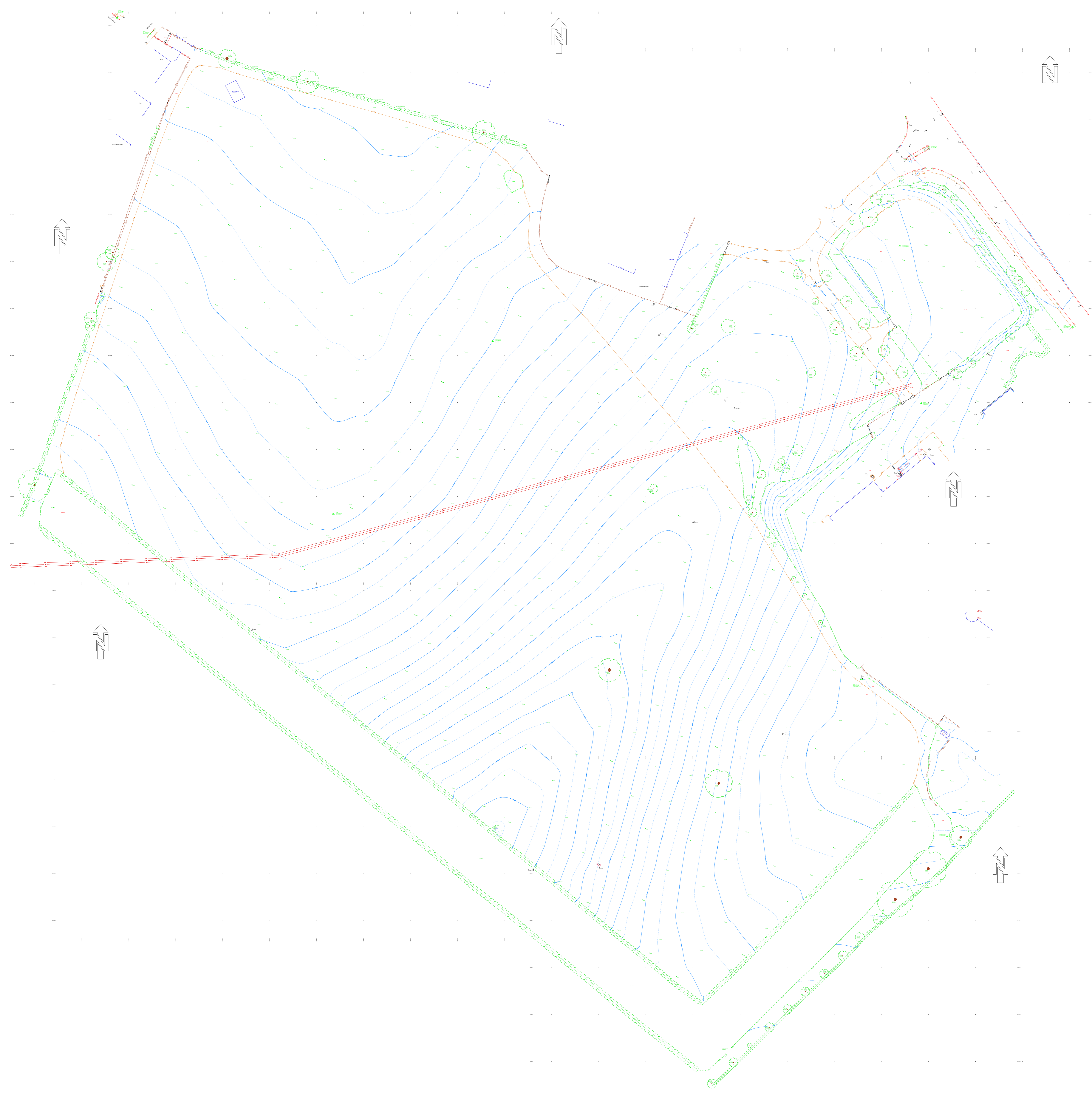




APPENDIX B
TOPOGRAPHICAL SURVEY



Notes:

1. This survey has been conducted in accordance with the requirements of BS5400 and BS5401. The survey was carried out for the purpose of providing a topographical survey for the site. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401.

2. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401.

3. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401.

4. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401.

5. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401.

6. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401. The survey was carried out in accordance with the requirements of BS5400 and BS5401.

STANDARD ABBREVIATIONS

AD	ADDITIONAL	AD	ADDITIONAL
AG	AGRICULTURE	AG	AGRICULTURE
AL	ALLOTMENT	AL	ALLOTMENT
AN	ANALOGUE	AN	ANALOGUE
AO	ARTS AND CRAFTS	AO	ARTS AND CRAFTS
AP	APPOINTMENT	AP	APPOINTMENT
AR	ARCHITECTURE	AR	ARCHITECTURE
AS	ASBESTOS	AS	ASBESTOS
AT	ATMOSPHERE	AT	ATMOSPHERE
AU	AUTOMATIC	AU	AUTOMATIC
AV	AUDIO VISUAL	AV	AUDIO VISUAL
AW	AIRWAY	AW	AIRWAY
AX	AXIS	AX	AXIS
AY	AYERS	AY	AYERS
AZ	AZIMUTH	AZ	AZIMUTH
BA	BANK	BA	BANK
BB	BANK BUILDING	BB	BANK BUILDING
BC	BANK CURB	BC	BANK CURB
BD	BANK DRAIN	BD	BANK DRAIN
BE	BANK ELEVATION	BE	BANK ELEVATION
BF	BANK FENCE	BF	BANK FENCE
BG	BANK GRASS	BG	BANK GRASS
BH	BANK HEDGEBANK	BH	BANK HEDGEBANK
BI	BANK INTERIOR	BI	BANK INTERIOR
BJ	BANK JUNCTION	BJ	BANK JUNCTION
BK	BANK KILN	BK	BANK KILN
BL	BANK LAMP	BL	BANK LAMP
BM	BANK MOUND	BM	BANK MOUND
BN	BANK NEST	BN	BANK NEST
BO	BANK OAK	BO	BANK OAK
BP	BANK POND	BP	BANK POND
BQ	BANK QUARRY	BQ	BANK QUARRY
BR	BANK ROAD	BR	BANK ROAD
BS	BANK SAND	BS	BANK SAND
BT	BANK TOWER	BT	BANK TOWER
BV	BANK VALLEY	BV	BANK VALLEY
BW	BANK WALL	BW	BANK WALL
BX	BANK WATER	BX	BANK WATER
BY	BANK YARD	BY	BANK YARD
BZ	BANK ZONE	BZ	BANK ZONE
CA	CADASTRAL	CA	CADASTRAL
CB	CADASTRAL BOUNDARY	CB	CADASTRAL BOUNDARY
CC	CADASTRAL CORNER	CC	CADASTRAL CORNER
CD	CADASTRAL CURB	CD	CADASTRAL CURB
CE	CADASTRAL ELEVATION	CE	CADASTRAL ELEVATION
CF	CADASTRAL FENCE	CF	CADASTRAL FENCE
CG	CADASTRAL GRASS	CG	CADASTRAL GRASS
CH	CADASTRAL HEDGEBANK	CH	CADASTRAL HEDGEBANK
CI	CADASTRAL INTERIOR	CI	CADASTRAL INTERIOR
CJ	CADASTRAL JUNCTION	CJ	CADASTRAL JUNCTION
CK	CADASTRAL KILN	CK	CADASTRAL KILN
CL	CADASTRAL LAMP	CL	CADASTRAL LAMP
CM	CADASTRAL MOUND	CM	CADASTRAL MOUND
CN	CADASTRAL NEST	CN	CADASTRAL NEST
CO	CADASTRAL OAK	CO	CADASTRAL OAK
CP	CADASTRAL POND	CP	CADASTRAL POND
CQ	CADASTRAL QUARRY	CQ	CADASTRAL QUARRY
CR	CADASTRAL ROAD	CR	CADASTRAL ROAD
CS	CADASTRAL SAND	CS	CADASTRAL SAND
CT	CADASTRAL TOWER	CT	CADASTRAL TOWER
CV	CADASTRAL VALLEY	CV	CADASTRAL VALLEY
CW	CADASTRAL WALL	CW	CADASTRAL WALL
CX	CADASTRAL WATER	CX	CADASTRAL WATER
CY	CADASTRAL YARD	CY	CADASTRAL YARD
CZ	CADASTRAL ZONE	CZ	CADASTRAL ZONE
DA	DRAINAGE	DA	DRAINAGE
DB	DRAINAGE BOUNDARY	DB	DRAINAGE BOUNDARY
DC	DRAINAGE CORNER	DC	DRAINAGE CORNER
DD	DRAINAGE CURB	DD	DRAINAGE CURB
DE	DRAINAGE ELEVATION	DE	DRAINAGE ELEVATION
DF	DRAINAGE FENCE	DF	DRAINAGE FENCE
DG	DRAINAGE GRASS	DG	DRAINAGE GRASS
DH	DRAINAGE HEDGEBANK	DH	DRAINAGE HEDGEBANK
DI	DRAINAGE INTERIOR	DI	DRAINAGE INTERIOR
DJ	DRAINAGE JUNCTION	DJ	DRAINAGE JUNCTION
DK	DRAINAGE KILN	DK	DRAINAGE KILN
DL	DRAINAGE LAMP	DL	DRAINAGE LAMP
DM	DRAINAGE MOUND	DM	DRAINAGE MOUND
DN	DRAINAGE NEST	DN	DRAINAGE NEST
DO	DRAINAGE OAK	DO	DRAINAGE OAK
DP	DRAINAGE POND	DP	DRAINAGE POND
DQ	DRAINAGE QUARRY	DQ	DRAINAGE QUARRY
DR	DRAINAGE ROAD	DR	DRAINAGE ROAD
DS	DRAINAGE SAND	DS	DRAINAGE SAND
DT	DRAINAGE TOWER	DT	DRAINAGE TOWER
DV	DRAINAGE VALLEY	DV	DRAINAGE VALLEY
DW	DRAINAGE WALL	DW	DRAINAGE WALL
DX	DRAINAGE WATER	DX	DRAINAGE WATER
DY	DRAINAGE YARD	DY	DRAINAGE YARD
DZ	DRAINAGE ZONE	DZ	DRAINAGE ZONE

Utility Lines

Utility Line	Symbol	Utility Line	Symbol
ADDITIONAL	---	ADDITIONAL	---
AGRICULTURE	---	AGRICULTURE	---
ALLOTMENT	---	ALLOTMENT	---
ANALOGUE	---	ANALOGUE	---
ARTS AND CRAFTS	---	ARTS AND CRAFTS	---
APPOINTMENT	---	APPOINTMENT	---
ARCHITECTURE	---	ARCHITECTURE	---
ASBESTOS	---	ASBESTOS	---
ATMOSPHERE	---	ATMOSPHERE	---
AUTOMATIC	---	AUTOMATIC	---
AUDIO VISUAL	---	AUDIO VISUAL	---
AIRWAY	---	AIRWAY	---
AXIS	---	AXIS	---
AYERS	---	AYERS	---
AZIMUTH	---	AZIMUTH	---
BANK	---	BANK	---
BANK BUILDING	---	BANK BUILDING	---
BANK CURB	---	BANK CURB	---
BANK DRAIN	---	BANK DRAIN	---
BANK ELEVATION	---	BANK ELEVATION	---
BANK FENCE	---	BANK FENCE	---
BANK GRASS	---	BANK GRASS	---
BANK HEDGEBANK	---	BANK HEDGEBANK	---
BANK INTERIOR	---	BANK INTERIOR	---
BANK JUNCTION	---	BANK JUNCTION	---
BANK KILN	---	BANK KILN	---
BANK LAMP	---	BANK LAMP	---
BANK MOUND	---	BANK MOUND	---
BANK NEST	---	BANK NEST	---
BANK OAK	---	BANK OAK	---
BANK POND	---	BANK POND	---
BANK QUARRY	---	BANK QUARRY	---
BANK ROAD	---	BANK ROAD	---
BANK SAND	---	BANK SAND	---
BANK TOWER	---	BANK TOWER	---
BANK VALLEY	---	BANK VALLEY	---
BANK WALL	---	BANK WALL	---
BANK WATER	---	BANK WATER	---
BANK YARD	---	BANK YARD	---
BANK ZONE	---	BANK ZONE	---
CADASTRAL	---	CADASTRAL	---
CADASTRAL BOUNDARY	---	CADASTRAL BOUNDARY	---
CADASTRAL CORNER	---	CADASTRAL CORNER	---
CADASTRAL CURB	---	CADASTRAL CURB	---
CADASTRAL ELEVATION	---	CADASTRAL ELEVATION	---
CADASTRAL FENCE	---	CADASTRAL FENCE	---
CADASTRAL GRASS	---	CADASTRAL GRASS	---
CADASTRAL HEDGEBANK	---	CADASTRAL HEDGEBANK	---
CADASTRAL INTERIOR	---	CADASTRAL INTERIOR	---
CADASTRAL JUNCTION	---	CADASTRAL JUNCTION	---
CADASTRAL KILN	---	CADASTRAL KILN	---
CADASTRAL LAMP	---	CADASTRAL LAMP	---
CADASTRAL MOUND	---	CADASTRAL MOUND	---
CADASTRAL NEST	---	CADASTRAL NEST	---
CADASTRAL OAK	---	CADASTRAL OAK	---
CADASTRAL POND	---	CADASTRAL POND	---
CADASTRAL QUARRY	---	CADASTRAL QUARRY	---
CADASTRAL ROAD	---	CADASTRAL ROAD	---
CADASTRAL SAND	---	CADASTRAL SAND	---
CADASTRAL TOWER	---	CADASTRAL TOWER	---
CADASTRAL VALLEY	---	CADASTRAL VALLEY	---
CADASTRAL WALL	---	CADASTRAL WALL	---
CADASTRAL WATER	---	CADASTRAL WATER	---
CADASTRAL YARD	---	CADASTRAL YARD	---
CADASTRAL ZONE	---	CADASTRAL ZONE	---

Local Grid

Ordnance Datum

Derived from NG GPS Observations to the OS Active Network (OSTN02)

By GPS Observations to the OS Active Network (OSGM02) Stn 116.083m

Station	Amendment	Date	Name
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

RPS THE SURVEY GROUP

Stafford - Clevedon - Ilam - Warrington - Edinburgh

T: 0800 917 8227 E: rps.survey@rpsgroup.com www.rpsgroup.com

2 West Courtyard, Durston Business Village, Bedford Road, Durston, Bath BA2 9ST

CLIENT: RPS Planning & Development (Abingdon)

PROJECT: Cotefield Farm Phase II Bodicote Nr. Banbury

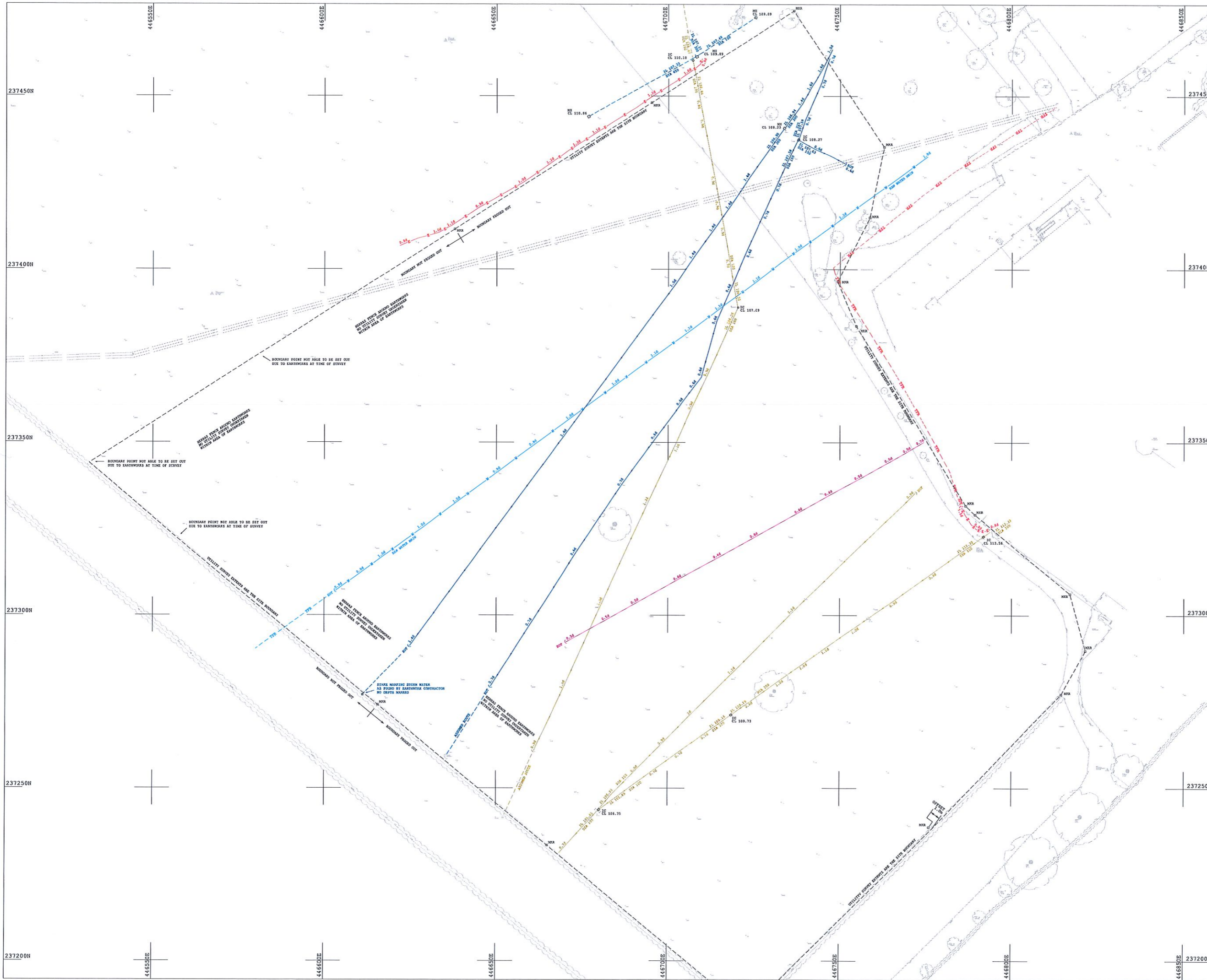
TITLE: Topographical Survey

Drawn: JGC Checked: GP

Date: April 2014 Scale: 1:600 @ A0

Dwg No: UAS304_A_02 Sheet: 1

ASSET & INFRASTRUCTURE MAPPING



KEY (Where Applicable)

UTILITIES AND SERVICES

MB	-	DASHED LINES ON UTILS INDICATE TAKEN FROM RECORD
A	-	UNDERGROUND UNAPPROVED SERVICE
TV	-	UNDERGROUND CABLE TELEVISION
C	-	UNDERGROUND COAX CABLES
D	-	UNDERGROUND DUCTING
E	-	UNDERGROUND ELECTRICITY
FO	-	UNDERGROUND FIBRE OPTIC CABLE
FJ	-	UNDERGROUND FUEL SUPPLY
G	-	UNDERGROUND GAS
AG	-	ABOVE GROUND GAS
W	-	UNDERGROUND CONDENSED WATER
FW	-	UNDERGROUND FRESH WATER
SW	-	UNDERGROUND SURFACE WATER
T	-	UNDERGROUND TELECOMS
S	-	UNDERGROUND TRAFFIC SIGNALS
U	-	TRENCH SCAR
U	-	UNDERGROUND UNIDENTIFIED SIGNAL
W	-	UNDERGROUND WATER SUPPLY
AW	-	ABOVE GROUND WATER SUPPLY
EW	-	OVERHEAD ELECTRIC WIRES
OT	-	OVERHEAD TELEGRAPH CABLES
EDT	-	END OF TRACE
TER	-	ROUTE TAKEN FROM RECORDS OR ASSUMED. (DASHED LINE WITH APPROPRIATE STYLE)
-----	-	REQUESTED SURVEY AREA
d	-	DEPTH: SEE ACCURACY STATEMENTS AND ASSOCIATED REPORT.
---	-	SITE BOUNDARY (LINE BETWEEN MARKER PEGS)

DISCLAIMER

DEPTH ESTIMATIONS, WHERE QUOTED, SHOULD BE TAKEN AS APPROXIMATE, DUE TO THE VARYING METHODS OF DETECTION USED MEASURING TO DIFFERENT DEPTHS OF THE SERVICE. GENERALLY DEPTHS SHOWN ALONG GRADES AND SENSORS ARE TO THE INVERT LEVELS OF THE RELEVANT PIPE. ELECTROMAGNETIC DETECTION METHODS ESTIMATE THE DEPTH TO THE CENTRE OF THE SERVICE AND ALLOWANCE SHOULD BE MADE FOR THE TOP OF LARGE DIAMETER SERVICES BEING SMALLER THAN THE ESTIMATED DEPTH. GROUND PENETRATING RADAR DEPTH ESTIMATIONS ARE TAKEN TO THE TOP OF THE DETECTED SERVICE.

IT SHOULD BE NOTED THAT THE PLAN POSITION OF A DETECTED SERVICE IS, AS A GENERAL RULE, GOOD TO +/- 10% OF ITS ESTIMATED DEPTH. WHERE SERVICES HAVE NOT BEEN ABLE TO BE DETECTED FROM ONSITE SEARCHES, THEN A COMBINATION OF INFORMATION TAKEN FROM RECORD DRAWINGS, RELEVANT SURFACE DETAILS AND TRENCH SCARS HAS BEEN USED WHILE EVERY EFFORT HAS BEEN MADE TO LOCATE ALL SERVICES THE COMPLETENESS OF ANY UTILITY SURVEY CANNOT BE GUARANTEED AND SAFE EXCAVATING PROCEDURES SHOULD BE EMPLOYED IRRESPECTIVE OF THE INFORMATION SHOWN ON THIS DRAWING.

REPORT

ALWAYS REFER TO THE REPORT THAT ACCOMPANIES THIS DRAWING.

NOTES

DATUMS

ALL LEVELS RELATED TO PREVIOUS CONTROL. COORDINATES RELATED TO PREVIOUS CONTROL. DATA PRESENTED ON A LOCAL PLANE GRID. DATUMS DETERMINED BY OTHERS.

No	INFORMATION	By	Date	Chd
REVISIONS				

M&A surveys LTD

The Old Chapel
Hopkins Street
Burnt Tree
W.Midlands DY4 7ST

tel 0121-557 0787
fax 0121-557 0787
e-mail mandsa@mandasurveys.co.uk

CLIENT:	RIDDINGS MIDLANDS LTD
LOCATION:	LAND OFF OXFORD ROAD, BODICOTE, BANBURY
DRAWING TITLE:	UTILTIY SURVEY & BOUNDARY SURVEY
SCALE: 1:500	SHEET SIZE: A1
DATE: 30.11.2017	DRAWING No: 17/065_01
DRAWN BY: FD	CHECKED BY: AH
©2017	COPYRIGHT OF M & A SURVEYS LIMITED



APPENDIX C
EXTRACTS FROM THE GROUND INVESTIGATION



Executive Summary and Conceptual Site Model

SITE INFORMATION AND SETTING	
Report Purpose	Phase 2 interpretative ground investigation and risk assessment.
Client	Crest Nicholson
Site Name and Location	Bodicote, Banbury, Oxfordshire.
Proposed Development	A development of 96 residential houses with associated infrastructure and gardens.
PHASE 2 – GROUND INVESTIGATION	
Hydrock Site Works	The Hydrock ground investigation comprised: <ul style="list-style-type: none"> • 18 trial pits to a maximum depth of 3.2m bgl; • 4 infiltration tests; • chemical testing of soils and leachates and geotechnical testing of soils;
Ground Conditions Encountered (All Data)	Marlstone Rock Formation – to >3.2 bgl , comprising brown gravelly clays with limestone beds. Dryham Formation – >3.2m bgl , blue grey silty clays.
Groundwater Encountered (All Data)	Groundwater was encountered at between 1.6m bgl and 3.0m bgl during the investigation.
GEO-ENVIRONMENTAL ASSESSMENT AND CONCLUSIONS	
Conclusions of Contamination Generic Risk Assessment	<p>Human health: Pervasive arsenic.</p> <p>Plant growth: There are no chemicals of potential concern to plant life.</p> <p>Ground gases or vapours: Negligible risk from ground gases</p> <p>Radon: The site is in a Radon Affected Area (>10% of existing homes affected).</p> <p>Water supply pipes: Greenfield site with no significant contaminants of concern and standard pipework is envisaged. However, confirmation should be sought from the water supply company at the earliest opportunity.</p>
Proposed Mitigation Measures	Full radon protective measures are necessary according to current guidance.



GEOTECHNICAL CONCLUSIONS	
Obstructions	Limestone beds are present within the ground at varying depths.
Groundworks and Earthworks	Excavation to proposed founding depth generally should be readily achievable with standard excavation plant. Heavy duty excavation plant/breaking equipment may be required to excavate the Limestone beds. Water seepages into excavations are likely to be adequately controlled by sump pumping.
Foundations	Strip/trench fill foundations from 0.90 m bgl, subject to the presence of existing trees within medium volume change potential soils. Piled foundations may be required where tree influence makes foundation depths greater than 2.50m. Allowable net bearing pressure of 100 kN/m ² should be available, keeping total and differential settlement within acceptable limits. Deepening of foundations/heave protection is likely to be required to allow for the effects of trees.
Ground Floor Slabs	Suspended because of depth of presence of medium shrinkage potential clay soils. Suspended over a void where within the influencing distance of trees.
Road Pavement Design (CBR)	it is considered likely an equilibrium CBR of over 2.5% will be achievable over most of the site which can be used for preliminary design purposes, subject to in situ testing during construction.
Soakaways	Soakaway drainage is considered unsuitable for this site.
Buried Concrete	Design Sulfate Class - DS-1 and ACEC Class AC-1. Equivalent to Design Chemical Class DC-1 for a 50 year design life.
FUTURE CONSIDERATIONS	
Uncertainties and Limitations	There is insufficient gas monitoring to fully characterise the site in accordance with CIRIA Report665.
Further Work	The following further works will be required: <ul style="list-style-type: none"> ● further investigation with boreholes and trial pits, together with further laboratory testing and monitoring to provide further information on the issues outlined in this report, particularly the extend and depth of the Head Deposits in the base and sides of the on-site valley feature; ● discussions with piling contractors regarding their method for designing and emplacing piles; ● discussions with service providers regarding the materials suitable for pipework etc.; ● discussions with regulatory bodies regarding the conclusions of this report; ● foundation depth in relation to trees assessment, following a tree survey to BS 5837:2012; and ● detailed design of foundations.

This Executive Summary forms part of Hydrock Consultants Limited report number R/05995/001 (Issue 1) and should not be used as a separate document.



4.0 GROUND INVESTIGATION RECORDS AND DATA

4.1 Physical Ground Conditions

4.1.1 Summary of Strata Encountered

The following sections present a summary of the ground and groundwater conditions encountered and their properties, based on field observations, interpretation of the field data and laboratory test results, taking into account, excavation and sampling methods, transport, handling and specimen preparation.

All relevant data from the Hydrock investigation detailed in Section 3.0 as well as any suitable previous investigations mentioned in Section 1.4 are used from this point forward.

For the purposes of property designation, soils are divided into fine soils (clays and silts) and coarse soils (sands, gravels, cobbles and boulders) in accordance with BS 5930:2015.

Soil plasticity class for fine soils is based on the classification system of BS 5930:2015, adopting modified plasticity index values (based on percentage passing 425 µm sieve). Volume change potential of fine soils on change of moisture content has been assessed using guidance provided in NHBC Standards/BRE Digest 240 - Part 1.

The ground conditions proven during the current investigation are in general accordance with the published geological literature and expectations from the desk study and previous investigation works. However, a stratum derived from Head or solifluction deposits (flow of soil down a slope) was identified and is identified on the exploratory hole logs in Appendix C.

Details of the strata are described in the logs in Appendix C; a summary is presented in Table 4.1 and the individual strata are described in the sections below. Relevant geological cross sections are presented in Appendix A.



Table 4.1: Strata Encountered

Stratum	Summary Description	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
Topsoil	Soft dark brown sandy gravelly clay and clayey gravelly sand with rootlets.	0	0.20 - 0.35	0.20 – 0.35
Head Deposits (southwest area of site on lower slopes)	Stiff greenish grey mottled orange silty sandy gravelly clay	0.30	>1.80 - >2.70	>1.50 - >2.40
	Orange brown clayey gravelly sand			
	Soft blue grey / purple gravelly clay / silt			
Marlstone Rock Formation	Firm to stiff orange brown to greenish grey silty sandy gravelly CLAY, with fine to coarse angular to rounded gravel of limestone and ironstone.	0.20 - 0.30	0.70 - >3.10	0.50 - >2.80
	Orange brown clayey silty gravelly sand with limestone and ironstone gravel.			
	Moderately strong fractured grey brown limestone			
Dyrham Formation	Stiff blue grey silty CLAY, weathered to firm orange brown clay near the upper surface.	0.60 – 2.60	>2.00 > 3.20	>0.20 - >1.60

Head Deposits, derived from solifluction deposits, were identified in exploratory holes SA104, TP201 and TP202. It is likely that they are present along the lower parts of the slope and the base of the valley feature. Where Head Deposits were encountered, their thickness was not fully proven but as they are generally in the lower parts of the site they are likely to be mostly underlain by the Dyrham Formation.

The level of the boundary between the Marlstone Rock and the underlying Dyrham Formation away from the area potentially affected by cambering and solifluction is between 105.4mOD and 107.2mOD, with an average of approximately 106mOD. Possible cambering in the lower parts of the site may result in the boundary occurring at a slightly lower level.

4.1.2 Topsoil

For the purposes of this report, topsoil is defined in accordance with BS5930: 2015 as the upper layer of an *in situ* soil profile, usually darker in colour and more fertile than the subsoil layer below and which is a product of natural chemical, physical, biological and environmental processes. The topsoil identified in the logs does not imply compliance with BS 3882:2015. Subsoil has not been identified as a separate layer.

4.1.3 Possible Made Ground

Based on local anecdotal information, Made Ground may be present across the eastern corner of the site, although it was not identified in any of the exploratory holes.



4.1.4 Head Deposits

Head Deposits were identified in TP 201, TP202 and SA104. They were encountered in the lower parts of the valley feature in the southwestern part of the site.

The Head Deposits are formed by the down-slope migration of soils from higher up the slope and hence they are of variable composition and formed of disturbed mixtures of the cohesive and granular source materials. Their classification properties are considered to be similar to those described in the following sections, but in TP201 a layer of soft clay was noted between 1.50m and 1.60m depth, resulting from softening caused by water in the sand materials above and below the clay.

In SA104 a single hand shear vane reading of 75kPa was obtained indicating medium strength.

One plasticity index test on Head Deposits showed a plastic limit of 20%, liquid limit 33%, 93% passing the 425um sieve and a modified plasticity of 12% with a natural moisture content of 26%, showing it to be of medium plasticity and of low volume change potential.

However, the materials are inherently variable and its geotechnical properties are likely to vary.

4.1.5 Marlstone Rock Formation

'Marlstone Rock Formation' was encountered underlying the topsoil in the topographically higher parts of the site. This generally consisted of brown sandy gravelly clays with limestone and ironstone gravel and beds of ferruginous limestone.

Natural moisture contents in the fine units of these materials range from 20% to 41%, and modified plasticity indices range from 12% to 29%. On this basis, these soils are classified as of low to high plasticity (CL-CH soils) and of low to medium volume change potential.

Undrained shear strength parameters of the cohesive units of the Marlstone Rock Formation materials based on seven *in situ* hand vane tests undertaken on samples recovered from trial pits recorded values between 76kPa and 103kPa indicating high strength.

4.1.6 'Dyrham Formation'

'Dyrham Formation' strata were encountered underlying the Marlstone Rock Formation. This generally consisted of stiff blue grey silty clay.

Natural moisture contents in the fine units of these materials range from 21% to 29%, and the plasticity index in one sample was 22%. On this basis, these soils are classified as of intermediate plasticity (CI) and of medium volume change potential.

Based on comparison of the plasticity indices with the moisture content, the clays in the Dyrham Formation are stiff to very stiff and a characteristic value of its shear strength is considered to be 75kPa.



4.2 Obstructions

Four of the trial pits encountered obstructions during excavation in the Marlstone Rock Formation as summarised in Table 4.2.

Table 4.2: Obstructions Encountered During Hydrock Investigations

Exploratory Hole	Depth (m)	Description	Stratum
SA101	2.00	Limestone bed.	Marlstone Rock Formation
TP203	1.80	Limestone bed.	Marlstone Rock Formation
TP204	1.00	Limestone bed.	Marlstone Rock Formation
TP205	2.60	Limestone bed.	Marlstone Rock Formation

4.2.1 Sulfate Content

In accordance with BRE (Special Digest 1), the Design Sulfate (DS) classification and the Aggressive Chemical Environment for Concrete (ACEC) classification derived from laboratory tests undertaken are presented in Table 4.3. The assessment summary sheet is presented in Appendix D.

Table 4.3: Aggressive Chemical Environment Concrete Classification

Stratum	No. Tests	DS	ACEC
Marlstone Rock Formation	6	DS-1	AC-1

4.3 Groundwater

4.3.1 Groundwater Levels

Groundwater strikes encountered during the investigation are summarised in Table 4.5.

Table 4.2: Groundwater Data

Stratum	Exploratory Hole	Fieldwork
		Depth Groundwater Encountered (m bgl)
Marlstone rock	TP206	1.60
	TP212	3.00
	SA103	2.00

Where groundwater was not encountered, the groundwater level can be assumed to be deeper than the base of the trial pits. On this basis, the depth to groundwater where not encountered in the trial pits varies between >0.70m and >3.20m below existing ground level.



4.3.2 Infiltration Tests

The results of the infiltration testing undertaken are summarised in Table 4.5. The results sheets are presented in Appendix D. All testing was carried out in accordance with Hydrock’s 1-day assessment methodology. This is in general accordance with BRE Digest 365 (BRE 2007) where infiltration rates allow three test runs during a working day (or where there is no infiltration), but where low infiltration rates were encountered the available time may not have been sufficient to fully comply with the BRE test method.

Where less than three tests were possible in a particular location the results provided should be considered indicative only and should not be used for design purposes. Further discussion concerning the suitability of infiltration testing at the site is provided in Section 7.7.

Table 4.5: Infiltration Test Results – Marlstone Rock Formation

Stratum	Trial Pit no.	Depth	Infiltration Rate (m/s)		
			Test 1	Test 2	Test 3
Limestone	SA101	2.0	Drainage too fast to measure	Drainage too fast to measure	Drainage too fast to measure
Clay	SA102	2.4	Too slow to measure	-	-
Clay	SA103	2.0	Too slow to measure	-	-
Clay	SA104	2.1	Too slow to measure	-	-

These results indicate fast infiltration into the limestone beds where these occur as the outflow from the pit was greater than the inflow that could be gained from a water bowser. The clay horizons in the Marlstone Rock Formation are effectively impermeable for soakaway purposes.

4.4 Geo-Environmental Results

The chemical test results for soil, leachate and groundwater are given in Appendix F, which also includes summary tables of the data.

Concentrations of the following determinands in soils were reported as below the laboratory limits of detection:

- Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene, Cadmium (aqua regia extractable), Chromium (hexavalent); and Selenium (aqua regia extractable).

4.5 Updated Ground Model

The preliminary conceptual site model initially developed from the desk study and walk-over survey (Section 2.0) has been confirmed using the findings of the ground investigation.



APPENDIX D
FOUL & SURFACE DRAINAGE STRATEGY LAYOUT

KEY:

- Extent of development covered by current planning application.
- Adjacent Development Phase

NOTES:

The foul & surface water design has been based on the approved principles outlined within the Flood Risk Assessment & Drainage Strategy undertaken by Forge Engineering Design Solutions.

Foul Water:

The foul water flows from each property will drain via gravity through the private house drainage before out-falling to a new sewer located typically within the development road network. All foul flow from the development gravitates in a southerly direction to a new foul outfall sewer constructed as part of the adjacent Cala Homes Development.

The development foul drainage network will be offered to Thames Water for adoption under a Section 104 agreement of the Water Industry Act 1991.

Surface Water:

The surface water drainage strategy sets of general principles for the designs. The sub strata is unsuitable for infiltration type SUDs and will therefore require a more traditional approach.

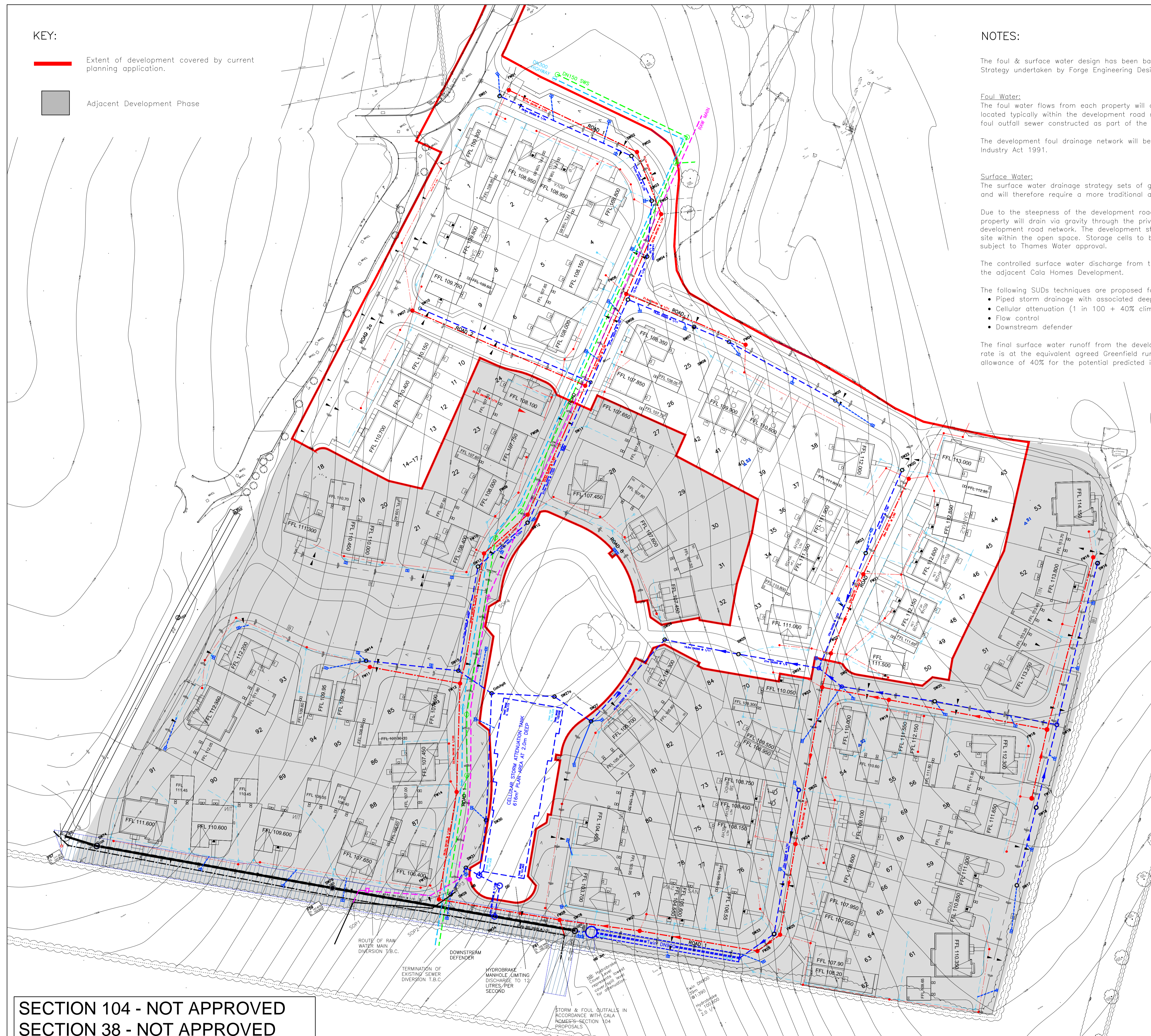
Due to the steepness of the development roads and drives permeable type paving is unsuitable. The surface water flows from each property will drain via gravity through the private house drainage before out-falling to a new storm drain located typically within the development road network. The development storm drainage discharges to an attenuation tank located towards the southern end of the site within the open space. Storage cells to be placed below POS avoiding LEAP and to be an off line design. Detail design to be subject to Thames Water approval.

The controlled surface water discharge from the development will outfall to a new surface water outfall sewer constructed as part of the adjacent Cala Homes Development.

The following SUDs techniques are proposed for the development site and form part of the drainage treatment train.

- Piped storm drainage with associated deep trapped gullies and catchpits
- Cellular attenuation (1 in 100 + 40% climate change)
- Flow control
- Downstream defender

The final surface water runoff from the development will be strictly controlled via the above Sustainable Drainage Systems. The runoff rate is at the equivalent agreed Greenfield runoff rate and be designed to manage the 1 in 100 year return storm plus an extra allowance of 40% for the potential predicted increase in peak rainfall up to 2115.



KEY:

Proposed Adoptable Sewers:

Foul sewer —●—

Storm sewer —●—

Road Gully (no distinction between private or adopted at this time) —●—

Storm Attenuation (see plan for details) □

Proposed Private Drainage:

Foul drain -.-●-.-

Storm drain -.-●-.-

Diversions to Existing:

RAW Water Main (subject to Thames Water approval) -.-

Private Storm -.-

Highway DN300 -.-

PRELIMINARY - FOR PLANNING

REV. No.	DATE	DESCRIPTION	INITIALS
J	20.07.18	Revised in accordance with current planning layout.	AJW
H	***	Interim design issue.	JRV
G	12.06.18	Revised in accordance with current planning layout.	JRV
F	12.06.18	Revised in accordance with current planning layout Rev. Z.	JRV
E	25.05.18	Additional RAW diversion details proposed. Drainage layout updated.	AJW
D	09.05.18	Storm water system remodeled to remove from LEAP/LAP extents, in accordance with Planning comment.	AJW
C	24.04.18	Revised in accordance with current planning layout.	AJW
B	02.04.18	Revised in accordance with current planning layout.	AJW
A	23.01.18	Revised in accordance with current planning layout (extents and layout).	AJW

Client CREST NICHOLSON		MJA CONSULTING CIVIL AND STRUCTURAL ENGINEERS Monarch House, Barton Lane, Abingdon, Oxon, OX14 3NB Tel: 01235 555173 Fax: 01235 523226	
Project Bodicote, Banbury		Scale 1:500 @A1	Date Nov' 2017
Title Proposed Drainage Strategy Plan (Phase 1)		Checked KTG	Drawn AJW
		Drawing No. 5692:P70	Rev J

SECTION 104 - NOT APPROVED
SECTION 38 - NOT APPROVED

KEY:

- Extent of development covered by current planning application.
- Adjacent Development Phase

NOTES:

The foul & surface water design has been based on the approved principles outlined within the Flood Risk Assessment & Drainage Strategy undertaken by Forge Engineering Design Solutions.

Foul Water:

The foul water flows from each property will drain via gravity through the private house drainage before out-falling to a new sewer located typically within the development road network. All foul flow from the development gravitates in a southerly direction to a new foul outfall sewer constructed as part of the adjacent Cala Homes Development.

The development foul drainage network will be offered to Thames Water for adoption under a Section 104 agreement of the Water Industry Act 1991.

Surface Water:

The surface water drainage strategy sets of general principles for the designs. The sub strata is unsuitable for infiltration type SUDs and will therefore require a more traditional approach.

Due to the steepness of the development roads and drives permeable type paving is unsuitable. The surface water flows from each property will drain via gravity through the private house drainage before out-falling to a new storm drain located typically within the development road network. The development storm drainage discharges to an attenuation tank located towards the southern end of the site within the open space. Storage cells to be placed below POS avoiding LEAP and to be an off line design. Detail design to be subject to Thames Water approval.

The controlled surface water discharge from the development will outfall to a new surface water outfall sewer constructed as part of the adjacent Cala Homes Development.

The following SUDs techniques are proposed for the development site and form part of the drainage treatment train.

- Piped storm drainage with associated deep trapped gullies and catchpits
- Cellular attenuation (1 in 100 + 40% climate change)
- Flow control
- Downstream defender


The final surface water runoff from the development will be strictly controlled via the above Sustainable Drainage Systems. The runoff rate is at the equivalent agreed Greenfield runoff rate and be designed to manage the 1 in 100 year return storm plus an extra allowance of 40% for the potential predicted increase in peak rainfall up to 2115.


KEY:

Proposed Adoptable Sewers:

Foul sewer 


Storm sewer 

Road Gully (no distinction between private or adopted at this time) 

Storm Attenuation (see plan for details) 

Proposed Private Drainage:

Foul drain 

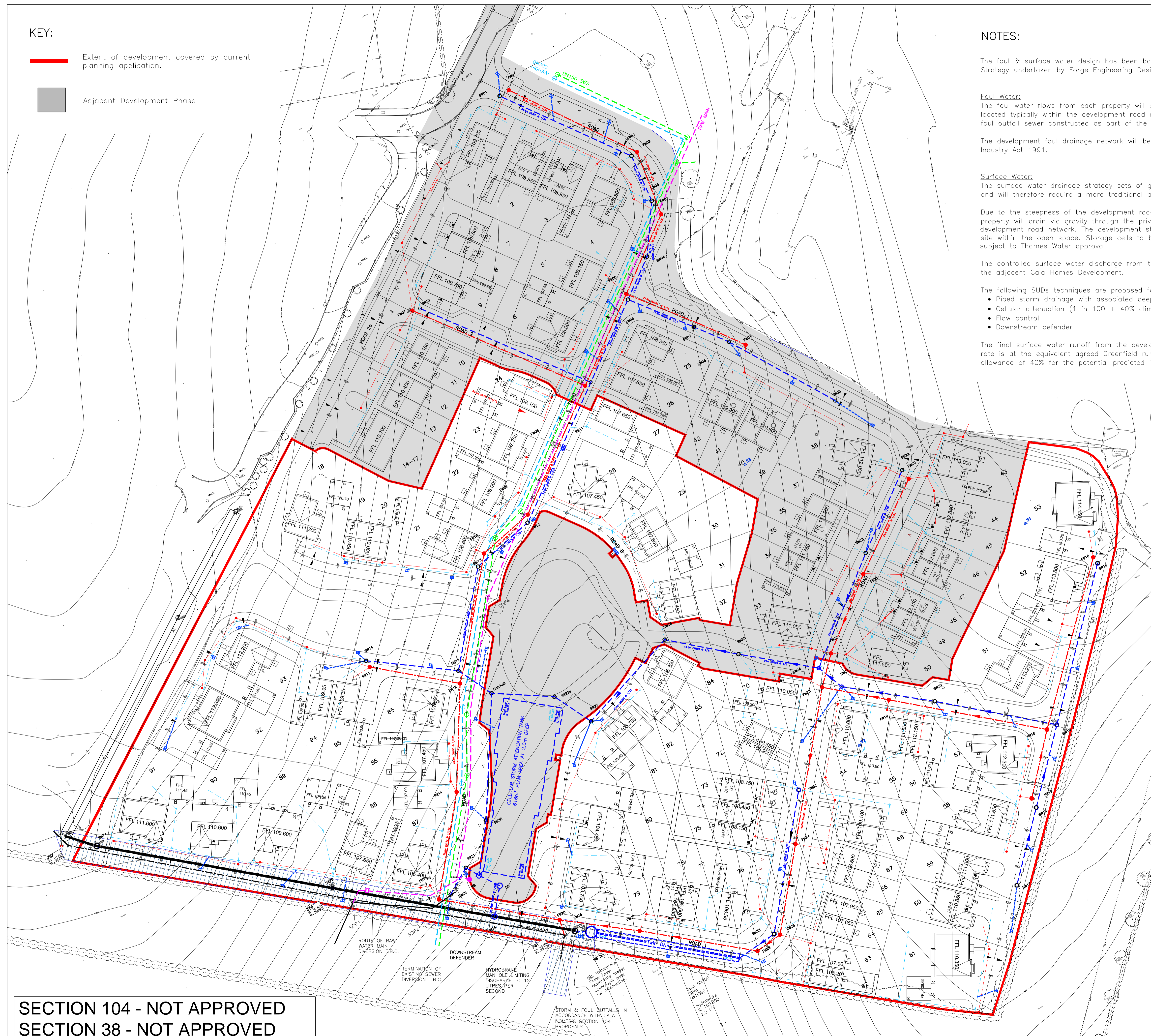
Storm drain 

Diversions Works to Existing:

RAW Water Main (subject to Thames Water approval) 

Private Storm 

Highway DN300 



PRELIMINARY - FOR PLANNING

REV. No.	A	20.07.18	Revised in accordance with current planning layout.	AJW
Client	CREST NICHOLSON			INITIALS
Project	Bodicote, Banbury			
Title	Proposed Drainage Strategy Plan (Phase 2)			
Scale	1:500	@A1	Date	Nov' 2017
Checked	KTG	Drawn	AJW	
Drawing No.	5692:P71			Rev
				A

SECTION 104 - NOT APPROVED
SECTION 38 - NOT APPROVED

© This drawing is the copyright of Michael A Jennings Associates Limited and may not be copied, altered or reproduced in any way without their permission.

MJA CONSULTING

Civil & Structural Engineers

Monarch House • Abingdon Science Park
Barton Lane • Abingdon • Oxon • OX14 3NB
Tel: (01235) 555173 • www.mjaconsulting.co.uk