	Specific groundwater control is unlikely to be required at this site. Limited pumping from sumps or bailing out may be required to deal with slight seepages or surface water ingress during periods of inclement weather.
PARTY WALL ISSUES	As there are no nearby third party structures, the Party Wall Act is unlikely to apply to the development.

6.3. SLOPE STABILITY

The site is relatively flat and no significant changes in level as part of the development are anticipated. It is therefore considered that slope stability is unlikely to be a significant concern at this site.

6.4. SUB-SURFACE CONCRETE

ALL ON-SITE SOILS	
SITE / SOIL CATEGORY	Natural ground (Marlstone Rock and Dyrham Formation). Brownfield. (Made Ground)
DESIGN SULPHATE CLASS	DS-1
GROUNDWATER REGIME	Static.
AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) CLASS	AC-1s
COMMENTS	Static groundwater conditions have been selected as groundwater is expected to be permanently below the lowest level of proposed construction.

6.5. SOAKAWAYS

The majority of the site is unsuitable for private soakaways due to the loose material which could be subject to inundation settlement.

However, the proposed drainage solution is positive drainage into an attenuation pond in the south eastern corner of the site and this is in an area of competent natural strata.

A drainage report was conducted in this part of the site and soakage tests undertaken in the gravelly soils of the Marlstone Rock Formation recorded good permeability rates.

There is the possibility that the western boundary of the proposed pond may be in contact with the deep Made Ground and therefore it will be necessary to ensure that the run-off water percolates only into the natural ground by the installation of a pond liner/membrane across this boundary. This aspect should be inspected by a geo-environmental consultant.

6.6. PAVEMENT CONSTRUCTION

Due to the depth of Made Ground covering the site, it is recommended that a preliminary design California Bearing Ratio (CBR) of less than 2% is assumed at this stage.

Increased road pavement construction thickness should be anticipated where paved areas cross over ground disturbed by the removal of the existing structures. In areas of deep Made Ground, the use of geo-grid should be used to re-inforce the sub-base.

All unsuitable soils, such as topsoil or desiccated soils, should be removed from beneath proposed paved areas. The exposed sub-grade formation should then be proof rolled to reveal any excessively soft or compressible zones and any such features identified also removed by excavation. Where unsuitable materials are removed, the resultant voids should be filled in layers

with appropriately compacted suitable granular fill. To reduce the loss of granular construction materials into the sub-grade, consideration should be given to utilising a geotextile starter layer across the formation level.

6.7. PRELIMINARY FOUNDATION RECOMMENDATIONS

6.7.1. Introduction

The following recommendations are mostly centred on Field A as it is the part of the site which is under planning application, however, because the site investigation has slightly extended into the northern Field B and similar ground conditions have been recorded, the similar recommendations are likely to be applicable.

The site, Field A, it is proposed to be developed with 21No. new residential properties with rear gardens, allocated parking spaces and access roads.

The reworked ironstone Made Ground soils, were noted to be of variable consistency and sometimes noted as being loose in nature with occasional collapse of the trial pit sidewalls encountered. These reworked soils are not usually suitable as bearing strata. Therefore, the location of where these soils extend to a significant depth (>2.50m) is likely that ground improvement or a piled foundation solution will be required as conventional footings would be deemed to be too deep or difficult to construct.

However, for those areas where these deposits are recorded to depths of less than 2.5m, in particular, south and eastern boundaries, it is considered that shallow spread foundations may be adopted for the proposed residential properties emplaced within the Marlstone Rock Formation and/or Dyrham Formation recorded along these areas.

Where footings straddle different soil types, gravel and clay, they will require reinforcement.

6.7.2. Floor Slabs

Due to the depth of Made Ground across the site, fully suspended floor slabs designed and constructed in accordance with NHBC Standards are recommended at this development.

With reference to Section 2.2, the floor construction will have to incorporate full radon gas protection measures.

6.7.3. South and eastern site boundaries

6.7.3.1. Traditional Footings

East and southern boundaries have been recorded with fill thickness of less than 2.5m and then these parts of the site are suitable for the adoption of shallow strip/trench fill footings. Foundations should be taken through Made Ground/topsoil to bear upon the Marlstone Rock Formation and/or Dyrham Formation.

Due to the rapid potential variation in ground conditions likely to be encountered at those areas of the site of the site, steel mesh reinforcement of the footings is generally recommended to guard against the potential for differential settlement.

For eastern boundary and part of the southern boundary when the Marlstone Rock is recorded, a presumed bearing value of 125kN/m^2 is considered appropriate for foundations up to 1m wide bearing upon the gravel and cobbles of ironstone rock. Immediate and long term settlement should be within tolerable limits and take place largely during the construction period.

The minimum foundation depth required is to found below the Topsoil/Made Ground.

For southern boundary a presumed bearing value of 85kN/m^2 is considered appropriate for foundations up to 1m wide bearing upon the clay soils of the Dyrham Formation. Immediate and long term settlement should be within tolerable limits and take place over several years.

The Dyrham Formation clay has been shown to have a medium volume change potential when assessed against NHBC standards and therefore the minimum foundation depth required is 0.90m, but 1.25m where required to allow for restricted new tree planting. Under the NHBC Standards, foundation depths have to be increased if they are within the influence zone of felled trees, existing trees or proposed tree planting. A hedge of coniferous trees was recorded along the southern boundary and foundation depth in that area should consider tree zone of influence of these trees.

It should be noted that where trees are in groups the resulting competition for resources can lead to deeper root systems than allowed for in the NHBC Standards. In any event, foundations should be taken below any roots encountered in foundation trench excavation. Where the required foundation depth varies around a structure, this can be accommodated by forming steps in the foundation as per NHBC Standards.

Where foundation depths exceed 1.50m in clay soils and are within the zone of influence of existing or felled trees or where foundations cut through tree roots, a compressible void former will be required against the internal faces of new foundations in order to accommodate potential long term soil heave. Such precautions against heave should be designed and constructed in accordance with NHBC Standards.

6.7.3.2. General Comments

A number of trees and tree stumps are located along the site boundaries. It will be necessary to remove all unwanted trees, stumps and root structures prior to commencing with the development. Any resultant void should be backfilled accordingly with respect to the preferred foundation design.

Where existing structures are to be demolished it is difficult to predict potential footing depths as the demolition works and foundation removal are likely to disturb the soils and therefore locally over deepened footings should be anticipated in areas of former structures.

During construction, any soft spots found at foundation formation level should be excavated and replaced with lean mix concrete. Foundation excavations should be kept dry and left open for the minimum amount of time possible. Where foundations cannot be completed immediately, a blinding layer of concrete should be placed.

6.7.4. Majority of the site

As mentioned before, most of the site is covered with mostly loose Made Ground and then a different foundation approach should be considered.

6.7.4.1. Ground Improvement

It may be considered more economical to adopt a foundation solution employing ground improvement techniques to improve bearing capacity and also reduce the risk of adverse settlement.

The use of vibro-replacement stone columns would lead to densification of the Made Ground such that shallow reinforced strip footings could then be employed. This solution also had economic benefits and wider sustainable construction gains as the amount of concrete and steel is reduced in comparison to a piled solution.

Discussions with specialist contractors should be held to confirm that their particular technique is suitable for the ground conditions at the site.

Ground improvement techniques such as dynamic compaction, excavation and replacement with suitable engineered fill, and surcharging for to allow the use of shallow spread foundations are not generally accepted by construction warranty providers, e.g. NHBC, and are therefore not discussed.

6.7.4.2. Piling

As an alternative to ground improvement techniques, a piled foundation design could be used due to the depth of the Made Ground and potential for instability of excavations.

In order to confirm deeper ground conditions for pile design further ground investigation is recommended.

6.8. RECOMMENDATIONS FOR FURTHER GEOTECHNICAL WORK

If required, in order to confirm deeper ground conditions for pile or vibro ground improvement design further ground investigation comprising deep combined rotary cable percussive boreholes is recommended. It is suggested that 2No. boreholes are drilled to depths of 18m. Monitoring wells should be included in the boreholes and at least one post work monitoring visit should be undertaken to record groundwater levels. Insitu Standard Penetration Tests should be conducted during forwarding of the boreholes and collected soil samples submitted for appropriate geotechnical laboratory testing.

7. RISK ESTIMATION – SOILS

7.1. HUMAN HEALTH

The Generic Assessment Criteria (GAC) employed below are for residential land use as this is appropriate to the proposed form of development.

CONTAMINANT	UNITS	NUMBER OF TESTS	MAXIMUM CONCENTRATION	GAC	NUMBER EXCEEDING GAC
Arsenic	mg/kg	14	301	37	14
Cadmium	mg/kg	8	3.1	22	0
Chromium (hexavalent)	mg/kg	8	<2	21	0
Chromium (total)	mg/kg	8	336	910	0
Copper	mg/kg	8	335	2,400	0
Lead	mg/kg	8	607	200	1
Mercury	mg/kg	8	<1	11	0
Nickel	mg/kg	8	106	180	0
Selenium	mg/kg	8	<3	250	0
Zinc	mg/kg	8	3030	3,700	0
pH	Units	13	8	<5-10>	0
Naphthalene	mg/kg	8	0.21	2.3	0
Acenaphthylene	mg/kg	8	<0.1	170	0
Acenaphthene	mg/kg	8	<0.1	210	0
Fluorene	mg/kg	8	<0.1	170	0
Phenanthrene	mg/kg	8	0.76	95	0
Anthracene	mg/kg	8	<0.1	2,400	0
Fluoranthene	mg/kg	8	1.47	280	0
Pyrene	mg/kg	8	1.24	620	0
Benzo(a)anthracene	mg/kg	8	0.67	7.2	0
Chrysene	mg/kg	8	0.79	15	0
Benzo(b)fluoranthene	mg/kg	8	0.84	2.6	0
Benzo(k)fluoranthene	mg/kg	8	0.33	77	0
Benzo(a)pyrene	mg/kg	8	0.47	2.2	0
Indeno(1,2,3-cd)pyrene	mg/kg	8	0.36	27	0
Dibenzo(a,h)anthracene	mg/kg	8	<0.1	0.24	0
Benzo(ghi)perylene	mg/kg	8	0.28	320	0
TPH Aliphatic C5-C6	mg/kg	4	<0.01	42	0
TPH Aliphatic C6-C8	mg/kg	4	<0.05	100	0
TPH Aliphatic C8-C10	mg/kg	4	<2	27	0
TPH Aliphatic C10-C12	mg/kg	4	<2	130	0
TPH Aliphatic C12-C16	mg/kg	4	<3	1,100	0
TPH Aliphatic C16-C35	mg/kg	4	<10	65,000	0
TPH Aliphatic C35-C44	mg/kg	4	<10	65,000	0

CONTAMINANT	UNITS	NUMBER OF TESTS	MAXIMUM CONCENTRATION	GAC	NUMBER EXCEEDING GAC
TPH Aromatic C5-C7	mg/kg	4	<0.01	70	0
TPH Aromatic C7-C8	mg/kg	4	<0.05	130	0
TPH Aromatic C8-C10	mg/kg	4	<2	34	0
TPH Aromatic C10-C12	mg/kg	4	<2	74	0
TPH Aromatic C12-C16	mg/kg	4	<2	140	0
TPH Aromatic C16-C21	mg/kg	4	<3	260	0
TPH Aromatic C21-C35	mg/kg	4	<10	1,100	0
TPH Aromatic C35-C44	mg/kg	4	<10	1,100	0
Benzene	mg/kg	4	<2	0.87	0
Toluene	mg/kg	4	<5	130	0
Ethylbenzene	mg/kg	4	<2	47	0
Xylene (total of all types)	mg/kg	4	<2	56	0
Methyl Tert Butyl Ether (MTBE)	mg/kg	4	<5	49	0
Semi-Volatile Organic Compounds (SVOCs)	mg/kg	2	<LOD	LOD*	0
Asbestos	Presence	4	<0.001	Fibres Present	0
Hydrocarbon Vapour (PID)	ppm	25	0.0	50	0
Notes: *Limit of detection: Given the large amount of compounds in this group, coupled with the lack of GAC for certain compounds, any concentrations above the limit of detection will be highlighted in the first instance.					

RESULTS EXCEEDING HUMAN HEALTH ASSESSMENT CRITERIA	
LEAD	When compared to the generic assessment criteria of 200mg/kg, a single elevated concentration of lead was recorded in the layer of black gravelly sand of ash and clinker at concentrations of 607mg/kg in TP03.
ARSENIC	Elevated arsenic has been identified consistently across the site within the near surface soils, the reworked backfill and the natural bedrock at similar concentrations. There is no discernible difference in soil types between the arsenic distribution and therefore the arsenic is considered to be associated with the natural geochemistry of the iron rich sandy soils (as evidenced by their strong orange coloration), whether they be natural or reworked. Naturally elevated arsenic is common in iron rich soils, such as the Jurassic strata through middle England and glacial and river deposits formed from them. In the case of arsenic it is therefore appropriate to consider all of the samples as being one dataset. Furthermore, 6No. samples tested for arsenic were from the near surface topsoil and the remaining 7No. tests were of samples collected from the reworked ironstone and a single sample was collected from the natural bedrock. These results ranged from 79 mg/kg – 301 mg/kg all, with similar results deriving from the near surface soils and those from the reworked ironstone. Hence, the test results are considered a single dataset of 14No. samples.

RESULTS EXCEEDING HUMAN HEALTH ASSESSMENT CRITERIA	
	A normality plot was undertaken which demonstrated that the arsenic concentrations for the 14No. samples did not approximate to a normal distribution as a result of the value at 301 mg/kg from the deepest sample at 2.5m bgl, however the maximum value test demonstrated that there are unlikely to be any statistical outliers. The mean arsenic concentration was 156 mg/kg and the upper 95th percentile was 181 mg/kg. The risk from the elevated arsenic is considered separately below.

7.1.1. Site Specific Human Health Risk Assessment for Arsenic

7.1.1.1. Arsenic Bioavailability

Whether arsenic in contaminated soils poses a human health risk depends upon the potential of the arsenic to leave the soil and enter the bloodstream. The use of total arsenic concentrations in soil to assess this risk is a conservative approach as it assumes that all the metal content of the soil is available for adsorption by the body.

The Contaminated Land Exposure Assessment (CLEA) model derived Suitable for Use Levels (S4ULs) for arsenic are significantly exceeded by many natural soils in the United Kingdom. It is therefore clear that a practical methodology for taking into account the relative oral bioavailability of arsenic in soil compared to that found in drinking water (the medium upon which the toxicological data is based) is required. The oral bioaccesibility is the fraction of ingested arsenic that can be absorbed into the systemic circulation and therefore available to give rise to toxic effects.

The Bioaccesibility Research Group of Europe (BARGE) developed a Unified Method is an in vitro method for simulating the human digestive system through the use of synthetic digestive fluids. This method provides an indication of the oral bioaccesibility of the arsenic as a measure of its solubility within the gastrointestinal tract.

The test procedure is essentially replicates passage of the soil through the human gastro-intestinal tract through three different compartments: mouth (5 minutes), stomach (1 hour) and small intestine (4 hours), and is undertaken at body temperature. This measure of oral bioaccesibility can therefore be factored into the risk estimation stage as the amount of arsenic that is actually absorbed by the human body will be less than or equal to the amount which is mobilised.

7.1.1.2. Unified BARGE Method Results

The Unified BARGE Method test recorded the total arsenic concentration in 2No. samples of 140 mg/kg and 210 mg/kg and was consistent with the initial results recorded in the other samples by DETS.

The result of the extraction recorded very low values of 1.5% and 1.6%. The worst case relative bioavailability of 1.6% and has been adopted in the risk assessment model.

7.1.1.3. Risk Assessment Model

The current CLEA model (Version 1.07) has been chosen to derive site specific assessment criteria for this assessment. The model incorporates the latest UK legislation is used for derivation of the C4SL values and is therefore considered to be the most appropriate model. The model also allows the user to input bioaccesibility data.

The model has been used with all of the same parameters used to derive the C4SL with the only variable being the oral bioavailability, which has been entered in to the model.

7.1.1.4. Site Specific Assessment Criteria for Arsenic

The Site Specific Assessment Criteria (SSAC) for arsenic has been calculated as 411 mg/kg. The results of the CLEA model assessment are presented in the Appendices.

The maximum recorded total concentration of arsenic was 301 mg/kg. Therefore, the calculated SSAC of 411 mg/kg exceeds the maximum recorded arsenic concentration at the site. In light of this result it is considered that the bioavailability testing confirms there is no significant risk to human health from the elevated arsenic.

7.2. WATER ENVIRONMENT

It is not appropriate to consider human health assessment criteria for human health in relation to the risk to the water environment, but currently there are no generic soil assessment criteria in respect of the water environment. In the absence of any groundwater sampling data, the soil results are assessed on the basis of professional judgement.

The contaminant concentrations recorded in the soils at the site are not considered to be at such levels that they would present any significant risk to the underlying water environment.

7.3. BUILDING MATERIALS

CONTAMINANT	UNITS	NUMBER OF TESTS	MAXIMUM CONCENTRATION	GAC	NUMBER EXCEEDING GAC
pH	units	13	7.3	<5.5	0
Sulphate (w/s)	mg/l	13	84	500	0
Sum of any VOC above detection limits	mg/kg	2	Below detection limits	0.5	0
Sum of SVOC + Aliphatic TPH >C5-C10 + Aromatic TPH >C5-C10 above detection limits	mg/kg	2	Below detection limits	2	0
Sum of Aliphatic TPH >C10-C21 + Aromatic TPH >C10-C21 above detection limits	mg/kg	4	Below detection limits	10	0
Sum of Aliphatic TPH >C21-C34 + Aromatic TPH >C10-C35 above detection limits	mg/kg	4	Below detection limits	500	0
Sum of BTEX + MTBE above detection limits	mg/kg	4	Below detection limits	0.1	0
Phenols	mg/kg	2	<0.1	2	0
Cresols and chlorinated phenols	mg/kg	2	<0.15	2	0
Naphthalene	mg/kg	8	0.21	0.5	0
Benzo(a)pyrene	mg/kg	8	0.47	0.5	0

None of the samples record any contaminants at concentrations exceeding their respective assessment criteria.

8. RISK EVALUATION

8.1. REVISED CONCEPTUAL MODEL

The revised conceptual site model plan is presented in the Appendices.

ADDITIONAL POLLUTANT LINKAGES	During the ground investigation, no additional sources of contamination were identified.
INVALID POLLUTANT LINKAGES	Although the naturally occurring arsenic is at elevated concentrations across the site, the bioavailability of the arsenic is very low and therefore demonstrated to not pose a contamination risk. Within the vicinity of the barn, no asbestos fibres or hydrocarbon contamination above the detection limits were identified. However, parts of the asbestos cement sheeting on the lean-to structure of the barn was in poor condition and it is anticipated that some asbestos cement fragments may be present on the surface in this area. Therefore, all asbestos fragments will be required to be removed off-site during the preliminary site clearance works. The topsoil was found to be uncontaminated, therefore the previously identified bonfires do not pose a contamination risk. The former quarry has been primarily backfilled with reworked ironstone, therefore landfill gases deriving from the degradation of the backfill material are not anticipated on the site due to a lack of any organic material within the backfill. A single elevated lead value is present within a layer of sandy ash within the backfilled material at approximately 0.8m bgl. Given that the elevated lead sample was from a significant depth below the surface and a sample from the same location at a shallower depth of 0.4m did not return as elevated (129mg/kg), lead is not considered to pose a risk to the future residents based on the current situation. However, should site levels be altered the lead could end up closer to the surface. In addition the ashy strata containing the elevated lead may vary in depth across the area. It is not considered that the lead concentration recorded is not significantly elevated to pose a risk to the aquifer or future buried materials and services.
LIMITATIONS AND UNCERTAINTIES	Due to access restrictions, it was not possible to undertake any exploratory holes under the barn floor slab at this stage. Elsewhere, all of the potential contamination sources have been targeted by the exploratory holes and therefore there are no other significant limitations.

8.2. UPDATED CONTAMINATION RISK ASSESSMENT

The pollutant linkages identified in the revised conceptual site model will now be evaluated as to their severity:

SOURCES AND CONTAMINANTS	PATHWAYS (REFERENCE FROM MODEL)	RECEPTORS	POTENTIAL RISK
Naturally elevated arsenic in the topsoil, the underlying reworked ironstone, and the bedrock.	Ingestion of dust Dermal contact Inhalation of dust Consumption of home grown produce	Residents	Negligible Risk
Quarry fill	Ingestion of dust Dermal contact Inhalation of dust Consumption of home grown produce (1)	Residents	Low Risk
	Horizontal & vertical migration	Groundwater	Negligible Risk
	Direct Contact	Building materials and services	Negligible Risk
Bonfires	Ingestion of dust Dermal contact Inhalation of dust Consumption of home grown produce	Residents	Negligible Risk
	Horizontal & vertical migration	Groundwater	Negligible Risk
	Direct Contact	Building materials and services	Negligible Risk
Barn	Ingestion of dust Dermal contact Inhalation of dust Consumption of home grown produce (2)	Residents	Negligible Risk*
	Horizontal & vertical migration	Groundwater	Negligible Risk*
	Direct Contact	Building materials and services	Negligible Risk*

Notes: *subject to further investigation

The contamination risks that are presented to the various receptor groups are discussed further in the following sections:

RISK TO HUMAN HEALTH
No significant contamination risks to human health have been identified by this investigation. However, there is a localised area of buried ashy Made Ground which contains elevated lead, as well as potential contamination beneath the existing building yet to be investigated.

RISK TO WATER ENVIRONMENT
No significant risks identified, subject to confirming beneath the existing building.

RISK TO BUILDING MATERIALS AND SERVICES
No significant risks identified subject to confirming beneath the existing building.

8.3. RISK MANAGEMENT

8.3.1. Introduction

It is recommended that this report is submitted to the planning department of the Local Authority, the organisation undertaking the Building Control function to confirm that the investigation completed to date is satisfactory.

8.3.2. Further Contamination Assessment

It is recommended that additional ground investigation in the form of trial pits is undertaken around the position of TP03 to further assess the extent and depth of the buried ashy material in this location and undertake additional lead testing from the soils to confirm if any risk is presented to future residents.

In addition, following the demolition of the existing building, further exploratory holes should be completed in this area to determine whether or not there are any contamination risks.

8.3.3. Outline Remediation Strategy

At this stage it has been demonstrated that the vast majority of the site is uncontaminated and does not require any remedial measures. In the south eastern corner the buried ashy materials appear to be at a depth which will not affect future residents, but additional exploratory holes are required to confirm this as well as confirming the finished ground levels. Should the lead concentrations be confirmed to be elevated and the ashy material will be present near surface, then some form of capping layer will likely be required for areas of garden and landscaping in the south western corner of the site.

In the vicinity of the building, there is unlikely to be any significant contamination as other exploratory holes have been completed nearby with no contamination recorded. However, any localised contamination will likely have to be dealt with by either off site removal or additional soil capping.

Any surface asbestos fragments located in the area of the barn should be removed under controlled conditions as part of site clearance activities.

All remediation works should be supervised and verified by an experienced Geo-Environmental Consultant. The remediation works should be documented in a Verification Report.

8.4. WASTE SOIL DISPOSAL

Topsoil should be viewed as a resource rather than a waste. As the topsoil is suitable for residential garden use in terms contamination, the topsoil at the site should be stripped and the surplus reused on other developments. It should be noted that topsoil, even if uncontaminated, is unlikely to constitute 'inert waste' due to its high organic matter content.

It is considered that the any natural sub-soils disposed of from the site would be classified as 'non-hazardous waste' and would be characterised for disposal to landfill as 'inert waste'. However, the chemical results should be forwarded to the proposed landfill site and the waste classification confirmed prior to disposing of any surplus soils. Waste Acceptance Criteria (WAC) testing of the soils will also be required where the soil is to be disposed of at a landfill permitted to accept inert waste. The waste code from the European Waste Catalogue (EWC) 2002 for the soils would be 17 05 04 'Soil and Stones, not containing dangerous substances'.

It is considered that the ashy subsoil encountered in the south western corner of the site (TP3) would be classified as 'hazardous waste'. Such waste will require pre-treatment prior to off-site treatment or disposal e.g. by selective excavation and further testing. Waste Acceptance Criteria (WAC) testing of the soils for disposal will also be required if the soil is to be disposed of to landfill. The waste code from the European Waste Catalogue (EWC) 2002 for the soils would be 17 05 03 'Soil and Stones, containing dangerous substances'.

As discussed above it is recommended that further delineation of this soil is undertaken in order to assess the human health risk and the waste soil classification can also be further confirmed as part of this process.

9. HEALTH AND SAFETY FILE INFORMATION

9.1. INTRODUCTION

The aim of the following sections is to present pertinent Health and Safety information that has arisen from the current investigation/survey works discussed in this report. The aim is to identify health and safety controls that may be necessary during any subsequent maintenance, refurbishment, demolition or construction works. The information is not exhaustive and stems only from the aspects identified within the scope of the works undertaken by BRD.

Where BRD has been appointed as a Principal Contractor, then this information shall form the Health and Safety Files as required by the Construction Design and Management (CDM) Regulations 2015.

Reports are always forwarded to the Client and they shall be responsible for ensuring this safety information is disseminated to those who need it.

The works undertaken by BRD are detailed in the previous sections of this report.

9.2. HAZARDS

During the course of the BRD works the following noteworthy safety hazards have been identified:

9.2.1. Contamination

Although the naturally occurring arsenic has been demonstrated to present a negligible risk to future residents, construction workers may be at greater risk due to their increased exposure to the soils. Equally, the shorter duration of exposure may result in a decreased risk. The localised area of ashy soils may present a greater risk to construction workers if they are exposed to it, for example during demolition, utility services work and foundation construction. Therefore during the redevelopment of the site, the presence of contaminated soils should be considered within health and safety plans. Measures to protect the health and safety of site workers should be implemented including use of appropriate personal protective equipment, education and good hygiene procedures. If during the redevelopment any anomalous material is encountered that is different to that conditions revealed by this investigation, then expert environmental advice should be sought.

9.2.2. Asbestos

Materials potentially containing asbestos were noted in the debris surrounding the barn and may pose a risk to those undergoing clearance of the site. All the surface asbestos containing material should be removed from the site as part of site clearance activities prior commencing the development. These works should be undertaken in accordance with Health and Safety Executive (HSE) guidance by contractors trained in working with non-licensed asbestos.

In accordance with Health and Safety Executive (HSE) guidance, a 'Refurbishment Demolition Survey' (RDS) should be undertaken to identify whether or not asbestos containing materials are present in the existing structure(s) prior to demolition or refurbishment. The results of the survey should then be used to plan for the safe management, removal and disposal of asbestos containing materials from the existing buildings and infrastructure should such materials be present.

9.2.3. Other Issues

During the BRD works the following safety hazards were identified:

- There are multiple slip, trip and fall hazards around the site.

- There is a 2m deep concrete tank without a secure cover and containing water.

9.3. EXISTING STRUCTURES

The roof present on the lean-to of the barn is not intact and parts of the roof may break off, additionally the structural integrity of this part of the building may be weak.

BRD recommend that advice on existing structures is gained from a qualified and experienced Building Surveyor or Structural Engineer.

9.4. HAZARDOUS MATERIALS

BRD did not construct anything with hazardous materials.

Any soils to be imported to the site, in particular topsoil, should be tested to confirm their suitability in the development.

9.5. UTILITY SERVICES

No previously unidentified utility services were encountered during the BRD works.

The utility services plans held by the Client should be referred to.

The utility service companies should be contacted for records of their own equipment.

REPORT SPECIFIC REFERENCES

- 'Phase 1 Geo-Environmental Desk Study – Hempton Road, Deddington', BRD Environmental Ltd, ref. BRD3567, dated October 2019
- 'Mewies Engineering Consultants Ltd (M-EC), 'Infiltration Test Results', ref. 23933/06-18/6075, date: 18/06/2018.

SUPPORTING INFORMATION

GROUND INVESTIGATION

Exploratory holes are logged by an experienced Geo-Environmental Consultant in general accordance with 'Code of practice for site investigations' BS5930:2015, British Standards Institution, 2015. Soil samples for chemical and geotechnical analysis are taken from the exploratory holes at intervals dictated by the nature of the soils and the objectives of the investigation.

Where stated on the logs of inspection pits, trial pits or boreholes (where insitu testing has not been undertaken), the relative density of coarse (sand and gravel) soils is tentative only. Such assessments of density are on the basis of visual inspection only taking into consideration such factors as drilling rates, stability of pit side walls, appearance and behaviour under excavation.

Where Chalk strata is encountered it is logged and graded in general accordance with CIRIA guidance 'C574 - Engineering in Chalk'. It should be recognised that where percussive drilling methods are employed, the structure of the Chalk is destroyed and therefore the grading stated on such logs is either tentative or absent where it is not possible to assess the grade.

Hand Dug Inspection Pits

Hand tools are used to forward shallow inspection pits as a cost effective method of describing and sampling near surface soils. The technique is also used where exposure of existing footings is required. The depth reached by such techniques is a function of the nature of the ground and generally does not exceed 1.5m

Trial Pits

Mechanically excavated trial pits allow detailed inspection of near surface ground due to the large volume of soil exposed. A wheeled backhoe loader is the usual machine for digging trial pits that are typically 3 to 4.5m deep, 0.5m wide and 3m long.

Windowless Sampling Boreholes

This type of borehole is formed by a small tracked dynamic percussion drilling rig with samples retrieved in thin plastic liners within the narrow diameter steel sampling tubes. Borehole depths of up to 5m are typical, but in exceptional circumstances up to 15m depth can be achieved. This is the smallest type of rig that is capable of undertaking Standard Penetration Tests (SPTs).

Hand Held Window Sampling

Hand held window sampling is a useful method of drilling narrow diameter boreholes particularly where access is difficult. Hand held mechanical percussive hammers are used to drive the sampling tube into the ground. The soil samples are collected within the hollow metal sampling tubes and inspected via the open window along one side. Window sampling boreholes can be forwarded to depths of 3m to 6m depending upon ground conditions.

Cable Percussive Boreholes

This form of drilling involves repetitive dropping of a tube into the soil under its own weight from a tripod support. The sample is obtained from the clay cutter head in fine soils or a bailer for wet granular soils. As the borehole progresses SPTs can be undertaken and relatively undisturbed samples can be obtained. Typically these boreholes are 15 to 25m deep, but depths of double that can be achieved in soils, but only thin weak rock layers can be penetrated.

Rotary Boreholes

Where competent rock is required to be drilled then rotary drilling techniques are required. The drilling rigs can vary in size from small tracked units to larger units mounted on four wheel drive trucks. Rotary open hole drilling techniques break the rock into small fragments and so recovery of any samples is limited. In contrast, rotary coring retrieves excellent samples. Some rigs also allow windowless sampling to be undertaken through soil layers. There are no practical limits to the depths that this drilling method can achieve.

Dynamic Probing

Dynamic probing comprises a sectional rod with a sacrificial cone at the base of slightly larger diameter than the rod. The rod is driven into the ground by a constant mass falling through a set distance. The number of blows required to forward the rod per 100mm is then recorded and presented in a graph of N_{10} values. The standard applicable to dynamic probing is "BS EN ISO 22476-2:2005 Incorporating corrigendum No. 1, Geotechnical investigation and testing — Field testing — Part 2: Dynamic probing" BSi, February 2007.

Static Cone Penetration Tests

Cone Penetration Tests (CPT) consist of pushing a conical 60° cone into the ground at a constant rate and recording the force required to do this. Sensors in the cone record other information and this data can be correlated to a number of different geotechnical parameters.

Dynamic Penetrometer

The Transport Research Laboratory Dynamic Cone Penetrometer (TRL DCP) uses an 8 kg hammer dropping through a height of 575mm to drive a 60° cone of 20mm maximum diameter into the ground. The depth driven either per blow or per several blows is recorded. The strength of each of the soil layer encountered is then calculated by converting the penetration rate (mm per blow) into an approximate California Bearing Ratio (CBR) value employing the correlation proposed by TRL.

Gas Monitoring

Gas monitoring is undertaken with a portable gas monitor for oxygen, Methane, Carbon Dioxide, Hydrogen Sulphide and Carbon Monoxide together with recording of atmospheric pressure and any flow rate.

Vapour Monitoring

Headspace tests and monitoring for Volatile Organic Compounds (VOC) or Semi Volatile Organic Compounds (SVOC) is undertaken using a Photo Ionisation Detector (PID). The MiniRAE models used have a 10.6 eV lamp calibrated for isobutylene. The PID is useful tool to indicate the presence of a wide range of volatile compounds, but only provides semi-quantitative data as different compounds provide a different response and thus the reading is not a true reflection of the actual concentration present.

Low PID readings can be recorded in natural uncontaminated organic soils or even as a result of atmospheric pollution. It is generally accepted by consultants and regulators that recorded values in excess 50 parts per million (ppm) represents the presence of organic compound pollutants and in excess of 100 ppm such contamination may be significant.

The headspace test procedure involves the collection of a sample of suspected contaminated soils and placing within a sample bag. A tight seal to the bag is formed with a similar volume of air trapped to that of the soil and the sample is left for fifteen minutes to allow volatilisation of any contaminants. The bag is then pierced by, and sealed around, the sample probe of the PID and a reading taken.

Borehole well monitoring is undertaken by connecting the PID directly to the gas tap on the monitoring well installation.

Groundwater Level Monitoring

Groundwater levels are recorded with an electronic dip meter that has a detector end that is lowered into the borehole well. An audible signal is made when water is reached and the depth recorded from the graduated tape used to lower the detector. Where there is potential for a separate Light Non Aqueous Phase Liquid (LNAPL) to be present floating on the groundwater an oil/water interface meter is used in preference to a conventional dip meter so that any such floating product can be detected.

Geotechnical Sampling

BRD schedule a range of geotechnical testing as appropriate to the identified ground conditions, available budget and the proposed development. Different types of soil samples are obtained as appropriate to the ground conditions and planned testing.

SAMPLE TYPE	SYMBOL USED ON LOGS	DESCRIPTION
Disturbed	*D*	*Small disturbed soil samples of about 1 to 2 kg are collected in plastic bags.*
Bulk	*B*	*Large disturbed bulk samples up to about 20 to 30 kg are collected in plastic bags*
Undisturbed	*U*	*'Undisturbed' samples generally collected in plastic or metal tubes within cable percussive boreholes of 100mm diameter for samples of fine soils of firm to stiff consistency. Can also be representative of samples taken by cutting plastic sample liners from windowless sampling drilling methods. It is recognised that such samples do not generally meet Eurocode sample quality requirements for the tests commonly employed. However, given the wealth of experience with these sampling methods this continues to be common in United Kingdom practice particularly for less sensitive developments where more expensive sampling techniques are not economically justifiable.*
Undisturbed	*UT*	*A thin walled steel sampler developed by Archway Engineering called a UT100 in an attempt to gain better quality samples of soft to firm fine soils when using cable percussive drilling methods.*

Contamination Sampling

BRD schedule contamination testing as appropriate to the ground conditions, available budget, potential contaminants and the proposed development. Samples are collected in single use laboratory supplied containers.

Soil samples are retrieved in plastic containers and/or amber glass jars with a lined plastic cap. Contamination samples are indicated by a 'J' on exploratory hole logs.

Water samples are collected in plastic bottles and/or amber glass jars with a lined plastic cap then placed in cool boxes together with freezer packs. Water samples are indicated by a 'W' on exploratory hole records, but generally such samples are not tested as testing from dedicated monitoring wells is preferred for sample quality reasons.

Samples retrieved from the exploratory holes are dispatched to the laboratory by overnight courier. Where samples cannot be transported directly from site they are temporarily stored in the BRD dedicated sample storage facility which includes refrigeration where necessary. The individual accreditation of the test methods is detailed in the laboratory test report.

GEOTECHNICAL ASSESSMENT

Under Eurocode 7 (EC7) the following risk ranking is applied to geotechnical projects:

GEOTECHNICAL CATEGORY	DESCRIPTION
1	*Small and relatively simple structures for which it is possible to ensure that the fundamental requirements will be satisfied on the basis of experience and qualitative geotechnical investigations with negligible risk. For example, straightforward ground conditions, local experience, no excavation below the water table unless this will be straight forward.*
2	*Conventional types of structures and foundations. No difficult soil or loading conditions. Quantitative geotechnical data and laboratory testing. Routine procedures for field and laboratory testing. Conventional structures and no exceptional geotechnical risk. For example, spread, raft and piled foundations, retaining walls, bridge piers and abutments, embankments, ground anchors, tunnels and excavations.*
3	*Those structures not in Categories 1 and 2 such as very large or unusual structures, structures involving abnormal risks, or unusual or exceptionally difficult ground or loading conditions. Structures in highly seismic areas. Structures in areas of probable site instability or persistent ground movements that require separate investigation or special measures.*

GEOTECHNICAL PARAMETERS

Soakage Tests

Soakage tests comprise the filling of a test pit with water and recording the time taken for the water to drain away. The tests are undertaken in general accordance with 'Digest DG 365: Soakaway design' BRE, Revised 2016. The test pits are usually gravel filled for safety with a slotted vertical pipe through which water observations are made. Water is generally supplied by a tanker to allow fast filling of the pits with water. Compliant tests are filled and allowed to drain near empty three times.

Standard Penetration Tests

The standard penetration test (SPT) determines the resistance of soils at the base of a borehole to the dynamic penetration of a split barrel sampler and the recovering of disturbed samples for identification purposes. In gravelly soils and some soft rocks a solid cone is used in preference to the sampler.

The basis of the test consists in driving a sampler by dropping a hammer of 63.5 kg mass on from a height of 760 mm. The number of blows (N value) necessary to achieve a penetration of the sampler of 300 mm is recorded. The test is described in 'Geotechnical investigation and testing — Field testing — Part 3: Standard penetration test - BS EN ISO 22476-3:2005 Incorporating corrigendum No. 1', BSi, 2007.

The uncorrected N values of the SPT tests are recorded upon the borehole logs together with a record of blows for each 75mm test portion including the seating blows. Where the full test depth cannot be achieved due to refusal on hard stratum, the number of blows and the distance achieved is recorded and the N value given as >50. The abbreviation SPT(c) is used upon the logs indicates that the test was performed with a solid cone rather than a split spoon sampler.

It is necessary to apply a correction to the N values to account for the effects of energy delivery using the equation: $N_{60} = \frac{E_r}{60} N$ *where* E_r *is the energy ratio of the specific test equipment.*

In the case of tests in sand, for the effects of overburden and rod length the equation is modified to $N_{60} = \frac{E_r}{60} \; x \; \lambda \; x \; C_N \; x \; N$ *where* λ *is the correction factor for energy losses due to the rod length and* C_N *is the correction factor for vertical stress due to overburden of the soil.*

Sulphate

In order to compare the laboratory soil test results with 'Concrete in aggressive ground. BRE Special Digest 1: 2005' (BRE, 2005) laboratory results are converted to SO_4 *mg/l. Laboratory results expressed as* SO_3 *g/l and are multiplied by a factor of 1200 to express the results as* SO_4 *mg/l.*

Index Property Tests

In accordance with National House Building Council (NHBC) Standards Chapter 4.2 – Building near trees, the laboratory plasticity indexes are assessed against their volume change potential. The Modified Plasticity Index is defined as the Plasticity Index of the soil multiplied by the percentage of particles with a nominal diameter of less than 425µm. Whilst the NHBC Standards were developed for residential buildings, the advice is equally applicable to a large number of other types of low rise structures.

Hand Shear Vane

The undrained shear strength of the fine (i.e. clay) soils at the site can be established using hand shear vane apparatus. Usually three readings are taken at every depth tested and the uncorrected results recorded on the exploratory point log. Shear vane readings from depths below 1.2m depth in trial pits are from tests performed on excavated soil. In accordance with Eurocode 7 — Geotechnical design — Part 2: Ground investigation and testing EN 1997-2:2007 the results should be corrected. BRD employ only simple correction methods as the more complex correction methodologies imply undue accuracy to a test that has distinct disadvantages and limitations.

Pocket Penetrometers

The Pocket Penetrometer is a lightweight instrument for use by field personnel to check visual classification of soils. It is a simple test and there is inherent uncertainty related to the small volume of soil being tested and so the results should be used with appropriate caution. Pocket penetrometers are calibrated in terms of unconfined compressive strength and once converted to undrained shear strength (divide by two) the results are further reduced by a factor of 1.5 - 2.0 as the device tends to overestimate strengths.

Instrument Reading (uncompressive strength in kg/cm²)	*Indicative Undrained Shear Strength (kN/m²)*	*Indicative Consistency*	*Indicative strength*
1.0	*25 – 33*	*Soft*	*Low*
1.5	*38 – 50*	*Soft to firm*	*Low to medium*
2.0	*50 - 67*	*Firm*	*Medium*
2.5	*63 – 83*	*Firm to stiff*	*Medium to high*
3.5	*88 – 116*	*Stiff*	*High*
4.5	*113 – 150*	*Stiff to very stiff*	*High to very high*

CONTAMINATION ASSESSMENT METHODOLOGY

UK Policy

The UK Government's policy in relation to land affected by historic contamination is based on a 'suitable for use' approach. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Contamination risks therefore need to be assessed on a site-by-site basis. The 'suitable for use' approach limits requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to either the current use or future use of the land.

The three main drivers for contamination assessment and remediation are:

- *Voluntary action.*
- *Development as part of the planning regime.*
- *Regulatory action to mitigate unacceptable risks e.g. Part 2A of the Environmental Protection Act 1990.*

Pollutant Linkages

For a contamination risk to exist there must be a 'pollutant linkage' from the contaminant (source) via a pathway (the route from contaminant to receptor) to a receptor (the entity that could be harmed). The absence of a contaminant, pathway or receptor breaks the pollutant linkage and therefore no contamination risk exists.

Contamination is typically present at a site (in the ground and/or in the underlying groundwater) as a result of a historic or current industrial use, usually as a result of leaks, spills or disposal of residues, wastes and excess raw materials from the industrial processes. Contamination may also be present due to:

- *The deliberate application of chemicals e.g. the spraying of herbicide/pesticide.*
- *Migration of pollutants from adjacent land.*
- *Naturally occurring processes e.g. elevated concentrations of particular heavy metals associated with specific geological strata.*

Conceptual Site Model

The conceptual site model can be defined as a textual or graphical representation of the identified pollutant linkages for a given site. The model forms the basis for designing the investigation as the aim will be to target all of the potential pollutant linkages to determine, through the subsequent phases of risk assessment, whether or not they pose an actual risk.

It is important that the conceptual site model is updated with new information as the various investigation, risk assessment and remediation works are completed.

Technical Guidance

The technical and legal framework for contamination assessment is complex. The process adopted through this report for assessing contamination risks is in general accordance with the following guidance, as listed below:

- *'Investigation of Potentially Contaminated Sites - Code of Practice - BS 10175:2011+A2:2017', The British Standards Institution 2017.*
- *'Model Procedures for the management of Land Contamination - CLR Document No. 11', Environment Agency, 2004.*
- *'Guidance for the safe development of housing on land affected by contamination - R&D66: 2008', NHBC/Environment Agency, 2008.*

Risk Assessment Methodology

In line with the technical guidance, the contamination risk assessment follows a series of phased stages for each particular site:

PHASE	DESCRIPTION	RISK ASSESSMENT STAGE
PHASE1	*Generally limited to desk based research and a site walkover survey to develop an initial conceptual site model and identify what risks, if any, are likely to be presented by the site.*	***Hazard Identification and Assessment*** *A preliminary stage of risk assessment concerned with identifying and characterising the hazards that may be associated with a particular site and identifying potential pollutant linkages.*
PHASE 2	*This phase is concerned with establishing whether contamination is present, usually through intrusive ground investigation, and then evaluating the degree and magnitude of the associated risks.*	***Risk Estimation*** *A stage concerned with estimating the likelihood that receptors will suffer adverse effects if they come into contact with, or are otherwise affected by, a hazardous substance or agent under defined conditions.* ***Risk Evaluation*** *A stage of risk assessment concerned with evaluating the acceptability of estimated risks, taking into account the nature and scale of the risk estimates, any uncertainties associated with the assessment and the broad costs and benefits of taking action to mitigate risks.*
PHASE 3	*The appraisal and selection of remediation techniques, their implementation and verification.*	***Risk Management*** *The process whereby decisions are made to accept a known or assessed risk and/or the implementation of action to reduce the consequences or probabilities of occurrence.*

Risk Classification

The objective of risk assessment is to identify the nature and magnitude of the potential risks and should be based on a consideration of both:

- *The likelihood/probability of an event [taking into account both the presence of the hazard and receptor and the integrity of the pathway].*
- *The severity of the potential consequence [taking into account both the potential severity of the hazard and the sensitivity of the receptor].*

There is a need for a logical, transparent and repeatable system in defining the categories of severity of consequence and likelihood as well as for the risk itself and therefore the following risk rating matrix is employed:

		SEVERITY OF CONSEQUENCE			
		SEVERE	***MEDIUM***	***MILD***	***MINOR***
PROBABILITY	***HIGH LIKELIHOOD***	*Very High Risk*	*High Risk*	*Moderate Risk*	*Moderate/Low Risk*
	LIKELY	*High Risk*	*Moderate Risk*	*Moderate/Low Risk*	*Low Risk*
	LOW LIKELIHOOD	*Moderate Risk*	*Moderate/Low Risk*	*Low Risk*	*Negligible Risk*
	UNLIKELY	*Moderate/Low Risk*	*Low Risk*	*Negligible Risk*	*Negligible Risk*

These risk classifications are defined as follows:

- *Very High Risk - There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action.*
- *High Risk - Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action.*
- *Moderate Risk - It is possible that without appropriate remediation action harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.*
- *Low Risk - It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild.*
- *Negligible Risk - The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.*

This risk assessment matrix and classification system is based on guidance produced by Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency in connection with contaminated land assessment.

RISK ESTIMATION - SOILS

Introduction to Soil Human Health Generic Assessment Criteria (GAC)

The Environment Agency (EA) and Department of Environment Food and Rural Affairs (DEFRA) had previously issued revised guidance following the consultation about the DEFRA publication "Assessing risks from land contamination – a proportionate approach. Soil Guideline Values: the Way Forward". This resulted in a revised version of the Contaminated Land Exposure Model (CLEA) model (version 1.06) and a few of the previously published Soil Guideline Values (SGVs) were revised.

The main legislative driver for dealing with historical land affected by contamination is Part 2A of the Environmental Protection Act 1990. Revised Statutory Guidance to support Part 2A was published in April 2012. This Guidance introduced a new four-category system for classifying land under Part 2A for cases of a Significant Possibility of Significant Harm to human health,1 where Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is acceptably low. The impact assessment for the new Statutory Guidance stated "The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land". The C4SLs are still derived using the CLEA model, but adopt a slightly different approach to toxicological assessment and exposure modelling.

In March 2014, the outcome of "SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - Final Project Report" (CL:AIRE) was published. Due to slightly ambiguous wording within this report, Lord de Mauley, Parliamentary Under Secretary, DEFRA wrote to all local authorities on 3 September 2014 to confirm that the published C4SLs were final and that they can be used in risk assessment undertaken under the planning regime.

Whilst there are proposals for the industry to develop C4SLs for other contaminants, these have yet to produce any new values. BRD do not believe that C4SLs could be developed by a single organisation with sufficient confidence. BRD has therefore employed other, more conservative guidance based on the CLEA model (detailed below) within this assessment for compounds where C4SLs are not available. However, it should be noted that the results of this investigation may need to be reinterpreted as new C4SLs become available.

Due to the limited number of published C4SL values at this time, the Chartered Institute of Environmental health (CIEH) and Land Quality Management Ltd (LQM) have produced Generic Assessment Criteria (GAC) known as Suitable for Use Levels (S4ULs), for use in contaminated land human health risk assessment. These S4ULs (2014) have been derived for a large number of substances using the current CLEA model and are therefore consistent with current guidance. They also incorporate the revised exposure parameters as adopted by the C4SL programme, but have not adopted the revised toxicological approach adopted by the C4SLs and so remain a more conservative assessment criteria. The substances for which SGVs were previously published have also been revised as new S4ULs in light of the new exposure parameters proposed by the C4SL programme, and therefore effectively replace the existing SGVs.

In addition, in December 2009, other GAC for less common substances were produced by the Environmental Industries Commission (EIC), The Association of Geotechnical and Geoenvironmental Specialists (AGS) and Contaminated Land: Applications in Real Environments (CL:AIRE) using the CLEA model. These are referred to as the EIC/AGS/CLAIRE GAC.

In summary, C4SLs have been used where these are available. For those substances where C4SLs have yet to be issued, then the S4ULs have been adopted or in some cases, the EIC/AGS/CLAIRE GAC. All of the previously produced SGVs have now either been withdrawn, or superseded by the respective C4SLs or S4ULs.

The only exception to this approach is the PAH compound benzo(a)pyrene (BaP) where a C4SL guideline value has been produced, whereas BRD has adopted the S4UL value. The C4SL for BaP relates to its use as a surrogate marker compound representing all of the genotoxic PAH compounds as a mixture, rather than this individual compound. BRD has therefore adopted the compound specific S4UL value as the initial screening value, for consistency with the other PAH compounds before then employing the C4SL is necessary.

It should be noted that unless otherwise stated, all the assessment criteria adopted within this report have been derived based on a sandy loam soil at pH 7 and the values quoted are for a conservative soil organic matter content of 1% where applicable (i.e. organic contaminants).

Human Health - Soil Generic Assessment Criteria

The results of the soils analysis have been compared to generic assessment criteria for the default exposure scenarios comprising either residential land with plant uptake, residential land without plant uptake, or commercial/industrial land use. The criteria values selected are listed in the table below and full details on the source are referred to above. Where applicable, the results have also been assessed with reference to the required statistical tests presented within CLAIRE document "Guidance on comparing soil contamination data with a critical concentration".

ANALYSIS	GENERIC ASSESSMENT CRITERIA (mg/kg unless stated)			SOURCE
	RESIDENTIAL WITH PLANT UPTAKE	RESIDENTIAL WITHOUT PLANT UPTAKE	COMMERCIAL / INDUSTRIAL	
Arsenic	37	40	640	C4SL
Cadmium	22	150	410	
Chromium (total)[$]	910	910	8,600	S4UL
Chromium VI	21	21	49	C4SL
Lead	200	310	2,330	
Mercury*	11	15	320	S4UL
Selenium	250	430	12,000	
Nickel	180	180	980	
Copper	2400	7,100	68,000	
Zinc	3,700	40,000	730,000	
pH	<5 - 10> units			Professional judgement
Naphthalene	2.3	2.3	190	S4UL
Acenaphthylene	170	2,900	83,000	
Acenaphthene	210	3,000	84,000	
Fluorene	170	2,800	63,000	
Phenanthrene	95	1,300	22,000	
Anthracene	2,400	31,000	520,000	
Fluoranthene	280	1,500	23,000	
Pyrene	620	3,700	54,000	
Benzo(a)anthracene	7.2	11	170	
Chrysene	15	30	350	
Benzo(b)fluoranthene	2.6	3.9	44	
Benzo(k)fluoranthene	77	110	1,200	
Benzo(a)pyrene	2.2	3.2	35	
Indeno(1,2,3-cd)pyrene	27	45	500	
Dibenzo(a,h)anthracene	0.24	0.31	3.5	S4UL
Benzo(ghi)perylene	320	360	3,900	
TPH Aliphatic C5-C6	42	42	3,200	
TPH Aliphatic C6-C8	100	100	7,800	
TPH Aliphatic C8-C10	27	27	2,000	
TPH Aliphatic C10-C12	130	130	9,700	
TPH Aliphatic C12-C16	1,100	1,100	59,000	
TPH Aliphatic C16-C35	65,000	65,000	1,600,000	
TPH Aliphatic C35-C44	65,000	65,000	1,600,000	

ANALYSIS	GENERIC ASSESSMENT CRITERIA (mg/kg unless stated)			SOURCE
	RESIDENTIAL WITH PLANT UPTAKE	RESIDENTIAL WITHOUT PLANT UPTAKE	COMMERCIAL / INDUSTRIAL	
TPH Aromatic C5-C7	70	370	26,000	
TPH Aromatic C7-C8	130	860	56,000	
TPH Aromatic C8-C10	34	47	3,500	
TPH Aromatic C10-C12	74	250	16,000	
TPH Aromatic C12-C16	140	1,800	36,000	
TPH Aromatic C16-C21	260	1,900	28,000	
TPH Aromatic C21-C35	1,100	1,900	28,000	
TPH Aromatic C35-C44	1,100	1,900	28,000	
Benzene	0.87	3.3	98	C4SL
Toluene	130	880	56,000	S4UL
Ethylbenzene	47	83	5,700	
Xylene^	56	79	5,900	
MTBE	49	73	7,900	EIC/AGS/CL:AIRE GAC

Notes:
** The S4UL for methyl mercury has been adopted as the worst case mercury compound as generally there is no desk study evidence to suggest the potential for elemental mercury on the majority of sites.*
^ The lowest S4UL of either p-xylene, o-xylene or m-xylene has been adopted for each land use as a conservative measure.
$ S4UL for Chromium III adopted, as in the absence of Chromium VI it is likely that all of the chromium will be in this form as these are the two most common and stable forms of chromium in the soil environment.

Where no GAC is available, any concentrations exceeding the laboratory limit of detection are identified and discussed in more detail.

Water Environment - Soil Generic Assessment Criteria

There are no UK published Generic Assessment Criteria for soil test results in respect of the risk to the water environment and therefore risk estimation is on the basis of the professional judgement and experience of BRD to employ values that are a reasonable concentration above which concern for water resources is valid.

The Total PAH GAC employed is the sum of the 16No. priority PAH compounds regularly tested for in contaminated land analysis (i.e. US EPA 16PAHs). BRD employ a soil screening based upon the total PAH limit for 'inert waste' of 100mg/kg. The rationale is based on PAHs are recognised to be generally of low solubility and the risk to the water environment is correspondingly low.

In respect of Total Petroleum Hydrocarbons, BRD employ a value of 500 mg/kg as a screening value in comparison to the sum of the component aliphatic and aromatic TPH carbon bands. The employed soil screening value is based upon:

- *In common with some other consultants, the professional judgement and experience of BRD suggests that this value is a reasonable concentration above which concern for water resources is valid. The rationale is based on the fact that lower concentrations of fuel based contaminants are more likely to naturally degrade than migrate any great distance.*

- *BRD is aware of regional Environment Agency groundwater and contaminated land teams historically employing 500 mg/kg as a screening value for considering whether or not TPH could represent a risk to water resources.*

- *The value mirrors the mineral oil Waste Acceptance Criteria limits for what is considered 'inert waste'.*

Should elevated contaminants that pose a potential risk to the water environment be identified then site specific assessment criteria should be developed.

Building Materials and Services – Soil Generic Assessment Criteria

Some hydrocarbon compounds are known to both attack and permeate through certain plastic pipe materials, with the primary concern being the degradation and tainting of water supplies. The UK Water Industry Research (UKWIR) has therefore produced a document 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' (ref. 10/WM/03/21) that specifies threshold criteria for the adoption of 'standard' polythene (PE) or PVC pipes, protective barrier pipe and ductile iron/steel/copper pipes.

The UKWIR threshold assessment criteria from Table 3.1 of this document for standard PE pipes have been employed. It should be noted that the approach taken by UKWIR is very conservative, and both the document and research are flawed. However, it is these values that are being using to specify water pipe materials and therefore it is appropriate to consider them.

The UKWIR guidance is particularly flawed in respect of the chemical analysis it expects as it seeks a limit of detection that is generally below limits that are reasonable or commonly employed in contaminated land assessment. The UKWIR seeks that where a substance is below the limit of detection it should be taken as being present at half this concentration. For the larger suite of chemicals where the limit is against a sum of compounds, this approach would mean that a sample of virgin sub-soil from a greenfield site with absolutely no contamination would actually fail the criteria for using standard PE pipes. To avoid this situation, BRD have adopted the approach of summing only those compounds detected above their respective limits of detection.

In terms of building materials, the primary concern is in respect of concrete as certain commonly occurring natural ground conditions can adversely impact on buried concrete as discussed in 'Special digest 1:2005 Concrete in aggressive ground', BRE, 2005.

ANALYSIS	GENERIC ASSESSMENT CRITERIA	SOURCE
pH	<5.5	BRE Special Digest 1:2005
Sulphate (w/s)	500 mg/l	BRE Special Digest 1:2005
Sum of any VOC above detection limits	0.5 mg/kg	Relevant compounds adapted from UKWIR Table 3.1
Sum of SVOC + Aliphatic TPH >C5-C10 + Aromatic TPH >C5-C10 above detection limits	2 mg/kg	
Sum of Aliphatic TPH >C10-C21 + Aromatic TPH >C10-C21 above detection limits	10 mg/kg	
Sum of Aliphatic TPH >C21-C34 + Aromatic TPH >C10-C35 above detection limits	500 mg/kg	
Sum of BTEX + MTBE above detection limits	0.1 mg/kg	
Phenols	2 mg/kg	
Cresols and chlorinated phenols	2 mg/kg	
Naphthalene	0.5 mg/kg	
Benzo(a)pyrene	0.5 mg/kg	

RISK ESTIMATION – GROUNDWATER

The initial assessment of the contamination risk to groundwater is by comparing dissolved groundwater concentrations with screening values (GAC) that are protective of groundwater resources.

The reference source for the target concentrations is generally the EA's Environmental Quality Standards (EQS) (accessed July 2018: http://evidence.environment-agency.gov.uk/ChemicalStandards/report.aspx?cid=17), the Water Supply (Water Quality) Regulations 2016 and the DW1/DW2 criteria from the Surface Water (Abstraction for drinking water)(classification) Regulations 1996. The target concentrations are outlined in the table below. The 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies'. CL:AIRE, 2017 has also been used as reference source for the values.

ANALYSIS	GENERIC ASSESSMENT CRITERIA (GAC)	SOURCE
Arsenic	50 µg/l	DW1 & EQS
Cadmium	5 µg/l	EQS
Chromium (total)	50 µg/l	DW2 & EQS
Copper	50 µg/l	DW1
Nickel	20 µg/l	EQS
Lead	50 µg/l	DW1
Mercury	1 µg/l	WSR
Selenium	10 µg/l	WSR
Zinc	5 mg/l	DW2
Cyanide	50 µg/l	WSR
pH	6 to 9 units	EQS
Benzene	10 µg/l	EQS
Toluene	74 µg/l	EQS
Ethylbenzene	300 µg/l	WHO guideline
Xylene	30 µg/l	EQS
Methyl tert-butyl ether (MTBE)	15 µg/l	Taste and odour threshold.
Naphthalene	2 µg/l	EQS
Benzo(a)pyrene	0.0017 µg/l	EQS – Less than Limit of Detection (LOD)
Total PAH	0.2 µg/l	DW1
TPH Aliphatic C5-C6	15,000 µg/l	World Health Organization (WHO) guide values for TPHCWG fractions in drinking water
TPH Aliphatic C6-C8	15,000 µg/l	
TPH Aliphatic C8-C10	300 µg/l	
TPH Aliphatic C10-C12	300 µg/l	
TPH Aliphatic C12-C16	300 µg/l	
TPH Aromatic C5-C7	10 µg/l	
TPH Aromatic C7-C8	700 µg/l	
TPH Aromatic C8-C10	300 µg/l	
TPH Aromatic C10-C12	90 µg/l	
TPH Aromatic C12-C16	90 µg/l	
TPH Aromatic C16-C21	90 µg/l	
TPH Aromatic C21-C35	90 µg/l	

There are no available generic assessment criteria for some of the analytical parameters which have been scheduled, for example hexavalent chromium, and some VOC compounds. These parameters will be assessed based on professional judgement should they exceed the limit of detection.

RISK ESTIMATION - GROUND GAS

Introduction

A variety of potentially hazardous gases occur in naturally in the ground environment. Microbial decay of organic matter under anaerobic conditions and geological processes can lead to the generation of Methane and Carbon Dioxide, but can also include traces gases such as Hydrogen sulphide and Carbon monoxide.

Methane is a colourless and odourless gas that has the hazardous properties of being flammable and, at certain air/Methane mixtures, explosive. Methane has a low toxicity, but can be a simple asphyxiant due to the displacement of oxygen.

Carbon Dioxide is a colourless, odourless and non-combustible gas that has the hazardous property of being a highly toxic chemical. At concentrations of 3% by volume, shortness of breath and headaches will occur becoming acute by 6%. At levels of above 10% by volume headache, visual distortion, tremors and rapid loss of consciousness occur. Concentrations of Carbon Dioxide above 22% by volume are likely to be fatal. The effects of Carbon Dioxide poisoning are made more severe if there is accompanying reduction in oxygen concentrations.

Hydrogen sulphide is a colourless and flammable gas that has an odour of rotten eggs. It is important to that the sense of smell is over powered at higher concentrations. The gas is toxic and can be an asphyxiant.

Carbon monoxide is a colourless, odourless and explosive gas in air mixtures that has the hazardous property of being a highly toxic chemical.

Radon is a naturally occurring colourless and odourless gas that is radioactive. It is formed by the radioactive decay of radium which in turn is derived from the radioactive decay of uranium, both of which are minerals that can be found in many soil types. Whilst it is recognised that the air inside every building contains radon, some buildings built in certain defined areas of the country might have unacceptably high concentrations and require special precautions to be taken. The maps contained within BRE211:2015 'Radon: guidance on protective measures for new buildings' identify areas where no radon protection measures are necessary or where higher concentrations are present that either basic or full radon protection measures are required to be fitted to all new buildings, extensions or refurbishments.

Basis of Gas Assessment

In order to classify the level of risk and need, if any, for gas protection measures at a site with the potential for a gas problem, consideration of each of the following is necessary:

- *The source of the gas.*
- *The generation potential of the gas.*
- *The location of the source and the geological setting.*
- *Boreholes flow rate and estimated surface emission rate.*
- *The nature of the proposed development.*
- *Confidence in the knowledge of the gas regime.*

The gas assessment is made with reference to 'C665 - Assessing risks posed by hazardous ground gases to buildings', Construction Industry Research and Information Association (CIRIA), 2007 and 'BS8485:2015 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings' BSi 2015.

Gas Screening Value

The methods within CIRIA C665 and BS8485 both use the gas concentrations together with the borehole flow rates to define a characteristic situation for a site based on the limiting borehole gas volume flow for Methane and Carbon Dioxide. This limiting borehole gas volume flow is called the Gas Screening Value (GSV) and is expressed below:

Gas Screening Value (l /hr) = borehole flow rate (l/hr) x gas concentration (fraction)

The calculation of GSV is completed for both Methane and Carbon Dioxide and then the 'worse case' maximum values are used in the assessment. The assessment is to determine the gas regime at the site is dependent upon the nature of the development.

Characteristic Gas Situation

The characteristic situation for many sites is determined from evaluation of the Gas Screening Value derived against the criteria in the following table.

Characteristic situation	Hazard potential	Gas Screening Value (CH4 or CO2 l/hr)	Additional factors
CS1	Very low risk	<0.07	Typically Methane ≤1% and/or Carbon Dioxide ≤5%. Otherwise consider an increase to characteristic situation 2.
CS2	Low risk	0.07 to <0.7	Borehole air flow rate not to exceed 70 l/hr. Otherwise consider an increase to characteristic situation 3.
CS3	Moderate risk	0.7 to <3.5	-
CS4	Moderate to high risk	3.5 to <15	-
CS5	High risk	15 to <70	-
CS6	Very high risk	>70	-

Low rise housing with gardens – NHBC 'Traffic Lights'

The NHBC model for low rise housing development considered a typical residential house with a ground floor area of 64m^2, suspended floor and ventilated sub-floor void of height 150mm. Where the proposed development of a site is consistent with this model, the NHBC traffic light situation of the site is determined from evaluation of the Gas Screening Value against the criteria in the following table.

Traffic Lights	Methane		Carbon Dioxide	
	Typical maximum concentrations (%)	Gas Screening Value (l/hr)	Typical maximum concentrations (%)	Gas Screening Value (l/hr)
Green	≤1	≤0.16	≤5	≤0.78
Amber 1	1> to ≤5	>0.16 to ≤0.63	>5 to ≤10	>0.78 to ≤1.56
Amber 2	5> to ≤20	>0.63 to ≤1.56	>10 to ≤30	>1.56 to ≤3.13
Red	>20	>1.56	>30	>3.13

APPENDIX 1

Site Location Plan

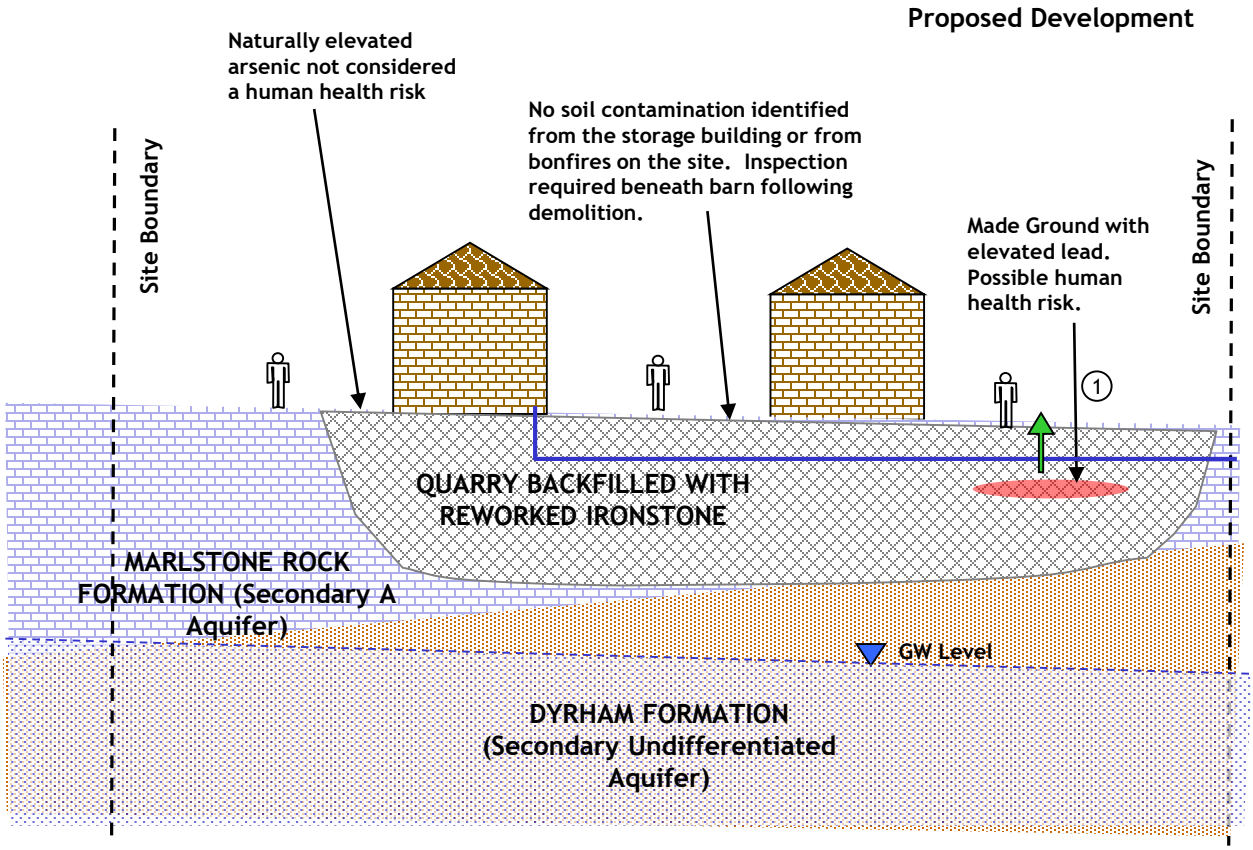
Reproduced by permission of Ordnance Survey® on behalf of The Controller of Her Majesty's Stationery Office.

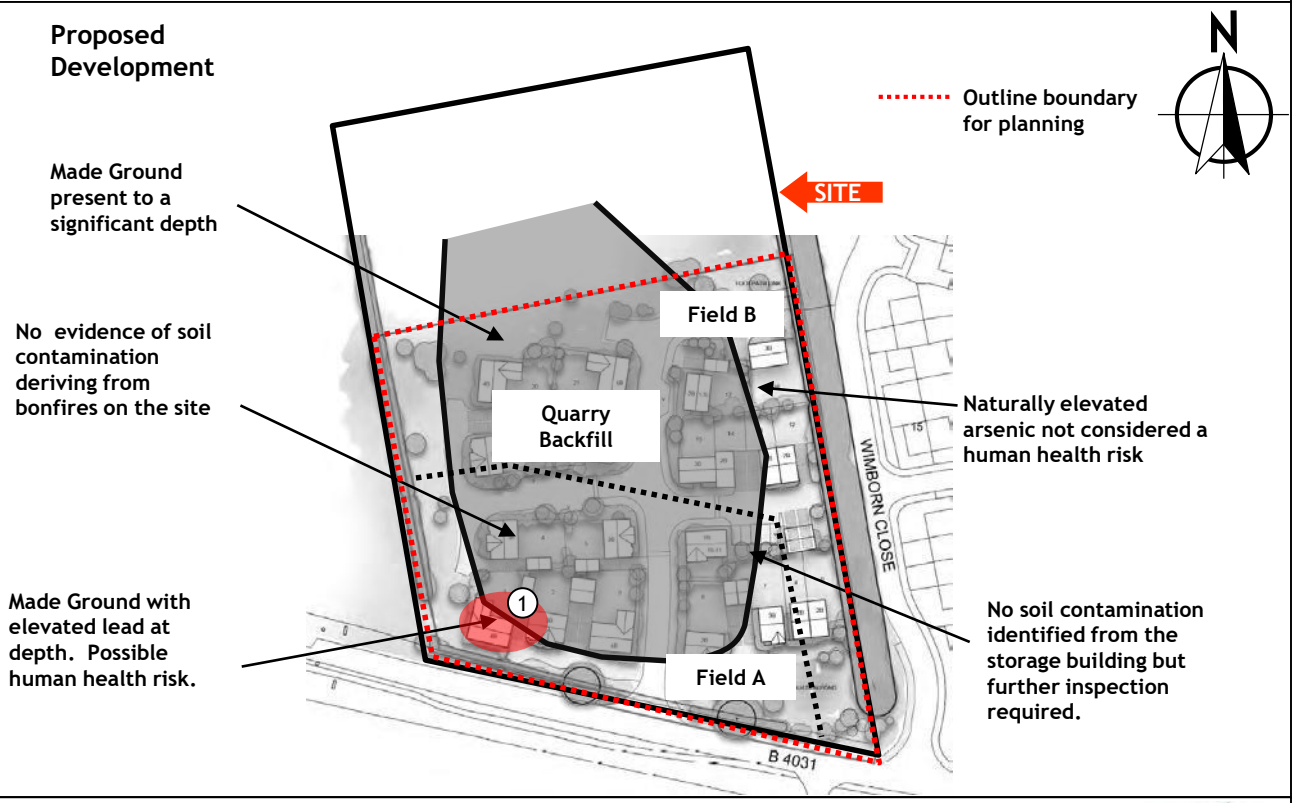
Not to scale.

Project Title:	Hempton Road, Deddington
Client:	Pembury Estates Limited
BRD Reference:	BRD3567-OP2-A
Date Issued:	October 2019

BRD
01295 272244
info@brduk.com

Initial Conceptual Model





Project Title:	Hempton Road, Deddington.
Client:	Pembury Estates Limited
BRD Reference:	BRD3567-OP7-A
Date Issued:	January 2020

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NO DIMENSIONS TO BE SCALED FROM DRAWING
ALL DIMENSIONS ARE APPROXIMATE AND TO BE CHECKED ON SITE

THIS DRAWING IS FOR PLANNING PURPOSES ONLY SUBJECT TO BUILDING CONTROL STANDARDS AND COMMENTS

REV:	BY:	DATE:	DETAILS:
D	AJT	14.05.2019	RED LINE AMENDED
C	AJT	26.03.2019	GENERAL AMENDMENTS FOLLOWING COMMENTS FROM LPA
B	AJT	04.03.2019	GENERAL AMENDMENTS FOLLOWING COMMENTS FROM LPA
A	AJT	09.07.2018	GENERAL AMENDMENTS

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PROJECT:
Hempton Road DEDDINGTON

DRAWING TITLE:
Illustrative Concept Plan

SCALE:	STAGE:	DATE:
1:1000 (A3)	Prelim	March 2018

DRAWING NO: **A_1807 P100**
REVISION: **D**

Key:

- BRD Trial Pit Locations
- BRD Site Boundary (Approximate Locations)

Notes:

All BRD Trial pits are located by Topographical survey.

Drawing reproduced from Greenhatch Group
Drawing Title: Topographical Survey
Drawing No: 29833_T; Rev .0; Dated: 23/03/2018

Revision	Date	Description	Drawn	Approved

Drawing title

EXPLORATORY POINT PLAN

Project title

HEMPTON ROAD, DEDDINGTON

Client

PEMBURY ESTATES LIMITED

Scale	Original drg. size/colour	Date
1:750	A3 / C	23/12/2019
Drawn	**Checked**	**Approved**
DB	JH	DB

Drawing Number	Rev
BRD3567-OD1	A

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Key:

- Shallow strip/trench fill footings
- Piles or Ground Improvement
- BRD Trial Pit Locations
- BRD Site Boundary (Approximate Locations)

Notes:

All BRD Trial pits are located by Topographical survey.

Foundation zones approximate only.

Drawing reproduced from Greenhatch Group
Drawing Title: Topographical Survey
Drawing No: 29833_T; Rev .0; Dated: 23/03/2018

Revision	Date	Description	Drawn	Approved

Drawing title

FOUNDATION ZONING PLAN

Project title

HEMPTON ROAD, DEDDINGTON

Client

PEMBURY ESTATES LIMITED

Scale	Original drg. size/colour	Date
1:750	A3 / C	03/02/2020
Drawn	**Checked**	**Approved**
RM	MM	BD

Drawing Number	Rev
BRD3567-OD3	A

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APPENDIX 2

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	16/10/2019
Method Used:	180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP01

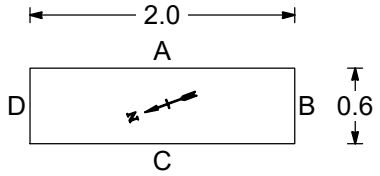
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		MADE GROUND TOPSOIL: Dark brown, very sandy, very gravelly clay. Gravel of fine to coarse, subangular limestone and ironstone and occasional rootlets.		MADE GROUND	
			MADE GROUND: Soft, brown, very sandy, gravelly clay. Gravel of fine to coarse, subangular ironstone.	0.30 ()		
0.70	D1					
0.80	J2					
1.00	PID	0.0 ppm	MADE GROUND: Loose, brown to yellow brown, sandy, clayey, fine to coarse, angular gravel of tabular ironstone.	0.90 ()		
2.00	PID B1	0.0 ppm				
			2.70m: Large scale collapse of sides.	2.70 ()		

Pit Stability: Pit sides collapsed
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
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Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	16/10/2019
Method Used:	180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP02

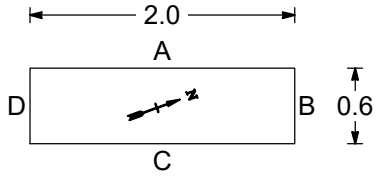
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	PID J1	0.0 ppm	MADE GROUND TOPSOIL: Dark brown, very sandy, very gravelly clay. Gravel of fine to coarse, subangular limestone and ironstone with occasional rootlets, brick and plastic fragments.			
			MADE GROUND: Medium dense to dense, orange brown to yellow brown, sandy, angular gravel and cobbles of tabular ironstone.	0.40 ()	MADE GROUND	
1.00	PID J2	0.0 ppm		1		
			Medium dense to dense, orange brown to yellow brown, sandy, angular GRAVEL and COBBLES of tabular ironstone.	1.20 ()	MARLSTONE ROCK FM	
2.00	PID D1	0.0 ppm		2		
			2.30m: Limited progress through rock.	2.30 ()		
				3		
				4		

Pit Stability: Generally stable throughout
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client: Pembury Estates
Project Title: Hempton Road, Deddington
Project No: BRD3567
Logged By: M Morgan
Date Completed: 16/10/2019
Method Used: 180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP03

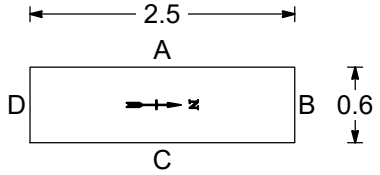
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			MADE GROUND TOPSOIL: Dark brown, very sandy, very gravelly clay with occasional rootlets. Gravel of fine to coarse, subangular limestone and ironstone.	0.20 ()	MADE GROUND	
0.40	PID J1	0.0 ppm	MADE GROUND: Brown to orange brown, gravelly, sandy clay. Gravel of fine to coarse, subangular ironstone, brick, breezeblock and occasional glass.			
0.80	PID D1 J2	0.0 ppm	MADE GROUND: Dark gray to brown / black gravelly sand of ash and clinker. Gravel of fine to coarse, rounded to subangular glass, ceramic and rare, small, animal bone fragments.	0.70 () 1		
			Firm, light brown, very sandy, gravelly CLAY with increasing gravel with depth. Gravel of subangular, medium to coarse ironstone.	1.30 () 2	DYRHAM FORMATION	
2.20	D2					
2.70	PID J3	0.0 ppm		2.90 () 3		
				4		

Pit Stability: See General Remarks
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Pit sides collapsed in Made Ground.
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client: Pembury Estates
Project Title: Hempton Road, Deddington
Project No: BRD3567
Logged By: M Morgan
Date Completed: 16/10/2019
Method Used: 180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP04

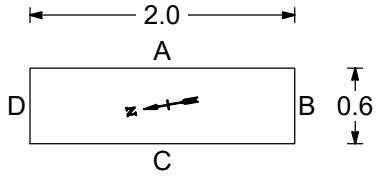
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		MADE GROUND TOPSOIL: Dark brown, very sandy, very gravelly clay. Gravel of fine to coarse, subangular limestone and ironstone and occasional rootlets.	0.25 ()	MADE GROUND	
			MADE GROUND: Loose, brown, very sandy, clayey gravel and cobbles of angular ironstone.			
0.50	D1					
0.60	J2			0.70 ()		
			MADE GROUND: Medium to dense, slightly sandy gravel and cobbles of angular ironstone.			
1.00	PID	0.0 ppm		1		
			1.40 m: Occasional boulders.			
2.00	PID	0.0 ppm		2		
2.50	D2					
			2.60m: Difficult to excavate due to boulders.	2.60 ()		
				3		
				4		

Pit Stability: See General Remarks
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Collapse of pit sides down to 1.8m.
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	16/10/2019
Method Used:	180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP05

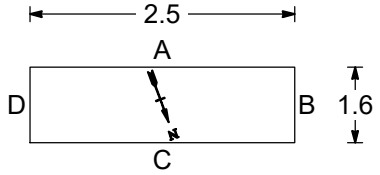
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	PID J1	0.0 ppm	MADE GROUND TOPSOIL: Dark brown, very sandy, very gravelly clay. Gravel of fine to coarse, subangular limestone and ironstone and occasional rootlets.	0.30 ()	MADE GROUND	
0.70	J2		MADE GROUND: Soft, brown, very sandy, gravelly clay. Gravel of fine to coarse, angular ironstone.			
0.80	PID D1	0.0 ppm		1		
			MADE GROUND: Loose, brown, clayey, sandy gravel, cobbles and boulders of angular ironstone.	1.10 ()		
				2		
2.10	B1					
2.20	PID J3	0.0 ppm				
			Medium dense, brown, clayey, sandy GRAVEL and COBBLES with boulders of angular ironstone.	2.30 ()	MRF	
				2.50 ()		
				3		
				4		

Pit Stability: See General Remarks
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Pit sides collapsed in Made Ground.
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client: Pembury Estates
Project Title: Hempton Road, Deddington
Project No: BRD3567
Logged By: M Morgan
Date Completed: 16/10/2019
Method Used: 180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP06

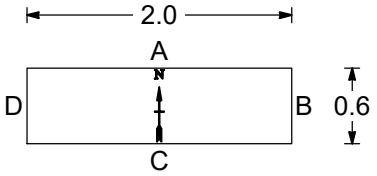
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	PID J1	0.0 ppm	MADE GROUND TOPSOIL: Loose, dark brown, sandy, slightly gravelly, clay. Gravel of fine to medium, angular ironstone.	0.30 ()	MADE GROUND	
0.60	PID J2	0.0 ppm	MADE GROUND: Firm, orange to brown, sandy, slightly gravelly clay. Gravel of fine to medium, angular ironstone (possible natural).			
0.65	D1		MADE GROUND: Loose to medium dense, yellow brown, sandy, clayey gravel and cobbles of angular ironstone (possible natural).	0.70 ()		
			1.20 m: Occasional boulders.	1		
2.00	PID D2	0.0 ppm		2		
2.30	B1		2.30m: Becoming difficult to excavate due to boulders.	2.30 ()		
				3		
				4		

Pit Stability: Slight spalling of sides
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client: Pembury Estates
Project Title: Hempton Road, Deddington
Project No: BRD3567
Logged By: M Morgan
Date Completed: 16/10/2019
Method Used: 180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP07

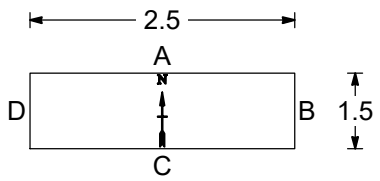
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		MADE GROUND TOPSOIL: Loose, dark brown, sandy, slightly gravelly, clay. Gravel of fine to medium, angular ironstone.			
			MADE GROUND: Firm, orange to brown, sandy, slightly gravelly clay. Gravel of fine to medium, angular ironstone (possible natural).	0.30 ()		
0.60	D1					
			MADE GROUND: Loose to medium, dense yellow brown, sandy, clayey gravel and cobbles of angular ironstone (possible natrual).	0.70 ()		
0.90	J2					
1.00	PID	0.0 ppm		1	MADE GROUND	
2.00	PID	0.0 ppm		2		
			2.10 m: Large scale collapse of sides.			
				3		
			3.00m: Becoming difficult to excavate due to boulders.	3.00 ()		
				4		

Pit Stability: Pit sides collapsed
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	16/10/2019
Method Used:	180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP08

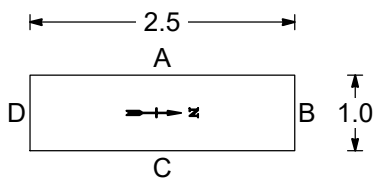
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		MADE GROUND TOPSOIL: Loose, dark brown, sandy, slightly gravelly, clay. Gravel of fine to medium, angular ironstone.			
			MADE GROUND: Firm, orange to brown, sandy, slightly gravelly clay. Gravel of fine to medium, angular ironstone.	0.30 ()		
0.80	D1					
1.00	PID	0.0 ppm	MADE GROUND: Loose to medium dense, yellow brown, sandy, clayey gravel and cobbles of angular ironstone.	0.90 () 1	MADE GROUND	
			1.20 - 2.80 m: Some collapse of trial pit sides.			
2.00	PID	0.0 ppm		2		
2.50	J2					
2.60	B1					
				2.80 ()		
				3		
				4		

Pit Stability: Pit sides collapsed
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client: Pembury Estates
Project Title: Hempton Road, Deddington
Project No: BRD3567
Logged By: M Morgan
Date Completed: 16/10/2019
Method Used: 180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP09

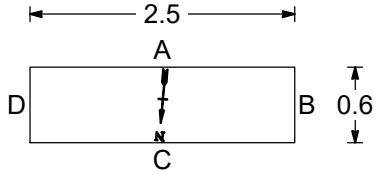
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			TOPSOIL: Loose, dark brown, sandy, slightly gravelly, clay. Gravel of fine to medium, angular ironstone.	0.30 ()	TS	
			Medium dense to dense, brown, sandy, clayey GRAVEL and COBBLES of fine to coarse, angular and tabular ironstone.		MARLSTONE ROCK FORMATION	
0.80	J1					
0.90	D1					
1.00	PID	0.0 ppm		1		
			1.70 m: Some boulders.			
2.00	PID	0.0 ppm		2		
			2.50 m: Becoming difficult to excavate.			
2.70	J2			3		
				3.10 ()		
				4		

Pit Stability: Slight spalling of sides
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client: Pembury Estates
Project Title: Hempton Road, Deddington
Project No: BRD3567
Logged By: M Morgan
Date Completed: 16/10/2019
Method Used: 180° Backhoe excavator (JCB 3CX type)

Trial Pit No.

TP10

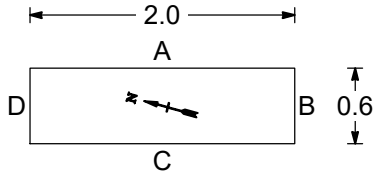
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		TOPSOIL: Loose, dark brown, sandy, slightly gravelly, clay. Gravel of fine to medium, angular ironstone.	0.30 ()	TS	
0.70	J2		Medium dense, brown, sandy, clayey GRAVEL and COBBLES of angular and tabular ironstone.		MARLSTONE ROCK FORMATION	
0.80	D1					
1.00	PID	0.0 ppm		1		
			1.50 m: Some boulders. 1.50 - 2.80 m: Increasingly difficult to excavate at depth.			
2.00	PID	0.0 ppm		2		
2.70	J3			2.80 ()		
3.00	PID	0.0 ppm		3		
				4		

Pit Stability: Generally stable throughout
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client: Pembury Estates
Project Title: Hempton Road, Deddington
Project No: BRD3567
Logged By: M Morgan
Date Completed: 10/12/2019
Method Used: 360° Mechanical Excavator

Trial Pit No.

TP11

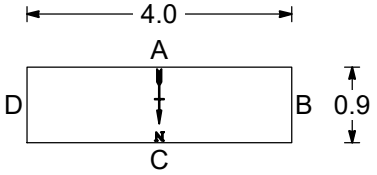
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		MADE GROUND TOPSOIL: Loose, brown, sandy, slightly gravelly clay. Gravel of fine to medium, subangular to angular ironstone with roots and rootlets.	0.35 ()	MG	
0.90	J2		Loose, orangish brown, slightly sandy, clayey gravel and cobbles of angular tabular ironstone (Possible Made Ground). 0.80 m: Increasing number of cobbles.	1	MARLSTONE ROCK FORMATION	
2.00	B1		2.30 m: Increasing number of boulders.	2		
			Strong, light brown, ironstone rock present as a continuous slab.	2.90 () 3 2.95 ()		
				4		

Pit Stability: Slight spalling of sides
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client: Pembury Estates
Project Title: Hempton Road, Deddington
Project No: BRD3567
Logged By: M Morgan
Date Completed: 10/12/2019
Method Used: 360° Mechanical Excavator

Trial Pit No.

TP12E

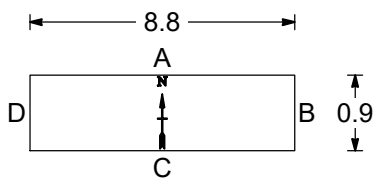
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			MADE GROUND TOPSOIL: Loose brown sandy, slightly gravelly clay. Gravel of fine to medium, subangular to angular ironstone with roots and rootlets.	0.30 ()	MADE GROUND	
			MADE GROUND: Loose orangish brown sandy gravelly clay. Gravel of fine to coarse, subangular to angular tabular ironstone (possible natural).	0.70 ()		
			Medium dense to dense, yellowish brown, clayey GRAVEL and COBBLES of angular to tabular, layered ironstone.	1	MRF	
				1.20 ()		
				2		
				3		
				4		

Pit Stability: Generally stable throughout
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.
Eastern end of trial pit TP12.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	10/12/2019
Method Used:	360° Mechanical Excavator

Trial Pit No.

TP12W

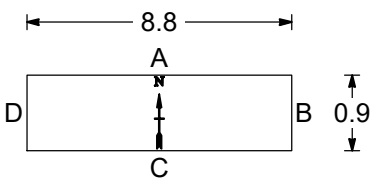
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			MADE GROUND TOPSOIL: Loose brown sandy, slightly gravelly clay. Gravel of fine to medium, subangular to angular ironstone with roots and rootlets.	0.30 ()	MADE GROUND	
			MADE GROUND: Loose orangish brown sandy gravelly clay. Gravel of fine to coarse, subangular to angular tabular ironstone (possible natrual).	0.70 ()		
			MADE GROUND: Loose, orangish brown, clayey gravel and cobbles of tabular ironstone (possible natural).	1		
			1.30 m: Increasing number of cobbles and boulders with depth. Average boulder size 400mm x 170mm x 300mm.	2		
				3		
			Strong, light brown, ironstone rock present as a continuous slab.	3.00 () 3.05 ()		
				4		

Pit Stability: Slight spalling of sides
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.
Western end of trial pit TP12.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	10/12/2019
Method Used:	360° Mechanical Excavator

Trial Pit No.

TP13

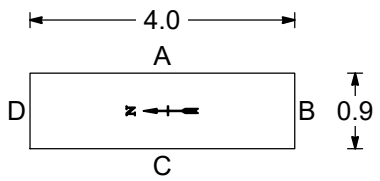
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			MADE GROUND TOPSOIL: Loose, dark brown, slightly sandy, gravelly clay. Gravel of fine to medium, subangular to angular ironstone and ceramic.	0.30 ()	MADE GROUND	
			MADE GROUND: Loose, orangish brown, sandy, clayey gravel and cobbles of angular tabular ironstone.	1 2		
			Strong, light brown, ironstone rock present as a continuous slab.	2.90 () 3 3.00 ()	M	
				4		

Pit Stability: Slight spalling of sides
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	10/12/2019
Method Used:	360° Mechanical Excavator

Trial Pit No.

TP14

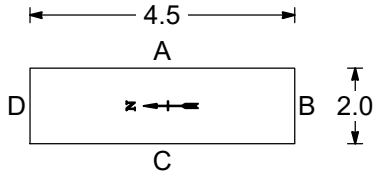
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			MADE GROUND TOPSOIL: Loose, dark brown, slightly sandy, gravelly clay. Gravel of fine to medium, subangular to angular ironstone and ceramic.	0.30 ()	MADE GROUND	
			MADE GROUND: Loose, orangish brown, sandy, clayey gravel and cobbles of angular tabular ironstone.	1		
			2.00 m: Some collapse of trial pit sides.	2		
				3	3.00 ()	
3.20 3.30	J1 D1		Firm, greyish brown with orange mottling slightly gravelly CLAY. Gravel of fine subrounded to subangular limestone and ironstone.		DYRHAM FM	
				3.50 ()		
				4		

Pit Stability: Pit sides collapsed
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	10/12/2019
Method Used:	360° Mechanical Excavator

Trial Pit No.

TP15

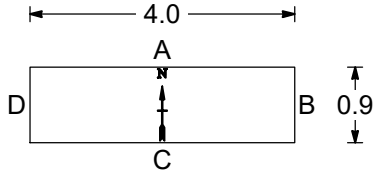
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			MADE GROUND / TOPSOIL: Loose, brown sandy, slightly gravelly clay. Gravel of fine to medium, subangular to angular ironstone with roots and rootlets.	0.35 ()	MG	
0.60	J1		Loose reddish to orangish brown, slightly sandy, gravelly CLAY. Gravel of medium to coarse, angular ironstone (possible Made Ground).	0.80 ()	MARLSTONE ROCK FORMATION	
			Very weak ironstone, recovered as orangish brown sandy, clayey, angular tabular GRAVEL and COBBLES of ironstone.	1		
			Loose, orangish brown, sandy, clayey GRAVEL and COBBLES of ironstone.	1.20 ()		
			1.50 m: ironstone bedrock extending as slab 1m from wall D.			
			2.00 m: Some collapse of trial pit sides.	2		
				3		
			Strong, light brown, ironstone rock present as a continuous slab.	3.10 () 3.15 ()		
				4		

Pit Stability: Pit sides collapsed
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	10/12/2019
Method Used:	360° Mechanical Excavator

Trial Pit No.

TP16

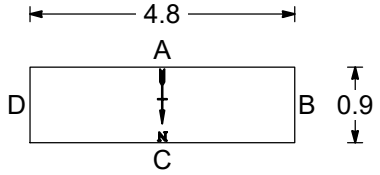
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			MADE GROUND / TOPSOIL: Loose, brown sandy, slightly gravelly clay. Gravel of fine to medium, subangular to angular ironstone with roots and rootlets.	0.30 ()	MG	
			Loose, orangish brown, slightly sandy, gravelly CLAY. Gravel of subangular to angular medium to coarse ironstone (possible Made Ground).	0.60 ()	MARLSTONE ROCK FORMATION	
			Loose to medium dense, orangish brown, clayey gravel and cobbles of angular tabular ironstone (possible Made Ground).	1		
1.20	D1					
1.50	J1					
			2.50 m: Becoming hard to dig with medium dense layer of ironstone extending 1m into the pit from from wall D.	2		
				3		
			Strong, light brown, ironstone rock present as a continuous slab.	3.40 () 3.45 ()		
				4		

Pit Stability: See General Remarks
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Pit sides collapsing in possible Made Ground.
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

TRIAL PIT RECORD

Client:	Pembury Estates
Project Title:	Hempton Road, Deddington
Project No:	BRD3567
Logged By:	M Morgan
Date Completed:	10/12/2019
Method Used:	360° Mechanical Excavator

Trial Pit No.

TP17

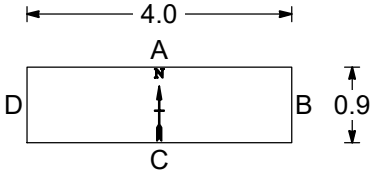
Sheet 1 of 1

Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
			MADE GROUND / TOPSOIL: Loose, brown, sandy, slightly gravelly clay. Gravel of fine to medium, subangular to angular ironstone with roots and rootlets.	0.30 ()	MG	
			Loose, orangish brown, slightly sandy, gravelly CLAY. Gravel of subangular to angular, medium to coarse ironstone (possible Made Ground).	0.90 ()	MARLSTONE ROCK FORMATION	
1.50	D1		Medium dense to dense, orangish brown, sandy, clayey GRAVEL and COBBLES of angular tabular ironstone.	1		
2.00	J1			2		
			Very weak, ironstone rock excavated as orangish brown clayey, gravelly COBBLES AND BOULDERS of angular tabular ironstone.	2.20 ()		
				3		
				3.50 ()		
				4		

Pit Stability: Slight spalling of sides
Groundwater: Not encountered

Surface Elevation Level:

Plan of Trial Pit:



General Remarks:
Relative density based on visual assessment only.

All dimensions in metres
Log Scale 1:25

BRD
Telephone: 01295 272244
Email: info@brduk.com

Trial Pit Photographs

TP01

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

01295 272244
info@brduk.com

Trial Pit Photographs

TP02

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

BRD
01295 272244
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Trial Pit Photographs

TP03

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

BRD
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Trial Pit Photographs

TP04

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

01295 272244
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Trial Pit Photographs

TP05

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

01295 272244
info@brduk.com

Trial Pit Photographs

TP06

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

BRD
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info@brduk.com

Trial Pit Photographs

TP07

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

BRD
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info@brduk.com

Trial Pit Photographs

TP08

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

BRD
01295 272244
info@brduk.com

Trial Pit Photographs

TP09

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP5-A
Date Issued: October 2019

BRD
01295 272244
info@brduk.com

Trial Pit Photographs

TP10

Project Title:	Hempton Road, Deddington
Client:	Pembury Estates
BRD Reference:	BRD2567-OP5-A
Date Issued:	October 2019

BRD
01295 272244
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Trial Pit Photographs

TP11

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP8-A
Date Issued: December 2019

BRD
01295 272244
info@brduk.com

Trial Pit Photographs

TP12

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP8-A
Date Issued: December 2019

BRD
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Trial Pit Photographs

TP13

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP8-A
Date Issued: December 2019

BRD
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info@brduk.com

Trial Pit Photographs

TP14

Project Title:	Hempton Road, Deddington
Client:	Pembury Estates
BRD Reference:	BRD2567-OP8-A
Date Issued:	December 2019

BRD
01295 272244
info@brduk.com

Trial Pit Photographs

TP15

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP8-A
Date Issued: December 2019

BRD
01295 272244
info@brduk.com

Trial Pit Photographs

TP16

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP8-A
Date Issued: December 2019

BRD
01295 272244
info@brduk.com

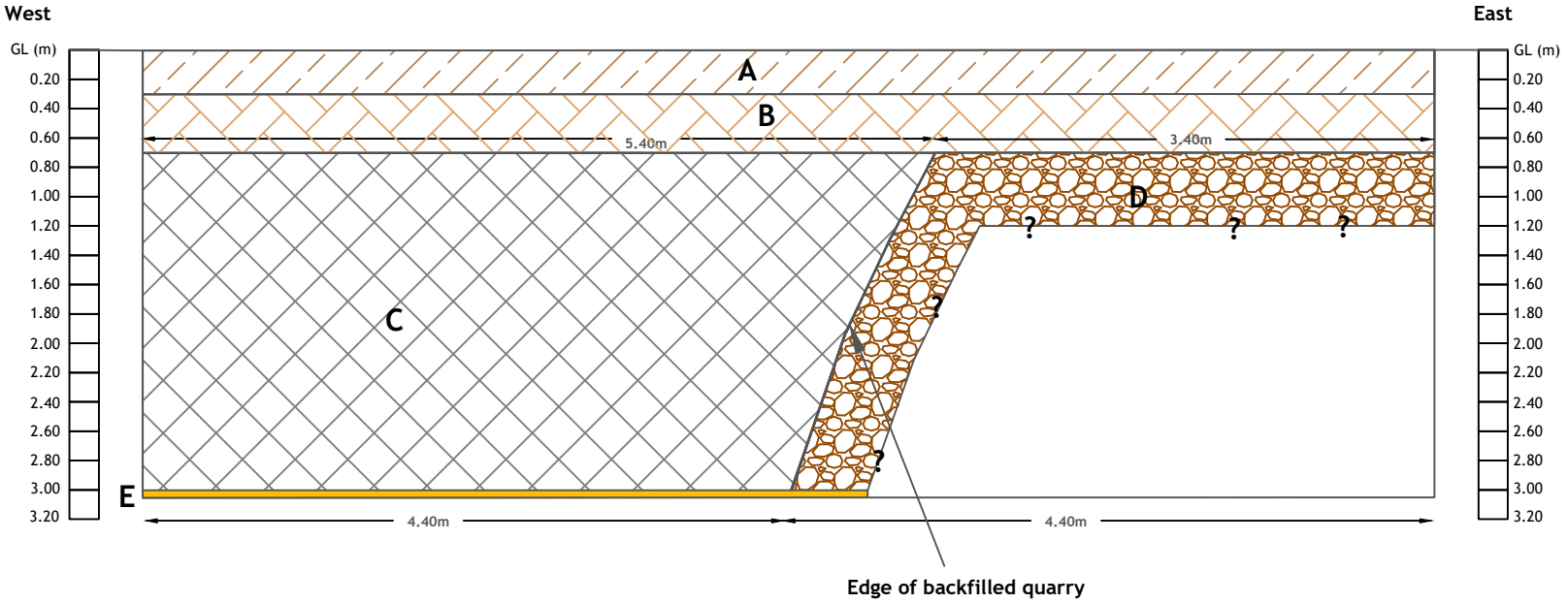
Trial Pit Photographs

TP17

Project Title: Hempton Road, Deddington
Client: Pembury Estates
BRD Reference: BRD2567-OP8-A
Date Issued: December 2019

BRD
01295 272244
info@brduk.com

TP12 CROSS SECTION FROM WEST TO EAST



A MADE GROUND/TOPSOIL: Loose, brown, sandy, slightly gravelly clay. Gravel of fine to medium, subangular to angular ironstone with roots and rootlets.

B MADE GROUND: Loose, orangish brown, sandy, gravelly clay. Gravel of fine to coarse, subangular to angular, tabular ironstone (possible natural).

C MADE GROUND: Loose, orangish brown, clayey gravel and cobbles of tabular ironstone (possible natural).

D Medium dense to dense, yellowish brown, clayey GRAVEL and COBBLES of angular to tabular, layered ironstone (MARLSTONE ROCK FORMATION).

E Strong, light brown ironstone bedrock presenting as continuous slab (MARLSTONE ROCK FORMATION).

General remarks:
Trial pit terminated at 3.05m bgl due to ironstone bedrock layer.
All dimensions in metres.

Strata Detail: 1.30m: In western section an incresing number of cobbles and boulders with depth. Average boulder size 400mm x 170mm x 300mm

Project title: HEMPTON ROAD, DEDDINGTON			Drawing title: TP12 CROSS SECTION DRAWING	
Client: PEMBURY ESTATE				
Scale: 1:50	Original drg. size/colour: A4 / C	Date: 06/01/2020		
Drawn: DB	Checked: JH	Approved: MM	Drawing Number: BRD3567-OD2	Rev: A

APPENDIX 3

Jessica Hand
BRD Environmental Ltd
Hawthorne Villa
1 Old Parr Road
Banbury
Oxfordshire
OX16 5HT

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 19-14862

Site Reference:	Hempton Road, Deddington
Project / Job Ref:	BRD3567
Order No:	None Supplied
Sample Receipt Date:	18/10/2019
Sample Scheduled Date:	18/10/2019
Report Issue Number:	1
Reporting Date:	29/10/2019

Authorised by:

[redacted]

Dave Ashworth
Technical Manager

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19	16/10/19	16/10/19	16/10/19
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP01	TP01	TP02	TP03	TP03
Project / Job Ref: BRD3567	**Additional Refs**	J1	J2	J1	J1	J2
Order No: None Supplied	**Depth (m)**	0.20	0.80	0.10	0.40	0.80
Reporting Date: 29/10/2019	**DETS Sample No**	442262	442263	442264	442265	442266

Determinand	Unit	RL	Accreditation					
Asbestos Quantification (S)	%	< 0.001	ISO17025		< 0.001		< 0.001	< 0.001
pH	pH Units	N/a	MCERTS	7.9	8.0	7.8	7.8	7.3
Total Sulphate as SO_4	mg/kg	< 200	NONE					
Total Sulphate as SO_4	%	< 0.02	NONE					
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	17	14	< 10	21	84
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.02	0.01	< 0.01	0.02	0.08
Total Sulphur	%	< 0.02	NONE					
Organic Matter	%	< 0.1	MCERTS	4.9	1.9	4.4	4.2	12.4
Arsenic (As)	mg/kg	< 2	MCERTS	148	143	139	108	79
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	2.1	1.9	2.1	1.8	3.1
Chromium (Cr)	mg/kg	< 2	MCERTS	233	252	220	179	77
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	43	22	40	102	335
Lead (Pb)	mg/kg	< 3	MCERTS	140	62	113	129	607
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	88	92	86	76	88
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	234	203	265	397	3030

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19	16/10/19	16/10/19	16/10/19
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP03	TP04	TP04	TP05	TP05
Project / Job Ref: BRD3567	**Additional Refs**	J3	J1	J2	J1	J2
Order No: None Supplied	**Depth (m)**	2.70	0.10	0.60	0.20	0.70
Reporting Date: 29/10/2019	**DETS Sample No**	442267	442268	442269	442270	442271

Determinand	Unit	RL	Accreditation					
Asbestos Quantification (S)	%	< 0.001	ISO17025					
pH	pH Units	N/a	MCERTS	7.9	8.0			8.0
Total Sulphate as SO_4	mg/kg	< 200	NONE	774				529
Total Sulphate as SO_4	%	< 0.02	NONE	0.08				0.05
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	74	< 10			12
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.07	< 0.01			0.01
Total Sulphur	%	< 0.02	NONE	0.04				0.04
Organic Matter	%	< 0.1	MCERTS		1.3			
Arsenic (As)	mg/kg	< 2	MCERTS		136	110	134	
Cadmium (Cd)	mg/kg	< 0.2	MCERTS		1.8			
Chromium (Cr)	mg/kg	< 2	MCERTS		222			
Chromium (hexavalent)	mg/kg	< 2	NONE		< 2			
Copper (Cu)	mg/kg	< 4	MCERTS		15			
Lead (Pb)	mg/kg	< 3	MCERTS		35			
Mercury (Hg)	mg/kg	< 1	NONE		< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS		79			
Selenium (Se)	mg/kg	< 3	NONE		< 3			
Zinc (Zn)	mg/kg	< 3	MCERTS		201			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19	16/10/19	16/10/19	16/10/19
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP05	TP06	TP07	TP07	TP08
Project / Job Ref: BRD3567	**Additional Refs**	J3	J2	J1	J2	J1
Order No: None Supplied	**Depth (m)**	2.20	0.60	0.10	0.90	0.20
Reporting Date: 29/10/2019	**DETS Sample No**	442272	442273	442274	442275	442276

Determinand	Unit	RL	Accreditation					
Asbestos Quantification (S)	%	< 0.001	ISO17025				< 0.001	
pH	pH Units	N/a	MCERTS	8.0			8.0	7.8
Total Sulphate as SO_4	mg/kg	< 200	NONE	704				
Total Sulphate as SO_4	%	< 0.02	NONE	0.07				
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	26			< 10	< 10
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.03			< 0.01	< 0.01
Total Sulphur	%	< 0.02	NONE	0.03				
Organic Matter	%	< 0.1	MCERTS				1.1	4.4
Arsenic (As)	mg/kg	< 2	MCERTS		152	181	185	178
Cadmium (Cd)	mg/kg	< 0.2	MCERTS				2.5	2.6
Chromium (Cr)	mg/kg	< 2	MCERTS				336	275
Chromium (hexavalent)	mg/kg	< 2	NONE				< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS				11	32
Lead (Pb)	mg/kg	< 3	MCERTS				36	90
Mercury (Hg)	mg/kg	< 1	NONE				< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS				105	106
Selenium (Se)	mg/kg	< 3	NONE				< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS				174	243

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19	16/10/19	16/10/19	
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP08	TP09	TP09	TP10	
Project / Job Ref: BRD3567	**Additional Refs**	J2	J1	J2	J2	
Order No: None Supplied	**Depth (m)**	2.50	0.80	2.70	0.70	
Reporting Date: 29/10/2019	**DETS Sample No**	442277	442278	442279	442280	

Determinand	Unit	RL	Accreditation					
Asbestos Quantification (S)	%	< 0.001	ISO17025					
pH	pH Units	N/a	MCERTS			8.0	8.0	
Total Sulphate as SO_4	mg/kg	< 200	NONE			776	784	
Total Sulphate as SO_4	%	< 0.02	NONE			0.08	0.08	
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS			< 10	< 10	
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS			< 0.01	< 0.01	
Total Sulphur	%	< 0.02	NONE			0.04	0.04	
Organic Matter	%	< 0.1	MCERTS					
Arsenic (As)	mg/kg	< 2	MCERTS	301	192			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS					
Chromium (Cr)	mg/kg	< 2	MCERTS					
Chromium (hexavalent)	mg/kg	< 2	NONE					
Copper (Cu)	mg/kg	< 4	MCERTS					
Lead (Pb)	mg/kg	< 3	MCERTS					
Mercury (Hg)	mg/kg	< 1	NONE					
Nickel (Ni)	mg/kg	< 3	MCERTS					
Selenium (Se)	mg/kg	< 3	NONE					
Zinc (Zn)	mg/kg	< 3	MCERTS					

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19	16/10/19	16/10/19	16/10/19
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP01	TP01	TP02	TP03	TP03
Project / Job Ref: BRD3567	**Additional Refs**	J1	J2	J1	J1	J2
Order No: None Supplied	**Depth (m)**	0.20	0.80	0.10	0.40	0.80
Reporting Date: 29/10/2019	**DETS Sample No**	442262	442263	442264	442265	442266

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.21
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.16	0.27	0.76
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.16	< 0.1	0.40	0.75	1.47
Pyrene	mg/kg	< 0.1	MCERTS	0.14	< 0.1	0.36	0.69	1.24
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.19	0.42	0.67
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.24	0.45	0.79
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.17	< 0.1	0.28	0.59	0.84
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.20	0.33
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.16	0.36	0.47
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.27	0.36
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.24	0.28
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	1.8	4.2	7.4

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

DETS Ltd
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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19	16/10/19		
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP04	TP07	TP08		
Project / Job Ref: BRD3567	**Additional Refs**	J1	J2	J1		
Order No: None Supplied	**Depth (m)**	0.10	0.90	0.20		
Reporting Date: 29/10/2019	**DETS Sample No**	442268	442275	442276		

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.20		
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.18		
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.14		
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.22		
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - TPH LQM Banded						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19	16/10/19	16/10/19	
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP01	TP02	TP03	TP05	
Project / Job Ref: BRD3567	**Additional Refs**	J2	J1	J2	J2	
Order No: None Supplied	**Depth (m)**	0.80	0.10	0.80	0.70	
Reporting Date: 29/10/2019	**DETS Sample No**	442263	442264	442266	442271	

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	
Aliphatic >C16 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Aliphatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	< 30	< 30	< 30	< 30	
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Aromatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	
Aromatic (>C5 - C44)	mg/kg	< 30	NONE	< 30	< 30	< 30	< 30	
Total >C5 - C44	mg/kg	< 60	NONE	< 60	< 60	< 60	< 60	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C

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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19	16/10/19	16/10/19	
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP01	TP02	TP03	TP05	
Project / Job Ref: BRD3567	**Additional Refs**	J2	J1	J2	J2	
Order No: None Supplied	**Depth (m)**	0.80	0.10	0.80	0.70	
Reporting Date: 29/10/2019	**DETS Sample No**	442263	442264	442266	442271	

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C

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Soil Analysis Certificate - Semi Volatile Organic Compounds (SVOC)						
DETS Report No: 19-14862	**Date Sampled**	16/10/19	16/10/19			
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied			
Site Reference: Hempton Road, Deddington	**TP / BH No**	TP01	TP03			
Project / Job Ref: BRD3567	**Additional Refs**	J2	J2			
Order No: None Supplied	**Depth (m)**	0.80	0.80			
Reporting Date: 29/10/2019	**DETS Sample No**	442263	442266			

Determinand	Unit	RL	Accreditation					
Phenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
1,2,4-Trichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1			
2-Nitrophenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
Nitrobenzene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
0-Cresol	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
bis(2-chloroethoxy)methane	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
bis(2-chloroethyl)ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
2,4-Dichlorophenol	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
2-Chlorophenol	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1			
1,3-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1			
1,4-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1			
1,2-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1			
2,4-Dimethylphenol	mg/kg	< 0.15	ISO17025	< 0.15	< 0.15			
Isophorone	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
Hexachloroethane	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
p-Cresol	mg/kg	< 0.15	MCERTS	< 0.15	< 0.15			
2,4,6-Trichlorophenol	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
2,4,5-Trichlorophenol	mg/kg	< 0.15	MCERTS	< 0.15	< 0.15			
2-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
4-Chloro-3-methylphenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
2-Methylnaphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Hexachlorocyclopentadiene	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
Hexachlorobutadiene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1			
2,6-Dinitrotoluene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Dimethyl phthalate	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
2-Chloronaphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
4-Chloroanaline	mg/kg	< 0.15	NONE	< 0.15	< 0.15			
4-Nitrophenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
4-Chlorophenyl phenyl ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
3-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
4-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
4-Bromophenyl phenyl ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Hexachlorobenzene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
2,4-Dinitrotoluene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Diethyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Dibenzofuran	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Azobenzene	mg/kg	< 0.1	NONE	< 0.1	< 0.1			
Dibutyl phthalate	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1			
Carbazole	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1			
bis(2-ethylhexyl)phthalate	mg/kg	< 0.15	MCERTS	< 0.15	< 0.15			
Benzyl butyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Di-n-octyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 19-14862	
BRD Environmental Ltd	
Site Reference: Hempton Road, Deddington	
Project / Job Ref: BRD3567	
Order No: None Supplied	
Reporting Date: 29/10/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
442262	TP01	J1	0.20	19	Brown loamy sand with stones and vegetation
442263	TP01	J2	0.80	19.2	Brown sandy clay with stones
442264	TP02	J1	0.10	20.4	Brown sandy clay with stones
442265	TP03	J1	0.40	21.5	Brown loamy sand with stones
442266	TP03	J2	0.80	32.5	Black loamy sand with stones
442267	TP03	J3	2.70	23.3	Brown sandy clay with stones
442268	TP04	J1	0.10	17.1	Brown sandy clay with stones
442269	TP04	J2	0.60	18.7	Brown sandy clay with stones
442270	TP05	J1	0.20	20.2	Brown sandy clay with stones
442271	TP05	J2	0.70	19.7	Brown sandy clay with stones and vegetation
442272	TP05	J3	2.20	18	Brown sandy clay with stones
442273	TP06	J2	0.60	22	Brown sandy clay with stones
442274	TP07	J1	0.10	22.1	Brown loamy sand with stones and vegetation
442275	TP07	J2	0.90	18.3	Brown loamy sand with stones
442276	TP08	J1	0.20	21.5	Brown loamy sand with stones
442277	TP08	J2	2.50	15.7	Brown sandy clay with stones
442278	TP09	J1	0.80	14.1	Brown sandy clay with stones
442279	TP09	J2	2.70	17.3	Brown sandy clay with stones
442280	TP10	J2	0.70	17.5	Brown sandy clay with stones

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

Jessica Hand
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Hawthorne Villa
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Banbury
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OX16 5HT

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t: 01622 850410

DETS Report No: 19-17332

Site Reference:	Hempton Road, Deddington
Project / Job Ref:	BRD3567
Order No:	None Supplied
Sample Receipt Date:	13/12/2019
Sample Scheduled Date:	13/12/2019
Report Issue Number:	1
Reporting Date:	19/12/2019

Authorised by:

[redacted]

Dave Ashworth
Technical Manager

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4480

Soil Analysis Certificate						
DETS Report No: 19-17332	**Date Sampled**	10/12/19	10/12/19			
BRD Environmental Ltd	**Time Sampled**	None Supplied	None Supplied			
Site Reference: Hempton Road, Deddington	**TP / BH No**	J1	J1			
Project / Job Ref: BRD3567	**Additional Refs**	TP14	TP16			
Order No: None Supplied	**Depth (m)**	3.20	1.50			
Reporting Date: 19/12/2019	**DETS Sample No**	452439	452440			

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	7.9	7.8			
Total Sulphate as SO_4	mg/kg	< 200	NONE	< 200	323			
Total Sulphate as SO_4	%	< 0.02	NONE	< 0.02	0.03			
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	44	16			
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.04	0.02			
Total Sulphur	%	< 0.02	NONE	< 0.02	0.02			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C
Subcontracted analysis (S)

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 19-17332	
BRD Environmental Ltd	
Site Reference: Hempton Road, Deddington	
Project / Job Ref: BRD3567	
Order No: None Supplied	
Reporting Date: 19/12/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
452439	J1	TP14	3.20	18.2	Brown clayey sand
452440	J1	TP16	1.50	20.9	Brown clayey sand with stones

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

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Tel : 01622 850410

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 19-17332
BRD Environmental Ltd
Site Reference: Hempton Road, Deddington
Project / Job Ref: BRD3567
Order No: None Supplied
Reporting Date: 19/12/2019

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Certificate of Analysis

Certificate Number	19-25703-1
	08-Jan-20
Client	DETS South Unit 1 Rose Lane Industrial Estate Rose Lane Lenham Heath Maidstone, Kent ME17 2JN
Our Reference	19-25703-1
Client Reference	3567/17333
Order No	(not supplied)
Contract Title	Hempton Road, Deddington
Description	2 Soil samples.
Date Received	16-Dec-19
Date Started	16-Dec-19
Date Completed	08-Jan-20
Test Procedures	Identified by prefix DETSn (details on request).
Notes	**This report supersedes 19-25703, amendments.** Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis

Soil Samples

Our Ref 19-25703-1
Client Ref 3567/17333
Contract Title Hempton Road, Deddington

Lab No	1613762	1613763
Sample ID	J1 - TP11	J2 - TP11
Depth	0.20	0.90
Other ID	452441	452442
Sample Type	SOIL	SOIL
Sampling Date	10/12/19	10/12/19
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Metals					
Arsenic Gastric % Bioaccessible (% of Total As)	DETSC 2400*	0	%	4.2	2.4
Arsenic Gastric mg/kg Bioaccessible	DETSC 2400*	0.5	mg/kg	8.7	3.3
Arsenic Gastro Intestinal % Bioaccessible (% of Total As)	DETSC 2400*	0	%	1.6	1.5
Arsenic Gastro Intestinal mg/kg Bioaccessible	DETSC 2400*	0.5	mg/kg	3.3	2.1
Arsenic	DETSC 2301#	0.2	mg/kg	210	140

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 19-25703-1
Client Ref 3567/17333
Contract Hempton Road, Deddington

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1613762	J1 - TP11 0.20 SOIL	10/12/19	PG		
1613763	J2 - TP11 0.90 SOIL	10/12/19	PG		

Key: P-Plastic G-Bag

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

CLEA Software Version 1.071

Report generated	09-Jan-20
Report title	Hempton Road, Deddington
Created by	J Hand at BRD Environmental Ltd

RESULTS

Environment Agency

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group						
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Arsenic (C4SL child)	4.11E+02	5.26E+02	NR	1.00	0.78	NR	NR	No	No	Yes	Yes	No	No	No	No	Yes
2																	
3																	
4																	
5																	
6																	
7																	
8																	
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Environment Agency

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group						
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	

Environment Agency

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic (C4SL child)	99.9	0.1	0.0	100.0	4.11E+02	NR	2.05E+02	1.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-01	1.64E-01	9.45E-02	1.36E-01	8.21E-02	4.52E-01
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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Environment Agency

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic (C4SL child)	4.87E-05	2.11E-04	4.07E-05	6.79E-06	0.00E+00	0.00E+00	0.00E+00	16.25	70.17	13.58	0.00	0.00	0.00	0.00	0.00
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Environment Agency

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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Environment Agency

		Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Arsenic (C4SL child)	ID	0.3	ID	0.0087	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	**0.016**	1
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	Oral Health Criteria Value (µg kg^{-1} BW day^{-1})	Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})	Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
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Environment Agency

		Soil-to-water partition coefficient ($cm^3\ g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg\ L^{-1}$)	Soil-to-plant concentration factor for green vegetables ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for root vegetables ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for tuber vegetables ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for herbaceous fruit ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for shrub fruit ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for tree fruit ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)
1	Arsenic (C4SL child)	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
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Environment Agency

	Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
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CLEA Software Version 1.071

Report generated	09/01/2020
Report title	Hempton Road, Deddington
Created by	J Hand at BRD Environmental Ltd

BASIC SETTINGS

Land Use	Residential with produce (C4SL)						
Building	Small terraced house						
Receptor	Female (res C4SL)	Start age class	1	End age class	6	Exposure Duration	6 years
Soil	Sandy loam						

Exposure Pathways

Direct soil and dust ingestion	✓	Dermal contact with indoor dust	✓	Inhalation of indoor dust	✓
Consumption of homegrown produce	✓	Dermal contact with soil	✓	Inhalation of soil dust	✓
Soil attached to homegrown produce	✓			Inhalation of indoor vapour	✓
				Inhalation of outdoor vapour	✓

Land Use Residential with produce (C4SL)

Receptor Female (res C4SL)

Age Class	Exposure Frequencies (days yr^{-1})						Occupation Periods (hr day^{-1})		Soil to skin adherence factors (mg cm^{2})		Direct soil ingestion rate (g day^{-1})	Body weight (kg)	Body height (m)	Inhalation rate (m^{3} day^{-1})	Max exposed skin factor		Total skin area (m^{2})
	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Indoors	Outdoors	Indoor	Outdoor					Indoor (m^{2} m^{-2})	Outdoor (m^{2} m^{-2})	
1	180	180	180	170	365	365	23.0	1.0	0.06	0.10	0.10	5.60	0.7	5.4	0.32	0.26	3.43E-01
2	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	9.80	0.8	8.0	0.33	0.26	4.84E-01
3	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	12.70	0.9	8.9	0.32	0.25	5.82E-01
4	365	365	365	170	365	365	23.0	1.0	0.06	0.10	0.10	15.10	0.9	10.1	0.35	0.28	6.36E-01
5	365	365	365	170	365	365	19.0	1.0	0.06	0.10	0.10	16.90	1.0	10.1	0.35	0.28	7.04E-01
6	365	365	365	170	365	365	19.0	1.0	0.06	0.10	0.10	19.70	1.1	10.1	0.33	0.26	7.94E-01
7	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	22.10	1.2	12.0	0.22	0.15	8.73E-01
8	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	25.30	1.2	12.0	0.22	0.15	9.36E-01
9	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	27.50	1.3	12.0	0.22	0.15	1.01E+00
10	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	31.40	1.3	12.0	0.22	0.15	1.08E+00
11	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	35.70	1.4	12.0	0.22	0.14	1.19E+00
12	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	41.30	1.4	15.2	0.22	0.14	1.29E+00
13	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	47.20	1.5	15.2	0.22	0.14	1.42E+00
14	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	51.20	1.6	15.2	0.22	0.14	1.52E+00
15	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	56.70	1.6	15.2	0.21	0.14	1.60E+00
16	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	59.00	1.6	15.2	0.21	0.14	1.63E+00
17	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	70.00	1.6	15.7	0.33	0.27	1.78E+00
18	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	70.90	1.6	13.6	0.33	0.27	1.80E+00

Consumption Rates

Consumption rates (g FW kg^{-1} bodyweight day^{-1}) by Produce Group

Age Class	MEAN RATES						90TH PERCENTILE RATES					
	Green veg	Root veg	Tuber veg	Herb. Fruit	Shrub fruit	Tree fruit	Green veg	Root veg	Tuber veg	Herb. Fruit	Shrub fruit	Tree fruit
1	3.47E+00	5.22E+00	9.22E+00	8.90E-01	1.07E+00	1.87E+00	7.12E+00	1.07E+01	1.60E+01	1.83E+00	2.23E+00	3.82E+00
2	3.34E+00	1.61E+00	3.14E+00	1.93E+00	2.60E-01	5.84E+00	5.87E+00	2.83E+00	6.60E+00	3.39E+00	4.60E-01	1.03E+01
3	3.34E+00	1.61E+00	3.14E+00	1.93E+00	2.60E-01	5.84E+00	5.87E+00	2.83E+00	6.60E+00	3.39E+00	4.60E-01	1.03E+01
4	3.34E+00	1.61E+00	3.14E+00	1.93E+00	2.60E-01	5.84E+00	5.87E+00	2.83E+00	6.60E+00	3.39E+00	4.60E-01	1.03E+01
5	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
6	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
7	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
8	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
9	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
10	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
11	2.54E+00	1.20E+00	2.65E+00	1.25E+00	1.10E-01	2.89E+00	4.53E+00	2.14E+00	4.95E+00	2.24E+00	1.90E-01	5.16E+00
12	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
13	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
14	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
15	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
16	1.03E+00	4.90E-01	1.60E+00	5.10E-01	4.00E-02	1.18E+00	1.87E+00	8.90E-01	3.05E+00	9.30E-01	8.00E-02	2.13E+00
17	1.26E+00	6.00E-01	1.18E+00	6.90E-01	9.00E-02	1.27E+00	2.36E+00	1.12E+00	2.35E+00	1.29E+00	1.80E-01	2.38E+00
18	1.35E+00	6.40E-01	1.25E+00	7.40E-01	1.00E-01	1.36E+00	2.34E+00	1.12E+00	2.36E+00	1.28E+00	1.80E-01	2.37E+00

Top 2 applied? Yes

Where top 2 method is applied, two produce categories use 90th percentile rates, while the remainder use the mean. Produce categories vary on a chemical-by-chemical basis. Where top 2 method is not used, all produce categories for all chemicals assume 90th percentile rates.

Building Small terraced house

Soil Sandy loam

Building footprint (m^2)	2.80E+01
Living space air exchange rate (hr^{-1})	5.00E-01
Living space height (above ground, m)	4.80E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	3.10E+00
Foundation thickness (m)	1.50E-01
Floor crack area (cm^2)	4.23E+02
Dust loading factor ($\mu g\ m^{-3}$)	5.00E+01

Porosity, Total ($cm^3\ cm^{-3}$)	5.30E-01
Porosity, Air-Filled ($cm^3\ cm^{-3}$)	2.00E-01
Porosity, Water-Filled ($cm^3\ cm^{-3}$)	3.30E-01
Residual soil water content ($cm^3\ cm^{-3}$)	1.20E-01
Saturated hydraulic conductivity ($cm\ s^{-1}$)	3.56E-03
van Genuchten shape parameter *m* (dimensionless)	3.20E-01
Bulk density ($g\ cm^{-3}$)	1.21E+00
Threshold value of wind speed at 10m ($m\ s^{-1}$)	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02
Soil pH	7.00E+00
Soil Organic Matter content (%)	6.00E+00
Fraction of organic carbon ($g\ g^{-1}$)	3.48E-02
Effective total fluid saturation (unitless)	5.12E-01
Intrinsic soil permeability (cm^2)	4.75E-08
Relative soil air permeability (unitless)	6.42E-01
Effective air permeability (cm^2)	3.05E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	65
Default soil gas ingress rate?	Yes
Soil gas ingress rate ($cm^3\ s^{-1}$)	2.50E+01
Building ventilation rate ($cm^3\ s^{-1}$)	1.87E+04
Averaging time surface emissions (yr)	6
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m ($m\ s^{-1}$)	5.00
Air dispersion factor at height of 0.8m *	2400.00
Air dispersion factor at height of 1.6m *	0.00
Fraction of site cover ($m^2\ m^{-2}$)	0.75

* Air dispersion factor in $g\ m^{-2}\ s^{-1}$ per $kg\ m^{-3}$

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	Homegrown fraction High	Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type Average

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 05/11/2019

0998

Contract	**Hempton Road, Deddington**
Serial No.	**36020**

Client:

BRD Environmental Ltd

BRD Environmental Ltd
Hawthorne Villa
1 Old Parr Road
Banbury
Oxfordshire
OX16 5HT

Soil Property Testing Ltd

15, 16, 18 Halcyon Court, St Margaret's Way,
Stukeley Meadows, Huntingdon,
Cambridgeshire, PE29 6DG

Tel: 01480 455579
Email: enquiries@soilpropertytesting.com
Website: www.soilpropertytesting.com

Samples Submitted By:

BRD Environmental Ltd

Samples Labelled:

Hempton Road, Deddington

Approved Signatories:

- ☑ **J.C. Garner B.Eng (Hons) FGS** — Technical Director & Quality Manager
- ☐ **S.P. Townend FGS** — Chairman
- ☐ **W. Johnstone** — Materials Lab Manager
- ☐ **D. Sabnis** — Operations Manager

[redacted]

Date Received: 21/10/2019 **Samples Tested Between:** 21/10/2019 **and** 05/11/2019

Remarks:

For the attention of Jessica Hand
Your Reference No: BRD3567

Notes:

1. All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
2. (a) UKAS - United Kingdom Accreditation Service.
   (b) Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
3. Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
4. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 05/11/2019

0998

Contract	**Hempton Road, Deddington**		
Serial No.	**36020**	**Target Date**	01/11/2019
Scheduled By	BRD Environmental Ltd		

SCHEDULE OF LABORATORY TESTS

Schedule Remarks

Bore Hole No.	Type	Sample Ref.	Top Depth	Water Content (BSEN)	Liquid/Plastic Limits	Wet Sieve Preparation	Particle Size Distribution (BS1377)														Sample Remarks
TP01	D	1	0.70	1	1	1															
TP01	B	1	2.00				1														
TP04	D	1	0.50	1	1	1															
TP07	D	1	0.60	1	1	1															
TP08	D	1	0.80	1	1	1															
TP08	B	1	2.60				1														
Totals				**4**	**4**	**4**	**2**														**End of Schedule**

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 05/11/2019

0998

Contract	**Hempton Road, Deddington**
Serial No.	**36020**

SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasti-city Index (%)	Liquid-ity Index	SAMPLE PREPARATION				Description	CLASS
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
TP01	0.70	D	1	**28.7**	48	33	15	-0.28	Wet Sieved	55 (M)	63.8*	26	Very soft mottled brown and orangish brown slightly gravelly sandy clayey SILT with rare yellowish brown mottling and ironstaining. Gravel brown and orange fine to coarse angular to subrounded ferruginous limestone.	MI
TP04	0.50	D	1	**28.5**	49	29	20	-0.03	Wet Sieved	42 (M)	49.1*	27	Firm orangish brown slightly gravelly sandy clayey SILT with occasional brown mottling, and rare ironstaining. Gravel is brown and orangish brown fine to coarse angular to subrounded ferruginous limestone.	MI
TP07	0.60	D	1	**25.3**	47	32	15	-0.45	Wet Sieved	45 (M)	46.0*	26	Soft orangish brown slightly gravelly sandy clayey SILT with occasional brown mottling, rare ironstaining, and decayed roots. Gravel is orangish brown and brown fine to coarse angular to subrounded limestone.	MI
TP08	0.80	D	1	**25.4**	47	31	16	-0.35	Wet Sieved	54 (M)	55.3*	26	Soft orangish brown slightly gravelly sandy clayey SILT with occasional brown mottling, and rare ironstaining. Gravel is orangish brown and brown fine to coarse angular to subrounded ferruginous limestone.	MI

Method Of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2
Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.4, 5.3, 5.4
Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments: *Corrected water content assume material greater than 0.425mm is non-porous. See BS1377: Part 2: 1990 Clause 3 Note 1.

Table Notation: Ret'd 0.425mm: (A) = Assumed, (M) = Measured

TEST REPORT

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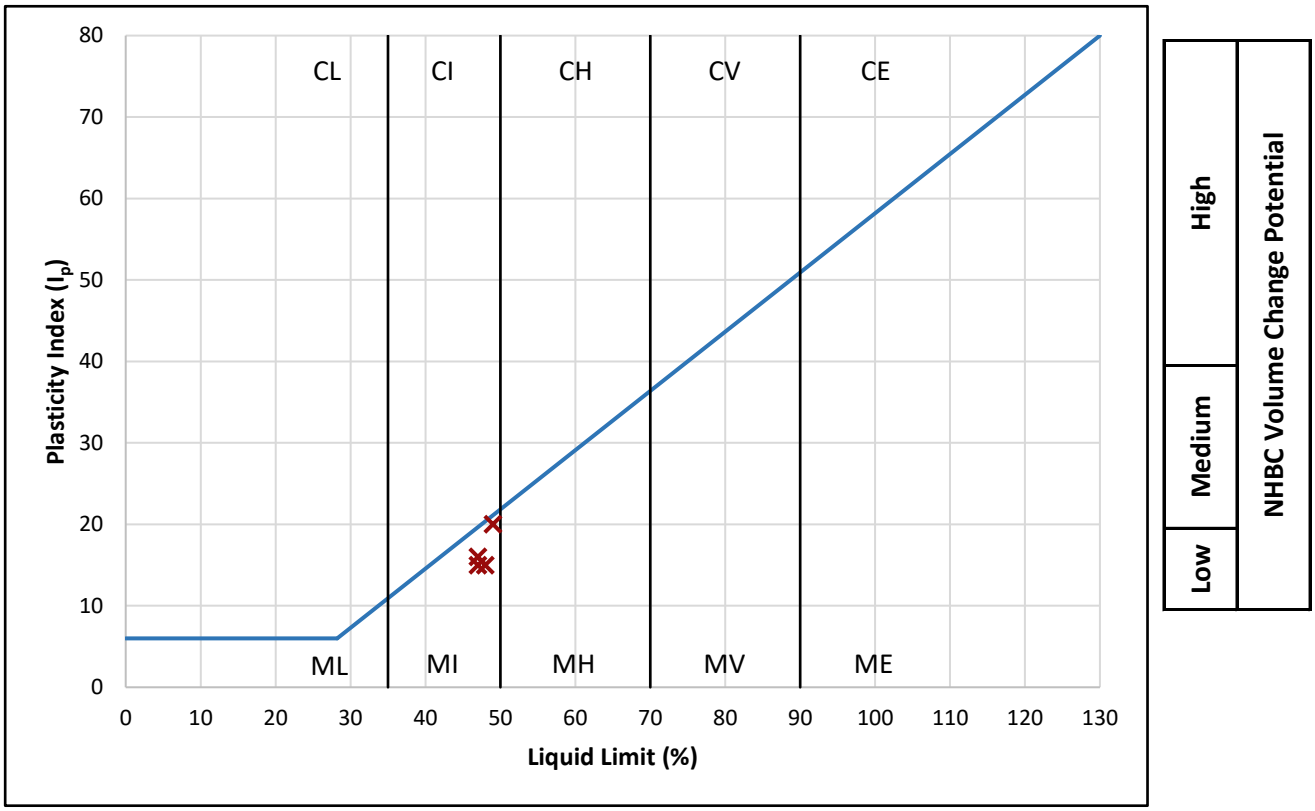
DATE ISSUED: 05/11/2019

0998

Contract	**Hempton Road, Deddington**
Serial No.	**36020**

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART

Plasticity				
Low	Medium	High	Very High	Extremely High



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS1377: Part 2: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index

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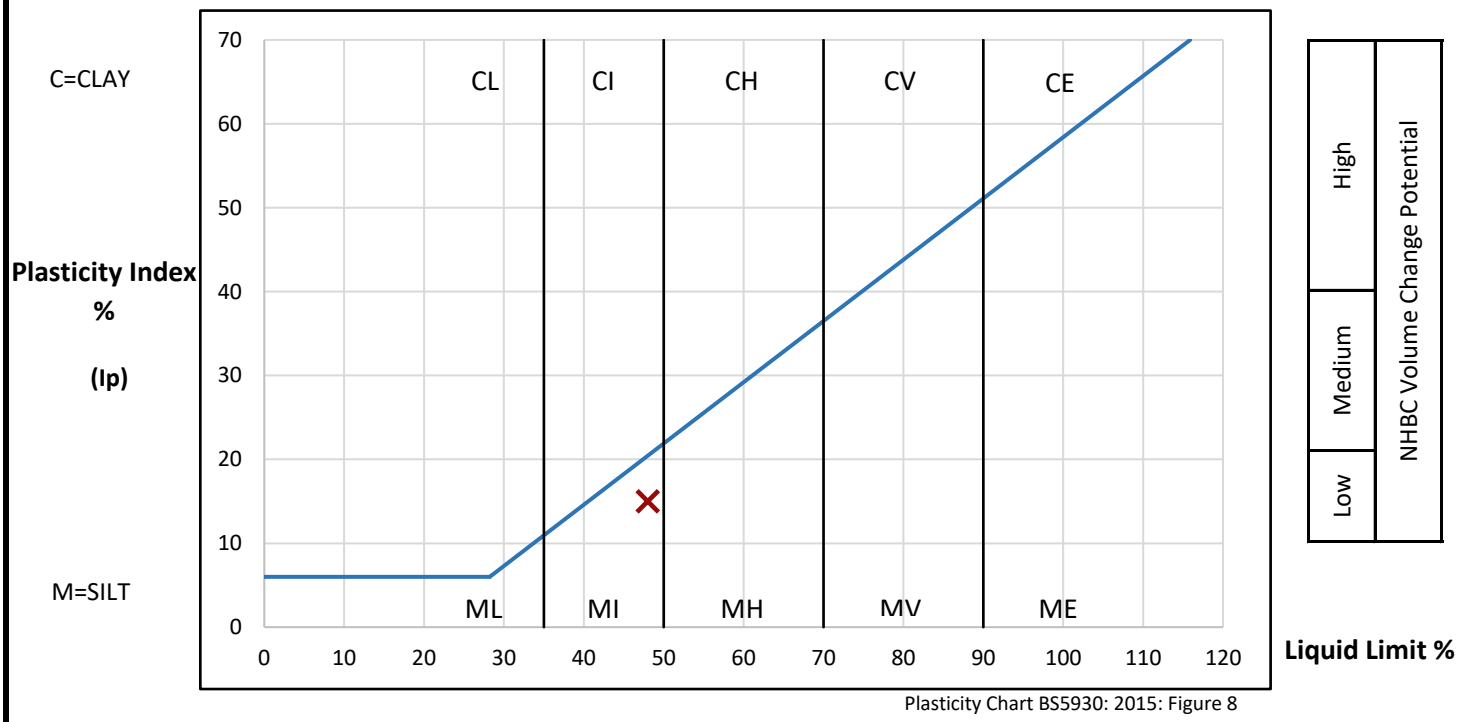
Contract	**Hempton Road, Deddington**
Serial No.	**36020**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
TP01	0.70	D	1	28.7	Very soft mottled brown and orangish brown slightly gravelly sandy clayey SILT with rare yellowish brown mottling and ironstaining. Gravel brown and orange fine to coarse angular to subrounded ferruginous limestone.	

PREPARATION			Liquid Limit	48 %
Method of preparation	Wet sieved over 0.425mm sieve		Plastic Limit	33 %
Sample retained 0.425mm sieve	(Measured)	55 %	Plasticity Index	15 %
Corrected water content for material passing 0.425mm		63.8 %	Liquidity Index	-0.28
Sample retained 2mm sieve	(Measured)	34 %	NHBC Modified (I'p)	7 %
Curing time	26 hrs	Clay Content Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

TEST REPORT

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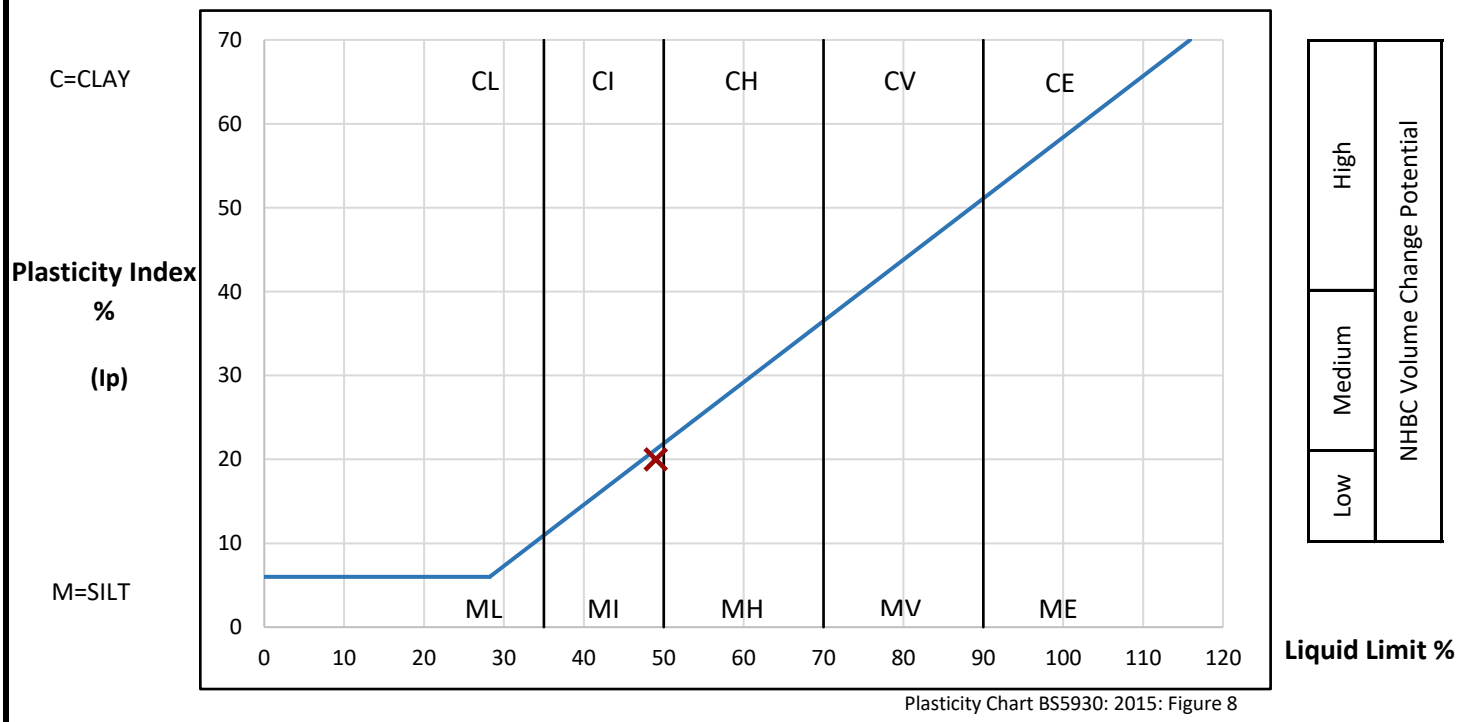
Contract	**Hempton Road, Deddington**
Serial No.	**36020**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
TP04	0.50	D	1	28.5	Firm orangish brown slightly gravelly sandy clayey SILT with occasional brown mottling, and rare ironstaining. Gravel is brown and orangish brown fine to coarse angular to subrounded ferruginous limestone.	

PREPARATION				Liquid Limit	49 %
Method of preparation		Wet sieved over 0.425mm sieve		Plastic Limit	29 %
Sample retained 0.425mm sieve	(Measured)	42 %		Plasticity Index	20 %
Corrected water content for material passing 0.425mm		49.1 %		Liquidity Index	-0.03
Sample retained 2mm sieve	(Measured)	22 %		NHBC Modified (I'p)	12 %
Curing time	27 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

TEST REPORT

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DATE ISSUED: 05/11/2019

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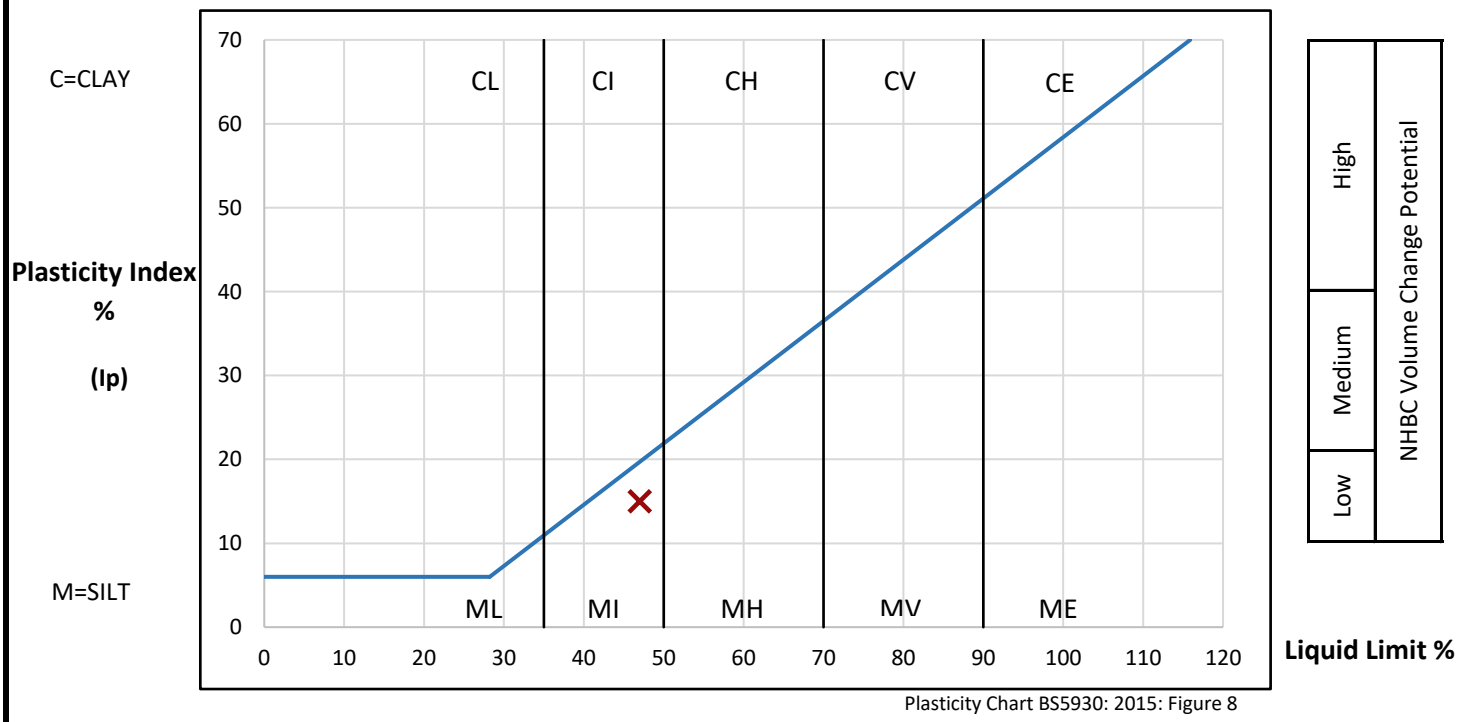
Contract	**Hempton Road, Deddington**
Serial No.	**36020**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
TP07	0.60	D	1	25.3	Soft orangish brown slightly gravelly sandy clayey SILT with occasional brown mottling, rare ironstaining, and decayed roots. Gravel is orangish brown and brown fine to coarse angular to subrounded limestone.	

PREPARATION				Liquid Limit	47 %
Method of preparation		Wet sieved over 0.425mm sieve		Plastic Limit	32 %
Sample retained 0.425mm sieve	(Measured)	45 %		Plasticity Index	15 %
Corrected water content for material passing 0.425mm		46.0 %		Liquidity Index	-0.45
Sample retained 2mm sieve	(Measured)	23 %		NHBC Modified (I'p)	8 %
Curing time	26 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

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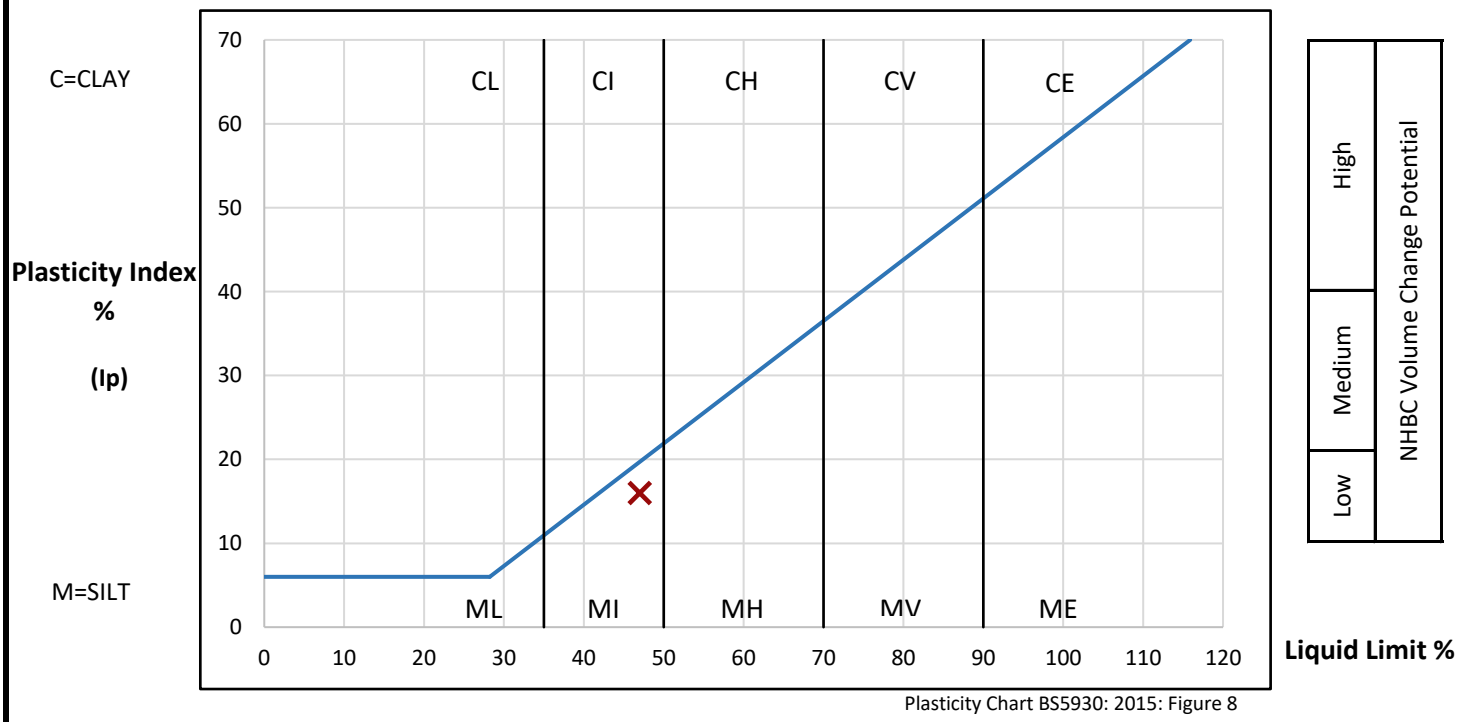
Contract	**Hempton Road, Deddington**
Serial No.	**36020**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
TP08	0.80	D	1	25.4	Soft orangish brown slightly gravelly sandy clayey SILT with occasional brown mottling, and rare ironstaining. Gravel is orangish brown and brown fine to coarse angular to subrounded ferruginous limestone.	

PREPARATION				Liquid Limit	47 %
Method of preparation	Wet sieved over 0.425mm sieve			Plastic Limit	31 %
Sample retained 0.425mm sieve	(Measured)	54 %		Plasticity Index	16 %
Corrected water content for material passing 0.425mm		55.3 %		Liquidity Index	-0.35
Sample retained 2mm sieve	(Measured)	32 %		NHBC Modified (I'p)	7 %
Curing time	26 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

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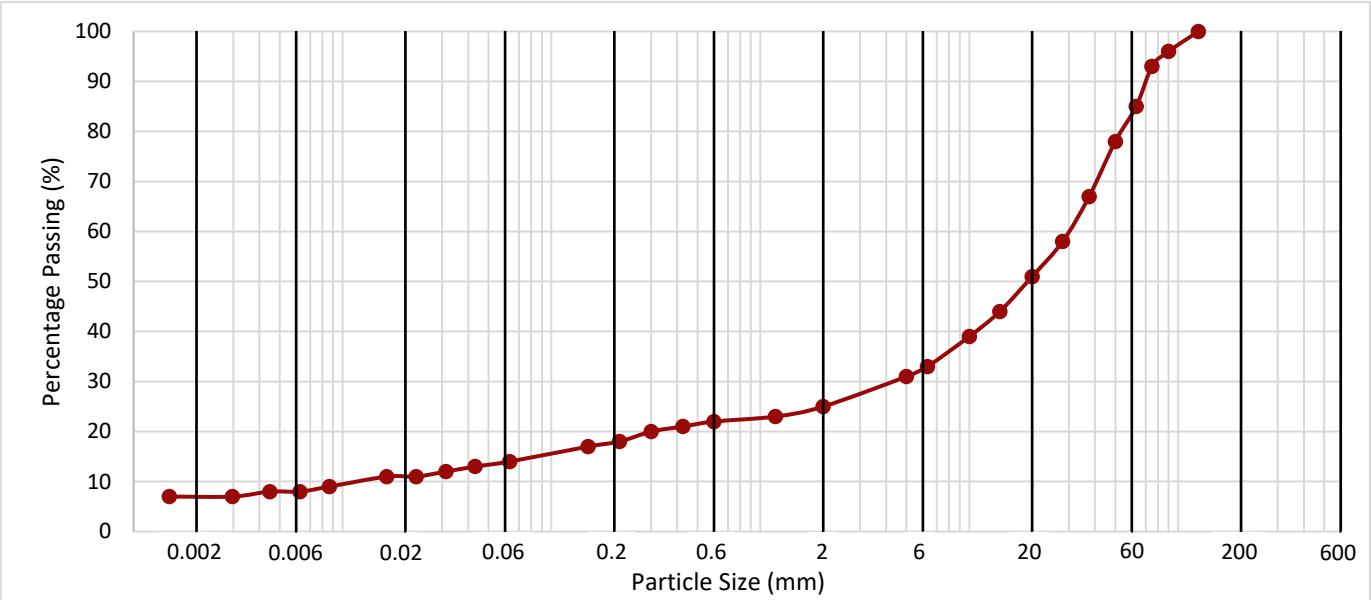
Contract	**Hempton Road, Deddington**
Serial No.	**36020**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
TP01	2.00	B	1	Reddish brown angular to subrounded ironstone, and orangish brown ferruginous limestone sandy clayey GRAVEL. Clay is orangish brown.	Dry mass of sample required 50kg. Mass of sample submitted 20.511kg. Sample Unrepresentative BS1377:Part 2:1990 Table 3.

Method of Test:	Wet Sieve + Hydrometer	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)	Clay by Dry Mass (%)
	0.0431	13	7	
	0.0313	12		
	0.0225	11		
	0.0163	11		7
	0.0087	9		
	0.0063	8		
	0.0045	8		
	0.0030	7		
	0.0015	7		

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	25	11
1.18	23	
0.600	22	
0.425	21	
0.300	20	
0.212	18	
0.150	17	
0.063	14	

Fines By Dry Mass (%)	
<0.063mm	14

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		75
125	100	
90	96	
63	85	
50	78	
37.5	67	
28	58	
20	51	
14	44	
10	39	
6.3	33	
5	31	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 05/11/2019

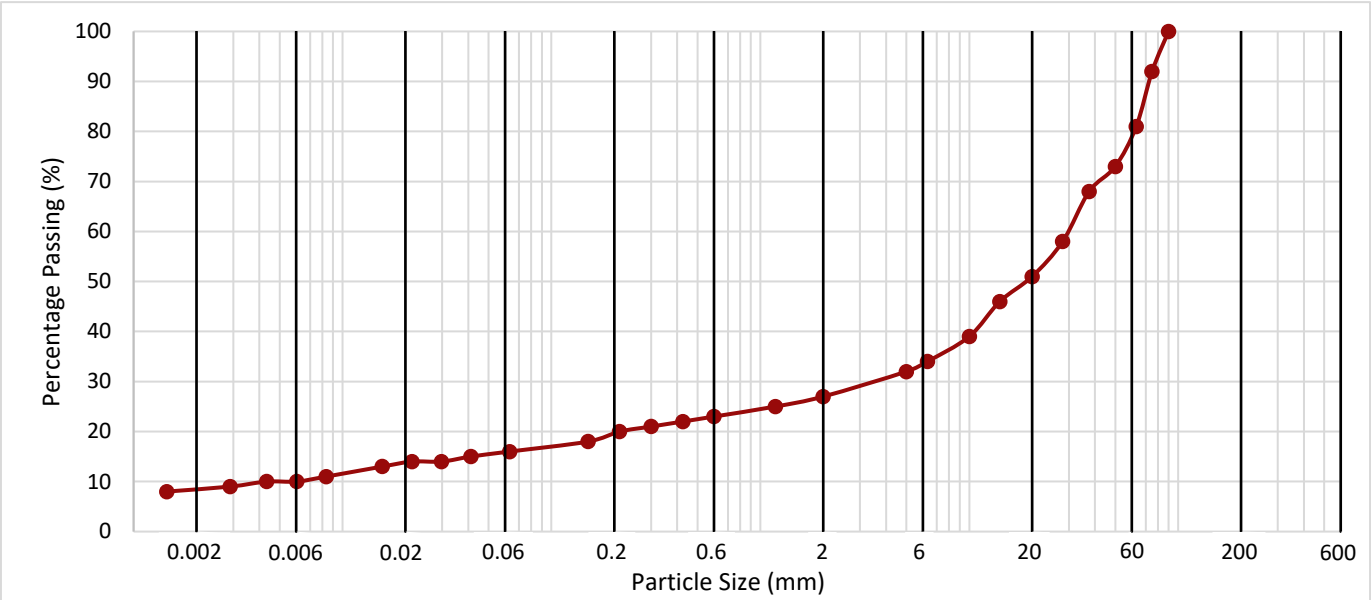
0998

Contract	**Hempton Road, Deddington**
Serial No.	**36020**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
TP08	2.60	B	1	Reddish brown angular to subrounded ironstone, and orangish brown ferruginous limestone sandy clayey GRAVEL. Clay is orangish brown.	Dry mass of sample required 50kg. Mass of sample submitted 10.294kg. Sample Unrepresentative BS1377:Part 2:1990 Table 3.

Method of Test:	Wet Sieve + Hydrometer	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)	Clay by Dry Mass (%)
	0.0411	15	7	
	0.0298	14		
	0.0215	14		
	0.0155	13		9
	0.0084	11		
	0.0060	10		
	0.0043	10		
	0.0029	9		
	0.0014	8		

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	27	11
1.18	25	
0.600	23	
0.425	22	
0.300	21	
0.212	20	
0.150	18	
0.063	16	

Fines By Dry Mass (%)	
<0.063mm	16

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		73
125		
90	100	
63	81	
50	73	
37.5	68	
28	58	
20	51	
14	46	
10	39	
6.3	34	
5	32	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 02/01/2020

0998

Contract	**Hempton Road, Deddington**
Serial No.	**36282**

Client:

BRD Environmental Ltd

BRD Environmental Ltd
Hawthorne Villa
1 Old Parr Road
Banbury
Oxfordshire
OX16 5HT

Soil Property Testing Ltd

15, 16, 18 Halcyon Court, St Margaret's Way,
Stukeley Meadows, Huntingdon,
Cambridgeshire, PE29 6DG

Tel: 01480 455579
Email: enquiries@soilpropertytesting.com
Website: www.soilpropertytesting.com

Samples Submitted By:

BRD Environmental Ltd

Samples Labelled:

Hempton Road, Deddington

Approved Signatories:

- ☑ **J.C. Garner B.Eng (Hons) FGS** — Technical Director & Quality Manager
- ☐ **S.P. Townend FGS** — Chairman
- ☐ **W. Johnstone** — Materials Lab Manager
- ☐ **D. Sabnis** — Operations Manager

[redacted]

Date Received: 23/12/2019 **Samples Tested Between:** 23/12/2019 **and** 02/01/2020

Remarks:

For the attention of Jessica Hand
Your Reference No: BRD3567

Notes:

1. All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
2. (a) UKAS - United Kingdom Accreditation Service.
   (b) Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
3. Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
4. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 02/01/2020

0998

Contract	**Hempton Road, Deddington**		
Serial No.	**36282**	**Target Date**	23/12/2019
Scheduled By	BRD Environmental Ltd		

SCHEDULE OF LABORATORY TESTS

Schedule Remarks

Bore Hole No.	Type	Sample Ref.	Top Depth	Particle Size Distribution (BS1377)	Water Content (BSEN)	Liquid/Plastic Limits															Sample Remarks
TP11	B	1	2.00	1																	
TP14	D	1	3.30		1	1															
Totals				**1**	**1**	**1**															**End of Schedule**

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 02/01/2020

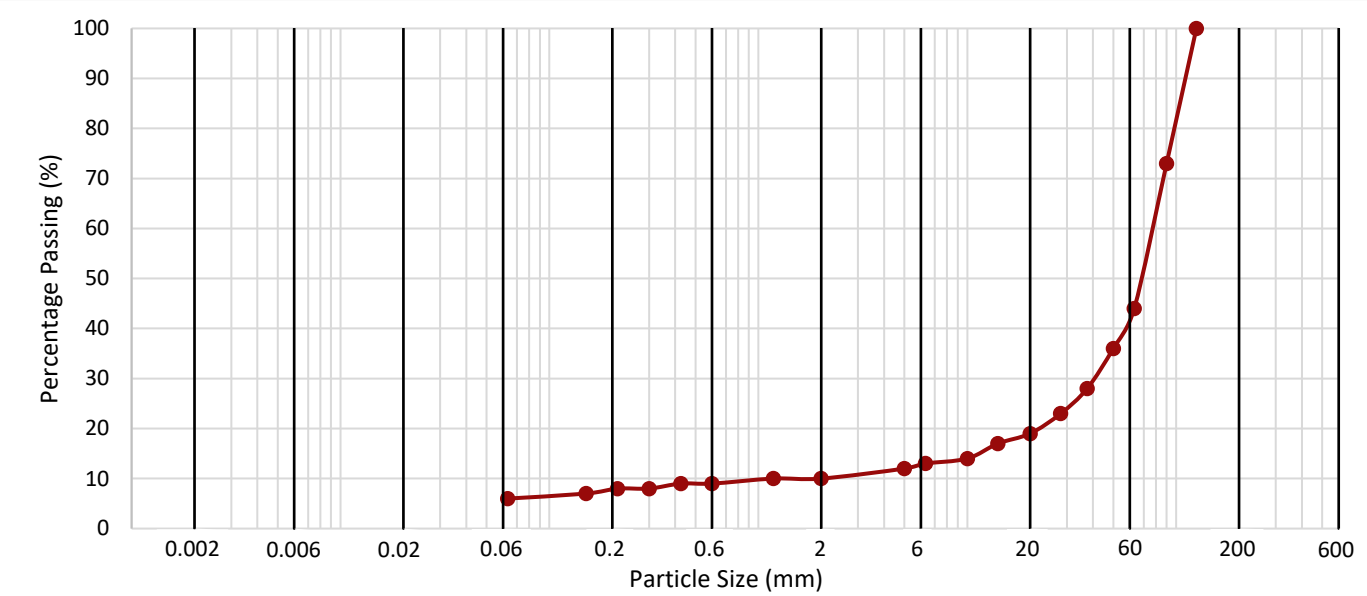
0998

Contract	**Hempton Road, Deddington**
Serial No.	**36282**

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
TP11	2.00	B	1	Orangish brown and reddish brown slightly sandy clayey angular to subrounded ironstone and rare yelllowish brown limestone GRAVEL	

Method of Test:	Wet Sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer	Particle Size (mm)	Passing (%)	**Silt by Dry Mass (%)**
			Clay by Dry Mass (%)

Sieve Size (mm)	Passing (%)	**Sand By Dry Mass (%)**
2.00	10	**4**
1.18	10	
0.600	9	
0.425	9	
0.300	8	
0.212	8	
0.150	7	
0.063	6	

Fines By Dry Mass (%)	
<0.063mm	**6**

Sieve Size (mm)	Passing (%)	**2mm+ By Dry Mass (%)**
300		**90**
125	100	
90	73	
63	44	
50	36	
37.5	28	
28	23	
20	19	
14	17	
10	14	
6.3	13	
5	12	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test: BS1377: Part 2: 1990: 9.2
Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 02/01/2020

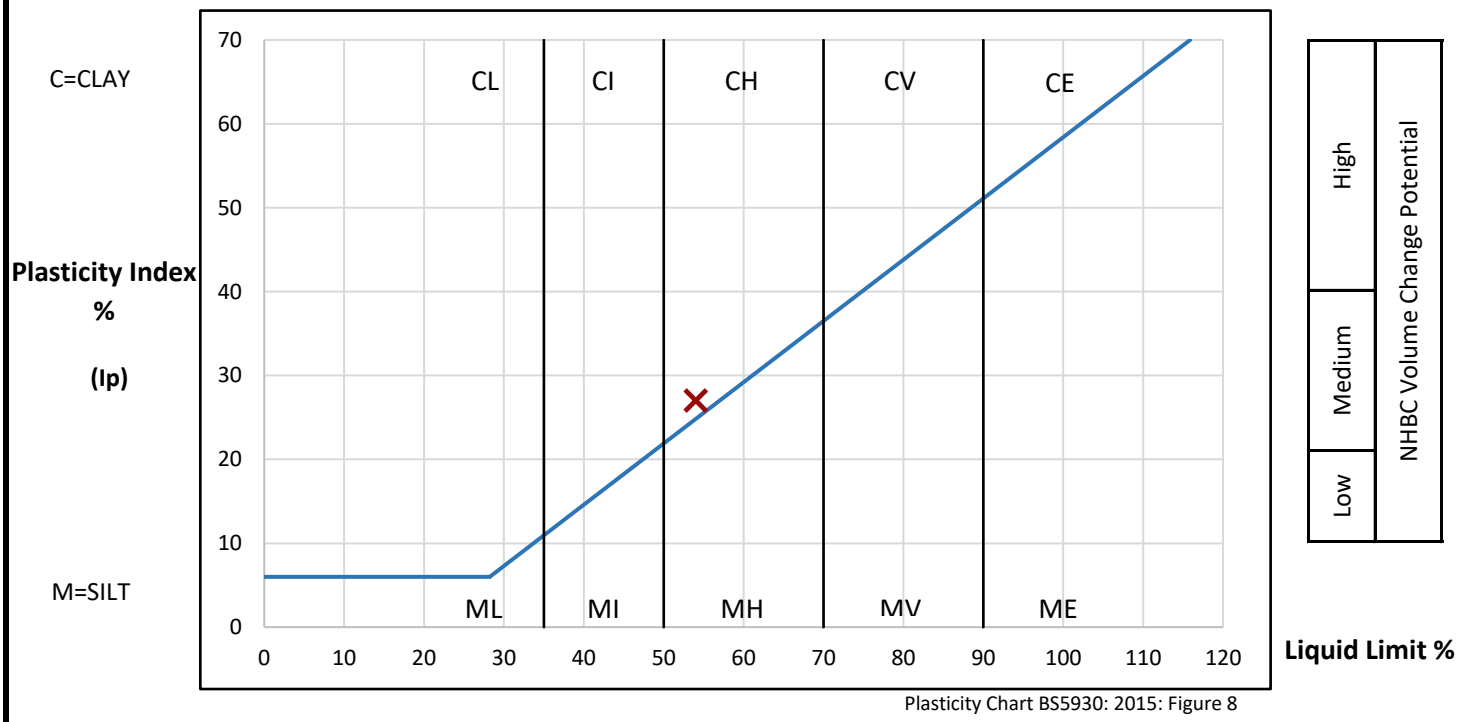
0998

Contract	**Hempton Road, Deddington**
Serial No.	**36282**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
TP14	3.30	D	1	27.9	Stiff light olive brown CLAY with rare recently active roots	

PREPARATION				Liquid Limit	54 %
Method of preparation		From natural		Plastic Limit	27 %
Sample retained 0.425mm sieve	(Assumed)	0 %		Plasticity Index	27 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.03
Sample retained 2mm sieve	(Assumed)	0 %		NHBC Modified (I'p)	n/a
Curing time	50 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

Appendix F

PROPOSED SILT FENCE HY-TEX TERRASTOP™ SILT FENCE OR SIMILAR TO BE INSTALLED PRIOR TO COMMENCEMENT OF WORKS AND MAINTAINED IN PLACE UNTIL BUILDING WORKS HAVE BEEN COMPLETED

ALL ROAD GULLIES TO BE FITTED WITH GULLY GUARD™ SACKS AND MAINTAINED UNTIL BUILDING WORKS COMPLET

MANHOLE TO BE PROVIDED WITH DEBRIS SCREEN AND TO BE MAINTAINED UNTIL BUILDING WORKS COMPLETE

HAY BALES LINED WITH HY-TEN TERRASTOP TO BE STAKED IN PLACE AROUND OUTFALL TO FORM TEMPORARY SILT FOREBAY. FOREBAY TO BE INSPECTED AFTER RAINFALL EVENTS TO DETERMINE SILT EMPTYING REQUIREMENT

NOTES:

1. DO NOT SCALE FROM THIS DRAWING
2. TOPSOIL TO REMAIN IN PLACE UNTIL WORKS ARE REQUIRED IN THAT AREA.
3. SURPLUS TOPSOIL AND SPOIL TO BE IMMEDIATELY REMOVED FROM SITE
4. SILT FENCES ARE TO BE LOCATED AROUND ALL TOPSOIL OR EXCAVATED MATERIAL STOCKPILES THAT ARE REQUIRED FOR RE-USE
5. ALL SILT FENCES AND DEBRIS SUMPS TO BE REGULARLY INSPECTED AND CLEANED OUT AS NECESSARY
6. ALL DISCHARGES FROM DE-WATERING FOUNDATION AND SEWER TRENCHES FROM RAINFALL TO PASS THROUGH STRAW BALE FILTERS.
7. ROADS TO BE SWEPT DAILY AND AT MORE FREQUENT INTERVALS DURING SPOIL REMOVAL FROM SITE TO PREVENT A BUILD UP OF MUD ON THE CARRIAGEWAY.

REV:	DESCRIPTION:	BY:	DATE:
P3	Minor amendments to planning layout	SR	18.11.22
P2	Minor amendments to planning layout	SR	04.05.22
P1	First issue	DM	21.04.22

STATUS: INFORMATION

EXPEDITE
Exeter
The Design Studio
35 Southernhay East
Exeter
EX1 1NX
t: 01392 691 631
www.expediteps.com

CLIENT: BURRINGTON HOMES (MIDLANDS)

SITE: LAND AT HEMPTON ROAD DEDDINGTON - PHASE 2

TITLE: CONSTRUCTION SURFACE WATER MANAGEMENT PLAN

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
NTS	Apr 2022	SR	KSR

PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	09.02	P3

Appendix G

EXPEDITE

DRAINAGE OPERATION AND MAINTENANCE MANUAL

PROPOSED RESIDENTIAL DEVELOPMENT

HEMPTON ROAD - PHASE 2, DEDDINGTON

www.expediteps.com

BRISTOL • CARDIFF • EXETER • LONDON

Proposed Residential Development

Hempton Road – Phase 2, Deddington

DRAINAGE OPERATION AND MAINTENACE MANUAL

Issued by:	Expedite 35 Southernhay East Exeter EX1 1NX
Client:	Burrington Estates Ltd
Project Reference:	ES20.020
Project Title:	Hempton Road – Phase 2, Deddington
Revision:	B
Date:	18th November 2022
Prepared by:	Sophie Canton
Checked by:	Kevin Ritter
Approved by:	Simon Lancaster

List of Contents

Sections

Appendices

1 Introduction

1.1 Expedite Engineering Services has been appointed by Burrington Estates Ltd to produce a Drainage Operations and Maintenance Manual (O&M Manual) for a proposed residential development of 14 units and associated infrastructure at Hempton Road - Phase 2, Deddington.

Scope of O&M Manual

1.2 This manual is intended to give an overview of the operation and maintenance for the range of SuDs features included with the drainage strategy and in relation to typical details only.

1.3 Where proprietary products are specified the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.

1.4 The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

Schedule of Components

1.5 The following Table 1 contains a schedule of onsite drainage components and who is responsible for the operation and maintenance.

Component	Adoptable (S104)	Persons responsible for operation and maintenance
Manholes and Pipes: *S200-S204-S7 F1A-F1B-F1*	Yes	Thames Water
House Inspection Chambers, Catchpits and Pipes – Surface Water	No	Private Ownership/Management Company
House Inspection Chambers and Pipes - Foul	No	Private Ownership/Management Company
Permeable Paving	No	Private Ownership/Management Company

Table 1.0 – Schedule of onsite components

1.6 For further information on the listed components refer to Drawings ES20.020-03.01 included in Appendix A.

1.7 All components adopted by Thames Water under a S104 agreement will be subject to their own operation and maintenance regime. The following sections of this report are intended for those components that are not proposed to be offered for adoption under a S104 agreement.

2 Maintenance of Drainage Systems

2.1 The following maintenance schedule has been split out into each drainage component. The schedule follows guidelines set out in C753 for the type of operation and maintenance requirements that may be appropriate for each drainage component.

Gravity drains and inspection chambers

2.2 Maintenance will usually be carried out manually, although a suction tanker can be used for sediment/debris removal, with more resistant debris removal using pressure jetting. If maintenance is not undertaken for long periods, deposits can become hard-packed and require more effort to remove.

3 Permeable Paving

Maintenance Schedule	Required action	Typical Frequency
Regular maintenance	Visual inspection of surface for ponding, build up of silt or damaged blocks	Annually, or after major storm event
	Manage adjacent vegetation and remove nuisance plants which may affect infiltration of surface	Yearly
	Remove litter, weeds and debris	Monthy
Occasional maintenance	Vacuum sweeping and brushing, replacing lost joint material	Annually
Remedial actions	Replace damaged blocks	As required
	Relevel uneven surfaces	As required
	Replace geotextile and bedding layer	Every 30 years

Table 3.0 – Operation and Maintenance requirements for permeable pavements

4 Consequences of Inadequate Maintenance

Gravity Drains and Sewers

4.1 Inadequate maintenance of the system, resulting in blocking of pipes or manholes with debris could lead to flooding of the proposed buildings and highway in the instance of high intensity and/or long duration storms. Remedial maintenance should also prevent the need for more expensive action such as complete replacement.

Permeable Paving

4.2 Inadequate maintenance of permeable paved surfaces will lead to an accumulation of debris, silt and plant matter which will prevent surface water flowing through the pavement and lead to the flow rate no longer being controlled.

5 Bibliography

5.1 Ciria. (2015, August 25). C753 – The SuDS Manual. Retrieved February 23, 2019 from CIRIA: http://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

Appendix A – Drainage Layout ES20.020-03.01

MANHOLES F1, F1B, S7 & S203 TO BE PROVIDED WITH GRIP TOP COVERS WITH THE AGREEMENT OF THAMES WATER, COVERS TO BE LOCATED MINIMUM OF 1m FROM CARRIAGEWAY EDGE

N

KEY

- ADOPTABLE FOUL SEWER AND MANHOLE
- ADOPTABLE SURFACE WATER SEWER AND MANHOLE
- EXISTING FOUL SEWER
- EXISTING SURFACE WATER SEWER
- HIGHWAY GULLY AND CONNECTION
- PRIVATE FOUL INSPECTION CHAMBER <3.0m DEEP WITH RESTRICTED ACCESS DEPTHS OVER 1.2m, AND ADOPTED SEWER
- FOUL SHALLOW ACCESS CHAMBER <0.6m DEEP
- PRIVATE SURFACE WATER INSPECTION CHAMBER <3.0m DEEP WITH RESTRICTED ACCESS DEPTHS OVER 1.2m
- PRIVATE SURFACE WATER RODDING EYE
- RAINWATER DOWNPIPE AND 100/150Ø DRAIN
- INTERNAL FOUL CONNECTION POINT AND 100Ø DRAIN
- AREA OF PERMEABLE PAVING - INFILTRATION OF PARKING ONLY

NOTES

1. ALL WORKS FOR ADOPTION UNDER A SECTION 38 AGREEMENT SHALL BE CARRIED OUT TO THE OXFORDSHIRE COUNTY COUNCIL SPECIFICATION FOR ROAD CONSTRUCTION IN RESIDENTIAL AREAS AND TO THE APPROVAL OF THE AREA HIGHWAY AUTHORITY.
2. ALL WORKS FOR ADOPTION UNDER A SECTION 104 AGREEMENT ALL SHALL BE IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE - APPENDIX G, "DESIGN AND CONSTRUCTION GUIDANCE FOR FOUL AND SURFACE WATER SEWERS" VERSION 2 MARCH 2020.
3. STREETLIGHTING POSITIONS TO BE PEGGED ON SITE AND AGREED BY THE LOCAL AUTHORITY PRIOR TO ERECTION COMMENCING.
4. ALL PRIVATE DRAINAGE SHALL BE IN ACCORDANCE WITH BS8301 AND RELEVANT SECTIONS OF APPROVED DOCUMENT H OF THE BUILDING REGULATIONS.
5. THE CONTRACTOR IS TO CHECK THE LEVEL OF EXISTING SEWERS BEING USED AS OUTFALLS OR CROSSING PROPOSED DRAINAGE RUNS PRIOR TO LAYING ANY PIPES. ANY DISCREPENCIES ARE TO BE REPORTED TO THE ENGINEER
6. PRIVATE HOUSE DRAINAGE WILL BE FLEXIBLY JOINTED PLASTIC OR CLAY PIPEWORK. DIAMETER 100mm UNLESS SHOWN OTHERWISE.
7. ALL CONNECTIONS FOR HOUSE DRAINAGE SHALL BE 100mm DIA. FOUL & 150mm DIA. SURFACE WATER UNLESS NOTED OTHERWISE AND MUST EXTEND 500mm BEHIND THE BACK OF FOOTWAY/HOMEZONE ROAD. ALL CONNECTIONS WHEN LAID SHALL BE PLUGGED, PROTECTED AS NECESSARY AND MARKED WITH A STAKE FOR FUTURE USE.
8. FOR PRIVATE DRAINS WHERE COVER TO PIPES IS LESS THAN 900mm IN VEHICULAR AREAS OR 600mm IN OTHER AREAS PROTECTION IN THE FORM OF A 100mm THICK CONCRETE PAD SHALL BE PROVIDED OVER THE PIPE GRANULAR SURROUND.
9. WHERE PIPES PASS THROUGH SCREEN WALLS, FOOTINGS OR RETAINING WALLS LINTELS ARE TO BE PROVIDED OVER. UNDER BUILDINGS PIPES SHALL BE SURROUNDED WITH 150mm THICKNESS OF GRANULAR MATERIAL. WHERE DRAINS PASS WITHIN 1M OF BUILDINGS THE WALL FOUNDATION SHALL BE TAKEN DOWN BELOW THE INVERT OF THE PIPE.
10. WHERE DRAINS DO NOT EXCEED 600mm DEEP, PLASTIC OR CLAY ACCESS FITTINGS MINIMUM DIAMETER 225mm SHALL BE USED. ELSEWHERE PROPRIETARY PLASTIC OR PRECAST CONCRETE INSPECTION CHAMBERS SHALL BE USED, UNLESS SHOWN OTHERWISE FW INSPECTION CHAMBERS ARE TO BE 750mm BELOW DPC LEVEL AND SW CHAMBERS AND RODDING EYES TO BE 600mm BELOW DPC.
11. ALL GULLIES AND RAINWATER DOWNPIPES CONNECTED DIRECTLY TO DRAINS ARE TO BE RODDABLE.
12. DRAINAGE RUNS SHOULD BE LAID AT A MINIMUM OF 5.0M FORM THE REAR OF PROPERTIES WHERE PRACTICAL TO ALLOW FOR FUTURE EXTENSIONS.
13. ALL DRAINAGE SHALL BE LAID UPSTREAM AND EACH RUN BETWEEN MANHOLES SHALL BE LAID COMPLETE PRIOR TO BACKFILLING. WHERE THIS IS NOT PRACTICAL TRIAL HOLES OR OTHER MEANS OF IDENTIFYING THE LINE AND LEVEL OF SERVICES SHALL BE CARRIED OUT PRIOR TO WORKS COMMENCING.
14. ALL BRANCH DRAINS, OR CONNECTIONS, ARE TO DISCHARGE TO THE COLLECTORS OBLIQUELY, AND IN THE DIRECTION OF THE MAIN FLOW.

REV:	DESCRIPTION:	BY:	DATE:
P6	Private drainage details added	SC	18.11.22
P5	Updated to latest planning layout housetypes and road safety audit	SC	08.11.22
P4	Additional detail added	SC	09.06.22
P3	Minor amendments to planning layout	SR	04.05.22

STATUS: PLANNING

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CLIENT: BURRINGTON HOMES (MIDLANDS)

SITE: LAND AT HEMPTON ROAD DEDDINGTON - PHASE 2

TITLE: DRAINAGE LAYOUT

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:250	JAN 2022	SR	KSR

PROJECT NO:	DRAWING NO:	REVISION:
ES20.020	03.01	P6

SURFACE WATER INFILTRATION BASIN

BED LEVEL	134.850mAOD
BANK LEVEL	136.500mAOD
MAX. ATTENUATED WATER LEVEL	135.929mAOD
MAX. ATTENUATED VOLUME	180.300m³
MAX. VOL. AVAILABLE 300mm FREEBOARD	238.300m³
SIDE SLOPES	1:4
DESIGN INFILTRATION RATE	2.797m/hr
SAFETY FACTOR	2.0