Waterman Infrastructure & Environment Limited
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Old Cemetery Road, Kempston

Flood Risk and Drainage Technical Note

Date: 17/06/2020

Client Name: Barton Wilmore

Document Reference: WIE17195-100-R-1-1-3 - TN

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

Issue	[redacted]	[redacted]

Introduction

1.1. Waterman Infrastructure and Environment (Waterman) has been commissioned by Barton Wilmore to investigate any constraints to development related to flood risk and drainage for land north of Cemetery Road in Kempston, Bedfordshire. This technical note provides a summary of the baseline flood conditions at the site and presents the results of two hydraulic model scenarios which provide predicted future flood conditions. Development constraints and opportunities are discussed based on the baseline and future flood conditions and the drainage of surface water runoff from the site.

1.2. The site ownership (Figure 1) extends to a 6.7ha parcel of greenfield land situated on Cemetery Road in Kempston (hereafter referred to as 'the Site'). The Site is bisected by a footpath (split 1.1ha to the north, 5.5ha to the south). The River Great Ouse runs along the northern boundary of the Site. Cemetery Road runs along the southern border, the A428 runs along the western border and to the east is further greenfield land.

Figure 1: Site Location

Site Location

Source: www.google.com/maps

1.3. The Site's topographic survey (Appendix A), taken by Global Surveys in May 2020 shows the larger southern parcel is largely flat with most of the site sitting at an elevation of around 28.4m AOD. The low spot is a small ditch adjacent to the raised footpath at around 27.9m AOD in the north east of the southern parcel. The southern parcel ramps up gently toward Cemetery Road to the south to a high point of approximately 30.0m AOD.

1.4. Levels in the northern parcel fall from approximately 27.8m AOD by the footpath down to approximately 27.0m AOD adjacent to the River Great Ouse on the northern border.

1.5. The footpath which bisects the Site is raised by up to 400mm compared to adjacent levels on-site. The path falls from approximately 28.5m AOD in the west to 28.1m AOD in the east. It is lined by an avenue of historic Elm trees.

1.6. The southern parcel contains several drainage ditches on its south, north and east borders as well as running either side along the existing hedgerow which breaks the southern parcel further into two fields.

1.7. Consultation responses have been received from the Environment Agency (EA) who are responsible for Main Rivers including the River Great Ouse and Central Bedfordshire Council (CBC), the Lead Local Flood Authority responsible for surface water and groundwater flood risk and the control of surface water runoff.

2. Existing Flood Risk

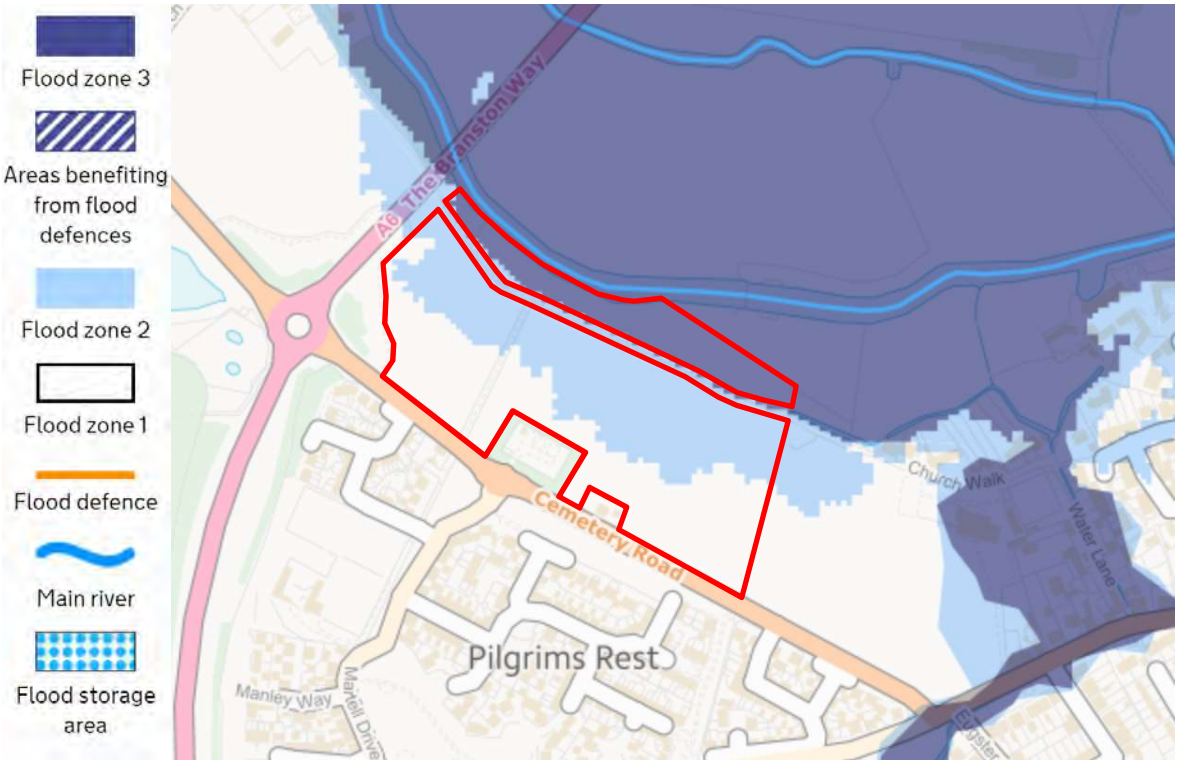
Fluvial and Tidal

2.1. The Environment Agency's Flood Map for Planning (Figure 2) shows that the Site sits partially within Flood Zones 1, 2 and 3. This suggests an Annual Exceedance Probability (AEP) of less than 0.1% (low risk), between 0.1% and 1% (medium risk) and greater than 1% (high risk) respectively across different areas of the Site in the present day.

2.2. The Site sits inland, directly adjacent to the River Great Ouse and therefore fluvial flooding is the main risk of flooding at this location. The Site is not at risk of tidal flooding.

2.3. The area of Flood Zone 3 is contained in the northern parcel, with the southern parcel at lower probability of flooding within Flood Zones 1 and 2 due in part to some protection afforded by the raised footpath.

Figure 2: Environment Agency Flood Risk from Rivers or the Sea Mapping



Source: https://flood-warning-information.service.gov.uk/long-term-flood-risk/

Hydraulic Modelling Results

2.4. The effects of climate change on the risk of flooding must be considered as part of the Flood Risk Assessment for planning. The hydraulic model of the Middle Great Ouse was obtained from the EA in order to run the model for the required climate change scenarios. The results of these model runs will be a control on site layout and setting floor levels (discussed in Chapter 3).

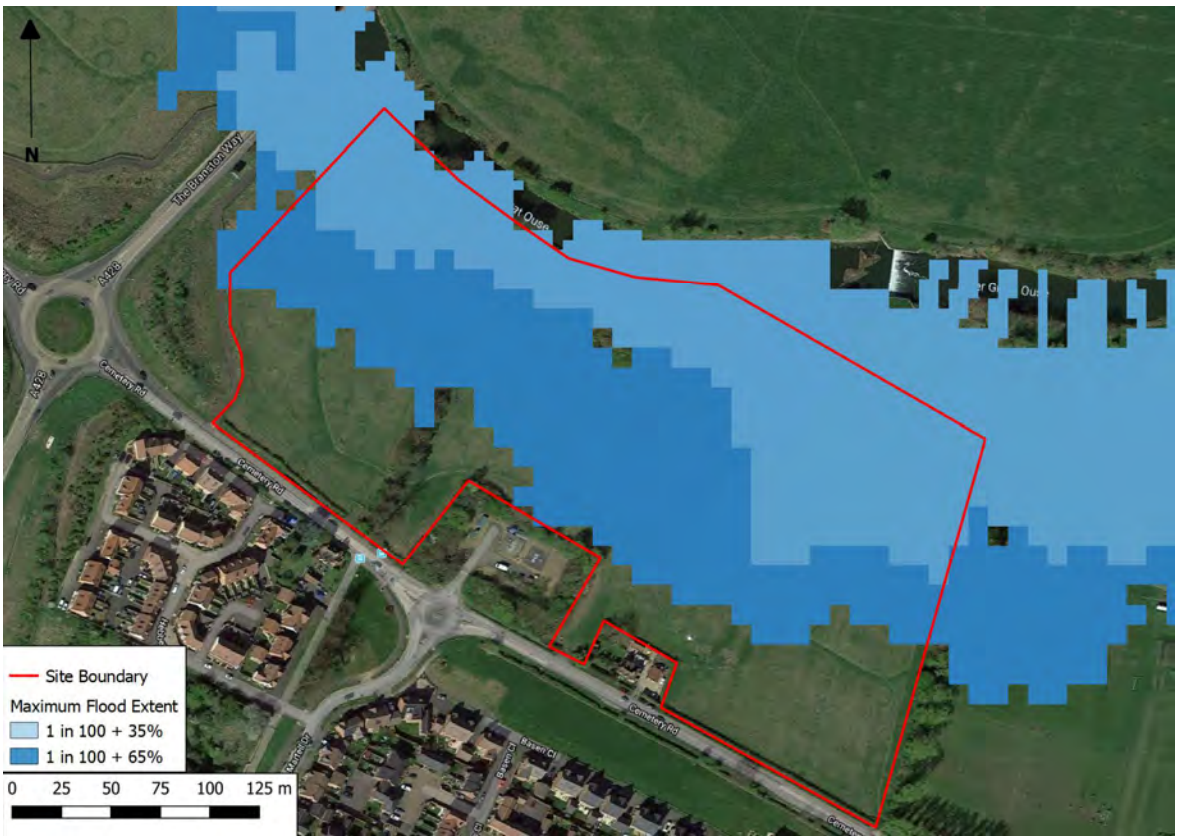
2.5. The model was run for two scenarios:

- 1 in 100 year event (1% AEP) plus 35% flows provides design levels for proposed development = **28.29m AOD**
- 1 in 100 year event (1% AEP) plus 65% flows used to check the residual risk in case the impacts of climate change are more severe than predicted = **28.59m AOD**

2.6. No other alterations have been made to the model.

2.7. Figure 3 shows the modelled flood extents (also presented in Appendix B) and shows that in the 1 in 100 plus 35% scenario the northern parcel floods completely. The southern parcel is flooded in two locations, in the eastern and western corners where water rises high enough to overtop the raised footpath. The maximum flood level is 28.29m AOD and there is a maximum of approximately 0.75ha flooding in the southern parcel in this scenario.

Figure 3: Maximum Modelled Flood Extents – 1 in 100 Year Plus 35% and 65% Climate Change



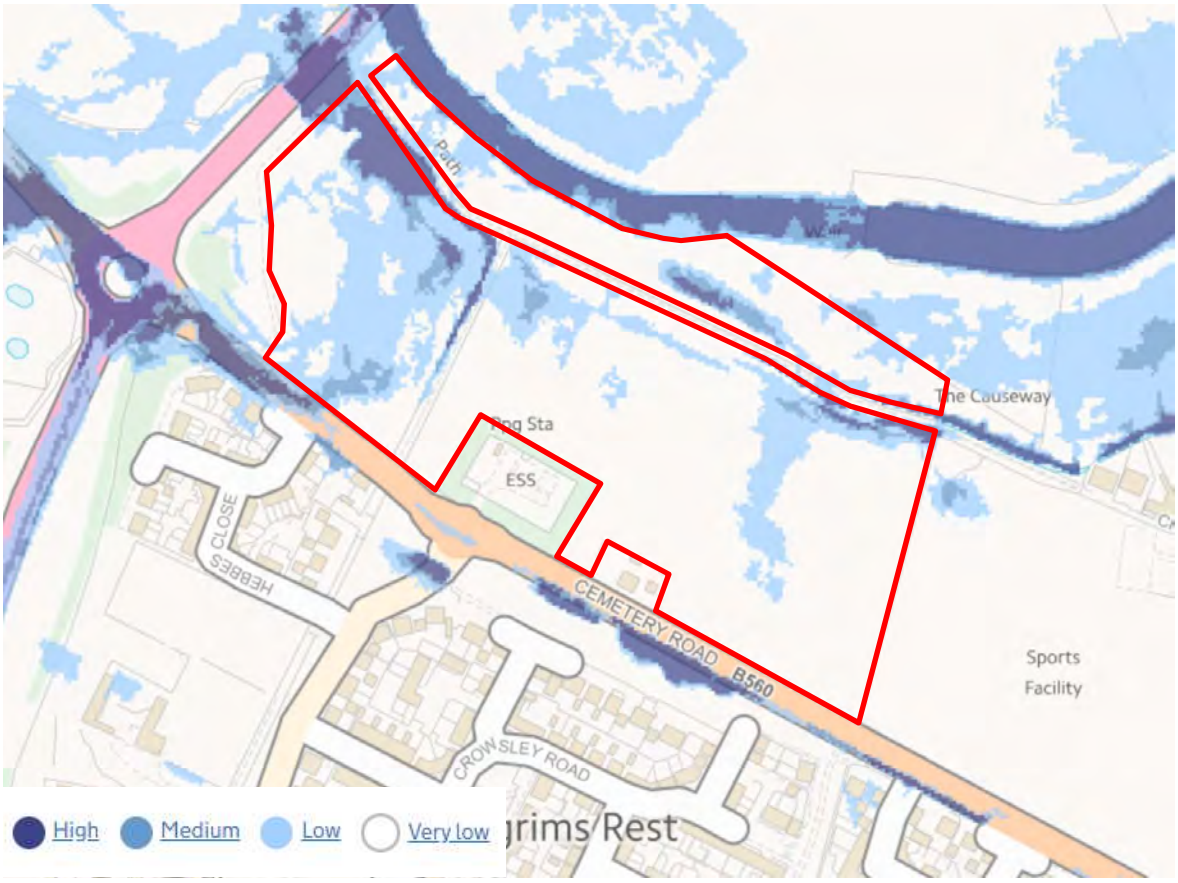
2.8. In the 1 in 100 year plus 65% scenario the maximum flood level is 28.59m AOD. The northern parcel is completely flooded, and the majority of the southern parcel is flooded with only the area to the south, adjacent to Cemetery Road remaining dry.

Pluvial/Surface Water

2.9. Pluvial flooding, also known as surface water flooding, occurs when natural and engineered drainage systems have insufficient capacity and are overwhelmed by the volume of rainfall. Pluvial flooding can occur in rural areas during medium intensity, long duration events where saturated ground conditions prevent infiltration into the subsoil. This flood water would then be conveyed via overland flow routes dictated by the local topography.

2.10. The Environment Agency's Flood Risk from Surface Water mapping (Figure 4) shows the Site is mostly at a very low risk of flooding however there are areas at low, medium and high risk.

Figure 4: Environment Agency Flood Risk from Surface Water Mapping



Source: https://flood-warning-information.service.gov.uk/long-term-flood-risk/

2.11. In a medium risk scenario (3.3% to 1% Annual Exceedance Probability (AEP)) there may be up to 900mm flooding in some areas with velocities of over 0.25 m/s. The greater flood depths are mainly associated with the drainage ditches in the southern parcel on the northern border and along the hedgerow.

2.12. The primary flow direction is from Cemetery Road in the south to the north. Surface water would historically have continued to drain into the river, however the existing raised path and drainage ditches appear to block the natural flow path northwards, resulting in surface water ponding against it in the north west corner of the Site, as shown in Figure 4.

Groundwater

2.13. Groundwater flooding occurs when water levels within the ground rise enough to breach the surface. According to British Geological Survey (BGS) mapping the Site is underlain by a mix of gravel/sand and clay/silt superficial deposits with clay and limestone bedrock.

2.14. BGS borehole records show the Site is underlain by strata of clay, silty clay and limestone with groundwater struck between 2.5m and 8.0m below ground level. The presence of clay strata suggests there is the possibility of perched groundwater levels (water accumulating above an impermeable clay stratum), however the clay strata may also preclude the perched water from reaching the surface.

2.15. According to the Bedford Strategic Flood Risk Assessment (SFRA) the Site is in an area with a susceptibility of groundwater flooding of between 50% and 75%. While the SFRA states Bedfordshire is not considered to be at risk of groundwater flooding it also states there have been some issues with waterlogged gardens in Kempston and there is some concern than groundwater flooding may be an issue.

Artificial Sources

2.16. The EA's Flood Risk from Reservoirs mapping (Figure 5 overleaf) shows the Site is not at risk in the event of a reservoir breach. The nearest area shown to be at risk is over 1km to the southwest.

Figure 5: Environment Agency Flood Risk from Reservoirs Mapping

Source: https://flood-warning-information.service.gov.uk/long-term-flood-risk/

3. Development Constraints and Opportunities – Flood Risk

Fluvial Flooding

3.1. The Site's location within Flood Zones 2 and 3 means it will be necessary to apply the Sequential Test if the Site is not already allocated for its proposed use, regardless of whether development is proposed within the Flood Zones.

3.2. According to the National Planning Policy Framework (NPPF) the vulnerability of the proposed land use should be commensurate with the risk of flooding. Land uses are split into vulnerability classifications with the Flood Zone classification defining land uses considered appropriate for particular areas. Residential development is classified as 'More Vulnerable' whereas community uses are 'Less Vulnerable'.

3.3. However, for the development of greenfield land the expectation is that all new development must be protected from the 1 in 100 year + 35% climate change 'design' flood event, either by leaving this

area undeveloped or providing mitigation through flood defences or raised finished floor levels. Any flood mitigation measures must not increase flood risk offsite.

3.4. The maximum modelled water level on site in the 100 + 35% scenario is 28.29m AOD. In line with national policy, 'more vulnerable' land uses should be raised a minimum of 300mm above this level. As such, residential and ideally all building Finished Floor Levels (FFL) should be set no lower than 28.59m AOD. This would restrict the land available for development to that outside of the design flood extent, i.e. the light blue area in Figure 4, unless land was raised to elevate it above this level.

3.5. To avoid causing offsite impacts, any land raising proposed in areas currently set below the design flood level would need to be compensated elsewhere on site. This means areas within the site that are currently above the design flood level would need to be lowered to provide equivalent flood storage to that lost by the land raising. This will need to demonstrated in the Flood Risk Assessment submitted for planning through level for level floodplain compensation design or hydraulic modelling.

3.6. It is possible to redefine the shape of the floodplain by altering ground levels, as long as there is no reduction in the available flood storage volume that would increase flood risk off site. Options for redefining the floodplain can be assessed by amending the Digital Terrain Model (DTM) within the hydraulic model.

3.7. The model has been run with LiDAR data used for the DTM. This is relatively coarse data it has been compared to the topographic survey (Appendix A) to check whether the levels in the hydraulic model match the more accurate topographic levels.

3.8. In comparing the LiDAR with the survey, it is noted that the footpath which bisects the Site has been filtered out from the LiDAR. The topographic survey shows a slight ridge all the way across the Site related to the footpath which does not feature in the LiDAR. Therefore the flood extents shown in Figure 3 may be over precautionary and could potentially be reduced if assessed against the topographic survey.

3.9. There are two flow routes onto the southern portion of the Site. The eastern flow route may be reduced slightly by introducing topographic levels however water would still be able to enter the Site here when comparing topographic levels with the maximum flood level, and so inserting the topography would make minimal difference to the developable area.

3.10. The levels in the LiDAR along the footpath in the west of the Site are between 0 and 400mm lower than the levels in the topographic survey. The topographic survey shows that levels in this area are all consistently higher than the maximum flood level of 28.29m AOD. If the topographic survey was added into the model it is possible the flow route in the west of the Site (which produces approximately 0.18ha flooding) could be prevented or greatly reduced, increasing the developable area.

Surface Water and Groundwater Flooding

3.11. The existing drainage ditches are expected to drain land to the south, including the Cemetery Lane highway drainage and runoff from roofs and external surfaces of the nearby housing. For this reason they must be retained post development.

3.12. The existing surface water flow routes should be taken into account when developing the masterplan. These 'Blue Green Corridors' should be retained within the masterplan to allow overland surface

water to be routed through the proposed development. Buildings should not be placed in areas where surface water ponding is predicted and proposed levels should be graded away from any proposed buildings to prevent internal flooding.

3.13. A Ground Investigation should be undertaken to confirm the underlying geology and the groundwater levels beneath the Site.

3.14. If basements are proposed, their access points should not be located in areas of elevated surface water flood risk or raised above the predicted flood level where this is strictly necessary. Internal access should also be provided to upper levels. Basement levels should be appropriately waterproofed to prevent ingress of water through the building structure from elevated groundwater.

4. Existing Surface Water Drainage

Existing Drainage

4.1. There are two land drainage ditches that flow from south to north and are likely to drain Cemetery Lane and the associated housing to the south. It is expected that these ditches drain runoff from the Site, before flowing north and discharging to the River Great Ouse beyond the Site boundary.

4.2. The existing drainage assets in the vicinity of the Site have been obtained from Anglian Water (via DigDat) and are presented in Appendix C. There are two assets running beneath the Site, both foul sewers, one entering the western end of the Site and running to a pumping station off Cemetery Road, the other running from just west of the pumping station northwards across the Site towards the River Great Ouse. Waterman will be advising on any development constraints associated with easements from these sewers under separate cover.

4.3. The following table sets out the assets in the vicinity of the Site.

Location	Assets
Beneath the Site	1 * 975mm Foul Sewer 1 * 1000mm Foul Sewer
Hebbes Close	1 * 375mm Surface Water Sewer 1 * 150mm Foul Sewer
Cemetery Road	1 * 450mm Surface Water Sewer 1 * 600mm Foul Rising Main

4.4. The public surface water sewer shown to the south of Cemetery Lane is likely to discharge into one or both of the two ditches, however Anglian Water's records are incomplete at this location and this will need to be verified on Site or through further consultation with Anglian Water.

5. Constraints and Opportunities – Surface Water Drainage

5.1. According the BGS records, the Site is underlain by a mix of gravel/sand and clay/silt superficial deposits with clay and limestone bedrock. It is considered likely that this would preclude drainage

by infiltration (e.g. soakaways and detention basins) but this will need to be confirmed following infiltration testing prior to submission of the planning application.

5.2. According to the drainage hierarchy it would be preferable to discharge runoff to ground through infiltration, however the nature of the subsoil may prevent this. The Site appears to drain to the River Great Ouse to the north via the two existing ditches on Site and it is likely that this will need to be replicated for the new development. The ditches appear to be shallow based on the topographic survey so some localised land raising may be required to facilitate gravity drainage.

5.3. The existing assets beneath the Site also need to be considered within the masterplan. These should be avoided where possible and Anglian Water are unlikely to grant a "build-over agreement" if diversion or offsets can be considered. A setback of 3m or more would be required from the existing assets depending on their depth (to be confirmed with Anglian Water) however a "build-near agreement" may be applied for.

5.4. According to local policy (Advice for the Provision of Surface Water Drainage Systems on New Developments – CBC 2017) developments should aim to discharge at no more than the greenfield rate of 17.3 l/s (based on the 6.7ha area of the Site) where possible and attenuation should be provided to achieve this rate without causing flooding onsite. The required volume of attenuation will be dependent on the total impermeable area of the proposed development.

5.5. There is scope for Sustainable Drainage Systems (SuDS) such as ponds, swales and detention basins (all lined and discharging to the agreed discharge location), which provide attenuation as well as water quality treatment and amenity benefits. These are looked upon favourably by planning authorities but require space and regular maintenance. In addition to these methods, permeable paving, blue/green roofs and rainwater harvesting can be included in the design to provide sustainable means of attenuation.

5.6. Once impermeable areas have been confirmed the allowable discharge rate can be quantified and the spatial requirements for SuDS considered further. Space should be reserved at the low point of the Site and outside the design flood extent.

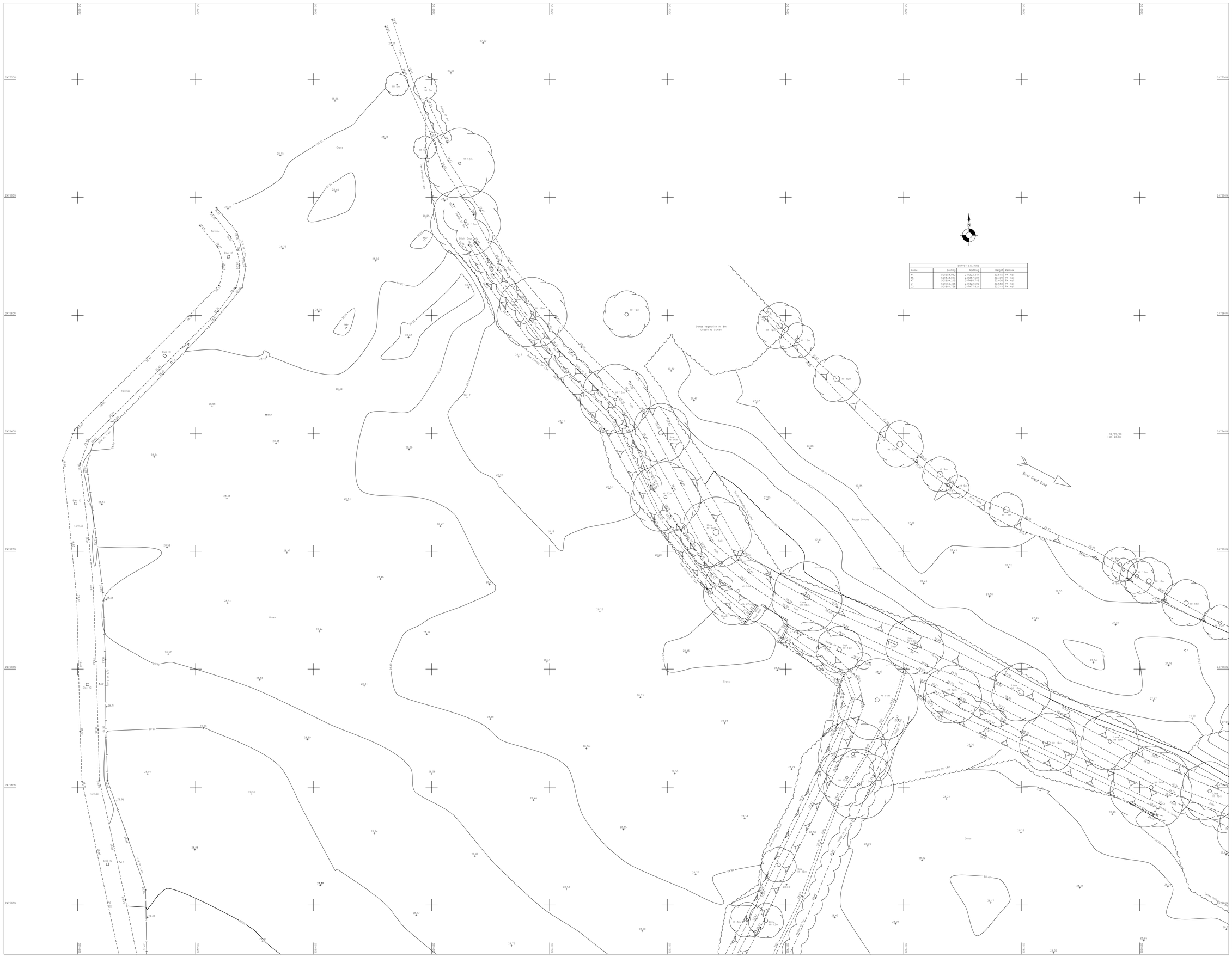
6. Recommendations

6.1. The following actions are recommended to improve confidence in the scale of development achievable.

- If the Site is not allocated for its proposed use the sequential test should be applied to demonstrate there are no alternative sites at a lower risk of flooding.
- The ability to develop the Site while avoiding the area shown within the 1 in 100 year plus 35% 'design' climate change extent (light blue area on Figure 3) should be considered. All FFLs should be set at or above 28.59m AOD, i.e. 300mm above the maximum flood level.
- It may be possible to redefine the shape of the floodplain (rather than reduce the area) through localised land raising to provide a better developable footprint, as long as levels are lowered elsewhere to ensure the current balance is maintained. Options for reshaping the floodplain can be assessed by amending the DTM of the hydraulic model.

- It is likely that running the hydraulic model with the LiDAR DTM replaced with the topographic survey will better represent the raised footpath and could reduce the extent of flooding in the north west corner of the Site, resulting in a small increase in the developable area.
- It is possible that a review of the EA's hydrology (inflows to the model) and representation of the river in the model may also reveal it is over-estimating the extent of the floodplain. This may allow for the development of currently sterile land and an initial assessment is recommended to assess whether this may be profitable.
- Existing land drainage ditches and associated 'Blue Green Corridors' should be retained and integrated into the development.
- The discharge of surface water runoff from the development into the shallow existing ditches may require localised land raising to achieve drainage by gravity.
- Surface water runoff from new development will require significant attenuation storage to be provided in the north of the Site but outside the flood extent, requiring land take. This can be quantified once the approximate impermeable area has been estimated.
- There are two Anglian Water foul sewers crossing the Site that must not be built over and will require no build easements of at least 3m.
- It is recommended that these sewers, along with the fluvial and surface water flooding extents set out in the figures above are overlaid onto a constraints plan so the physical constraints of the Site can be readily idenfied.

A. Topographic Survey and Environment Agency Hydraulic Model LiDAR



Legend:

Abbreviated Features:

AV	Air Valve	PB	Post Box
Av.	Average	PE	Pipe
BB	Bollard	PM	Parking Meter
BB	Building Beacon	RE	Rodding Eye
BH	Borehole	RL	Ridge Level
BL	Bed Level	RP	Reflector Post
BS	Bus Stop	RS	Road Sign
BT	British Telecom Cover	RW	Retaining Wall
B/RW	Brick Retaining Wall	RWP	Rain Water Pipe
BrW	Brick Wall	S	Spring
CATV	Cable TV Cover	SL	Soffit Level
CCTV	Close Circuit TV	SN	Sign
CL	Cover Level	SNP	Street Name Plate
Col.	Column	SV	Stop Valve
C/RW	Concrete Retaining Wall	SVP	Soil & Vent Pipe
C/PO	Catch Pit	SW	Surface Water
DPC	Damp Proof Course	S/RW	Stone Retaining Wall
DK	Drop Kerb	SW/W	Stone Wall
D	Drain	TCB	Telephone Call Box
DL	Down	TL	Traffic Light
EL	Eaves Level	TP	Telegraph Pole
EB	Earth Rod	UG	Underground
EP	Electricity Pole	UP	Up Pipe
FH	Fire Hydrant	UTL	Unable To Lift
FL	Flow Level	DUTL	Damaged UTL
F/Light	Flood Light	OUTL	Obstructed UTL
FW	Foul Water	SUTL	Sealed UTL
FP	Foot Path	VP	Vent Pipe
G	Gully	WL	Water Level
GV	Gas Valve	WM	Water Meter
GP	Gate Post	WO	Wash Out
Ht.	Height	WT	Water Top
IC	Inspection Chamber	D	Diameter
IL	Invert Level		
KO	Kerb Outlet		
LB	Letter Box		
LP	Lamp Post		
MH	Manhole		
Mkr	Marker Post		
MS	Mile Stone		
OSBM	Ordnance Survey Bench Mark		
OH	Overhead		
P	Post		

Fence Abbreviations:

B/W	Barbed Wire
C/B	Close Boarded
C/I	Corrugated Iron
C/L	Chain Link
C/P	Chestnut Paling
I/R	Iron Railing
P/R	Post & Rail
P/W	Post & Wire

Symbols:

Control Station :
Manhole/Inspection Chamber :
Inlet Pipe / Out Flow Pipe
Bush :
Tree : Spread & Girth Shown To Scale
Gate :
Spot Level : 52.85
Bore Hole :
Trial Hole :

Lines:

Wall :
Verge :
Fence :
Boundary :
Edge of Spread :
Hedge :
Embankment : Top of Bank / Bottom of Bank
OH Electric :
OH Telecom :
Drainage Flow :
Contours :

Hatching:

Building :
Open Sided Building :

General Notes:

1. Man entry to sewers has not been undertaken. Depths, pipe sizes and quantity of pipes are measured from the surface. We therefore cannot guarantee the completeness or accuracy of the sewer data which should be checked with the local authority and/or on site.

2. All tree heights and spreads are approximate. The plan position of trunks are taken at ground level. Girth measurements are taken at c 1.5m height. We have attempted to identify tree species, however if tree species are critical specialist advice should be sought.

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Plan Coordinates relate to OS National Grid OSGB36 using GPS.
LSF 1.000 at Stn A5

Level Datum:-
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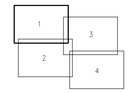
Sheet Location Diagram:



Notes:

REV. NO	REV. NOTE	DATE	SIGNED

RICS · THE SURVEY ASSOCIATION · chartered ices · CHAS · smas

GLOBAL SURVEYS
3 Brookfield, Duncan Close,
Moulton Park, Northampton, NN3 6WL
Tel: 01604 491543
Email: info@globalsurveys.co.uk

Site:	Land North of Cemetery Road Kempston MK43 8RA
Client:	Bedfordia Developments Ltd
Survey Description:	Topographical Survey

Date	May 2020	Scale	1/200 @ A0
Dwg No.	20024-TOPO	Surveyor	CJN
Sheet	1 of 4	Checked	MSW

SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
A4	501954.092	247322.347	30.815	PK Nail
A5	501833.014	247387.607	30.409	PK Nail
A7	501694.219	247468.746	30.408	PK Nail
C1	501752.498	247422.502	30.688	PK Nail
C2	501681.766	247477.821	30.314	PK Nail

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1 2 3 4

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DPC	Damp Proof Course
DK	Drop Kerb
Dr	Drain
EL	Eaves Level
ER	Earth Rod
EP	Electricity Pole
FH	Fire Hydrant
FL	Floor Level
F/Light	Flood Light
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FP	Foot Path
G	Gully
GV	Gas Valve
GP	Gate Post
Ht.	Height
IC	Inspection Chamber
IL	Invert Level
KO	Kerb Outlet
LB	Letter Box
LP	Lamp Post
MH	Manhole
Mkr	Marker Post
MS	Mile Stone
OSBM	Ordnance Survey Bench Mark
OH	Overhead
P	Post
PB	Post Box
PE	Pipe
PM	Parking Meter
RE	Rodding Eye
RL	Ridge Level
RP	Reflector Post
RS	Road Sign
RW	Retaining Wall
RWP	Rain Water Pipe
S	Stump
SL	Soffit Level
SN	Sign
SNP	Street Name Plate
SV	Stop Valve
SVP	Soil & Vent Pipe
SW	Surface Water
S/RW	Stone Retaining Wall
St/W	Stone Wall
TCB	Telephone Call Box
TL	Traffic Light
TP	Telegraph Pole
UG	Underground
US	Underside
UTL	Unable To Lift
DUTL	Damaged UTL
OUTL	Obstructed UTL
SUTL	Sealed UTL
VP	Vent Pipe
WL	Water Level
WM	Water Meter
WO	Wash Out
WT	Water Tap
Ø	Diameter

Fence Abbreviations:

B/W	Barbed Wire
C/B	Close Boarded
C/I	Corrugated Iron
C/L	Chain Link
C/P	Chestnut Paling
I/R	Iron Railing
P/R	Post & Rail
P/W	Post & Wire

Symbols:

Control Station :

Manhole/Inspection Chamber :

Inlet Pipe
Inlet Pipe
Out Flow
Pipe

Bush :

Tree : Spread & Girth Shown to Scale

Gate :

Spot Level : 52.65

Bore Hole :

Trial Hole :

Lines:

Wall :

Verge :

Fence :

Boundary :

Edge of Spread :

Hedge :

Embankment : Top of Bank / Bottom of Bank

Oh Electric :

Oh Telecom :

Drainage Flow :

Contours : 85.00 / 84.75

Hatching:

Building :

Open Sided Building :

General Notes:

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Plan Coordinate Control:–
Plan Coordinates relate to OS National Grid OSGB36 using GPS.
LSF 1.000 at Stn A5

Level Datum:–
All Levels relate to OSGB36 using GPS

Sheet Location Diagram:

1 2 3 4

Notes:

REV NO	REV NOTE	DATE	SIGNED

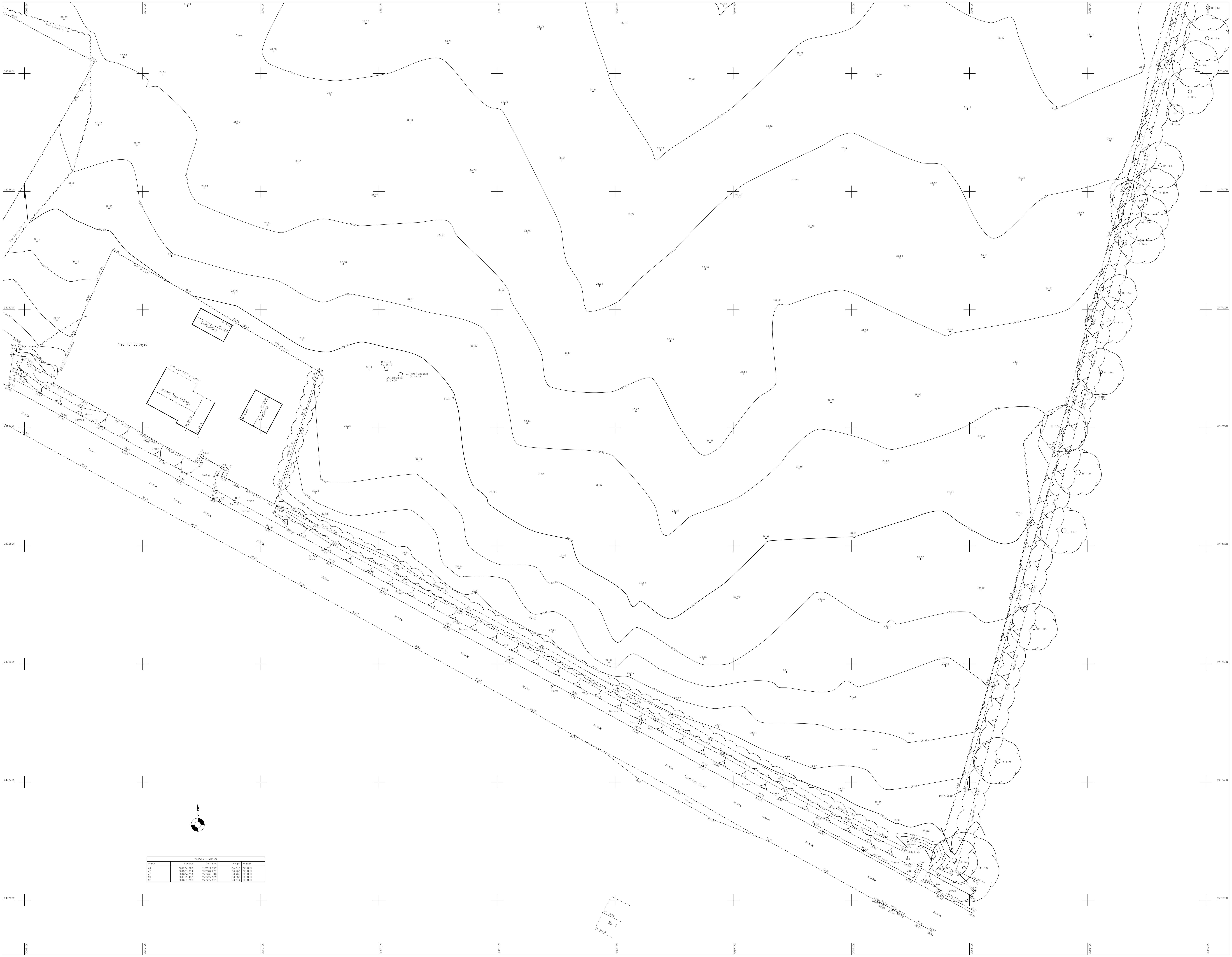
THE SURVEY ASSOCIATION

GLOBAL SURVEYS

3 Brookfield, Duncan Close,
Moulton Park, Northampton, NN3 6WL
Tel: 01604 491543
Email: info@globalsurveys.co.uk

Site:	Land North of Cemetery Road Kempston MK43 8RA
Client:	Bedfordia Developments Ltd
Survey Description:	Topographical Survey

Date	May 2020	Scale	1/200 @ A0
Dwg No.	20024-TOPO	Surveyor	CJN
Sheet	3 of 4	Checked	MSW



SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
A4	501954.092	247322.347	30.815	PK Nail
A5	501833.014	247387.607	30.409	PK Nail
A7	501694.219	247468.746	30.408	PK Nail
C1	501752.498	247422.502	30.688	PK Nail
C2	501681.766	247477.821	30.314	PK Nail

Legend:

Abbreviated Features:

AV	Air Valve
Av.	Average
B	Bollard
BB	Belisha Beacon
BH	Borehole
BL	Bed Level
BS	Bus Stop
BT	British Telecom Cover
B/RW	Brick Retaining Wall
Br/W	Brick Wall
CATV	Cable TV Cover
CCTV	Close Circuit TV
CL	Cover Level
Col.	Column
C/RW	Concrete Retaining Wall
C/Pit	Catch Pit
DPC	Damp Proof Course
DK	Drop Kerb
Dr	Drain
EL	Eaves Level
ER	Earth Rod
EP	Electricity Pole
FH	Fire Hydrant
FL	Floor Level
F/Light	Flood Light
FW	Foul Water
FP	Foot Path
G	Gully
GV	Gas Valve
GP	Gate Post
Ht.	Height
IC	Inspection Chamber
IL	Invert Level
KO	Kerb Outlet
LB	Letter Box
LP	Lamp Post
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Hedge :
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Contours : 85.00, 84.75

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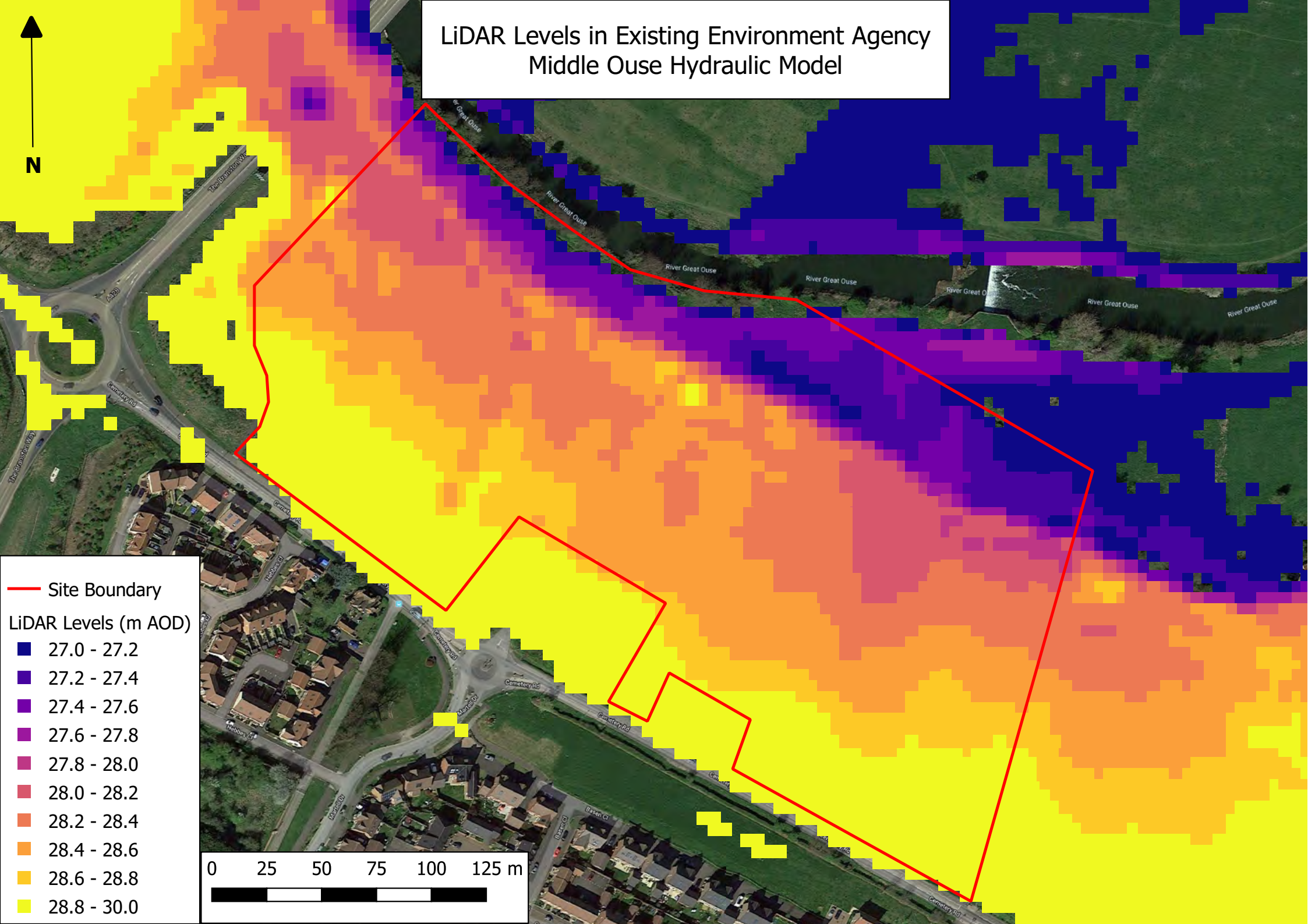
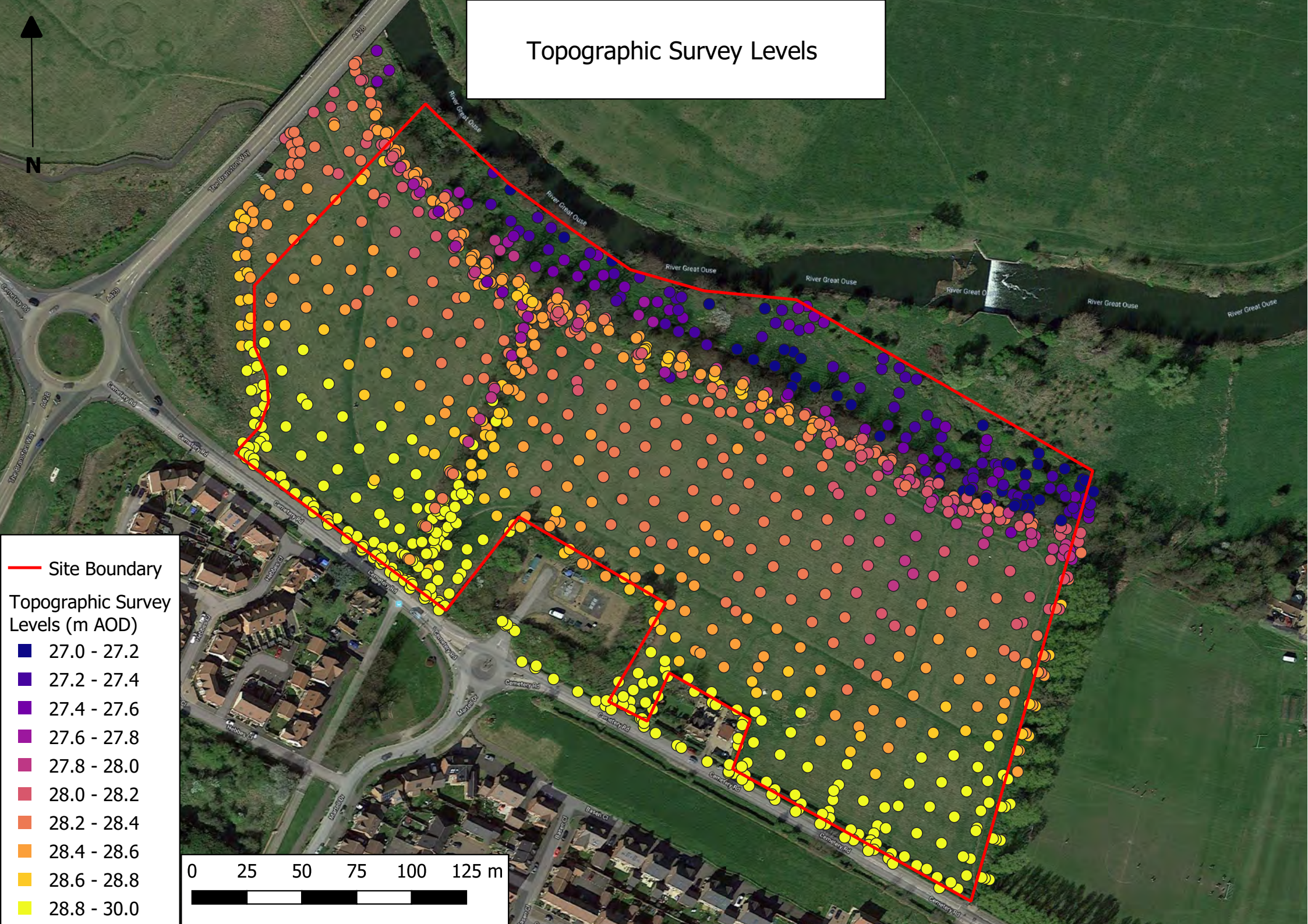
Moulton Park, Northampton, NN3 6WL
Tel: 01604 491543
Email: info@globalsurveys.co.uk

Site:	Land North of Cemetery Road Kempston MK43 8RA
Client:	Bedfordia Developments Ltd
Survey Description:	Topographical Survey

Date	May 2020	Scale	1/200 @ A0
Dwg No.	20024-TOPO	Surveyor	CJN
Sheet	4 of 4	Checked	MSW


LiDAR Levels in Existing Environment Agency Middle Ouse Hydraulic Model
N
Site Boundary
LiDAR Levels (m AOD)
27.0 - 27.2
27.2 - 27.4
27.4 - 27.6
27.6 - 27.8
27.8 - 28.0
28.0 - 28.2
28.2 - 28.4
28.4 - 28.6
28.6 - 28.8
28.8 - 30.0
0
25
50
75
100
125 m
River Great Ouse
Cemetery Rd
A428

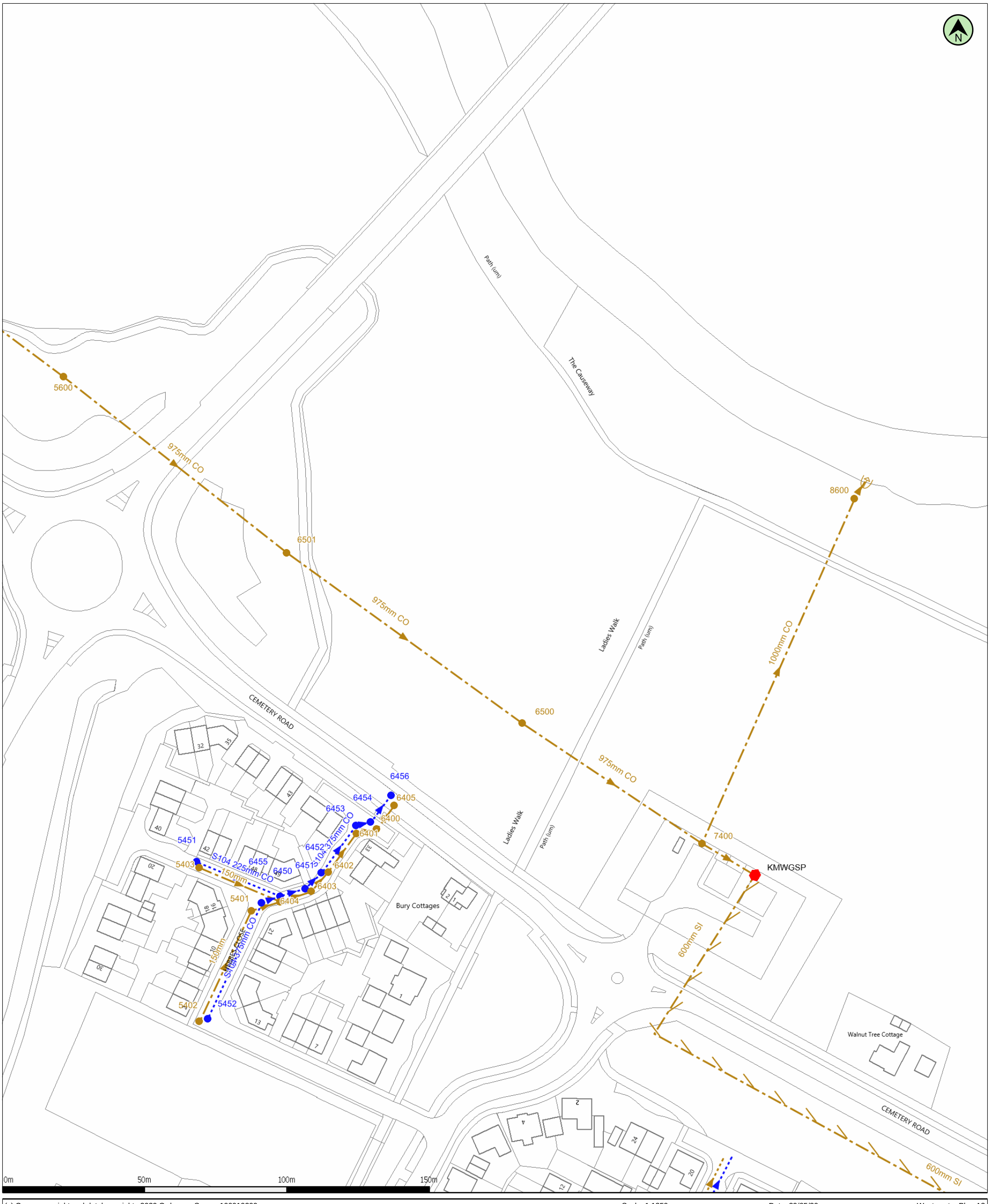

Topographic Survey Levels
N
Site Boundary
Topographic Survey Levels (m AOD)
27.0 - 27.2
27.2 - 27.4
27.4 - 27.6
27.6 - 27.8
27.8 - 28.0
28.0 - 28.2
28.2 - 28.4
28.4 - 28.6
28.6 - 28.8
28.8 - 30.0
0 25 50 75 100 125 m
River Great Ouse
Cemetery Rd
A428
The Brandon Way

B. Hydraulic Model Results


Maximum Flood Extent
River Great Ouse
1 in 100 Year + 35% Climate Change
N
Site Boundary
Maximum Flood Level (m AOD)
28.29
0 25 50 75 100 125 m


Maximum Flood Extent
River Great Ouse
1 in 100 Year + 65% Climate Change
N
Site Boundary
Maximum Flood Level (m AOD)
28.48
0 25 50 75 100 125 m

C. Anglian Water Existing Assets



Data updated: 30/04/20

Scale: 1:1250

Map Centre: 501689,247567

Date: 29/05/20

Our Ref: 392138 - 1

Wastewater Plan A3

Powered by digdat

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

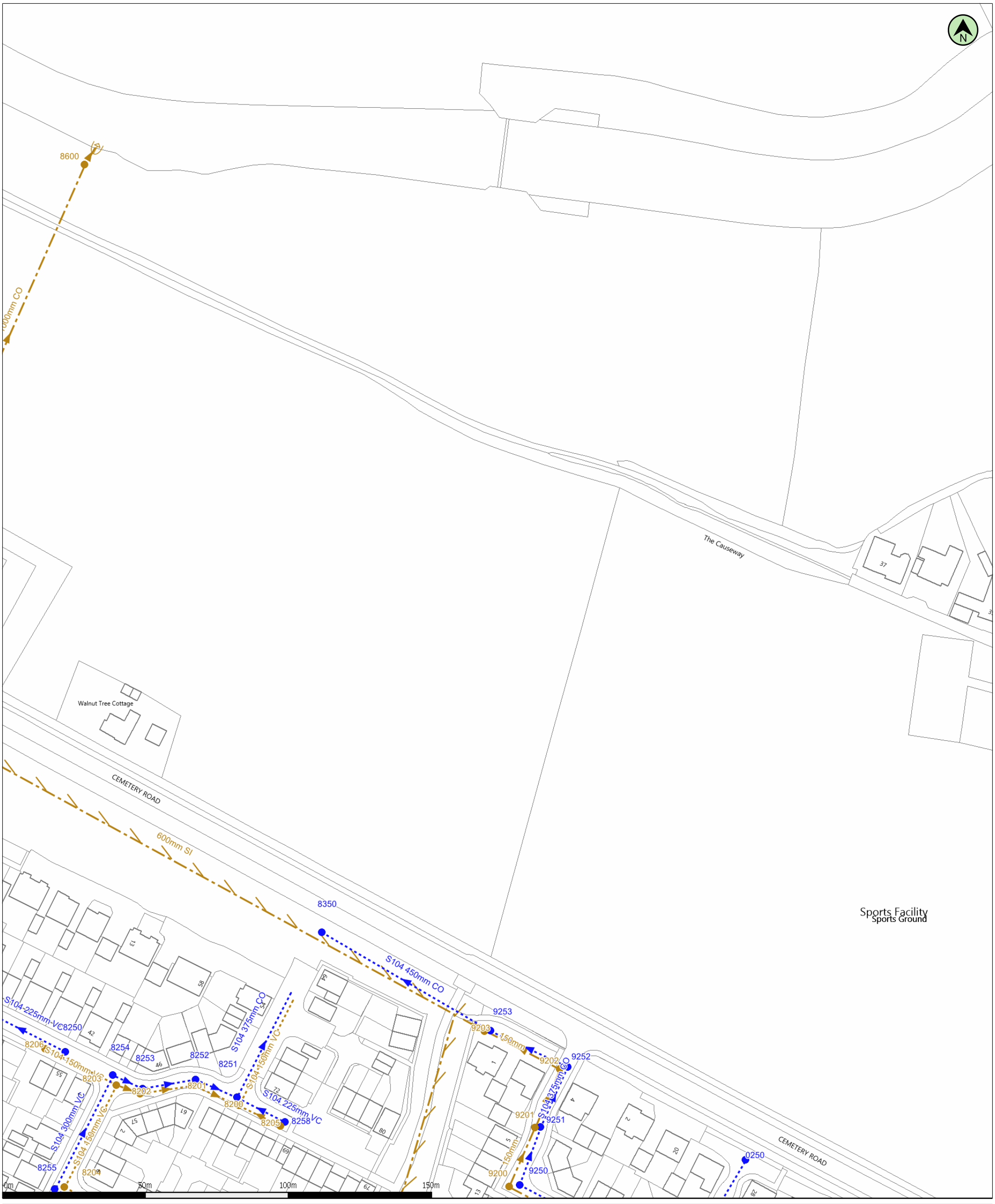
Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station

*(Colour denotes effluent type)

[redacted]

WIE17195

love every drop
anglianwater



Data updated: 30/04/20

Scale: 1:1250

Map Centre: 501959,247450

Date: 29/05/20

Our Ref: 392138 - 2

Wastewater Plan A3

Powered by digdat

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main*
- Private Sewer*
- Decommissioned Sewer*
- Outfall*
- Inlet*
- Manhole*
- Sewage Treatment Works
- Public Pumping Station
- Decommissioned Pumping Station

*(Colour denotes effluent type)

[redacted]

WIE17195

love every drop anglianwater