

ADEPT

CIVIL AND STRUCTURAL CONSULTING ENGINEERS



Help Out Mill Restaurant Cottage Proposed Housing Nuneaton

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CIVIL AND STRUCTURAL CONSULTING ENGINEERS

Client: GWPA

Project Name: Help Out Mill Proposed Housing

Report Title: Flood Risk Assessment

Document ref: 00.22224.FRA/3

Date: 20.12.22

Revision	Suitability	Date	Author	Checked	Approved	Description
2	P	12.01.23	JAS	RP	RP	Revised in line with clients comments
3	P	17.11.23	RP	RP	RP	Site proposals updated, JBA modelling included and responses to EA consultation included

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1.0 Introduction

Adept Consulting Engineers Ltd was commissioned to provide a Flood Risk Assessment (FRA) for our client in support of a planning application for a new dwelling in a listed building in Shackerstone, Nuneaton.

2.0 Limitations of report

Preliminary review and a concept drainage design have been undertaken as part of this study. These are based on the information and assumptions covered in this report at the time of preparation and provide a concept design for points of connection and general design parameters only.

The report is based on the interpretation and assessment of data provided by third parties. Adept Consulting Engineers Limited cannot guarantee the reliability of the third party information obtained. The conclusions and findings of the report may change if the third party data is subsequently amended or updated.

The assessment has been prepared using our best engineering judgement but there are levels of uncertainty implicit in the historical data and methods of analysis. The report is based on the following information:

- Flood Zone Maps from the Environment Agency website along with subsequent remodelling exercise carried out by JBA (details appended)
- Topographical Survey

3.0 Executive Summary

A site specific flood risk assessment is required to satisfy planning. The proposed site use is classified as more vulnerable as such fails the sequential test and the exception test is required. Note that historically the site has not flooded.

The proposed development is brownfield, recently a restaurant and occupies the same site as grade 2 listed buildings. The surrounding buildings are currently residential housing. As such it is appropriate for this building to also serve as housing. The floor levels are fixed; flood resilience measures are to be built into the property.

The building currently discharges surface water unattenuated to the River Sence. As the development is essentially an internal refurbishment with no proposed works to the outer building body or external surfaces other than maintenance the existing drainage systems will continue to serve the proposed development unaltered. Attenuation and flow restriction is not deemed appropriate for a development of this nature.

Foul run off from the proposed dwelling discharges to a package treatment works on the boundary of the site, given the sites previous use a restaurant the foul discharge will be reduced.

4.0 Description of the site

The site is located on the grounds of Help Out Mills Estate off Main St, Shackerstone, Nuneaton. The nearest postcode is CV13 0BT and the grid reference SK 37905 07844. The site is identified on the appended location plan.

Site description	
Total Site Area	100 square metres
Existing Impermeable Area	100 square metres
Land use	Disused restaurant- Commercial
Topography	Slopes less than 1m toward the south

A topographic survey is included in Appendix A. The site is wholly impermeable, being an existing building. The site is currently served by a private foul and surface water drainage networks. Surface water discharges to the nearby watercourse and the foul to a private treatment works. Reports on the existing drainage on site are included in Appendix B.

The River Sence runs from north to south to the western boundary of the site. Historically there were watercourses around the estate however these have since been dammed off. These redundant watercourses still appear on subsequent government flooding plans.

Assuming a peak 1 year run off rate of 50mm/hour using the modified rational method gives a peak 1 in 1 year run off from site of 1.4l/s. This will remain after development.

$$\begin{aligned}Q &= C I A \\&= 0.01 \times 50 \times 0.07 \\&= 1.4 \text{ l/s}\end{aligned}$$

5.0 Hydrology, Hydrogeology and Geology

Watercourses and waterbodies

The River Sence runs from north to south west on the western boundary of the site, 30m to the north west of the proposed dwelling.

Existing drainage

The site is currently served by private foul and surface drains. Survey is recommended to determine the condition of these and their viability for re-use. Given the remote location of the site there are no adopted sewers in the vicinity.

Geology

From the British Geological Society website the site is underlain with Gunthorpe member mudstone . No information is available on the overlying soils however given the location adjacent to watercourses it is likely to be alluvia.

Viability of Infiltration

It is unknown if infiltration is viable on the site. Soakaway testing is required to confirm viability. Underlying geology and proximity to watercourses suggests infiltration will not be possible on the site.

6.0 Flood Risk Sources and Extents

Summary

A summary of the sources and level of flood risk (negligible, low, medium or high) is given in Table 1. below.

Table 1. Summary of the Sources and Extent of Flood Risk	
Source	Risk Level
Fluvial	Low
Tidal - Coastal	Low-Not near coast
Surface Water / Pluvial	Low
Groundwater	Low
Surcharged Sewers	Low-No sewers near site
Other Man Made Sources	Low

The site is in Flood Zone 2 and 3 according to published maps from the Gov.uk website. Further modelling, however, has been undertaken by JBA that advises that the hazard-to-people rating in relation to the building is 'low'

The vulnerability classification of the proposed development is "More Vulnerable".

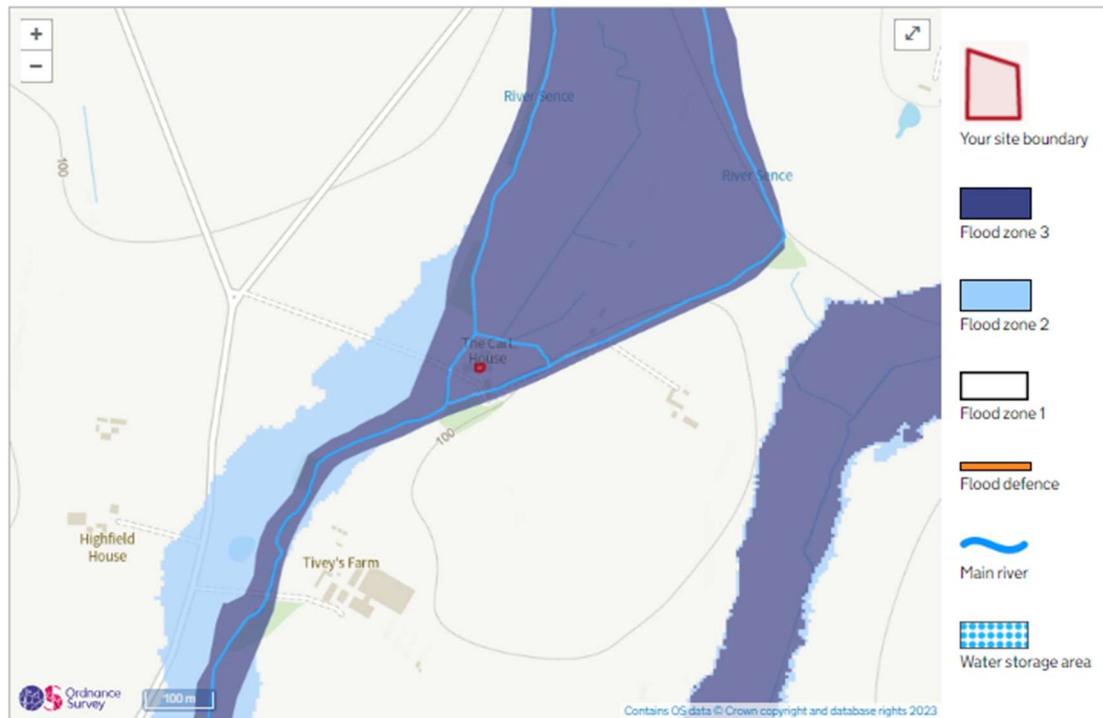
The sources and level of flood risk are demonstrated below.

This Flood Risk Assessment has been carried out in accordance with the requirements of the National Planning Policy Framework (Ref. 4) and the Planning Practice Guidance (Ref. 17).

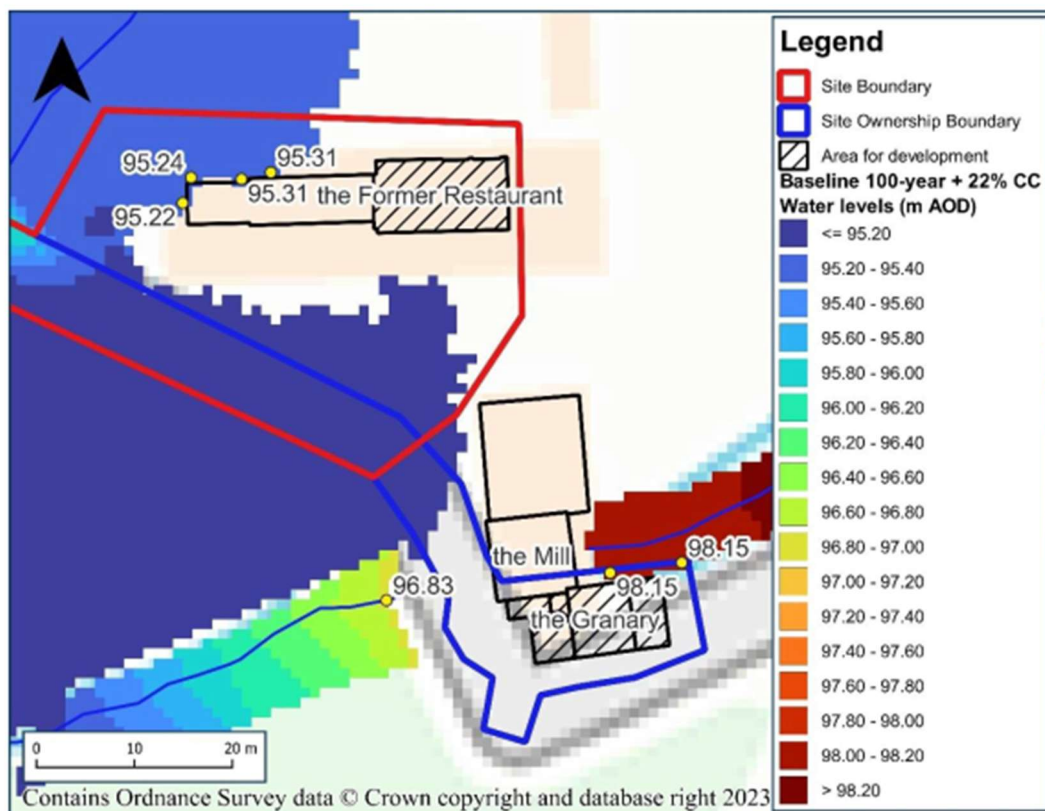
P4 data from the EA and Landmark Flood reports are included in Appendix B. These confirm the findings of the report.

Fluvial

An extract from the gov.uk website is shown below. The site is within Flood Zone 2 and 3.



Further modelling from JBA, which has now been accepted by the Environment Agency, shows the former restaurant being above the 100 year + 22% CC water levels as noted below, hence the risk can be reduced;



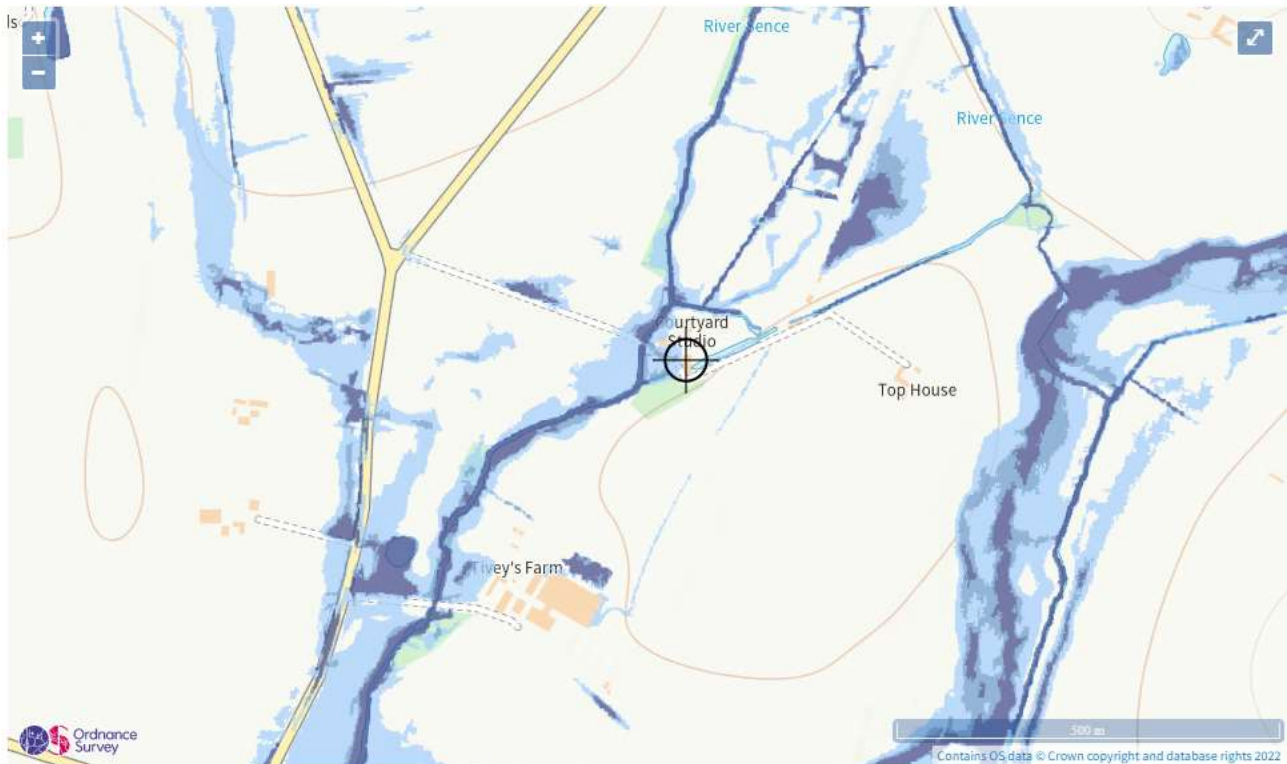
The peak water levels adjacent to the former mill being redeveloped are modelled to be 95.31m AOD in the 100 year +22% climate change event. The development building has a threshold of 95.70m AOD and is nearly 400mm above the peak water level noted.

Tidal

The site is not near the coast, as such not at risk of tidal flooding.

Surface Water / Pluvial

Surface water flood risk mapping from the gov.uk website shows that the proposed site is not affected by surface water flooding.



Extent of flooding from surface water

● High ● Medium ● Low ○ Very low ⊕ Location you selected

Groundwater Flooding

Given the site is adjacent to the river any ground water would emanate here as opposed to under the site.

Surcharged Sewers

There are no adopted sewers near the site.

Other Man Made Sources

The development site is not at risk of flooding from reservoir failure.

Discussions with Statutory Bodies

No discussions as yet have been held with Nuneaton Council's flood authority.

Historical Flood Issues

The proposed development site is one building within the Help Out Mills estate, which has been under the same ownership for 30 years. The buildings adjacent to the site are used as residences and are currently occupied. The owner has been consulted with regards to on site flooding, he has confirmed that the buildings and site access have not been affected by flooding in the past 30 years. Prior to the current ownership the previous owners stated that the site had not flooded in the previous 16 years. This is reinforced by the EA P4 data, included in Appendix B.

7.0 Proposed Development

Development Outline

The proposed development entails the conversion of a restaurant to a dwelling. See GWPA layout in Appendix A.

Proposed Drainage Strategy

As the development consists of what is essentially an internal refurbishment no attenuation or alterations to the existing drainage strategy, other than repairing and updating if necessary, are deemed appropriate. No alterations are proposed to the landscaping.

Sequential Testing

The proposed site use as residential is deemed as more vulnerable under Annex 3 of the Flood Vulnerability Classification. The main body of the site falls within FZ2 with the access in FZ3. As such the site fails the sequential test and the exception test is required

Exception Test

There are buildings on the Help Out Mill Estate which are Grade 2 listed. The list entry number of the site is 1188178, initially listed 10th January 1973. The existing restaurant itself is not listed however as this is part of the Help Out Mills estate it should be encouraged to stay in use as it enhances the appearance of the overall site.

Buildings adjacent to the site within the Help Out Estate are currently used as accommodation as such converting this building for residential use is appropriate and fitting with the surrounding site use.

We have reports from site residents that the buildings and site access have not flooded in 46 years. Correspondence included in Appendix B.

The exception test is considered to have been passed, the benefit to the wider community being that a building close to listed structures is kept from falling into disrepair. The residents will be kept safe from flooding which may affect the site by measures described below.

Flood Resilient Construction

The floor level of the building is c400mm above the peak water level from the 100 year event plus 22% for climate change. As the site is listed the existing floor levels of the buildings are to be maintained. We would recommend that flood gates will be fitted across external doorways to deter water entering the properties (upto a minimum height of 200mm to provide 600mm protection to the 100 year + 22% event)

Electrical sockets and wiring will be fitted a minimum 200mm above floor level to prevent them becoming affected by flood. Wiring should be taken down from the ceiling to the lower lying plugs.

The proposed floor construction is structurally concrete with a concrete screed, as such will not be susceptible to water damage. Any proposed floor coverings should either be either easily replaced in event of flooding or water resilient.

Any existing low lying air bricks will be sealed to prevent water ingress. Ventilation to be provided at a higher level in the building.

Flood Warning

The proposed site falls in an area covered by the flood warning service for the River Sence. This will alert the occupiers whether to deploy flood gates across doorways or move personal goods. Future residents will be made of this service.

8.0 Conclusions

Existing Drainage

The development site currently houses a building which most recently served as a restaurant with private foul and surface water drainage networks. The surface water drainage network discharges to the adjacent watercourse, as does the foul, via a package treatment works.

There is a river running to the west of the site, north to south.

Proposed Drainage Strategy

The existing drainage networks will be used to serve the proposed development.

As the site does not alter the footprint of the existing building or external surfaces attenuation and flow restriction are not deemed appropriate on the project.

Flood Risk

The site is within Flood Zone 3, and a modelling exercise has been undertaken by JBA to confirm flood modelled levels around the site, as such flood resilience measures will be employed to reduce the impact of any flooding that may occur. These measures should extend to a minimum of 600mm above the modelled peak water levels.

Historically the site has not flooded.

Recommendations for further work/investigation and obtaining agreement

A CCTV survey is recommended to confirm the viability of the existing drainage system for re-use.

9.0 Consultee responses

Environment Agency

The below addresses comments made by the Environment Agency

The below is in response to consultation dated 15th September 2023, reference LT/2022/127372/03-L01.

“We are currently unable to remove our objections to the development because the Hydraulic Modelling report does not address the following issues detailed in our previous response LT/2022/127372/02-L01 (inserted below):

- 1. The three Bullet points under Objection 1, on page 1.***
- 2. Bullet points 1 to 3 and 7 to 13 under Objection 2.”***

Summary of consultee feedback	Adept Response
Objection 1	
The application includes 2 bedrooms on the ground floor, the area of the building at highest fluvial flood risk. In the absence of information to confirm the design flood level at the site and thereby inform the depth of flooding to the ground floor, the assumptions made by the applicant that mitigation measures can overcome this currently undefined risk does not factually demonstrate that occupants could remain safe for the lifetime of the development. Either from the current flood risk and/or when allowances for climate change are taken into consideration.	To overcome this the layout of the building has now changed and it is proposed to move the bedrooms to the upper floors, removing this risk.
Flood avoidance should be the priority, with flood resistance and resilience measures only being considered when the sequential test has confirmed that there are no other suitable alternative sites available for the development and when the internal site layout has been sequentially undertaken, with alternative sites for vulnerable	As noted above. Following a sequential test of the internal layout of the building, the bedrooms have been relocated to the first floor.

elements of the development such as bedrooms considered first.	
The site specific fluvial flood risk to the development needs be established, as detailed below, prior to suggesting any building layout, flood warning, mitigation measures or evacuation plans.	An exercise has been carried out by JBA that has informed us that the building lies c400mm above the 100 year + 22% peak water level. Based on the flood levels now modelled then evacuation is not required.
Objection 2	
1. Correctly assess the fluvial flood risk to the site - Contrary to sections 3.0, 6.0, 7.0 (under Sequential Testing), 8.0 (under flood risk) and the Long Term Risk of Flooding map extract shown on page 8, this site lies within Flood Zone 3, and NOT Flood Zone 2 as stated incorrectly throughout the report. In addition the Landmark report in Appendix B, clearly shows on their front page gauge graphic that the site is at high risk of fluvial flooding with their Professional Opinion on page 1 restating this, and with page 13 stating the 'Individual Flood Risk' to be significant, with depths that would result in significant consequences.	Flood zone risk has been acknowledged and further modelling has been undertaken by JBA. This additional modelling prepared has demonstrated that the site sits nearly 400mm higher than the 100 year + 22% peak water level. The Landmark report has been omitted as is no longer relevant
2. Please Note The Environment Agency product 4 (P4) data supplied to the applicant/FRA consultant by us as referenced in Section 6 of the document (our REF: 283426) and meant to be included under Appendix B, is missing. However our information as shown on the attached Flood Map for Planning report from Gov.uk (dated 16 Jan 2023), also clearly states and shows this site is located in Flood Zone 3. In	All points are noted and we believe now addressed in the JBA modelling report carried out.

addition, the Landmark Flood report mapping information shown in Appendix B of their report incorrectly shows the information available on the Floodmark web site, as the pictures are missing the Flood Zone 3 and 2, Flood Map for Planning outlines (page 5), and surface water flood risk outlines (page 6), despite these being listed within the key of each map extract.	
3. Use the correct plot (red line boundary) location grid reference SK (43) 37905 07841 and/or the building outline when using the Gov.uk flood risk mapping products. Instead the report uses the inaccurate grid reference included in section 4.0 (438059,307865) for the map extracts on pages 8 and 9, and/or the Landmark report (437920,307820), both of which locate the site in the wrong place on the map (as shown on the OS/main River map extract attached), incorrectly placing the site in areas of lower risk of fluvial flooding (although these areas are still within Flood Zone 3, when using the correct map). In addition, the map extract shown on page 8, does not show the Flood Zone status of the site, as it is the wrong map, but shows the Long Term Risk of Fluvial Flooding map which takes into account flood risk management measures, and other reduction factors where they exist. This map is therefore not appropriate to be used in the current context.	The grid reference has been updated, SK 37905 07844, and extract from mapping updated with correct red line. We had used the 'Check you long term flood risk' gov.uk website which shows a medium risk of flooding. Flood zone 3 is now acknowledged in the report.
7. Include topographic survey and existing internal finished floor level information to Ordnance datum (GPS) within Appendix A – the site survey information provided has been undertaken to a Local datum	The survey has been updated and is now to Ordnance Datum. This shows the internal floor level at 95.70m.

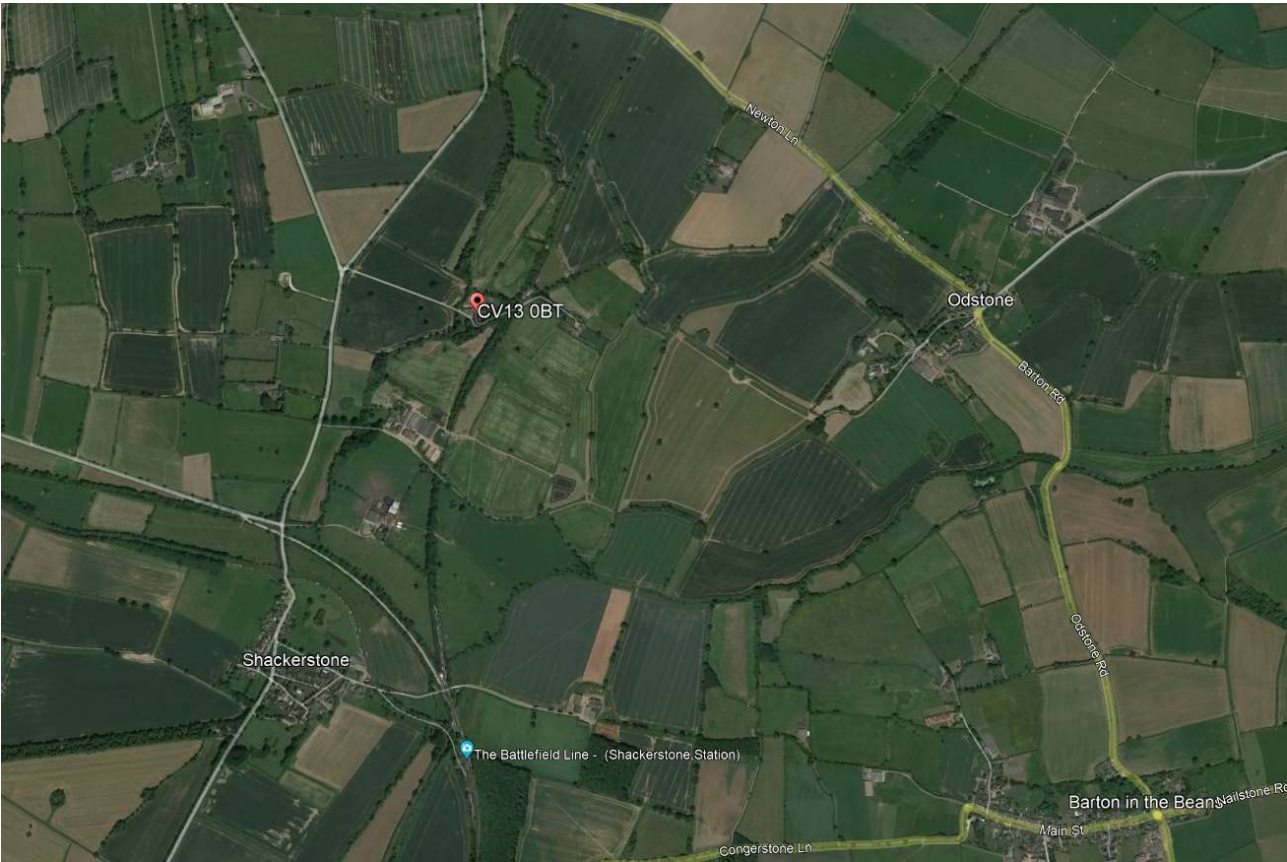
and does not show where the Survey Station was located on site. As such this information could not currently be compared with any modelled flood level information (required to be produced, see point 6 above), to establish the flood risk at the site, and/or depth of flooding predicted at the building	
8. Please Note the topographic survey must be to GPS Ordnance Datum (Adjusted to Ordnance Survey GPS, where traditional surveying methods are used). Any other topographic level information provided must also be corrected to OS GPS. Appropriate plans and cross-section(s) of the site must be provided extending from the site, through the watercourse and beyond (where necessary), detailing the site layout and levels and the predicted flood levels, with the above flood event outlines marked on the plan/s as contour lines.	The topographic survey is carried out to Ordnance Datum as confirmed in dialogue attached. The JBA reporting covers sections through the river watercourse
9. Appropriately report the historic flood risk to this site - contrary to Sections 3.0, 6.0 (Historical flood issues) and 7.0 we are unable to accept the witness statements of no flooding of this site, (no matter how long they may have lived there or known the site), because the Government require us to assess the fluvial flood event (design flood event) that through statistical modelling methods requires a significant amount of officially recorded hydrological and watercourse data (calculated and eg photographic evidence) to predict. In addition, where our product 4 data states that we do not hold any records of flooding on a site, this does not mean a site has never flooded, and therefore our comments have been taken out of context within Sections 6.0	These points are noted but still relevant to add context. The updated flood modelling by JBA will hopefully cover any concerns

(Historical flood issues) and 8.0 (Flood Risk).	
10. Take the impacts of climate change into account, because without first addressing point 6 above (hydraulic modelling or calculations requirements) the report cannot make an assessment of the impact of climate change using appropriate climate change allowances, for the lifetime of the development. For an explanation of which allowances should be used, see 'Flood risk assessments: climate change allowances'.	The JBA modelling includes for an allowance for climate change along with blockage scenarios and is appended to this report.
11. Appropriately consider how people will be kept safe from any flood hazards identified from points 6 and 9 above for a range of flooding events up to and including the extreme event – Contrary to sections 3.0, 7.0 (Exception Test) and 8.0 (Flood Risk), Flood avoidance should be the first priority, with flood resistance and resilience measures only being considered when the sequential test has confirmed that there are no other suitable alternative sites available for the development and when the internal site/building layout has been sequentially undertaken. With bedrooms currently proposed on the ground floor of this 2-storey building, it is clear that this exercise has not yet been undertaken.	The site is sequentially preferable and the modelled flood levels have been proven to be lower than the floor level of the building in extreme events. The bedrooms are now located on the first floor.
12. In addition, contrary to Section 7.0 (Flood Resilient Construction), without completing points 6 and 10 above it is not possible to determine what mitigation measures may be appropriate and/or feasible for this proposed listed development.	We have suggested that flood resilient construction should be considered to a height 600mm above the 100 year level + 22% climate change.

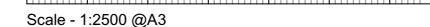
13. Appropriately consider any requirement for flood emergency planning including flood warning and evacuation of people for a range of flooding events up to and including the extreme event – contrary to Section 7.0 (Flood Warning), without completing points 6 and 10 above it is not possible to determine if or when evacuation of the proposed development would be required. In addition, whilst this area may be covered by our 'Flood Warning Service', the service on this stretch of the River Sence is limited to the issuing of a Flood Alert, when flooding of low lying land and property is predicted. Therefore, until the flood risks to this development are established as detailed above, it is not possible to determine if this level of service would be appropriate to meet the needs of any future owner/occupier of the proposed dwelling to either protect it and/or be used as a trigger to evacuate the site.	We understand that the site is already signed up to the Environment Agency Flood Warning system, We acknowledge that the Flood warning service in this area is limited but with the building now being shown to be above the 100 year 22% climate change extreme event then requirement for emergency planning is not critical.

Appendix A

- Location Plan
- Topographical Survey
- Site layout



Any discrepancies to be reported to the Architect.



-  Existing buildings within site boundary
 Proposed area of development
 Proposed site development boundary

05	11.01.23	Layout updated to show redundant waterways	JC	RT
04	06.01.23	Notes updated	JC	RT
03	25.11.22	Main road access added	JC	RT
02	24.11.22	Site boundary updated	JC	RT
01	06.10.22	First Issue	JC	RT
Rev	Date	Comment	Dr	Ch



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GWPA Ref (504)-2219

Job Title **Help Out Mill, Shackerstone
Nuneaton**

Client

Mr and Mrs Garnett

Site Location Plan
Scale - 1:2500@A3

Former Restaurant - Site Location
Plan

Name (504)-2219-GWP-01-00-DR-A-(PA)-0001

Scale	1:2500@A3	Revision	P05
Drawn/Checked	JC/RT	First Issue	06.10.22

Drawing Status	S - WIP
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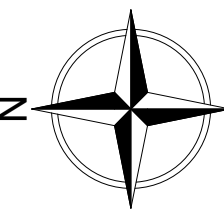
/Volumes/Data/CAD/(504)-2219-Help Out Mills, Nuneaton/A_Architects_(GWP)/Model/
504-2219-GWP-XX-ZZ-M3-A-1B-P01_Help Out Mill.pln

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LEVEL DATUM & ORIENTATION



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LEVELS CO-ORDINATED TO WORLD COORDINATES USING LEICA ZENO FL100 & LOCAL STATIONS POSITIONED ON SITE DURING SURVEY IN POSITIONS SHOWN ON PLAN.

ABBREVIATIONS & LEGEND:

LEVELS & HEIGHTS

CL - COVER LEVEL
IL - INVERT LEVEL
HT - HEIGHT
STN - SURVEY STATION
BM - BEAM
CE - CEILING
J - JOISTS
RA - RAFTERS
E - EAVES
F - FENCE
UIS - UNDERSIDE OF
RL - RIDGE LINE
FR - FLAT ROOF
HL - HIP LINE
VL - VALLEY LINE
PW - PARAPET WALL
SL - SLAB
SF - SOFFIT
T - TREE
THR - THRESHOLD
To - TOP OF
W - WALL
HH - HEAD HEIGHT
OH - OPENING HEIGHT
SH - SILL HEIGHT

GENERAL NOTES

AB - ADVERTISING BOARD
AC - AIR CONDITIONING UNIT
AHU - AIR HANDLING UNIT
AP - INTRUDER ALARM PANEL
B - BOLLARD
BA - BARRIER
BE - BENCH
BS - BUS STOP
BLR - BOILER
BXO - BOXING OUT
CAH - CEILING ACCESS HATCH
CHY - CHIMNEY
CPD - CUPBOARD
DB - DOG WASTE BIN
DW - DWAP WALL
DK - DROP KERB
EDR - ELECTRICAL DISTRIBUTION BOARD
EG - EXTRACT GRILLE
EM - ELECTRIC METER
FB - FUSE BOX
FP - FIRE PLACE
FU - FLUE
FAP - FIRE ALARM PANEL
GR - GRASS
GU - GUARDING
GM - GAS METER
HWC - HOT WATER CYLINDER
LB - LITTER BIN
LP - LAMP POST
PC - PELICAN CROSSING
PS - PAVING SLABS
PL - PLANTING
PB - POST BOX
RS - RAILING
RS - ROAD SIGN
RFL - ROOF LIGHT
SB - SPEED BUMP
SG - SIGNAGE
SN - STREET NAME SIGN
SWR - SHOWER
SHV - SHELVE
TB - TELEPHONE BOX
TL - TRAFFIC LIGHT
TM - TICKET MACHINE
TP - TELEGRAPH POLE
VE - VEGETATION
WA - WATER
WD - WARDROBE
WH - WATER HEATER
ZC - ZEBRA CROSSING

SERVICES

BT - BRITISH TELECOMS
CATV - CABLE TELEVISION
ER - EARTHING ROD
ES - ELECTRICAL SUPPLY
FH - FIRE HYDRANT
GAS - GAS SUPPLY
PO - POST OFFICE TELEPHONE
SV - STOP VALVE
TSSU - TRAFFIC LIGHT SIGNALS
DC - DRAINAGE CHANNEL
G - GULLY
IC - INSPECTION CHAMBER
MH - MANHOLE
RE - ROODING EYE
RW - RAIN WATER PIPE
U/L - UNABLE TO LIFT
SVP - SOL & VENT PIPE
ST - STOP TAP
WM - WATER METER

TYPICAL DRAWING SYMBOLS

SPOT LEVEL X 96.256
SPOT HEIGHT X 96.034

SURVEY STATION
STN 01
E 232183.251
N 517143.064
HT: 95.142

MANHOLE / INSPECTION CHAMBER
IC
CL 96.256
IL 94.824

SURVEY HEIGHT
H=0.794
WINDOW TAG
WINDOW TAG
SHEET 1 OF 1

DOOR TAG
DOOR TAG
SHEET 1 OF 1

RADIATOR TAG
RADIATOR TAG
SHEET 1 OF 1

TOP & BOTTOM OF KERB X 34.500
34.550

TOPOGRAPHICAL SYMBOLS
OVERHEAD ELECTRICAL
OVERHEAD ELECTRICAL
SHEET 1 OF 1

OVERHEAD TELEPHONE
OVERHEAD TELEPHONE
SHEET 1 OF 1

FENCE LINE
FENCE LINE
SHEET 1 OF 1

VEGETATION OUTLINE
VEGETATION OUTLINE
SHEET 1 OF 1

SINGLE GATE
SINGLE GATE
SHEET 1 OF 1

DOUBLE GATE
DOUBLE GATE
SHEET 1 OF 1

TREE
TREE
SHEET 1 OF 1

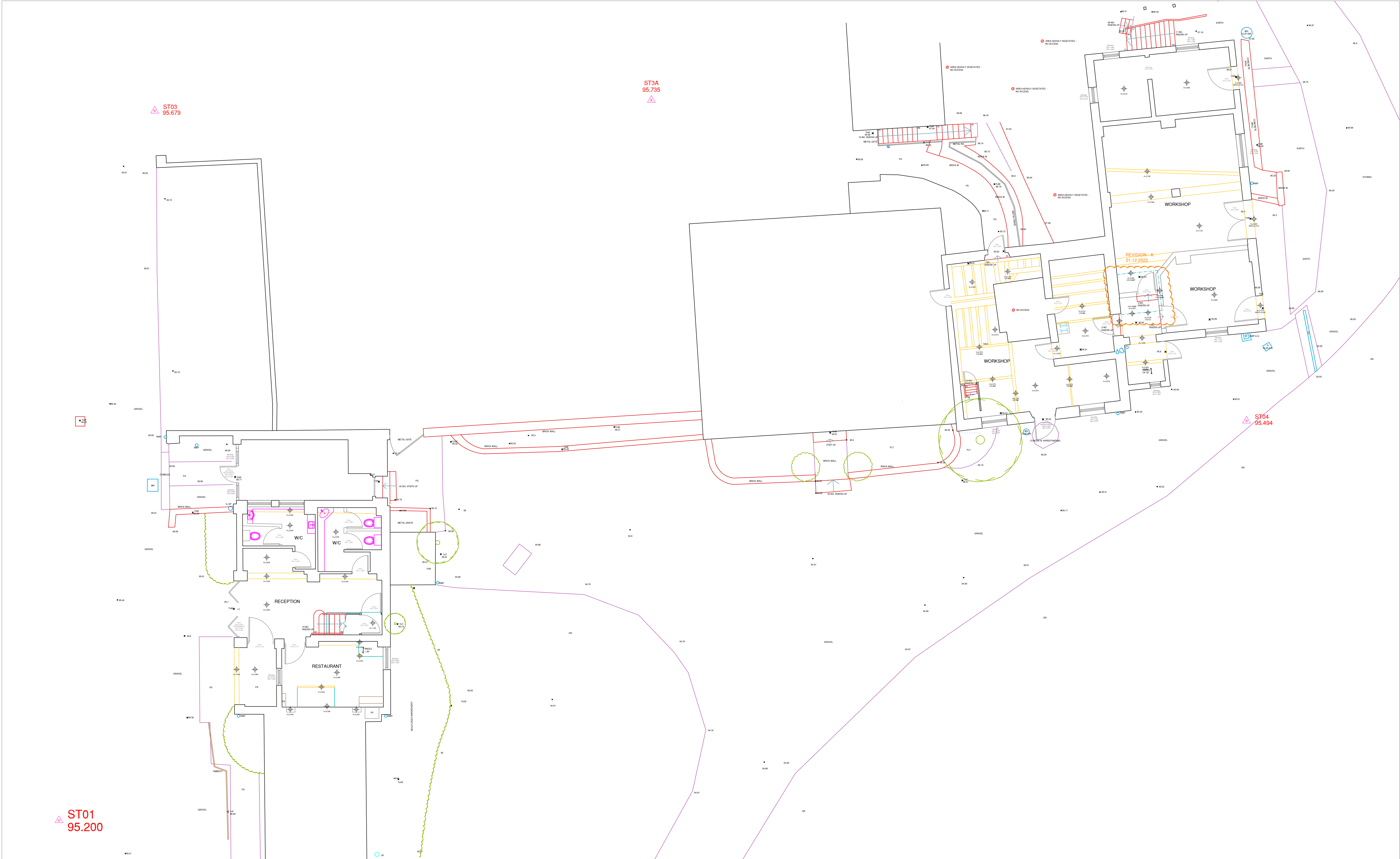
CONTOURS
CONTOURS
SHEET 1 OF 1

SLOPING DIRECTION LINE
SLOPING DIRECTION LINE
SHEET 1 OF 1

A 04.08.2023 LEVELS AMENDED TO GPS DATA
REV DATE AMENDMENTS

PROJECT: MEASURED BUILDING SURVEY
ADDRESS: HELP OUT MILL RESTAURANT, SHACKERSTONE, CV13 0BT
DWG NO.: 3586-01
DWG TITLE: SITE PLAN
DWG DATE: AUGUST 2022
DWG SIZE: SCALE AS SHOWN @ A1
DRAWN: JH CHECKED: AL ISSUE: A

MOBILE CAD Surveying Solutions
www.mobcad.co.uk
Unit 18 & 19, 2 Harropwell Lane, Walsby, West Yorkshire WF3 1DY
01977 525 076
London Office: Kemp House, 152-160 City Road, London, EC2V 2NX
020 3198 1197



SITE PLAN
1:100 Scale

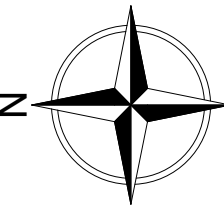
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LEVEL DATUM & ORIENTATION



GEOGRAPHICAL ORIENTATION & NORTH POINT SHOWN ARE INDICATIVE ONLY.

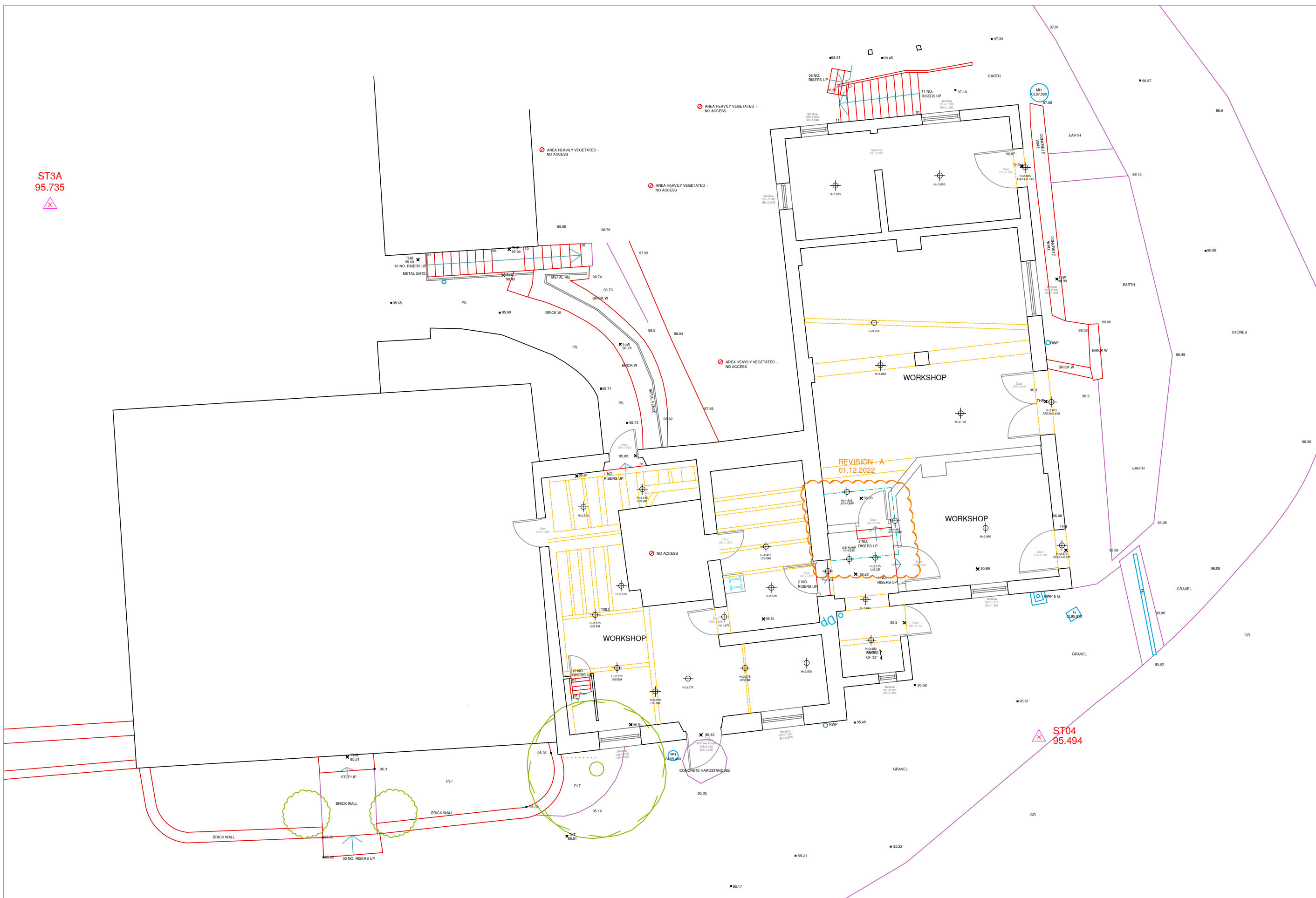
LEVELS CO-ORDINATED TO WORLD COORDINATES USING LEICA ZENO FLX100 & LOCAL STATIONS POSITIONED ON SITE DURING SURVEY IN POSITIONS SHOWN ON PLAN.

ABBREVIATIONS & LEGEND:

LEVELS & HEIGHTS	SERVICES
CL - COVER LEVEL	BT - BRITISH TELECOMS
IL - INVERT LEVEL	CATV - CABLE TELEVISION
LT - LEVEL	ER - EARTHING ROD
HT - HEIGHT	ES - ELECTRICAL SUPPLY
STN - SURVEY STATION	PH - FIRE HYDRANT
DM - DRAIN	GAS - GAS SUPPLY
CE - CEILING	PO - POST OFFICE TELEPHONE
J - JOISTS	SV - STOP VALVE
RA - RAFTERS	TSSU - TRAFFIC LIGHT SIGNALS
E - EAVES	
F - FENCE	
UIS - UNDERSIDE OF	DC - DRAINAGE CHANNEL
RL - RIDGE LINE	G - GULLY
FR - FLAT ROOF	IC - INSPECTION CHAMBER
HL - HIP LINE	MANHOLE
VL - VALLEY LINE	RE - ROODING EYE
PW - PARAPET WALL	RWP - RAIN WATER PIPE
SL - SLAB	UTL - UNABLE TO LIFT
SF - SOFFIT	SVP - SOL & VENT PIPE
T - TREE	ST - STOP TAP
THR - THRESHOLD	WM - WATER METER
To - TOP OF	
W - WALL	
HH - HEAD HEIGHT	
OH - OPENING HEIGHT	
SH - SILL HEIGHT	
GENERAL NOTES	TYPICAL DRAWING SYMBOLS
AB - ADVERTISING BOARD	SPOT LEVEL × 96.256
AC - AIR CONDITIONING UNIT	SPOT HEIGHT △ ToW 99.034
AHD - AIR HANDLING UNIT	
AP - INTRUDER ALARM PANEL	SURVEY STATION STN 01 E 2327483.251 N 517143.064 HT: 95.142
B - BOLLARD	
BA - BARRIER	MANHOLE / INSPECTION CHAMBER IC CL-96.256 IL-94.824
BE - BENCH	
BS - BUS STOP	SURVEY HEIGHT H=92.794
BLR - BOILER	WINDOW TAG WINDOW L15 SH=1.245
BKO - BOXING OUT	DOOR TAG DOOR L15 SH=1.245
CAH - CEILING ACCESS HATCH	RADIATOR TAG RADIATOR 600 H=1.245
CHY - CHIMNEY	TOP & BOTTOM OF KERB × 34.500 34.350
CPD - CUPBOARD	
DB - DOG WASTE BIN	TOPOGRAPHICAL SYMBOLS
DW - DWAP WALL	OVERHEAD ELECTRICAL
DK - DROP KERB	OVERHEAD TELEPHONE
EDB - ELECTRICAL DISTRIBUTION BOARD	FENCE LINE
EG - EXTRACT GRILLE	VEGETATION OUTLINE
EM - ELECTRIC METER	SINGLE GATE
FB - FUSE BOX	DOUBLE GATE
FP - FIRE PLACE	TREE
FU - FLUE	CONTOURS 92.000m
FAP - FIRE ALARM PANEL	SLOPING DIRECTION LINE
GR - GRASS	
GU - GUARDING	
GM - GAS METER	
HWC - HOT WATER CYLINDER	
LB - LITTER BIN	
LP - LAMP POST	
PC - PELICAN CROSSING	
PS - PAVING SLABS	
PL - PAVEMENT LIGHT	
PLT - PLANTING	
PB - POST BOX	
RS - RAILING	
RS - ROAD SIGN	
RFL - ROOF LIGHT	
SB - SPEED BUMP	
SG - SIGNAGE	
SN - STREET NAME SIGN	
SWR - SHOWER	
SHV - SHELVEING	
TB - TELEPHONE BOX	
TL - TRAFFIC LIGHT	
TM - TICKET MACHINE	
TP - TELEGRAPH POLE	
VE - VEGETATION	
WA - WATER	
WD - WARDROBE	
WH - WATER HEATER	
ZC - ZEBRA CROSSING	



MILL FIRST FLOOR PLAN
1:100 Scale



MILL GROUND FLOOR PLAN
1:100 Scale

B	04.08.2023	LEVELS AMENDED TO GPS DATA
A	01.12.2022	HUMP ADDED IN GRANARY
REV	DATE	AMENDMENTS

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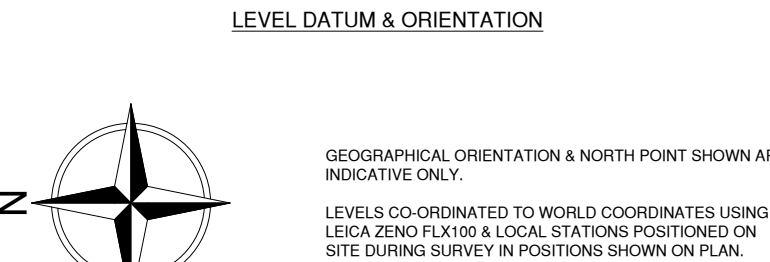
PROJECT: MEASURED BUILDING SURVEY
ADDRESS: HELP OUT MILL RESTAURANT, SHACKERSTONE, CV13 0BT
DWG NO.: 3556 - 02
DWG TITLE: MILL GROUND & FIRST FLOOR PLANS
DWG DATE: AUGUST 2022
DWG SIZE: SCALE AS SHOWN @ A1

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Note:
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ABBREVIATIONS & LEGEND:	
LEVELS & HEIGHTS CL - COVER LEVEL IL - INVERT LEVEL LT - LEVEL HT - HEIGHT STN - SURVEY STATION BM - BEAM CE - CEILING J - JOISTS RA - RAFTERS E - EAVES F - FENCE UIS - UNDERSIDE OF RL - RIDGE LINE FR - FLAT ROOF HL - HIP LINE VL - VALLEY LINE PW - PARAPET WALL SL - SLAB SF - SOFFIT T - TREE THR - THRESHOLD To - TOP OF W - WALL HH - HEAD HEIGHT OH - OPENING HEIGHT SH - SILL HEIGHT	SERVICES BT - BRITISH TELECOMS CATV - CABLE TELEVISION ER - EARTHING ROD ES - ELECTRICAL SUPPLY FH - FIRE HYDRANT GAS - GAS SUPPLY PO - POST OFFICE TELEPHONE SV - STOP VALVE TSSU - TRAFFIC LIGHT SIGNALS DRAINAGE DC - DRAINAGE CHANNEL G - GULLY IC - INSPECTION CHAMBER MH - MANHOLE RE - RIDDING EYE RW - RAIN WATER PIPE UTL - UNABLE TO LIFT SVP - SOL & VENT PIPE ST - STOP TAP WM - WATER METER TYPICAL DRAWING SYMBOLS SPOT LEVEL × 96.256 SPOT HEIGHT 99.034 SURVEY STATION STN 01 E 232.183.251 N 517.143.064 HT 95.142 MANHOLE / INSPECTION CHAMBER IC CL 96.256 IL 94.824 SURVEY HEIGHT H=0.794 WINDOW TAG WINDOW L15 SH=1.275 DOOR TAG DOOR 800 DOOR 800 RADIATOR TAG RADIATOR 800 RADIATOR 800 TOP & BOTTOM OF KERB × 34.500 34.350 TOPOGRAPHICAL SYMBOLS OVERHEAD ELECTRICAL OVERHEAD TELEPHONE FENCE LINE VEGETATION OUTLINE SINGLE GATE DOUBLE GATE TREE CONTOURS 92.000m SLOPING DIRECTION LINE
GENERAL NOTES AB - ADVERTISING BOARD AC - AIR CONDITIONING UNIT AHU - AIR HANDLING UNIT AP - INTRUDER ALARM PANEL B - BOLLARD BA - BARRIER BE - BENCH BS - BUS STOP BLR - BOILER BKO - BOXING OUT CAH - CEILING ACCESS HATCH CHY - CHIMNEY CPD - CUPBOARD DB - DOG WASTE BIN DW - DWAP WALL DK - DROP KERB EDB - ELECTRICAL DISTRIBUTION BOARD EG - EXTRACT GRILLE EM - ELECTRIC METER FB - FUSE BOX FP - FIREPLACE FU - FLUE FAP - FIRE ALARM PANEL GR - GRASS GU - GUARDING GM - GAS METER HWC - HOT WATER CYLINDER LB - LITTER BIN LP - LAMP POST PC - PELICAN CROSSING PS - PAVING SLABS PL - PAVEMENT LIGHT PLT - PLANTING PB - POST BOX RS - RAILING RFL - ROAD LIGHT SB - SPEED BUMP SG - SIGNAGE SN - STREET NAME SIGN SWR - SHOWER SHV - SHELVEING TB - TELEPHONE BOX TL - TRAFFIC LIGHT TM - TICKET MACHINE TP - TELEGRAPH POLE VE - VEGETATION WA - WATER WD - WARDROBE WH - WATER HEATER ZC - ZEBRA CROSSING	



MILL THIRD FLOOR PLAN
1:100 Scale



MILL SECOND FLOOR PLAN
1:100 Scale

B	04.08.2023	LEVELS AMENDED TO GPS DATA
A	01.12.2022	HUMP ADDED IN GRANARY
REV	DATE	AMENDMENTS

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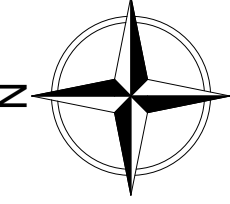
PROJECT: MEASURED BUILDING SURVEY
ADDRESS: HELP OUT MILL RESTAURANT, SHACKERSTONE, CV13 0BT
DWG NO.: 3586 - 03
DWG TITLE: MILL SECOND & THIRD FLOOR PLANS
DWG DATE: AUGUST 2022
DWG SIZE: SCALE AS SHOWN @ A1
DRAWN: JH
CHECKED: AL
ISSUE: B

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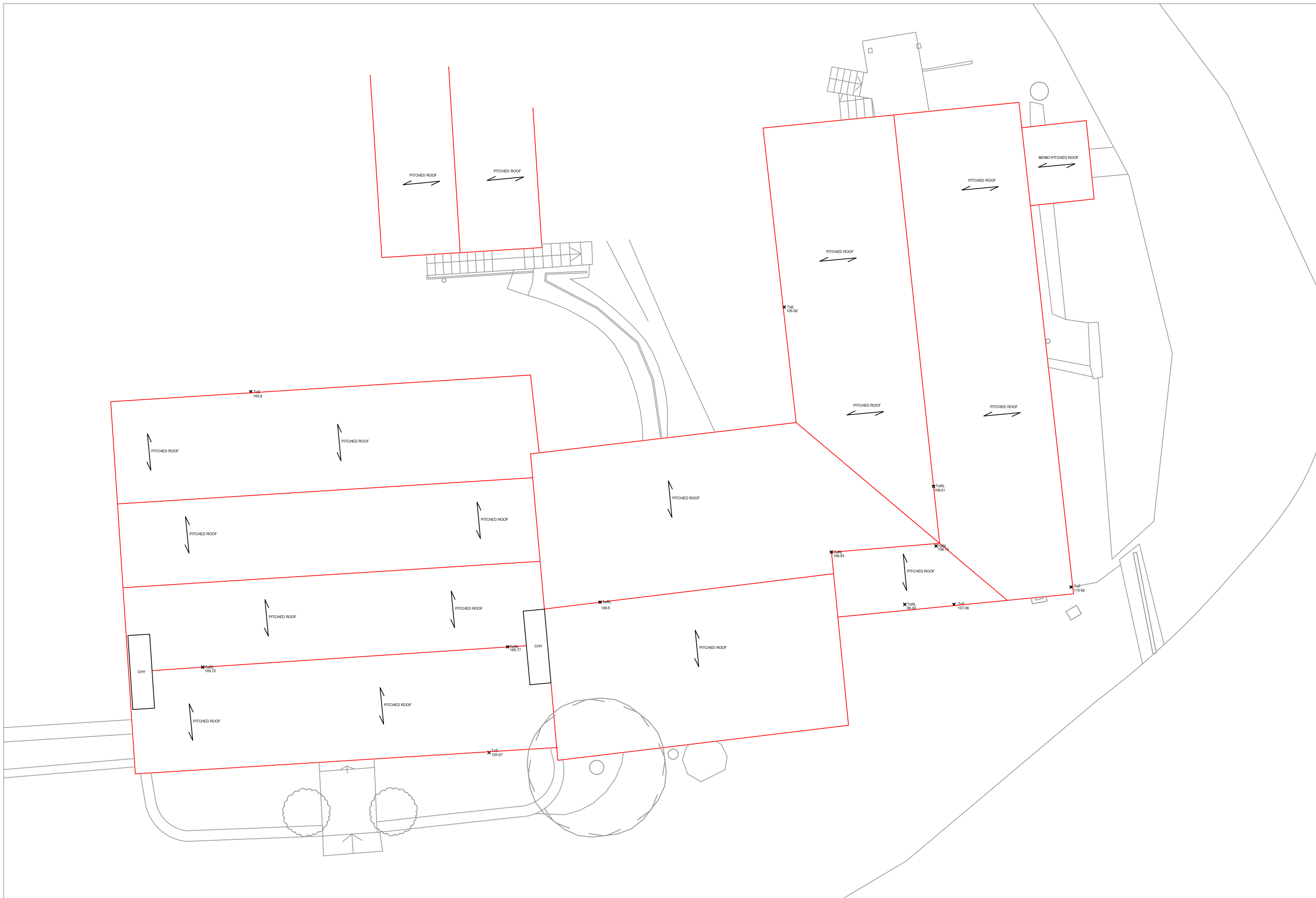
Note:
Areas drawn indicatively noted and indicated by grey dashed line as line below

LEVEL DATUM & ORIENTATION



GEOGRAPHICAL ORIENTATION & NORTH POINT SHOWN ARE INDICATIVE ONLY.

LEVELS CO-ORDINATED TO WORLD COORDINATES USING LEICA ZENO FL1010 & LOCAL STATIONS POSITIONED ON SITE DURING SURVEY IN POSITIONS SHOWN ON PLAN.



MILL ROOF PLAN
1:100 Scale

ABBREVIATIONS & LEGEND:

LEVELS & HEIGHTS	SERVICES
CL - COVER LEVEL	BT - BRITISH TELECOMS
IL - INVERT LEVEL	CATV - CABLE TELEVISION
LT - LEVEL	ER - EARTHING ROD
HT - HEIGHT	ES - ELECTRICAL SUPPLY
STN - SURVEY STATION	PH - FIRE HYDRANT
DM - BEAM	GAS - GAS SUPPLY
CE - CEILING	PO - POST OFFICE TELEPHONE
J - JOISTS	SV - STOP VALVE
RA - RAFTERS	TSSU - TRAFFIC LIGHT SIGNALS
E - EAVES	
F - FENCE	DRAINAGE
US - UNDERSIDE OF	DC - DRAINAGE CHANNEL
RL - RIDGE LINE	G - GULLY
FR - FLAT ROOF	IC - INSPECTION CHAMBER
HL - HIP LINE	MH - MANHOLE
VL - VALLEY LINE	RE - ROOFING EYE
PW - PARAPET WALL	RWP - RAIN WATER PIPE
SL - SLAB	UTL - UNABLE TO LIFT
SF - SOFFIT	SVP - SOL & VENT PIPE
T - TREE	ST - STOP TAP
THR - THRESHOLD	WM - WATER METER
To - TOP OF	
W - WALL	
HH - HEAD HEIGHT	
OH - OPENING HEIGHT	
SH - SILL HEIGHT	

GENERAL NOTES

AB - ADVERTISING BOARD
AC - AIR CONDITIONING UNIT
AHU - AIR HANDLING UNIT
AP - INTRUDER ALARM PANEL
B - BOLLARD
BA - BARRIER
BE - BENCH
BS - BUS STOP
BLR - BOILER
BKO - BOXING OUT
CAH - CEILING ACCESS HATCH
CHY - CHIMNEY
CPD - CUPBOARD
DB - DOG WASTE BIN
DW - DWAP WALL
DK - DROP KERB
EDR - ELECTRICAL DISTRIBUTION BOARD
EG - EXTRACT GRILLE
EM - ELECTRIC METER
FB - FUSE BOX
FP - FIRE PLACE
FU - FLUE
FAP - FIRE ALARM PANEL
GR - GRASS
GU - GUARDING
GM - GAS METER
HWC - HOT WATER CYLINDER
LB - LITTER BIN
LP - LAMP POST
PC - PELICAN CROSSING
PS - PAVING SLABS
PL - PAVEMENT LIGHT
PLT - PLANTING
PB - POST BOX
RS - RAILING
RS - ROAD SIGN
RFL - ROOF LIGHT
SB - SPEED BUMP
SG - SIGNAGE
SN - STREET NAME SIGN
SWR - SHOWER
SHV - SHELVING
TB - TELEPHONE BOX
TL - TRAFFIC LIGHT
TM - TICKET MACHINE
TP - TELEGRAPH POLE
VE - VEGETATION
WA - WATER
WD - WARDROBE
WH - WATER HEATER
ZC - ZEBRA CROSSING

TYPICAL DRAWING SYMBOLS

SPOT LEVEL $\times$ 96.256
SPOT HEIGHT $\triangle$ ToW 99.034
SURVEY STATION $\triangle$ STN 01 E 232.183.251 N 157.143.064 HT: 95.142
MANHOLE / INSPECTION CHAMBER $\square$ IC CL-96.256 IL-94.824
SURVEY HEIGHT $\oplus$ H=3.794
WINDOW TAG $\square$ WINDOW L15 SH=1.215
DOOR TAG $\square$ DOOR 889 SH=2.001
RADIATOR TAG $\square$ RADIATOR 889 SH=2.001
TOP & BOTTOM OF KERB $\times$ 34.500 34.350
TOPOGRAPHICAL SYMBOLS
OVERHEAD ELECTRICAL $\text{---} \text{---} \text{---} \text{---} \text{---}$
OVERHEAD TELEPHONE $\text{---} \text{---} \text{---} \text{---} \text{---}$
FENCE LINE $\text{---} \text{---} \text{---} \text{---} \text{---}$
VEGETATION OUTLINE $\text{---} \text{---} \text{---} \text{---} \text{---}$
SINGLE GATE $\text{---} \text{---} \text{---} \text{---} \text{---}$
DOUBLE GATE $\text{---} \text{---} \text{---} \text{---} \text{---}$
TREE $\text{---} \text{---} \text{---} \text{---} \text{---}$
CONTOURS $\text{---} \text{---} \text{---} \text{---} \text{---}$
SLOPING DIRECTION LINE $\text{---} \text{---} \text{---} \text{---} \text{---}$

A	04.08.2023	LEVELS AMENDED TO GPS DATA
REV	DATE	AMENDMENTS

PROJECT: MEASURED BUILDING SURVEY
ADDRESS: HELP OUT MILL RESTAURANT, SHACKERSTONE, CV13 0BT
DWG NO.: 5566 - 04
DWG TITLE: MILL ROOF PLAN
DWG DATE: AUGUST 2022
DWG SIZE: SCALE AS SHOWN @ A1
DRAWN: JH
CHECKED: AL
ISSUE: A

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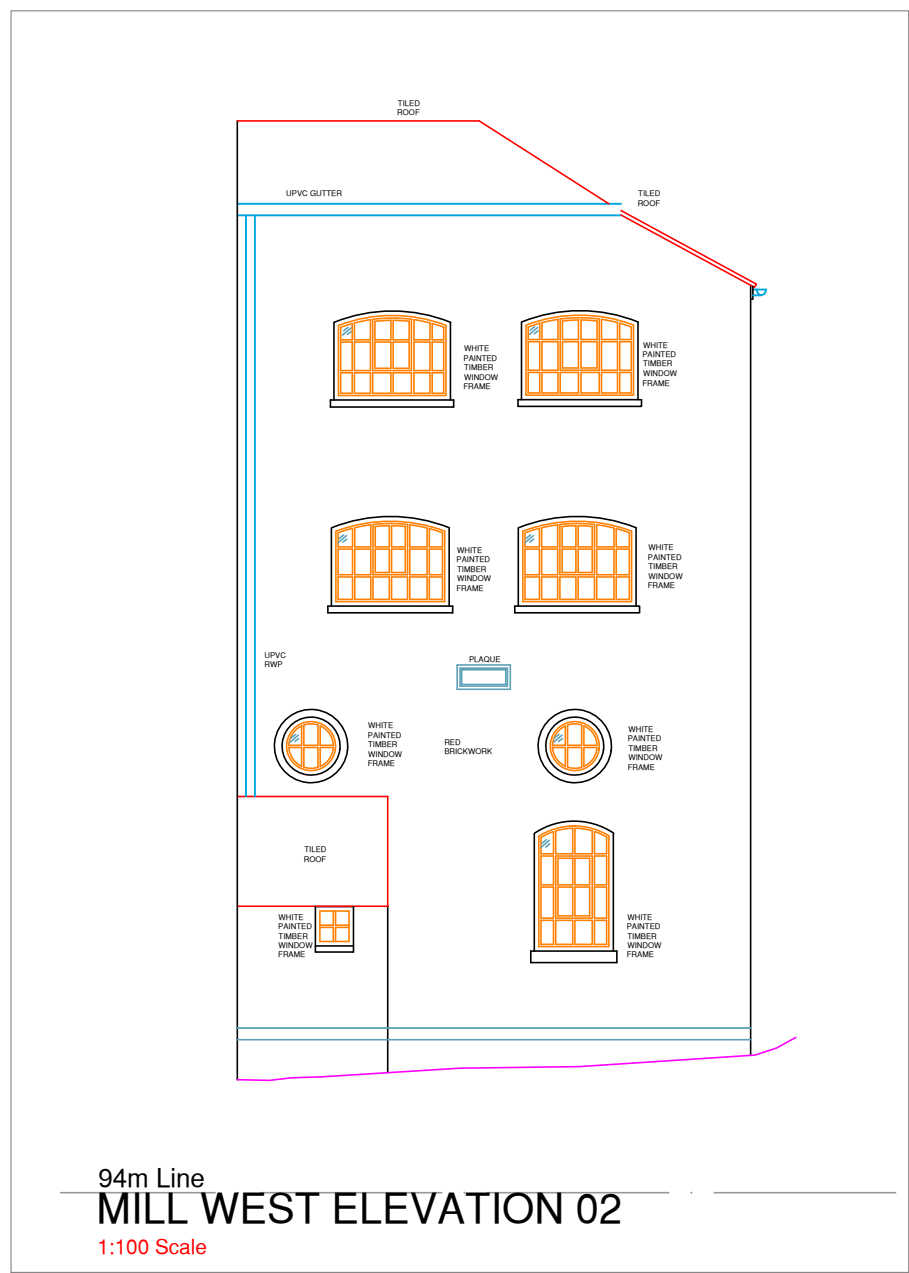
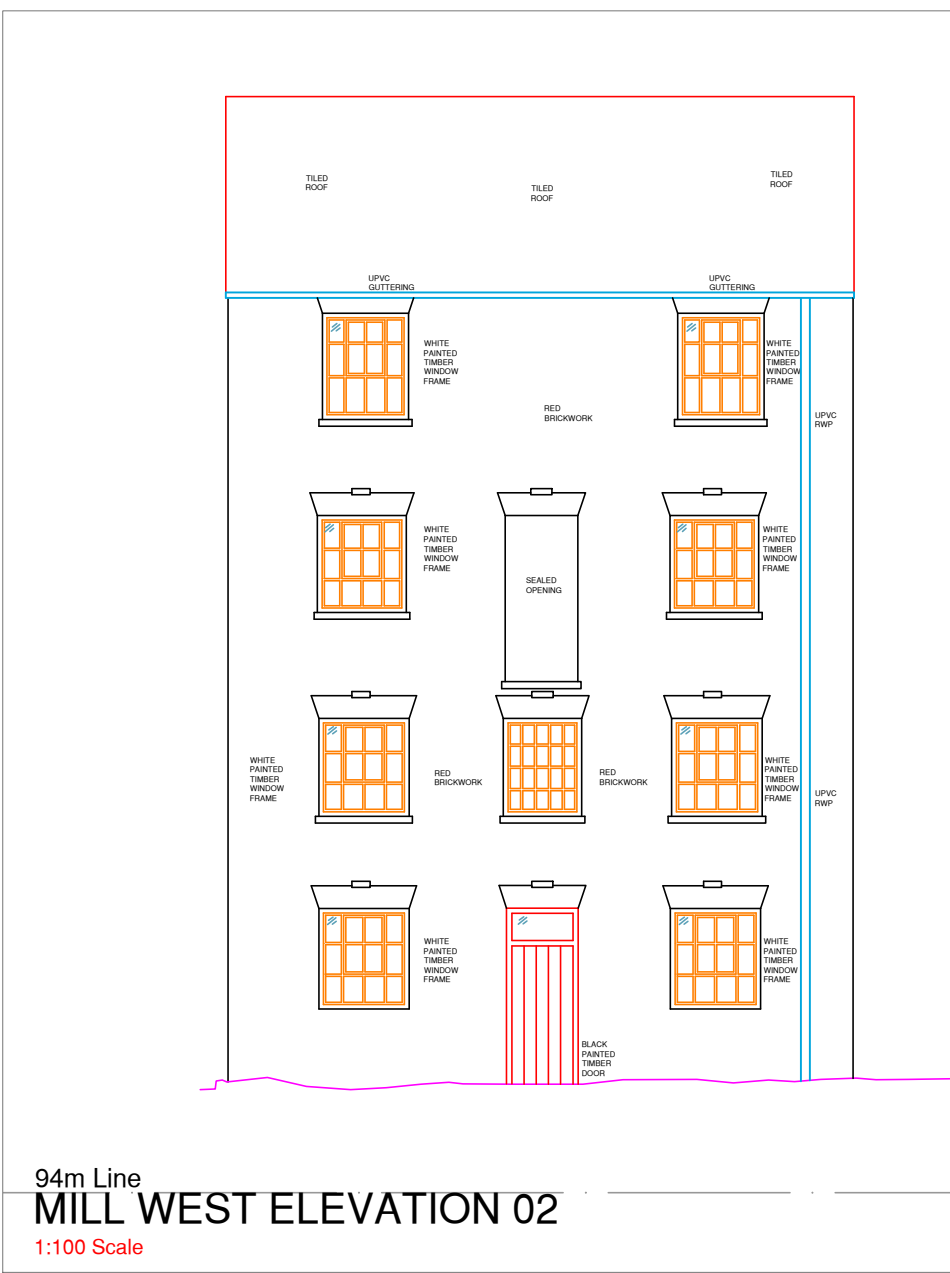
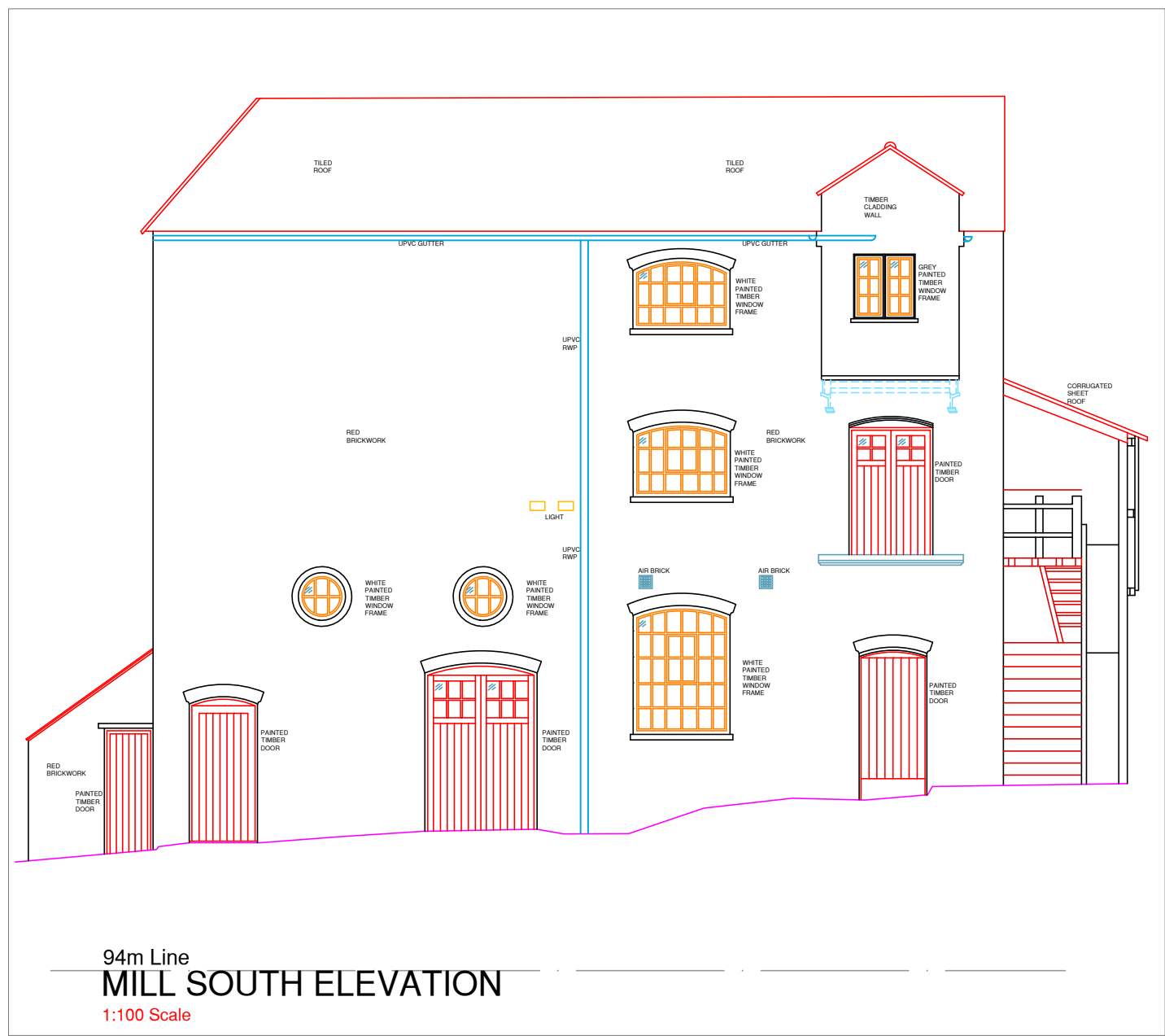
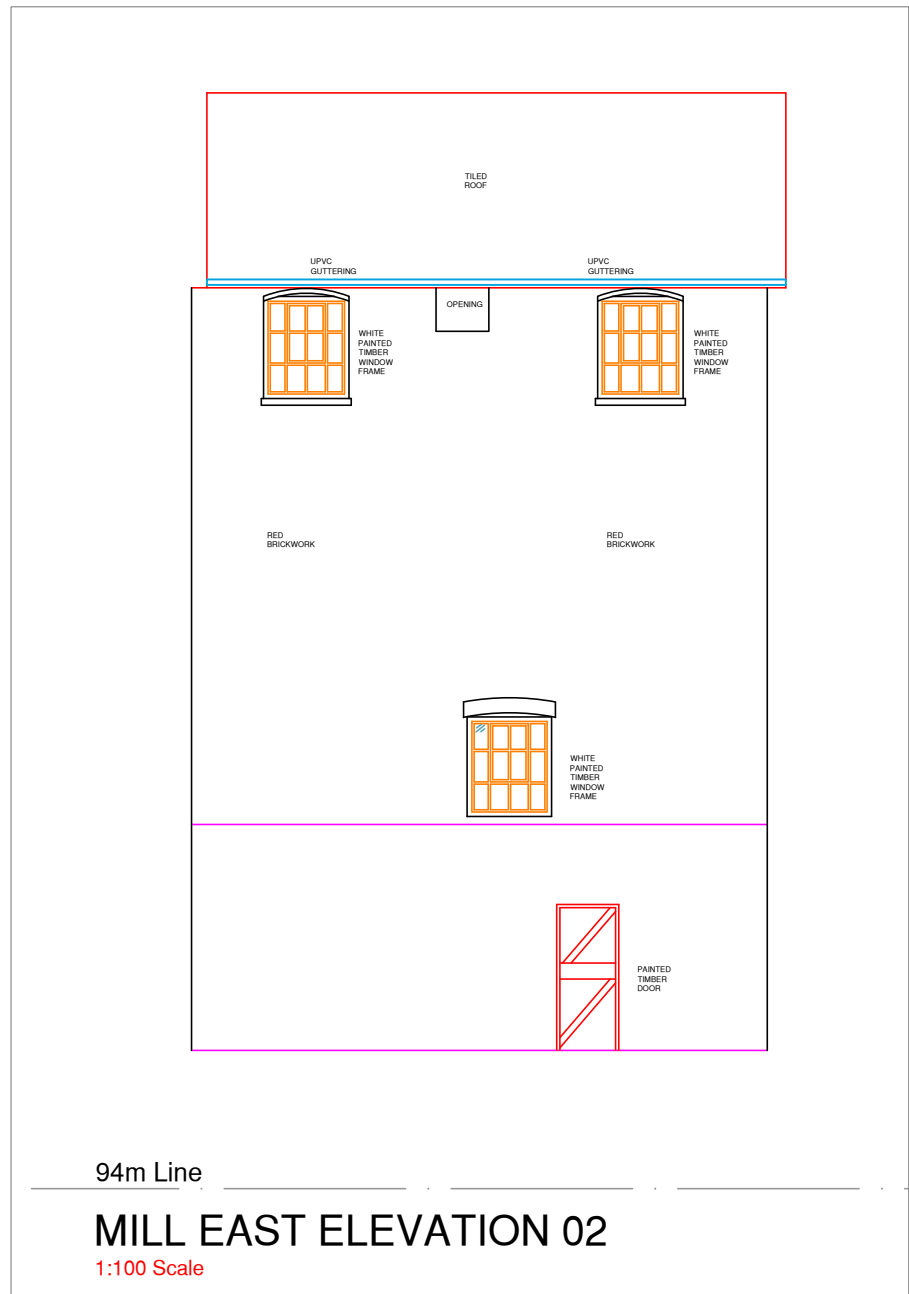
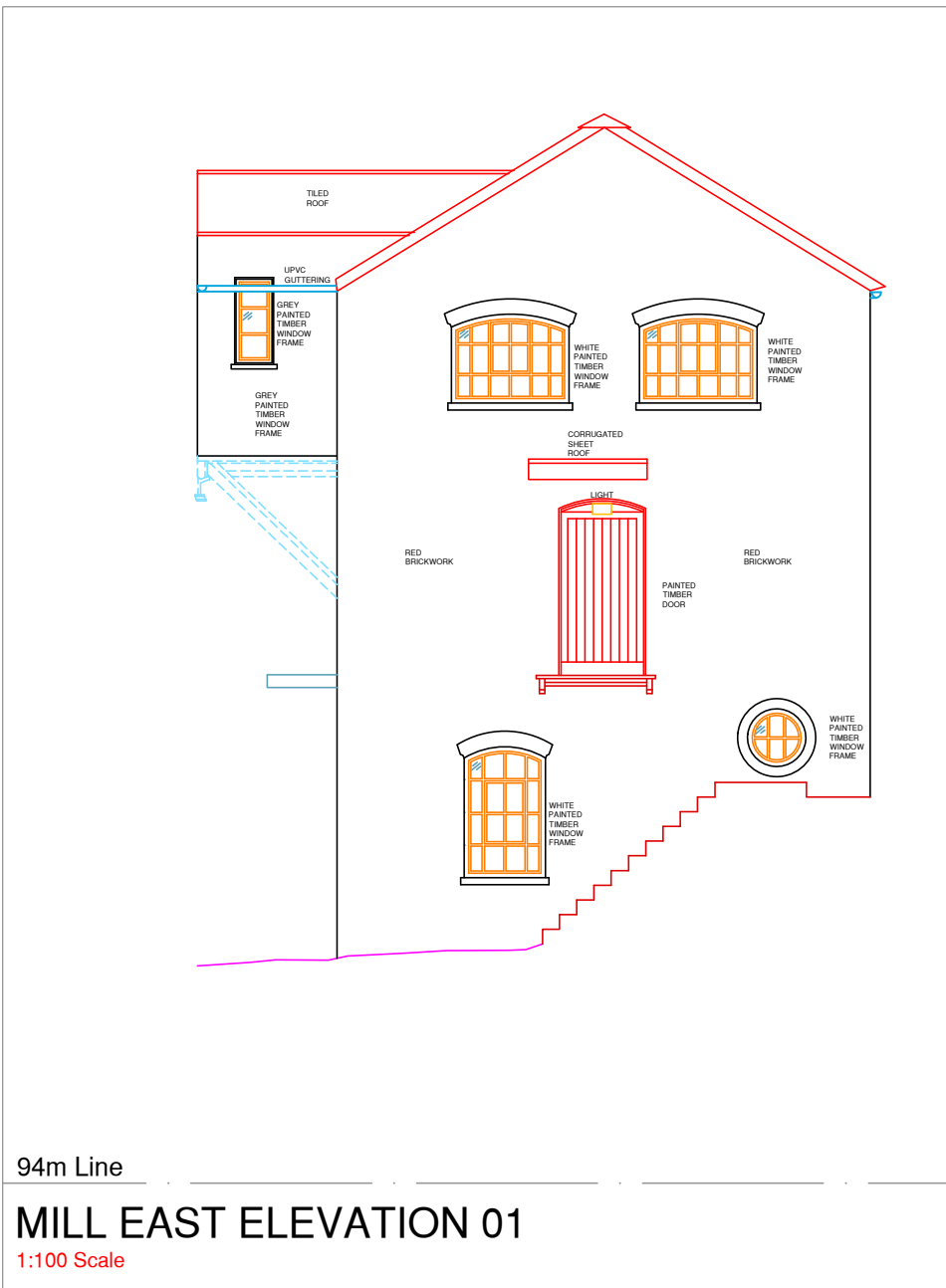
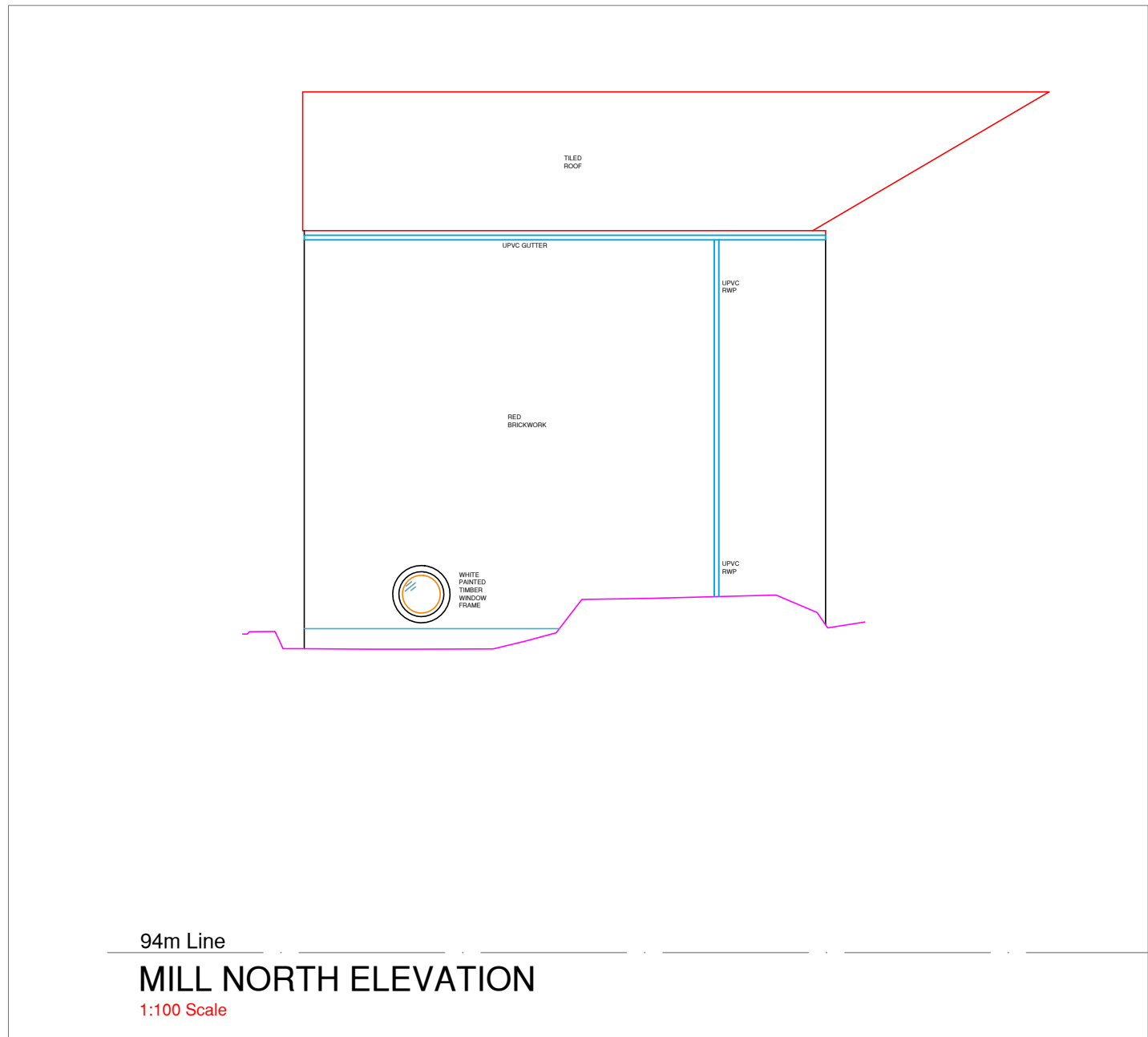
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ABBREVIATIONS & LEGEND:

LEVELS & HEIGHTS	SERVICES	DRAINAGE	TYPICAL DRAWING SYMBOLS
CL - COVER LEVEL IL - INVERT LEVEL L - LEVEL HT - HEIGHT STN - SURVEY STATION BM - BEAM CE - CEILING J - JOISTS RA - RAFTERS E - EAVES F - FENCE UIS - UNDERSIDE OF RL - RIDGE LINE FR - FLAT ROOF HL - HIP LINE PW - VALLEY LINE SL - SLAB SF - SOFFIT T - TREE THR - THRESHOLD To - TOP OF W - WALL HH - HEAD HEIGHT OH - OPENING HEIGHT SH - SILL HEIGHT	BT - BRITISH TELECOMS CATV - CABLE TELEVISION ER - EARTHING ROD ES - ELECTRICAL SUPPLY FH - FIRE HYDRANT GAS - GAS SUPPLY PO - POST OFFICE TELEPHONE EV - STOP VALVE TSSU - TRAFFIC LIGHT SIGNALS	DC - DRAINAGE CHANNEL G - GULLY IC - INSPECTION CHAMBER MH - MANHOLE RE - RIDDING EYE RWP - RAIN WATER PIPE UTL - UNABLE TO LIFT S-V-P - SOIL & VENT PIPE ST - STOP TAP WM - WATER METER	SPOT LEVEL SPOT HEIGHT SURVEY STATION MANHOLE / INSPECTION CHAMBER SURVEY HEIGHT WINDOW TAG DOOR TAG RADIATOR TAG TOP & BOTTOM OF KERB TOPOGRAPHICAL SYMBOLS OVERHEAD ELECTRICAL OVERHEAD TELEPHONE FENCE LINE VEGETATION OUTLINE SINGLE GATE DOUBLE GATE TREE CONTOURS SLOPING DIRECTION LINE



A 04.08.2023 LEVEL LINE AMENDED TO SUITE REVISED LEVELS
REV DATE AMENDMENTS

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EC2V 2NX
020 3198 1197

PROJECT: MEASURED BUILDING SURVEY
ADDRESS: HELP OUT MILL RESTAURANT, SHACKERSTONE, CV13 0BT
DWG NO.: 3586 - 06
DWG TITLE: MILL ELEVATIONS
DWG DATE: AUGUST 2022
DWG SIZE: SCALE AS SHOWN @ A1
DRAWN: BS
CHECKED: AL
ISSUE: A

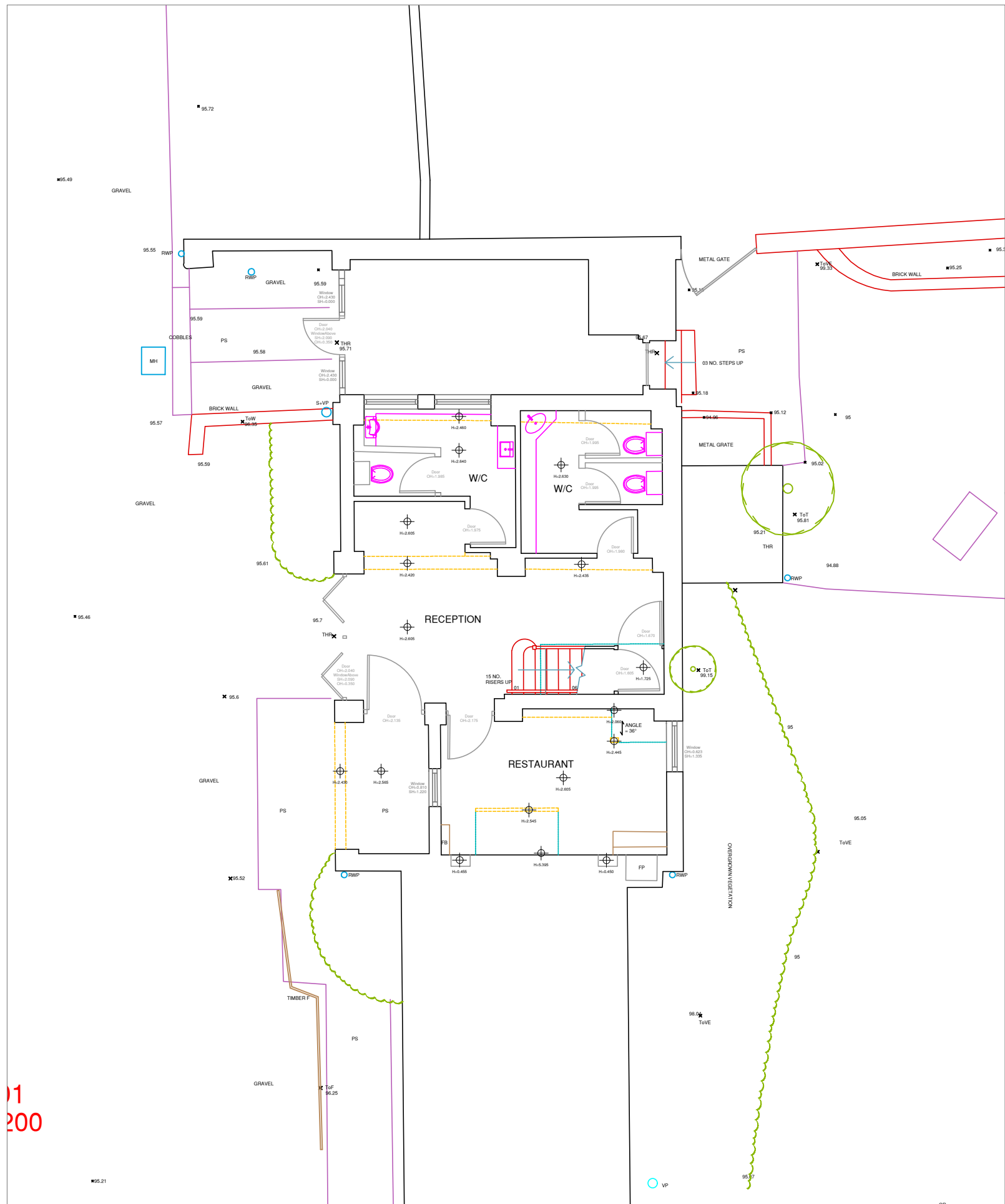
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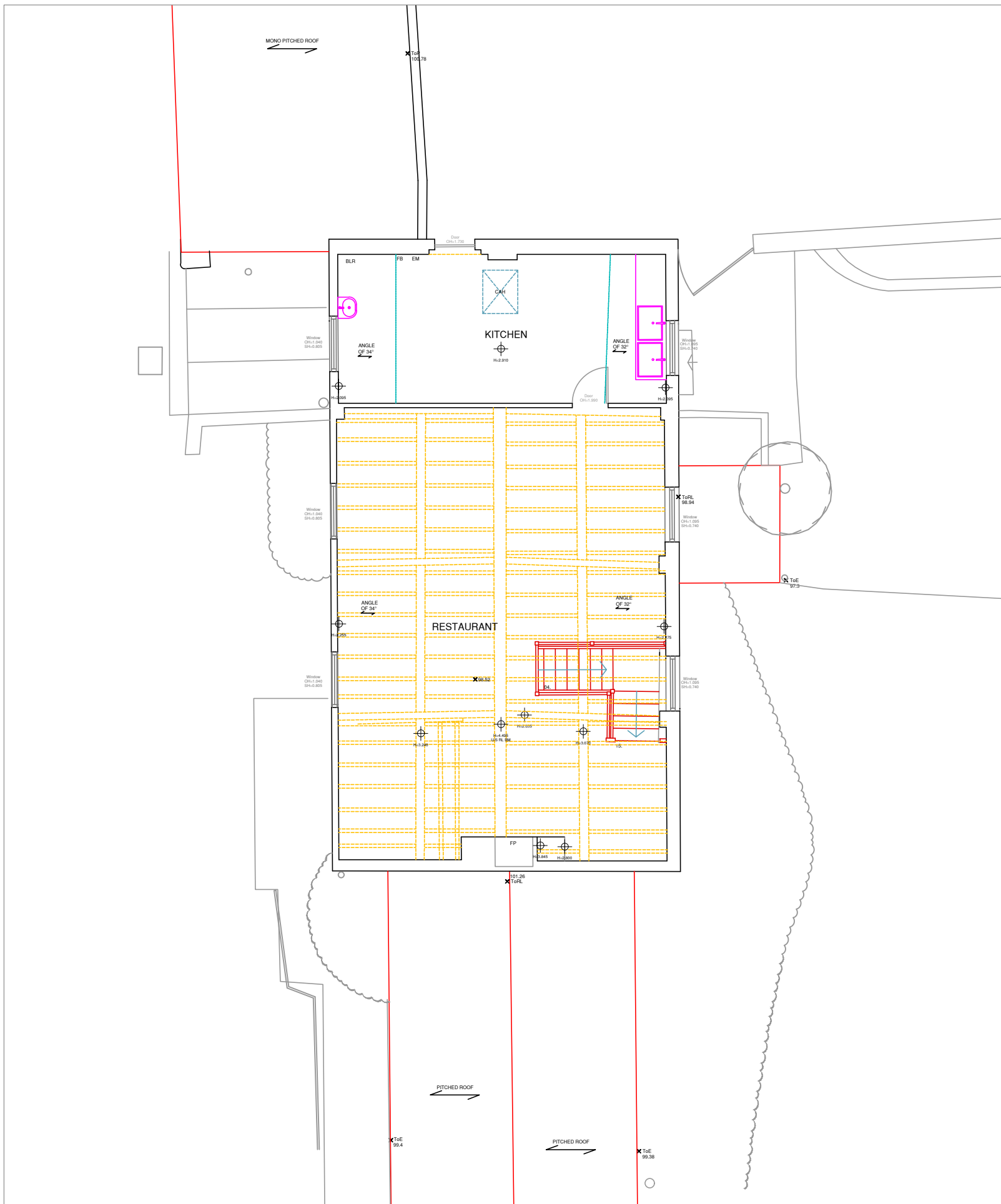
ABBREVIATIONS & LEGEND:

LEVELS & HEIGHTS	SERVICES
CL - COVER LEVEL	BT - BRITISH TELECOMS
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F - FENCE	
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SL - SLAB	UTL - UNABLE TO LIFT
SF - SOFFIT	S-VP - SOIL & VENT PIPE
T - TREE	ST - STOP TAP
THR - THRESHOLD	WM - WATER METER
To - TOP OF	
W - WALL	
HI - HEAD HEIGHT	
OH - OPENING HEIGHT	
SH - SILL HEIGHT	
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AHU - AIR HANDLING UNIT	
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BA - BARRIER	
BE - BENCH	
BS - BUS STOP	
BLP - BOILER	
BXD - BOXING OUT	
CAH - CEILING ACCESS HATCH	
CHV - CHIMNEY	
CPD - CLIPBOARD	
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PS - PAVING SLABS	
PL - PAVEMENT LIGHT	
PLT - PLANTING	
PB - POST BOX	
RG - RAILING	
RS - ROAD SIGN	
RFL - ROOF LIGHT	
SB - SPEED BUMP	
SG - SIGNAGE	
SN - STREET NAME SIGN	
SWR - SHOWER	
SHV - SHELVING	
TB - TELEPHONE BOX	
TL - TRAFFIC LIGHT	
TM - TICKET MACHINE	
TP - TELEGRAPH POLE	
VE - VEGETATION	
WA - WATER	
WD - WARDROBE	
WH - WATER HEATER	
ZC - ZEBRA CROSSING	
TYPICAL DRAWING SYMBOLS	
SPOT LEVEL	× 96.256
SPOT HEIGHT	× 99.034
SURVEY STATION	△ STN.01 E: 232103.251 N: 519743.664 HT: 95.142
MANHOLE / INSPECTION CHAMBER	× IC CL: 96.256 L: 95.024
SURVEY HEIGHT	⊕ 96.256
WINDOW TAG	WINDOW DIS SH: 1.215
DOOR TAG	DOOR DIS SH: 1.800
RADIATOR TAG	RADIATOR DIS SH: 1.800
TOP & BOTTOM OF KERB	× 34.500 34.500
TOPOGRAPHICAL SYMBOLS	
OVERHEAD ELECTRICAL	— — — — —
OVERHEAD TELEPHONE	— — — — —
FENCE LINE	— — — — —
VEGETATION OUTLINE	— — — — —
SINGLE GATE	— — — — —
DOUBLE GATE	— — — — —
TREE	— — — — —
CONTOURS	— — — — —
SLOPING DIRECTION LINE	— — — — —



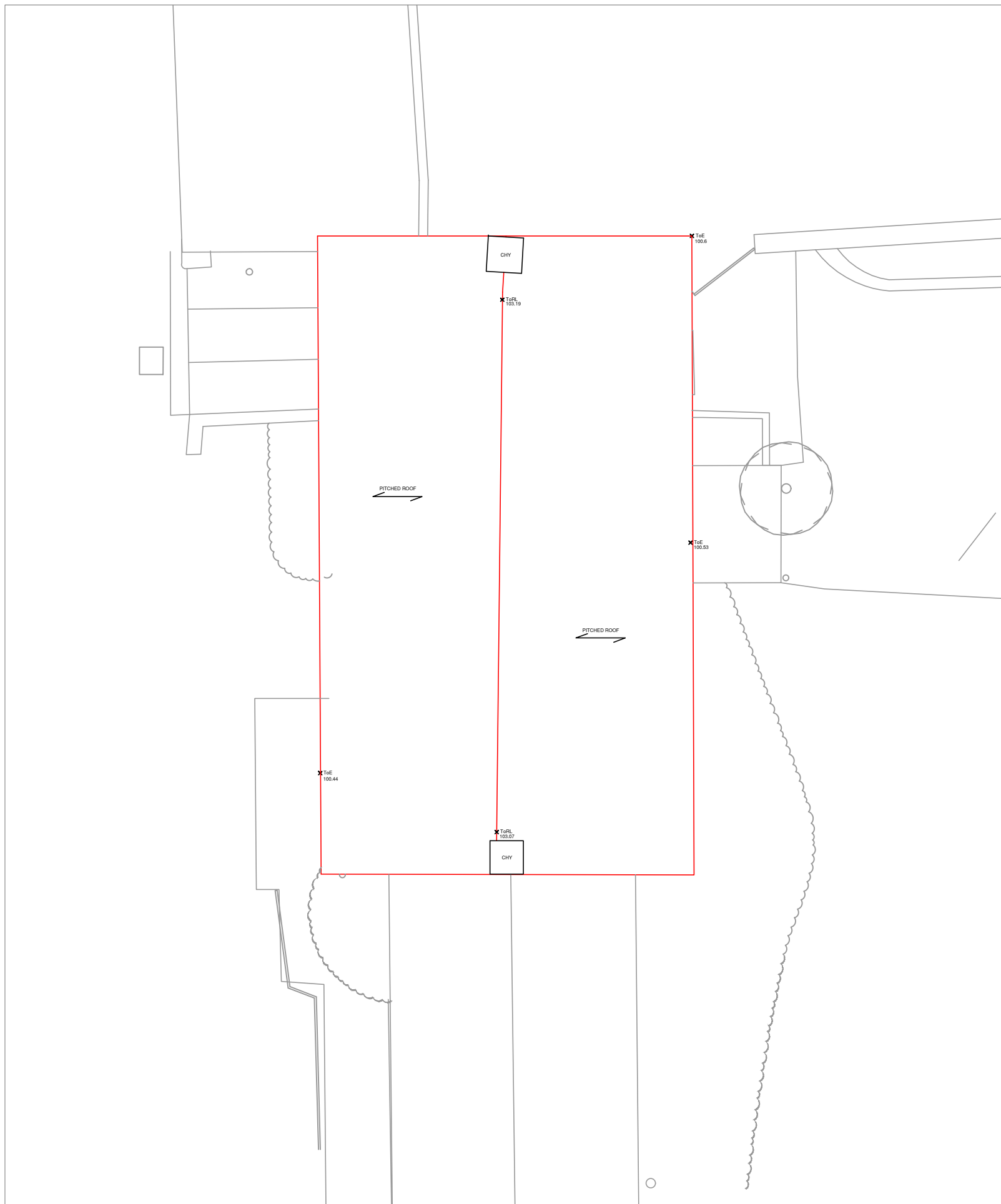
RESTAURANT GROUND FLOOR PLAN

1:100 Scale



RESTAURANT FIRST FLOOR PLAN

1:100 Scale



RESTAURANT ROOF PLAN

1:100 Scale

REV	A	04.08.2023	LEVEL LINE AMENDED TO SUITE REVISED LEVELS
DATE			AMENDMENTS

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020 3198 1197

PROJECT: MEASURED BUILDING SURVEY

ADDRESS: HELP OUT MILL, RESTAURANT, SHACKERSTONE, CV13 0BT

DWG NO.: 3556 - 03

DWG TITLE: RESTAURANT FLOOR & ROOF PLANS

DWG DATE: AUGUST 2022

DWG SIZE: SCALE AS SHOWN @ A1

DRAWN: JH
CHECKED: AL
ISSUE: A

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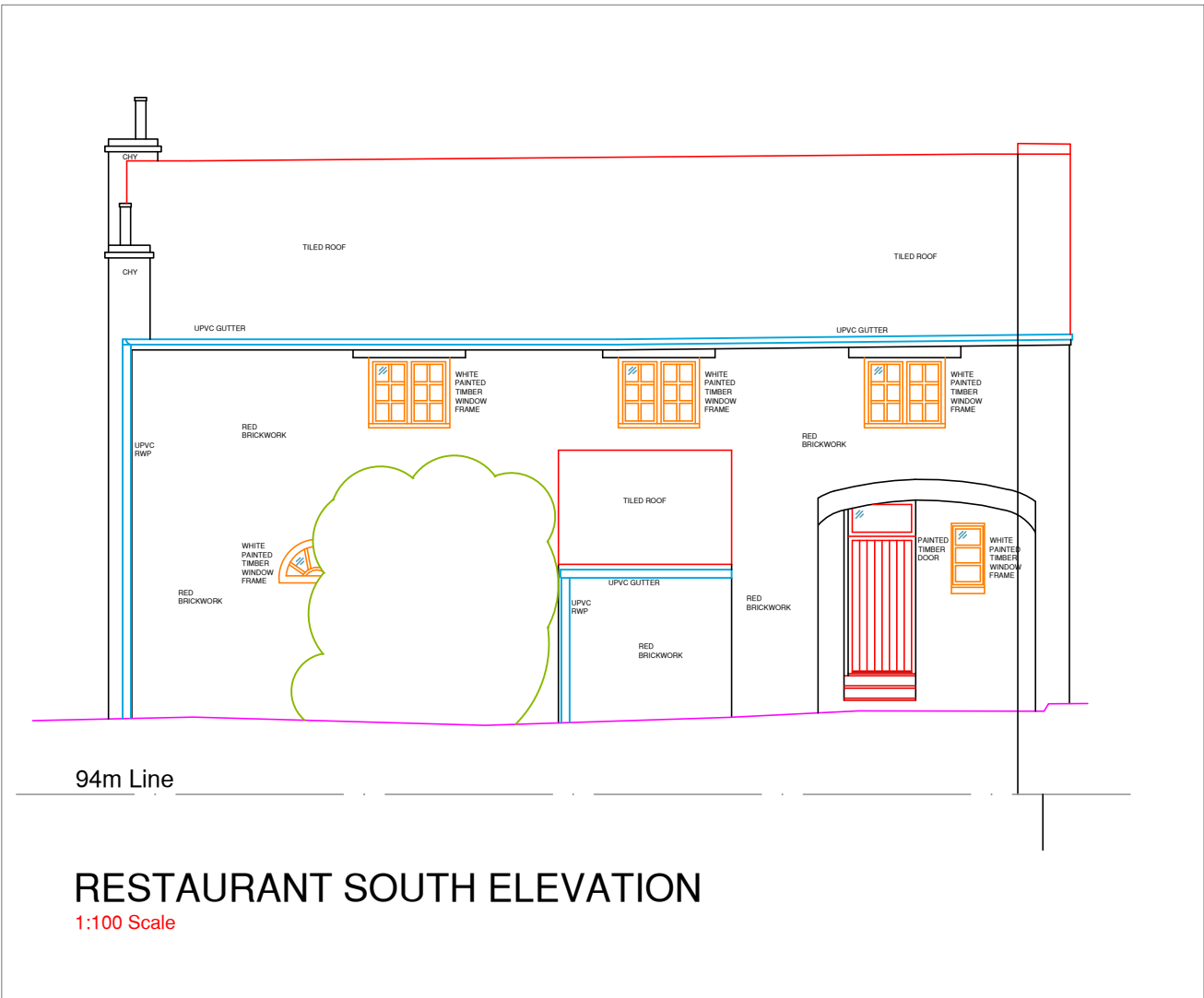
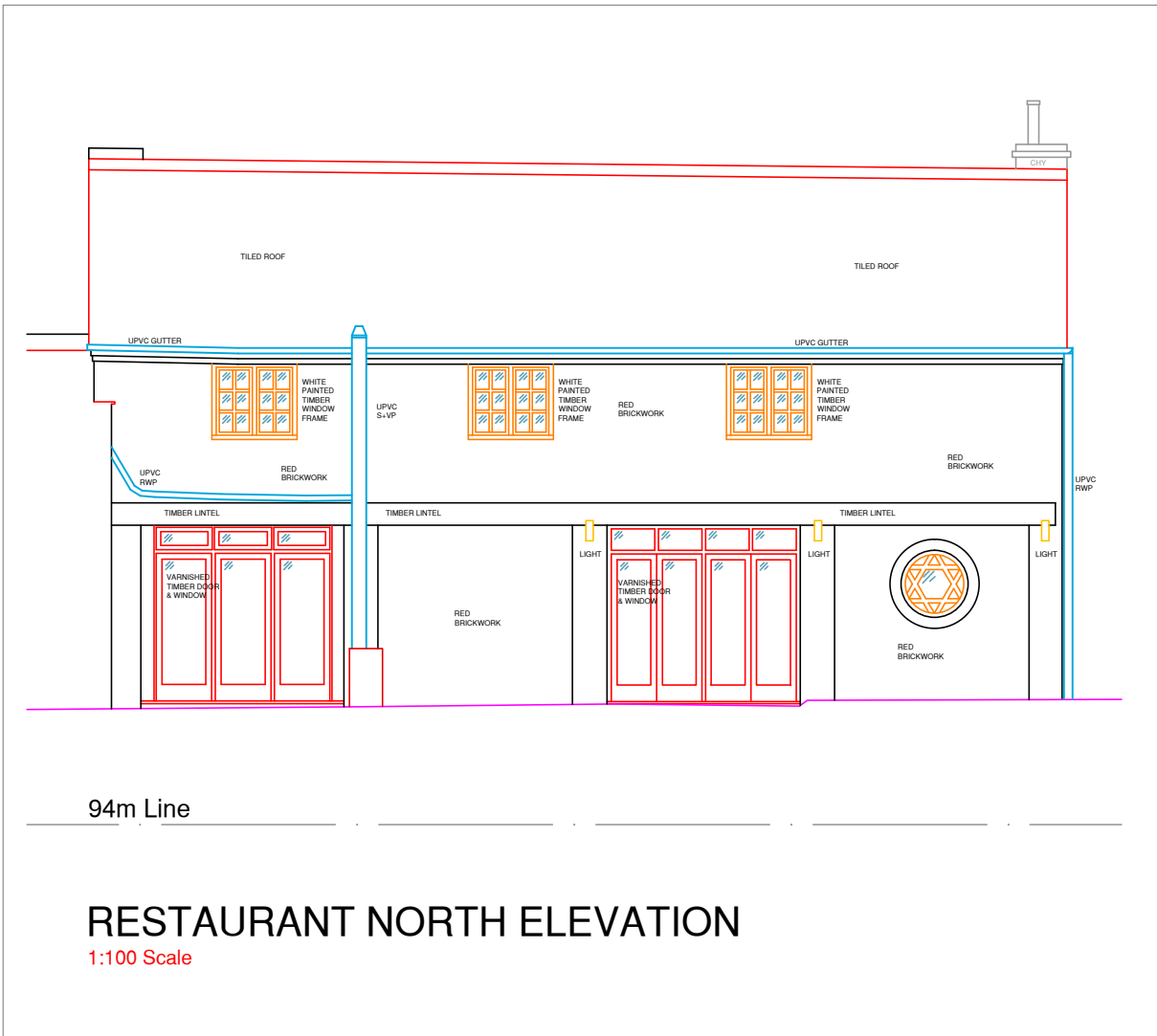
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ABBREVIATIONS & LEGEND:

LEVELS & HEIGHTS	SERVICES	DRAINAGE	TYPICAL DRAWING SYMBOLS
CL - COVER LEVEL	BT - BRITISH TELECOMS	DC - DRAINAGE CHANNEL	SPOT LEVEL × 96.256
L - LEVEL	CATV - CABLE TELEVISION	G - GULLY	SPOT HEIGHT × 99.034
HT - HEIGHT	ER - EARTHING ROD	IC - INSPECTION CHAMBER	SURVEY STATION $\triangle$ STN 01 E 532193.251 N 515743.694 HT 56.142
STN - SURVEY STATION	ES - ELECTRICAL SUPPLY	MH - MANHOLE	MANHOLE / INSPECTION CHAMBER $\times$ CL-96.256 CL=94.524
BM - BEAM	FI - FIRE HYDRANT	RE - RIDDING EYE	SURVEY HEIGHT $\triangle$ 94.254
CE - CEILING	GS - GAS SUPPLY	RWP - RAIN WATER PIPE	WINDOW TAG WINDOW 015 SH=1.215
J - JOISTS	PO - POST OFFICE TELEPHONE	SL - UNABLE TO LIFT	DOOR TAG DOOR 009 SH=2.000
RA - RAFTERS	SV - STOP VALVE	S-V - SOIL & VENT PIPE	RADIATOR TAG RADIATOR 009 SH=0.208 SH=0.208
E - EAVES	TSSU - TRAFFIC LIGHT SIGNALS	ST - STOP TAP	TOP & BOTTOM OF KERB × 94.500 94.550
F - FENCE		WM - WATER METER	TOPOGRAPHICAL SYMBOLS
LUS - UNDERSIDE OF			OVERHEAD ELECTRICAL
RL - RIDGE LINE			OVERHEAD TELEPHONE
FR - FLAT ROOF			FENCE LINE
HL - HIP LINE			VEGETATION OUTLINE
VL - VALLEY LINE			SINGLE GATE
PW - PARAPET WALL			DOUBLE GATE
SL - SLAB			TREE
SF - SOFFIT			CONTOURS 92.000m
T - TREE			SLOPING DIRECTION LINE
THR - THRESHOLD			
To - TOP OF			
W - WALL			
HH - HEAD HEIGHT			
OH - OPENING HEIGHT			
SH - SILL HEIGHT			
GENERAL NOTES			
AB - ADVERTISING BOARD			
AC - AIR CONDITIONING UNIT			
AHU - AIR HANDLING UNIT			
AP - INTRUDER ALARM PANEL			
B - BOLLARD			
BA - BARRIER			
BE - BENCH			
BS - BUS STOP			
BUL - BOILER			
BXO - BOXING OUT			
CAH - CEILING ACCESS HATCH			
CHV - CHIMNEY			
CPD - CUPBOARD			
DB - DOD WASTE BIN			
DW - DWARF WALL			
DK - DROP KERB			
EDB - ELECTRICAL DISTRIBUTION BOARD			
EG - EXTRACT GRILLE			
EM - ELECTRIC METER			
FB - FUSE BOX			
FP - FIREPLACE			
FU - FLUE			
FAP - FIRE ALARM PANEL			
GR - GRASS			
GU - GUARDING			
GM - GAS METER			
HWC - HOT WATER CYLINDER			
LB - LITTER BIN			
LP - LAMP POST			
PC - PELICAN CROSSING			
PS - PAVING SLABS			
PL - PAVEMENT LIGHT			
PLT - PLANTING			
RB - RAILING			
RS - ROAD SIGN			
RFL - ROOF LIGHT			
SB - SPEED BUMP			
SG - SIGNAGE			
SN - STREET NAME SIGN			
SW - SHOWER			
SHV - SHELVING			
TD - TELEPHONE BOX			
TL - TRAFFIC LIGHT			
TM - TICKET MACHINE			
TP - TELEGRAPH POLE			
VE - VEGETATION			
WA - WATER			
WD - WARDROBE			
WH - WATER HEATER			
ZC - ZEBRA CROSSING			

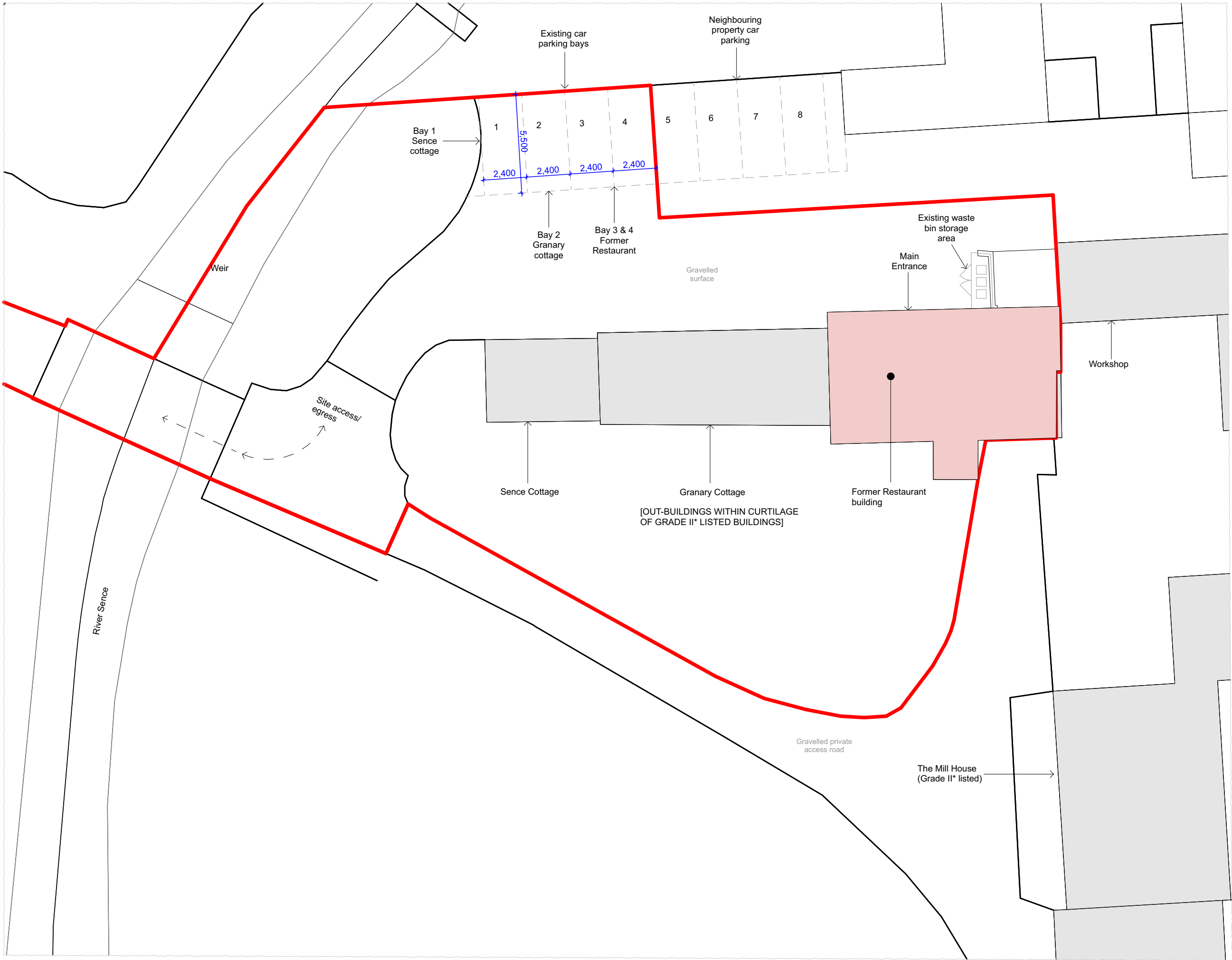


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PROJECT: MEASURED BUILDING SURVEY
ADDRESS: HELP OUT MILL
RESTAURANT,
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CV13 0BT
DWG NO.: 3556 - 08
DWG TITLE: RESTAURANT ELEVATIONS
DWG DATE: AUGUST 2022
DWG SIZE: SCALE AS SHOWN @ A1
DRAWN: BS
CHECKED: AL
ISSUE: A



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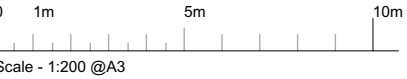
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- Key
- Existing buildings within site boundary
 - Proposed area of development
 - Proposed site development boundary

03	25.11.22	Car park boundary and notes added	JC	RT
02	24.11.22	Site boundary updated	JC	RT
01	06.10.22	First Issue	JC	RT
Rev	Date	Comment	Dr	Ch



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GWPA Ref (504)-2219

Job Title
Help Out Mill, Shackerstone Nuneaton

Client
Mr and Mrs Garnett

Former Restaurant - Proposed Site Plan

Name (504)-2219-GWP-01-00-DR-A-(PA)-0002

Scale	1:200@A3	Revision	P03
Drawn/Checked	JC/RT	First Issue	06.10.22
Drawing Status	S - WIP		

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Proposed Site Plan
Scale - 1:200@A3

Existing wall elements

New proposed wall elements



ALT - E



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Job Title Help Out Mill, Shackerstone
Nuneaton

Mr and Mrs Garnett

SK071123 Rev P01

Appendix B

- Existing Services Information
- JBA report
- Site User Correspondance
- Survey datum clarification

Hydraulic Modelling Study at Help Out Mill Restaurant and Granary, Shackerstone

Final Report

August 2023

Prepared for:
Mr & Mrs Garnett

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Document Status

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JBA Project Code	2023s0632

This report describes work commissioned by Mr & Mrs Garnett by an instruction dated 28th March 2023. The Client's representative for the contract was James Stockdale of Adept Consulting Engineers. Arran Bright and Emelie Persson of JBA Consulting carried out this work.

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The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between Monday 5th June and 25th August 2023 and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

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Where field investigations are carried out, these have been restricted to a level of detail required to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this Report.

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Abbreviations

1D	One Dimensional
2D	Two Dimensional
CC	Climate Change
DTM	Digital Terrain Model
EA	Environment Agency
ESTRY	1D Hydraulic Modelling Software
FEH	Flood Estimation Handbook
HQ	Head-Flow
JBA	Jeremy Benn Associates
LIDAR	Light Detection and Ranging
m AOD	Metres Above Ordnance Datum
TUFLOW	2D Hydraulic Modelling Software

Executive Summary

JBA Consulting (JBA) were commissioned by Mr & Mrs Garnett to undertake a fluvial hydraulic modelling study in relation to the Help Out Mill Restaurant and Granary located off Shackerstone Lane, Leicestershire.

The aim of this study is to support a planning application for the conversion of the existing two storey Former Restaurant to form a new dwelling, and the conversion of the existing three storey Granary building to form a new three storey dwelling.

The site of interest covers the buildings in question, as well as the access road which joins the site to Shackerstone Lane to the west of the property, the River Sence (a main river) flows approximately 28m to the west of the Former Restaurant and 68m to the west of the Granary. The dry bed of The Old Mill Leet runs in a south-westerly direction towards the Mill, which adjoins the Granary on the Granary's north side. A former overflow channel linking the River Sence and the head of the Mill Leet is located approximately 38m to the north of the Former Restaurant and 80m to the north-east of the Mill.

The Environment Agency's Flood Maps for Planning indicate that the site is fully located within Flood Zone 3. A review of the flood maps suggests these originate from broadscale modelling techniques and/or out-of-date hydraulic modelling results and thus should not be used to support a site-specific Flood Risk Assessment.

To assess the risk of fluvial flooding to the site, a detailed 1D-2D ESTRY – TUFLOW hydraulic model was produced to accurately represent flood levels, extents, and hazards within the site boundary. The fluvial model was run for the baseline scenario for the 30-year, 100-year, 100-year with 22% climate change and 1,000-year events in order to determine the existing fluvial flood risk to the site and support the Flood Risk Assessment accompanying the planning application.

The hydraulic model was also tested for its sensitivity to changes in key modelling parameters, including roughness values, downstream boundary conditions and flows. Results from the sensitivity analysis indicate that the model results are moderately insensitive to changes in flow and downstream boundary conditions and relatively insensitive to changes in roughness conditions.

Results from the model runs show that:

- The capacity of the River Sence is exceeded during all modelled scenarios whilst the Old Mill Leet is containing the flooding within its banks.
- Peak water levels of 95.31mAOD are predicted in the vicinity of the Former Restaurant during the 100-year plus 22% climate change 'design' event.
- Peak water levels of 98.15mAOD are predicted and contained within the banks of the Old Mill Leet channel adjacent to the Granary during the 100-year plus 22% climate change 'design' event.
- The majority of hazard-to-people rating in relation to the Former Restaurant and the Granary buildings falls under the 'low' hazard category.

- The hazard-to-people rating along the access road ranges between 'low' and 'high'.
- Two blockage scenarios were undertaken on two culverts closest to the site. A blockage of 75% was applied to SENCE_1_15380, which is a rectangular culvert that directs the River Sence beneath the access road. A blockage of 90% was applied to SENCE_2_69, a circular culvert that directs the Old Mill Leet beneath The Mill. The analysis showed that the 100-year with climate change peak flood levels near the Former Restaurant building may increase by 0.18m in the event of a 75% blockage at the River Sence culvert. Peak flood levels may increase 0.78m in the Old Mill Leet adjacent to the Granary, however due to high banks on the eastern side of the Old Mill Leet channel, the Granary is not expected to be affected by these flood levels overtopping the banks.

As a way forward, it is recommended that results from this hydraulic modelling report are used as part of the Flood Risk Assessment for the site and that the results from this hydraulic modelling study are validated with the Environment Agency.

1 Introduction

1.1 Terms of reference

JBA Consulting (JBA) were commissioned by Mr & Mrs Garnett to undertake a fluvial hydraulic modelling study in relation to the Help Out Mill Former Restaurant and the Granary, both located off Shackerstone Lane, Leicestershire.

To support this assessment, a 1D-2D ESTRY-TUFLOW hydraulic model was built to model part of the River Sence and its tributaries (see Table 1-1 for location).

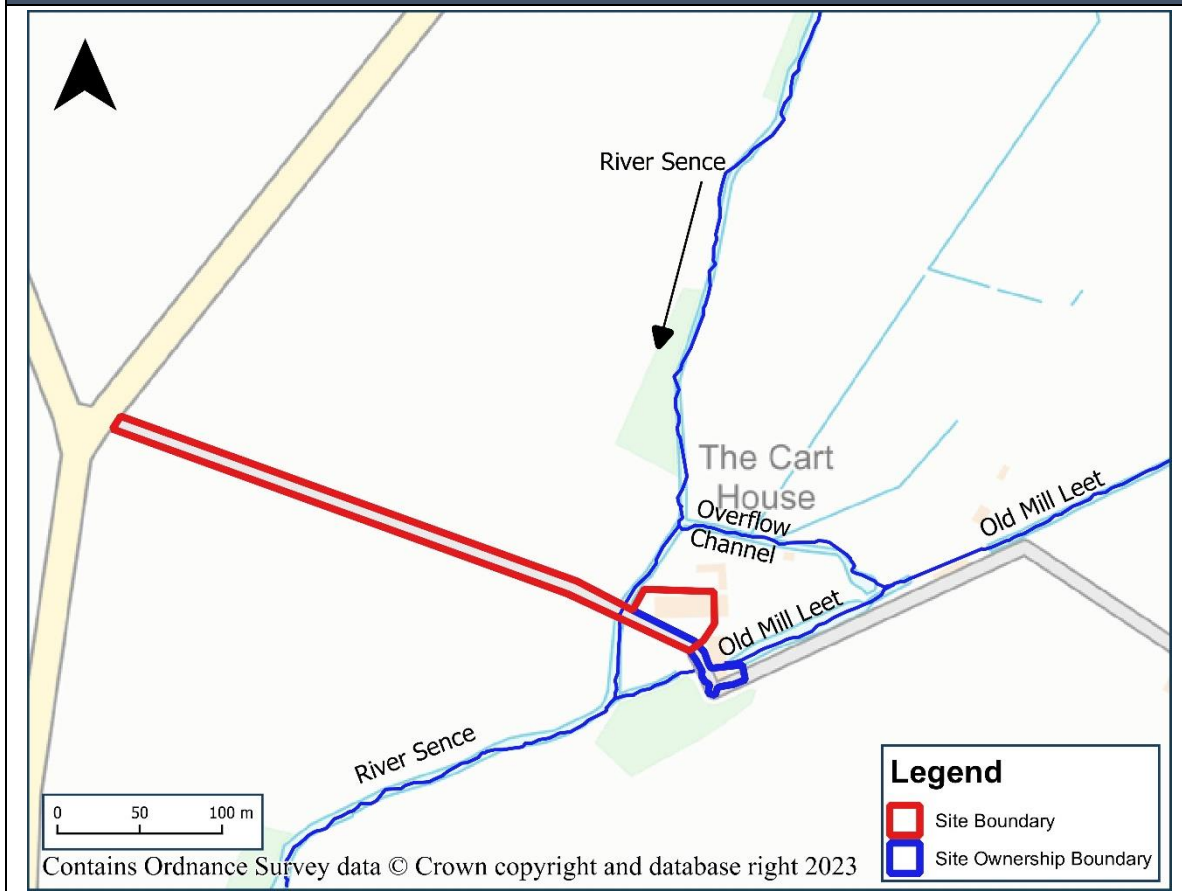
1.2 General approach

A new hydrological assessment was carried out to estimate the flows in the model. Channel cross section and LiDAR data were collected to build the model geometry. Finally, the model was run using the latest version of TUFLOW (2023-03-AA-iSP-w64) in order to simulate the 30-year, 100-year, 100-year with 22% climate change and 1,000-year fluvial flood events.

Table 1-1: Site details

Site details	
Site name	Help Out Mill (Former Restaurant and Granary)
Site area	0.18 ha
Existing land-use	Disused restaurant and disused Granary
OS NGR	SK 37914 07856
County	Leicestershire

Site details



1.3 Site description

The aim of this study is to support a planning application for the conversion of the Former Restaurant into a 2-bedroom dwelling and the proposed conversion of the existing three storey Granary building (subject to future planning application) into a 3-bedroom dwelling at the Help Out Mill site.

The application boundary covers the Former Restaurant and the Granary buildings and the site access road which joins Shackerstone Lane to the west of the site. The River Sence (a main river) flows approximately 28m to the west of the Former Restaurant and 68m to the west of the Granary. The dry bed of The Old Mill Leet runs in a south-westerly direction towards the Mill, which adjoins the Granary on the Granary's north side. A former overflow channel linking the River Sence and the head of the Mill Leet is located approximately 38m to the north of the Former Restaurant and 80m to the north-east of the Mill.

1.4 Existing flood data

The Environment Agency's Flood Map for Planning (FMfP) shows that the site and part of the access road crossing the River Sence are located within Flood Zone 3, see Figure 1-1. The western part of the access road falls within Flood Zone 2. These maps originate from broadscale modelling and do not take into account key hydraulic structures. As such, these should be treated as indicative only.

To refine flood risk in relation to the site, JBA Consulting was commissioned to carry out a detailed fluvial hydraulic modelling study in relation to the proposed development site.

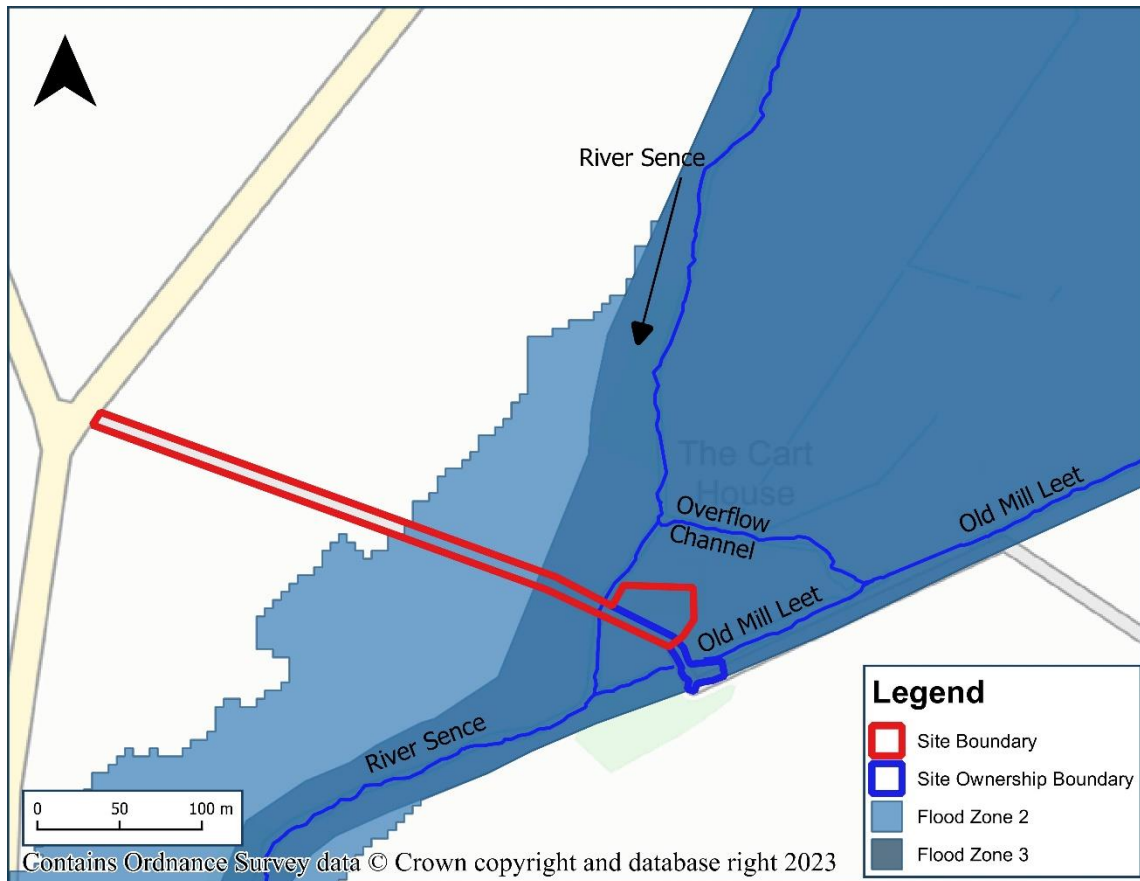


Figure 1-1: EA flood maps

2 Model build

2.1 Model approach

A 1D-2D ESTRY-TUFLOW hydraulic model representing the River Sence, the Old Mill Leet, and the Overflow Channel was produced to accurately represent the flooding at the site. The model uses LiDAR data from the DEFRA website (flown in 2022 with a 1m grid resolution) to represent ground levels in the floodplain. Site-specific topographic survey data provided was not included in the model due to its limited coverage and the spatial distribution of its elevation points. Therefore, ground levels within the site were represented using the finished floor levels of the surveyed existing buildings and the underlying LiDAR.

A hydrological assessment was carried out to estimate flows in the modelled river channels. The Hydrology Report is provided in Appendix C.

2.2 Model extent

The hydraulic modelling study represents the River Sence, the Old Mill Leet, the Overflow Channel and the flood plain in the vicinity of the site of interest. The extent of the model for this study is shown in Figure 2-1.

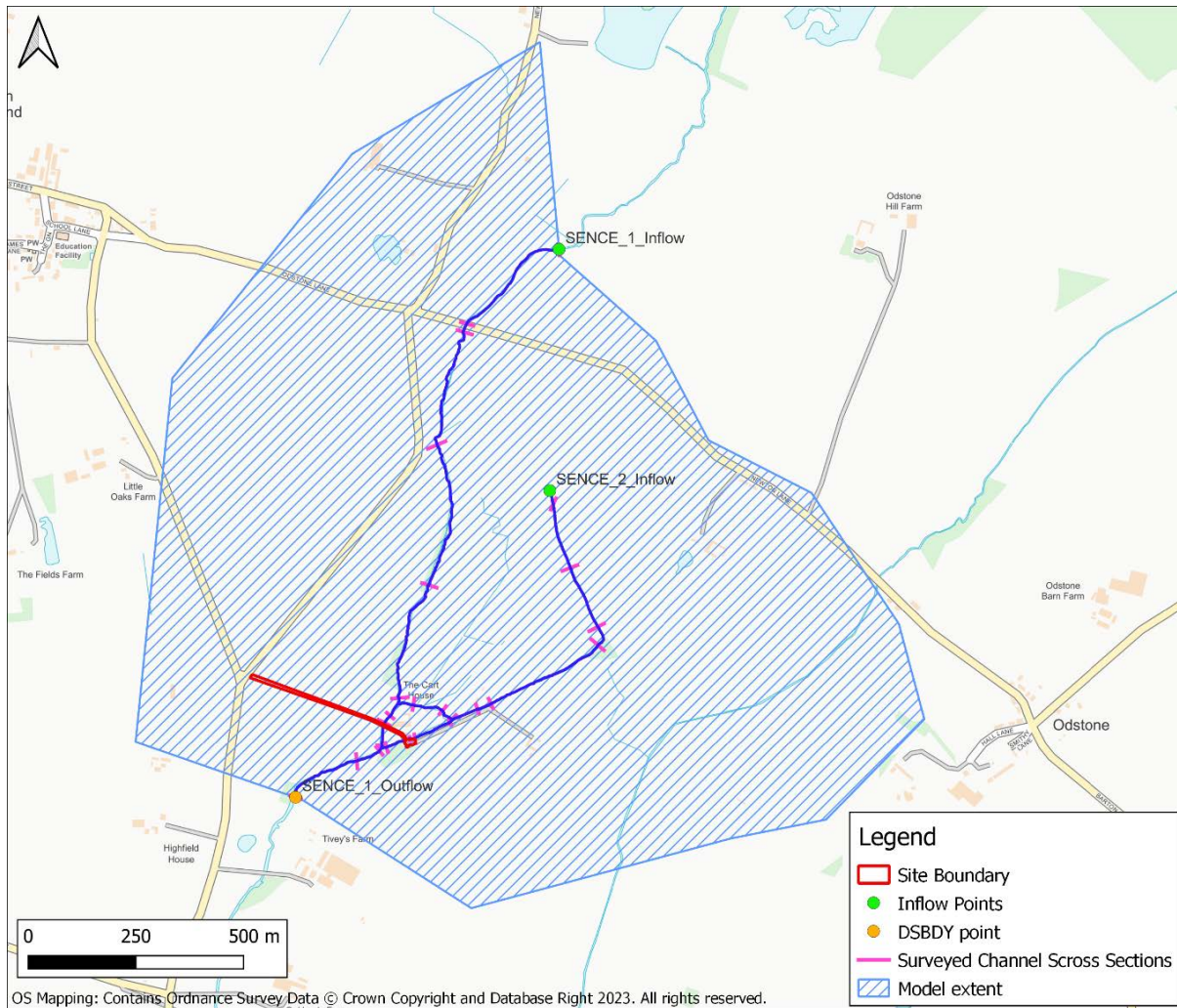


Figure 2-1: Model extent and inflow locations

The channels were represented as 1-dimensional (1D) features using ESTRY. The 1D representation of the River Sence channel starts approximately 1180m upstream of the site, the 1D representation of the Old Mill Leet starts approximately 630m upstream of the site. The downstream boundary of the model is located approximately 280m downstream of the site.

The 2D domain was represented using TUFLOW (version 2023-03-AA-iDP-w64) with floodplain topography represented using LiDAR data. The 2D domain has an area of 2.16km² and a 2m grid resolution. Based on a 2m grid resolution, a 2D timestep of 1s and 1D timestep of 0.5 were used. There are currently no active flood defences in the area.

2.3 Model inflows

New flow estimates were derived as part of the hydrological assessment (see Appendix C) and applied at the upstream end of the model, as shown in Figure 2-1. The effect of climate

change was assessed by increasing the 100-year peak flows by 22%, in line with the latest government guidance on climate change guidance issued in July 2021¹.

2.4 Model roughness parameters

For the 2D domain, Manning's n values were represented in a TUFLOW materials file (.tmf) and linked to a 2d_mat shapefile created with the use of OS Mastermap mapping. Manning's n values for the 1D domain were set in the same materials file and linked to all ESTRY files representing the 1D domain. Table 2-1 gives the range of Manning's n values used in the 1D and 2D domains.

Table 2-1: Mannings "n" values used as roughness parameters

Features	Manning's 'n' value assigned
1D Domain	
Concrete	0.016
Brick	0.018
Channel bed of cobbles	0.030
Channel bed of rocks with little vegetation	0.035
Vegetated bank with grass and light brush	0.040
Channel bed of natural stream with boulders	0.045
Thickly vegetated banks consisting of scrub and few trees	0.060
Thickly vegetated banks consisting of trees and heavy scrub	0.070
2D Domain	
Water	0.02
Road and tracks	0.025
Buildings	0.3
Woodland	0.07

2.5 Downstream boundary conditions

A flow-stage rating curve (created using the QH boundary creation tool in the hydraulic modelling software package 'Flood Modeller') was used to represent the downstream boundary condition in the channel. For the 2D domain, 2d_HQ boundaries were positioned at the southern end of the model extent with an assigned channel gradient. This allows TUFLOW to generate a Stage-Discharge relationship and allow water to flow out of the model.

¹ [Flood risk assessments: climate change allowances - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/flood-risk-assessments-climate-change-allowances)

2.6 Modelled scenarios

The following flood scenarios were simulated by the model:

Baseline scenarios

- 30-year (3.33% AEP) flood event;
- 100-year (1% AEP) flood event;
- 100-year (1% AEP) plus climate change (22%) flood event;
- 1,000-year (0.1% AEP) flood event.

Blockage analysis

- 100-year (1% AEP) plus climate change (22%) flood event with 75% blockage
- 100-year (1% AEP) plus climate change (22%) flood event with 90% blockage

Sensitivity analysis

- 100-year (1% AEP) flood event with 20% increase in peak flows;
- 100-year (1% AEP) flood event with 20% increase in roughness value;
- 100-year (1% AEP) flood event with 250mm increase in water levels at downstream boundary condition.

Key model files used to represent the above simulations are listed in Table 2-2.

Table 2-2: Model log

Simulation	Model files
Baseline	SENCE_~s1~_~e1~_011_TS_DP.tcf, SENCE_011_TS.ecf
Blockage - 75% and 90%	SENCE_Blockage75_011_TS_DP, SENCE_Blockage90_011_TS_DP.tcf SENCE_011_TS.ecf
Sensitivity Analysis - 20% increase in peak flows	SENCE_~s1~_~e1~_011_TS_DP_SF.tcf, SENCE_011_TS.ecf
Sensitivity Analysis - 20% increase in roughness value	SENCE_~s1~_~e1~_011_TS_DP_SR.tcf, SENCE_011_TS.ecf
Sensitivity Analysis - 250mm increase in water levels at downstream boundary condition	SENCE_~s1~_~e1~_011_TS_DP_SDSB.tcf, SENCE_0011_TS.ecf

The results of the baseline simulations are discussed in the following section and the sensitivity analysis is included in Appendix F.

3 Hydraulic model results

3.1 Baseline flood extents

Flood extents for the 30-year, 100-year, 100-year with 22% climate change and 1,000-year flood events are shown in Figure 3-1.

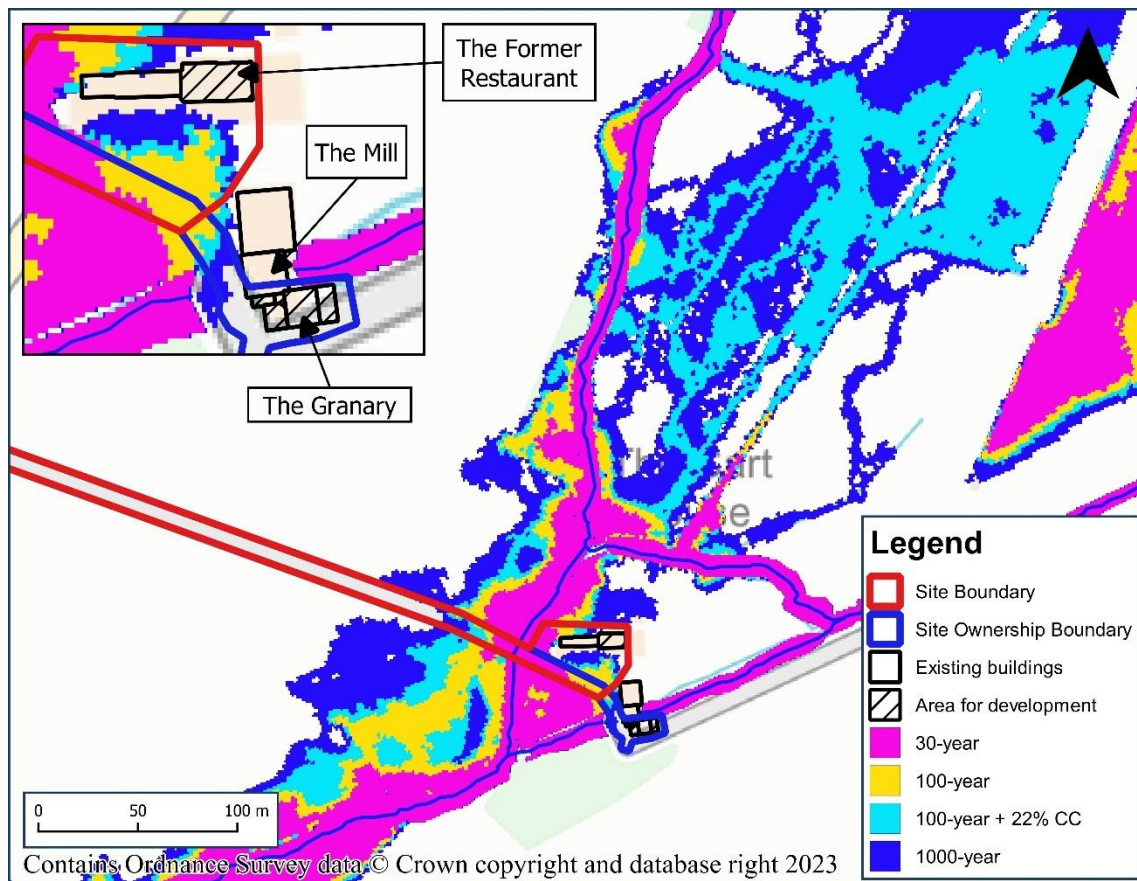


Figure 3-1: Baseline flood extents (30-year, 100-year, 100-year + 22% CC and 1,000-year)

Figure 3-1 shows that the proposed building to be converted does not flood during any of the modelled scenarios. The access road to the site however, floods during the 30-year, 100-year, 100-year plus 22% climate change and 1,000-year events.

The baseline flood depths during the 100-year with 22% climate change event are shown in Figure 3-2.

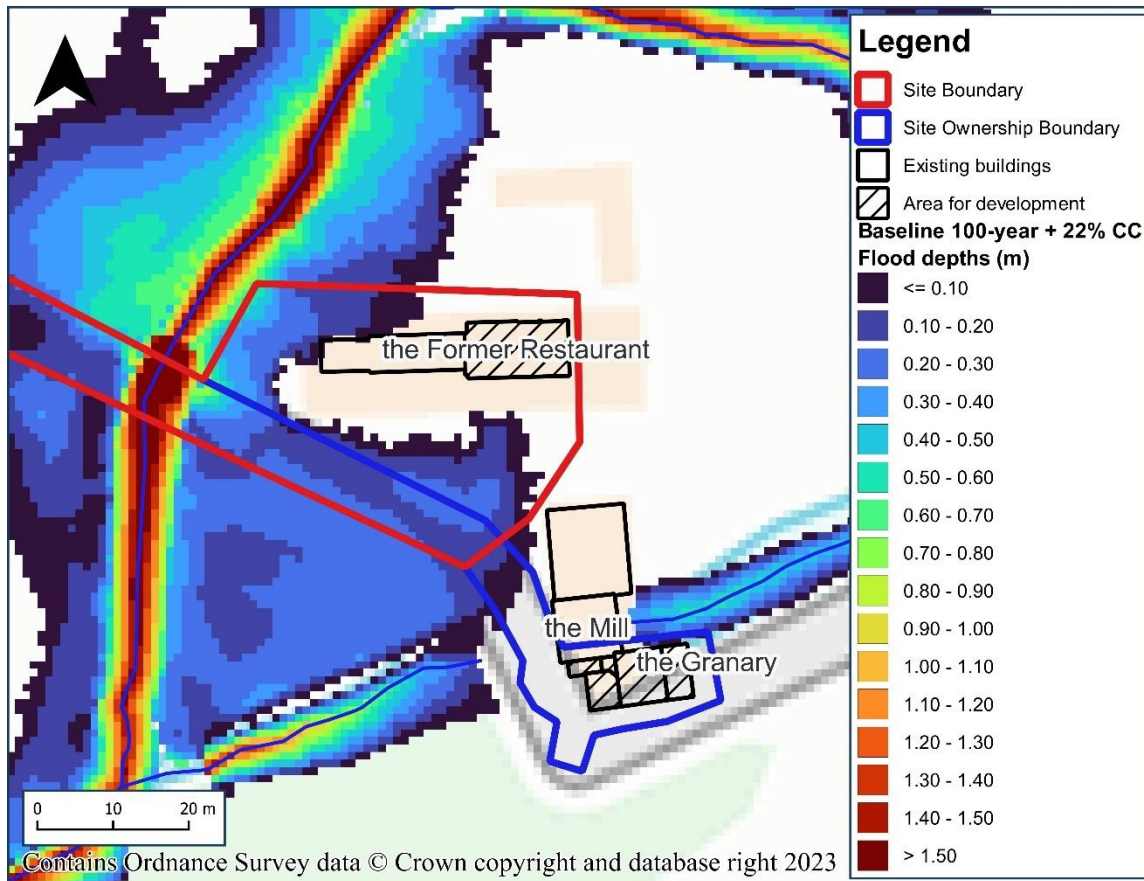


Figure 3-2: Baseline 100-year flood depths with +22% climate change scenario

Figure 3-2 shows that flood depths of up to 0.16m are predicted around the eastern side of the Former Restaurant building and flood depths of up to 0.51m are predicted in the Old Mill Leet channel adjacent to the Granary during the 100-year + 22% climate change event.

3.2 Baseline flood levels

The baseline flood levels during the 100-year with 22% climate change event are shown in Figure 3-3.

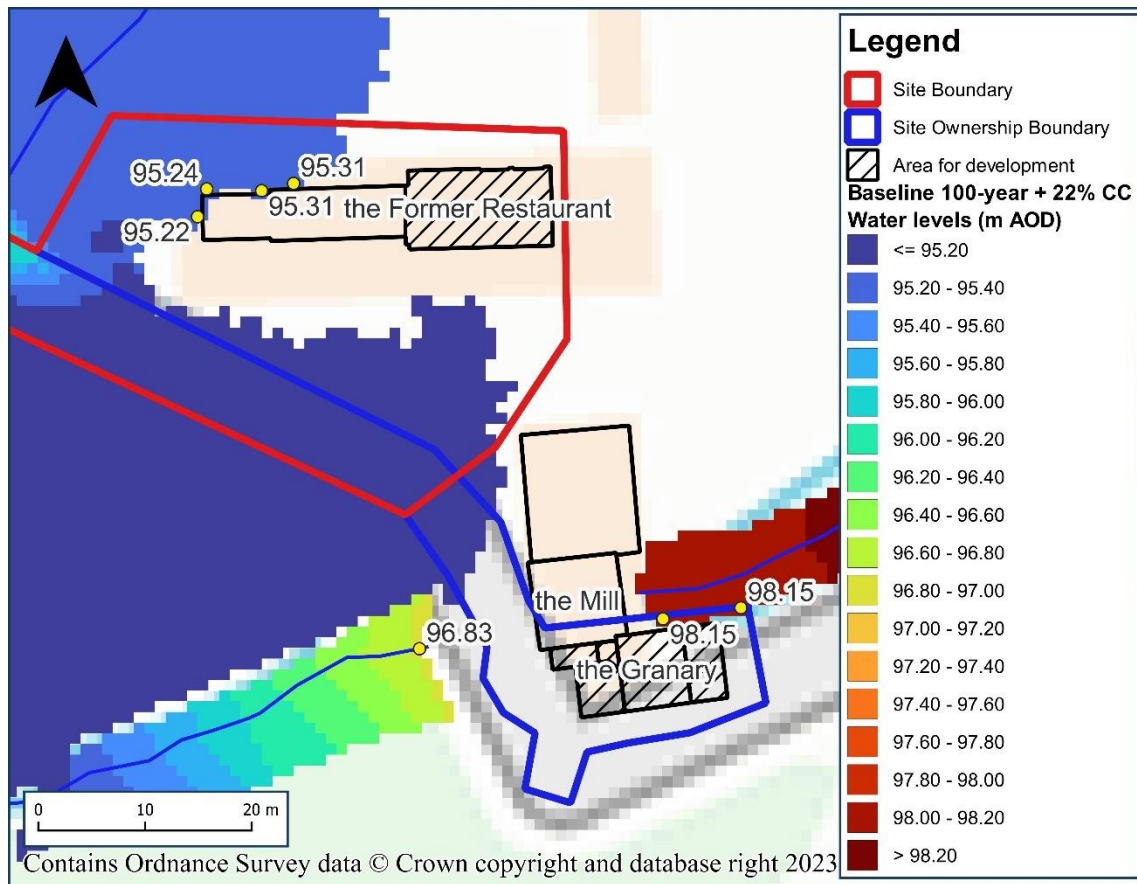


Figure 3-3: Baseline 100-year flood levels with +22% climate change scenario

Figure 3-3 indicates that the 100-year with 22% climate change flood levels vary between 95.22 m AOD and 95.31 m AOD around the Former Restaurant building and up to 98.15 m AOD within the banks in the Old Mill Leet channel adjacent to the Granary building.

Table 3-1: Baseline design peak flood levels

Baseline Event	Peak water level (m AOD)	
	The Former Restaurant	The Granary
100-year + 22% CC	95.31	98.15

3.3 Hazard-to-people classification

The fluvial hazard to people rating during 100-year with 22% climate change event has been mapped using the formula as suggested in Defra's FD2321/TR2 "Flood Risk to People". The different hazard categories are shown in and the hazard classification to the site during the 100-year with 22% climate change scenario is shown in Figure 3-4.

Table 3-2: Hazard to People categories

Flood hazard rating depth x (velocity+0.5) +DF	Level of Flood Hazard Description	Class label
<0.75	Low	Caution "Flood zone with shallow flowing water or deep standing water"
0.75 to 1.25	Moderate	Dangerous for some (i.e. Children) "Danger: flood zone with deep or fast flowing water"
1.25 to 2.00	Significant	Danger for most "Danger: flood zone with deep fast flowing water"
>2.00	Extreme	Dangerous for all "Extreme danger: flood zone with deep fast flowing water"
Using the hazard equation $HR = d \cdot (v + 0.5) + DF$ Where d = depth of flooding (m) v = velocity of floodwaters (m/sec) DF = debris factor		

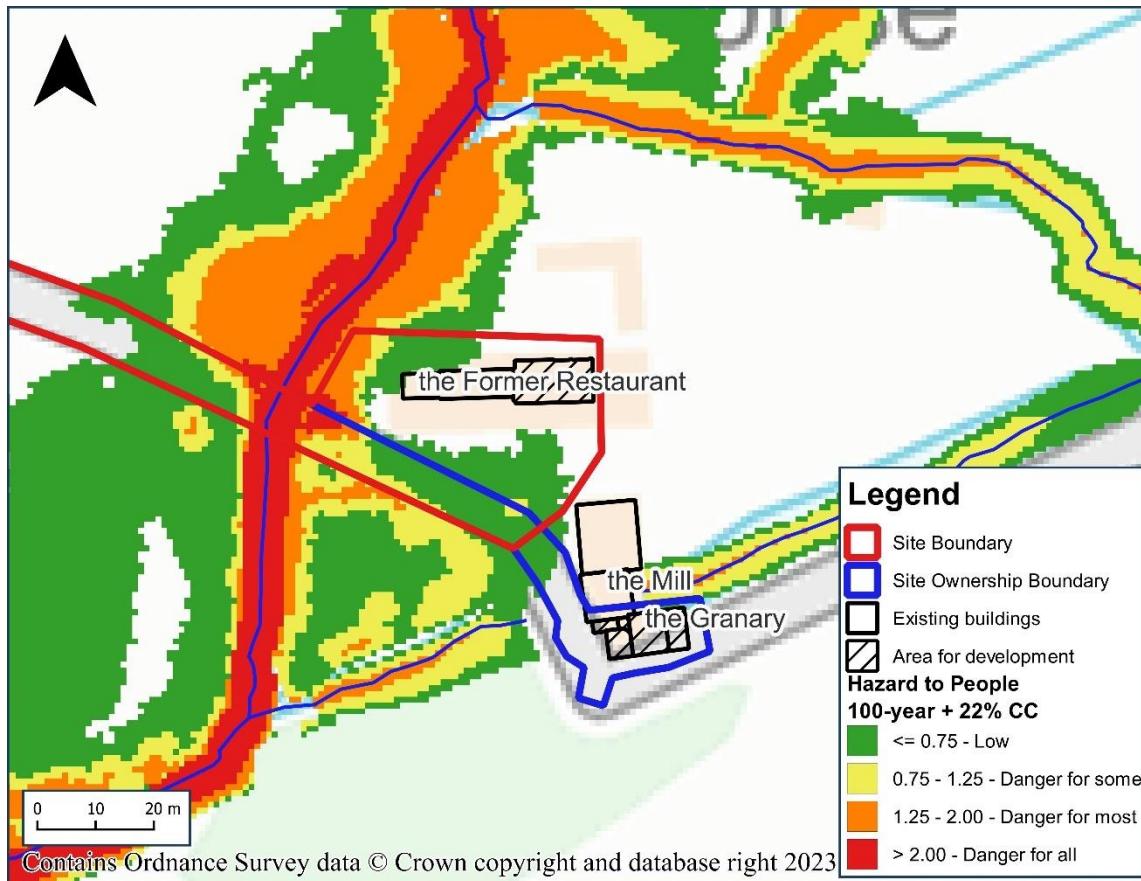


Figure 3-4: Hazard to people

Figure 3-4 shows that the hazard rating in relation to Former Restaurant building and the Granary is classified under the 'low' hazard category. The majority of the hazard classification along the access road to the site during the 100-year + 22% climate change scenario varies between 'low' and 'moderate' hazard and a 'high' hazard rating is predicted at the bridge crossing.

3.4 Impact analysis - Blockage scenarios

Following guidance set out by the Environment Agency, blockage scenarios have been simulated for the 100-year plus 22% climate change event and applied to the structures closest to the sites of interest. A 75% blockage has been applied to a rectangular culvert section with 3 openings that directs the River Sence beneath the access road to the site. In addition to this, a 90% blockage has been applied to a circular culvert section which directs the Old Mill Leet beneath the Mill. The location of these culverts can be seen in Figure 3-5.

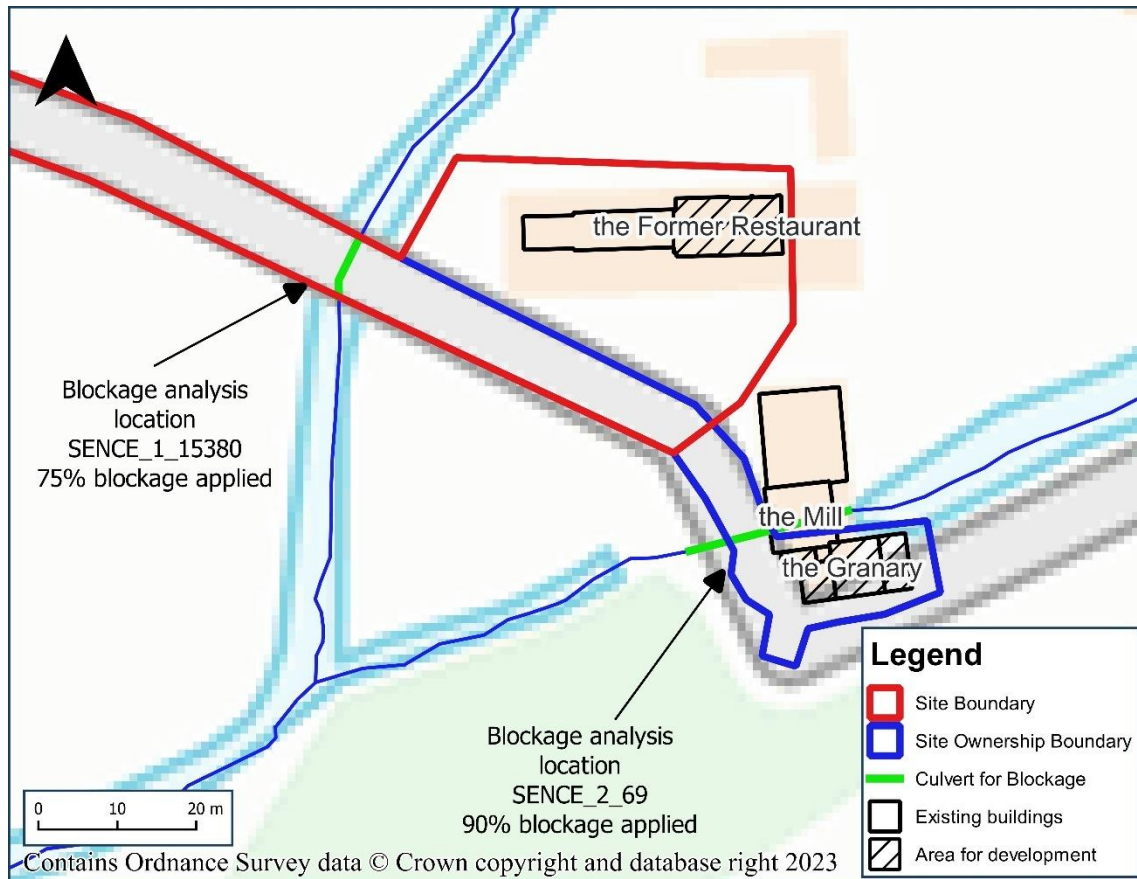


Figure 3-5: Location of blockage scenarios.

3.4.1 Blockage scenario 1 - 75% blockage at SENCE_1_15380

Figure 3-6 shows the flood depth comparison map between the baseline and 75% blockage scenarios during the 100-year plus 22% climate change event.

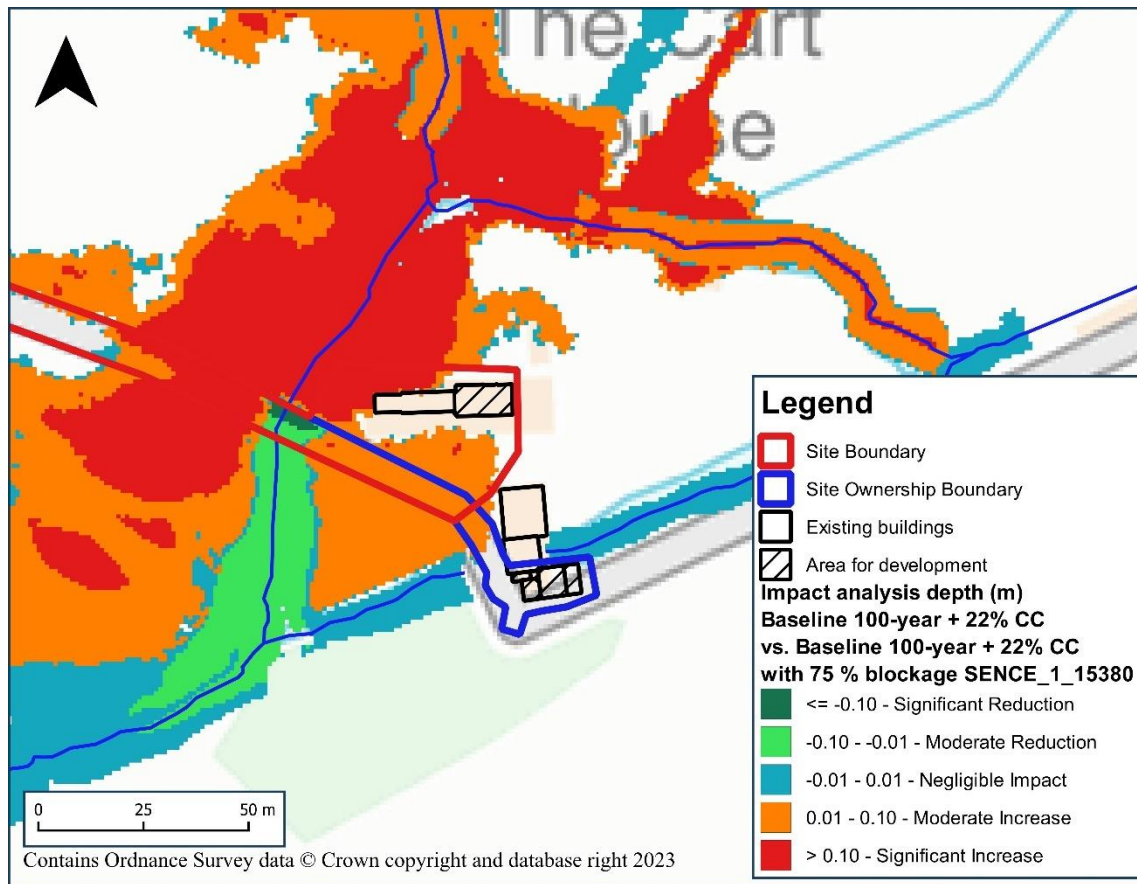


Figure 3-6: Baseline 100-year + 22% climate change with 75% blockage at SENCE_1_15380

Figure 3-6 show that a 75% blockage applied to Sence_1_15380 will generate a 'moderate' to 'significant' increase in flood depths around the Former Restaurant.

3.4.2 Blockage scenario 2 - 90% blockage at SENCE_2_69

Figure 3-7 shows the flood depth comparison map between the baseline and 90% blockage scenarios during the 100-year plus 22% climate change event.

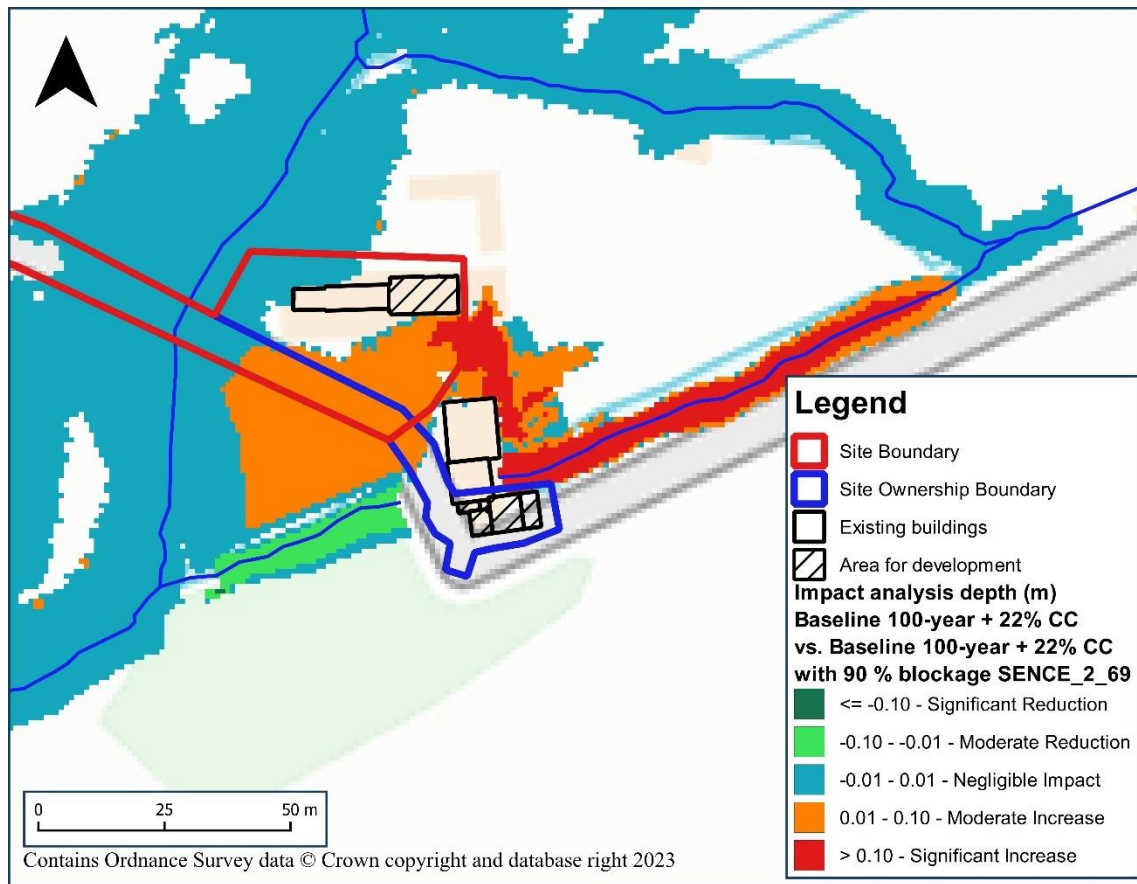


Figure 3-7: Baseline 100-year + 22% climate change with 90% blockage at SENCE_2_69

Figure 3-7 shows that a 90% blockage applied to SENCE_2_69 generates an increase in flood depths in the Old Mill Leet channel adjacent to the Granary building. 100-year plus 22% climate change peak water levels at the development areas during the Baseline, 75% blockage and 90% blockage scenarios are shown in Figure 3-7.

Table 3-3: Baseline, 75% Blockage and 90% Blockage peak flood levels.

Modelled Scenario	Peak water level (mAOD)	
	The Former Restaurant	The Granary
Baseline 100-year 22% CC	95.31	98.15
75% Blockage at SENCE_1_15380	95.49	98.15
90% Blockage at SENCE_2_69	95.50	98.93

Table 3-3 shows that in the event of a 75% blockage at the River Sence culverts (SENCE_1_15380) during the 100-year with 22% climate change scenario, peak flood levels near the Former Restaurant are predicted to increase by 0.18m. Peak flood levels may increase by 0.78m in the Old Mill Leet channel in the vicinity of the Granary in the event of a 90% blockage at the Old Mill Leet culvert (SENCE_2_69) during the 100-year with 22% climate change scenario, however due to high banks on the eastern side of the Old Mill Leet channel, the Granary is not expected to be affected by these flood levels overtopping the banks.

4 Conclusions and recommendations

4.1 Conclusions

- JBA Consulting (JBA) were commissioned by Mr and Mrs Garnett to undertake a fluvial hydraulic modelling study and to assess the flood risk in relation to the Help Out Mill Former Restaurant and Granary located off Shackerstone Lane, Leicestershire.
- The aim of this study is to support a planning application for the conversion of the existing two storey Former Restaurant to form a new dwelling, and the conversion of the existing three storey Granary building to form a new three storey dwelling (subject to future planning application).
- The hydraulic model covers the site of interest as well as the access road which connects the site to Shackerstone Lane to the west of the properties.
- The River Sence (a main river) flows approximately 28m to the west of the Former Restaurant and 68m to the west of the Granary. The dry bed of the former Mill leet runs in a south-westerly direction towards the Mill, which adjoins the Granary on the Granary's north side. A former overflow channel linking the River Sence and the head of the Mill Leet is located approximately 38m to the north of the former Restaurant and 80m to the north-east of the Mill."
- According to the Environment Agency's Flood Map for Planning, the site is at risk from fluvial flooding.
- To assess the risk of fluvial flooding to the site, a 1D-2D ESTRY – TUFLOW hydraulic model was produced to accurately represent extents, flood levels, flood depths and hazards within the site boundary.
- The fluvial model was run for the baseline scenario for the 30-year, 100-year, 100-year with 22% climate change and 1,000-year events in order to determine the existing fluvial flood risk to the site.
- The hydraulic model was tested for its sensitivity to changes in Manning's roughness, downstream boundary and increase in flow. Results from the hydraulic model were tested for their sensitivity to changes in Manning's roughness, downstream boundary conditions, and flows. Results from the sensitivity analysis indicate that the model results are moderately insensitive to changes in flow and downstream boundary conditions and relatively insensitive to changes in roughness conditions.
- Results from the fluvial model runs show that:
 - o The capacity of the River Sence is exceeded during all modelled scenarios whilst the Old Mill Leet is containing the flooding within its banks.
 - o Peak water levels of 95.31mAOD are predicted in the vicinity of the Former Restaurant during the 100-year plus 22% climate change 'design' event.
 - o Peak water levels of 98.15mAOD are predicted in the vicinity of the Granary during the 100-year plus 22% climate change 'design' event.

- o The majority of the hazard-to-people rating in relation to the Former Restaurant and the Granary buildings falls under the 'low' category.
- o The hazard-to-people rating along the access road ranges between 'low' and 'high'.
- o Two blockage scenarios were undertaken on two culverts closest to the site. A blockage of 75% was applied to SENCE_1_15380, a rectangular culvert that directs the River Sence beneath the access road. A blockage of 90% was applied to SENCE_2_69, a circular culvert that directs the Old Mill Leet beneath the Mill. This analysis showed that the 100-year with climate change peak flood levels may increase by 0.18m at the western site of the Former Restaurant building in the event of a 75% blockage at the River Sence culverts. Peak flood levels may increase 0.78m in the Old Mill Leet channel in the vicinity of the Granary in the event of a 90% blockage at the Old Mill Leet culvert, however due to high banks on the eastern side of the Old Mill Leet channel, the Granary is not expected to be affected by these flood levels overtopping the banks.

4.2 Recommendations

- It is recommended that results from this hydraulic modelling report are used as part of the Flood Risk Assessment for the site (e.g. to confirm whether ground floor sleeping accommodations are acceptable within the outbuilding proposed for conversion).
- It is also recommended to validate results from this hydraulic modelling study with the Environment Agency as part of the planning stage.

A QA: Lidar vs. Topographic Survey

A site-specific topographic survey was provided by the client and converted from point elevation data into a separate DEM to represent the site above the underlying LiDAR data. However, analysis of the survey data showed that there wasn't a sufficient amount of data points provided in the survey for an accurate DEM to be created. In addition to this, the initial elevations of the site specified in the survey appeared to be a discrepancy of 5.0m when compared to the underlying LiDAR data. This can be seen in Figure A-1.

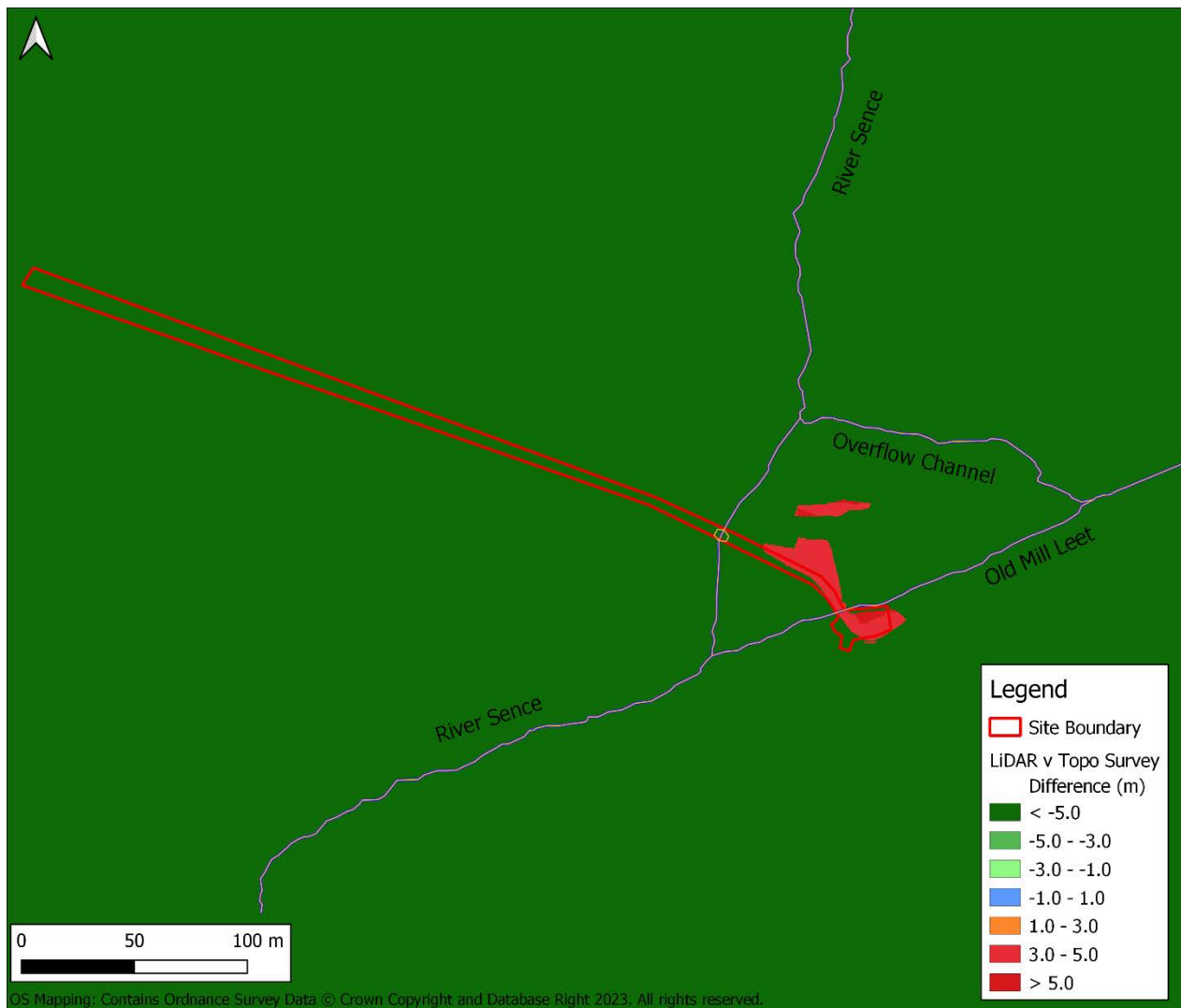


Figure A-1: Ground level comparison between underlying LiDAR data and topographic survey

Due to the lack of correlation between both datasets, topographic survey data was therefore not considered in the model.

B Channel Survey



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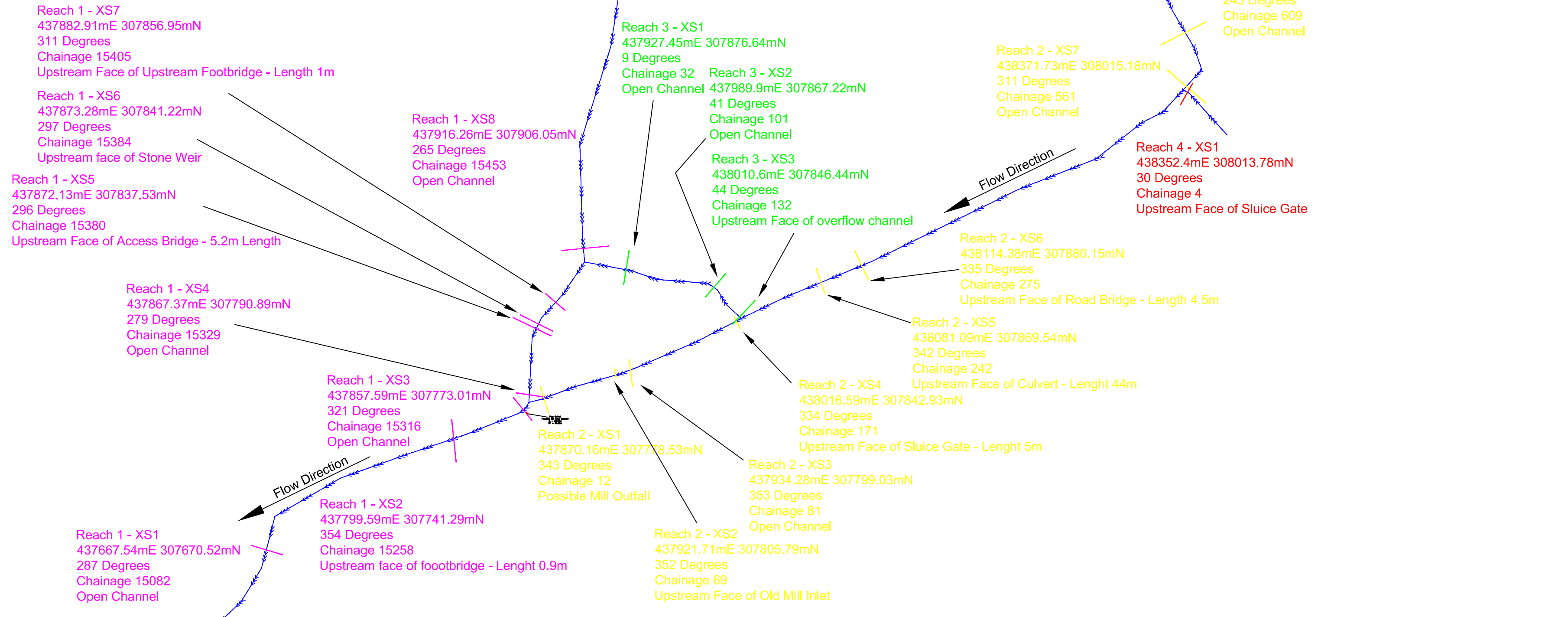
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River Sense
(Key Plan)

 **Grantham Coates
Surveys Ltd**

2 Arden Court, Arden Road, Alcester
Warwickshire, B49 6HN

Drawing No: GCS/JBA/River Sense/1	Rev: -
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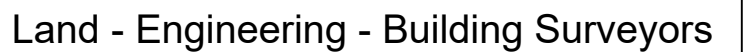
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A National Grid (OSGB36) coordinate has been established on site via
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was used to orientate the survey to Ordnance Grid.
No scale factor has been applied to the survey

Title: WATERCOURSE SURVEY AT
River Sense
Reach 1
(Cross Sections)

Client:

JBA CONSULTING
The Library
St. Philip's Courtyard
Coleshill
Warwickshire B46 3AD



2 Arden Court, Arden Road, Alcester
Warwickshire, B49 6HN

Tel: 01789 764420

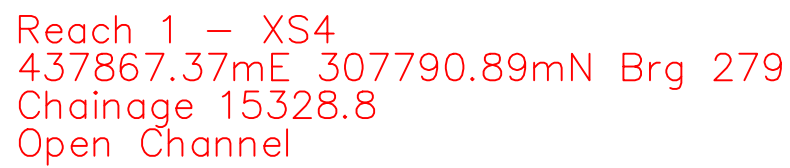
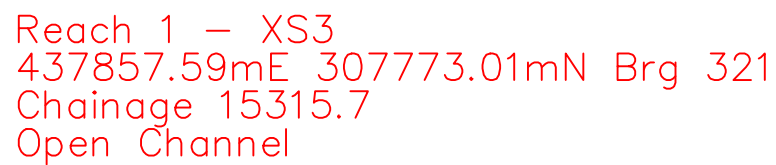
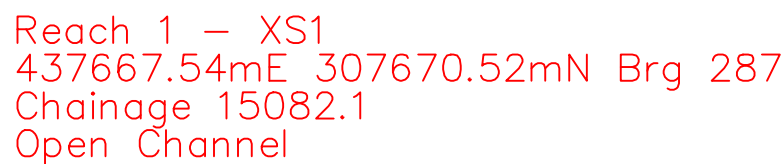
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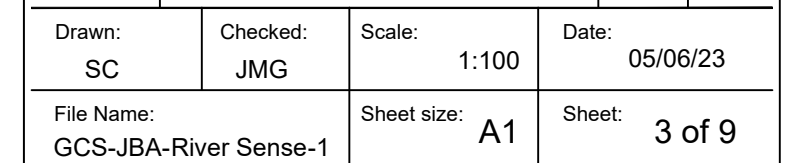
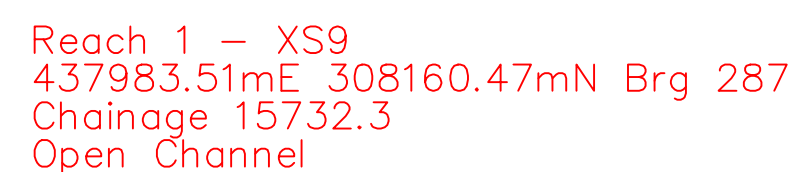
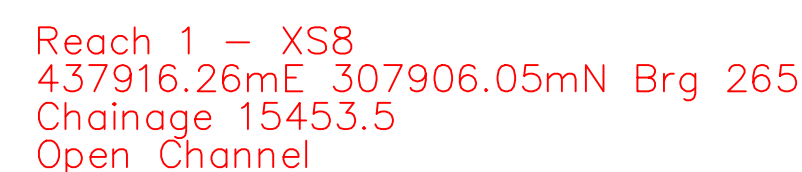
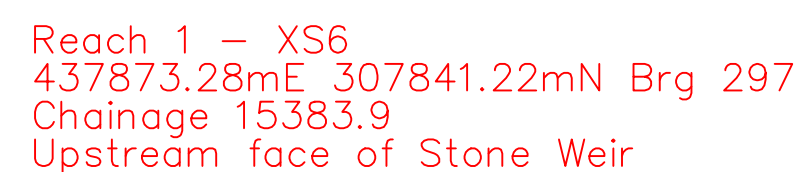
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ASSOCIATION**
FULL MEMBER

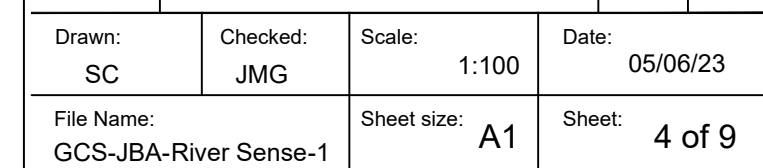
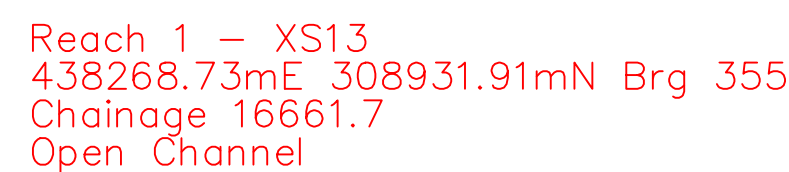
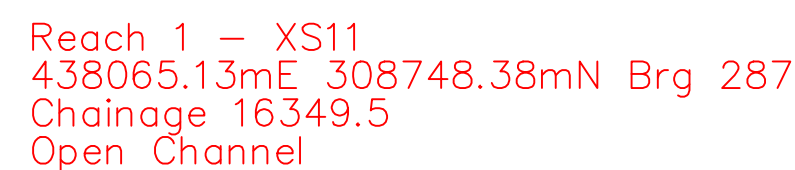
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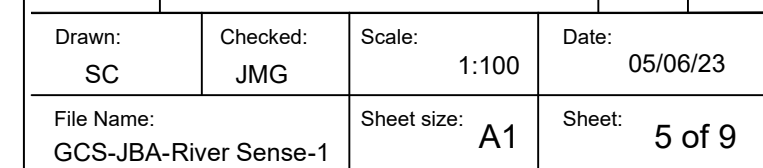
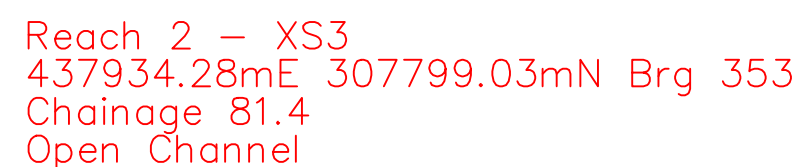
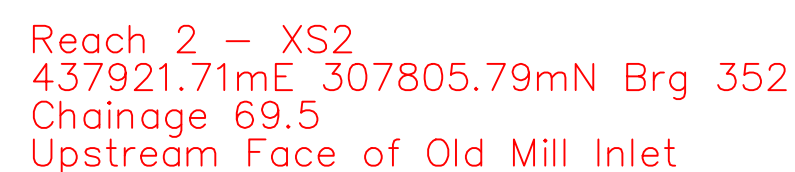
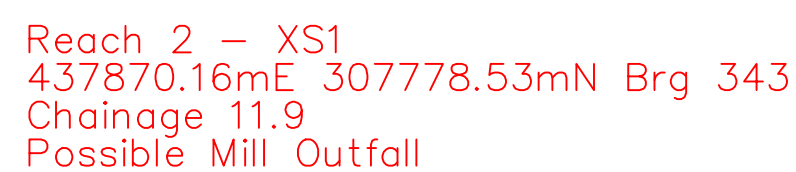
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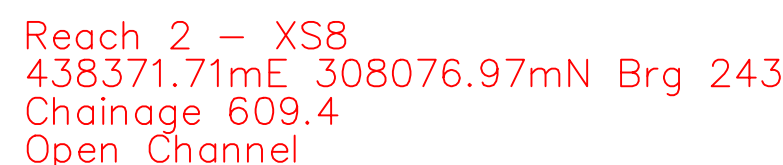
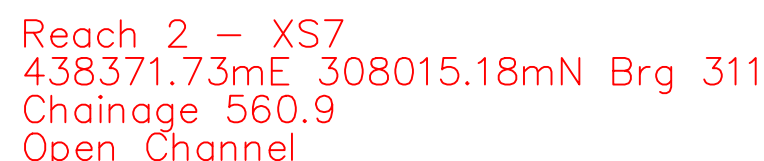
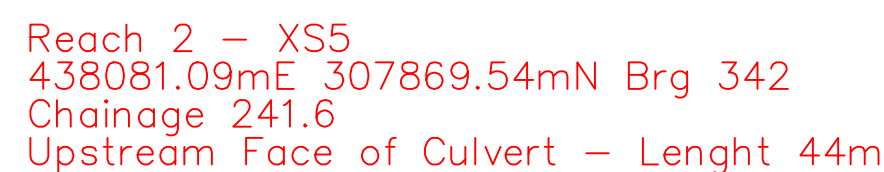
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Legend

AIR VALVE	AV	WATER TAP	W
BOILED	BO	TEMPORARY BENCH MARK	TBM
BORER HOLE	BHL	TELEPHONE CABLE BOX	TCB
BUT	B	TELEPHONE POLE	TP
CACTUS INSPECTION COVER	CC	THRESHOLD LEVEL	THL
BT BOX	BTB	TRAFFIC LIGHT	TL
CB	CB	TOP OF CURB WALL	TOW
COVER LEVEL	CL	TELEGRAPH POLE	TP
DOWN PIPE	DP	UNABLE TO LIFT	UTL
DROPPED KERB	DK	VENT PIPE	VP
ELECTRICITY CONNECTION BOX	ECB	RAIN WELD	WE
ELECTRICITY CABLE	EM	WATER METER	WM
ELECTRICITY MANHOLE	EH	WASHOUT	WO
ELECTRICITY POLE	EP		
ER	ER		
FINISHED FLOOR LEVEL	FFL		
FIRE HYDRANT	FL		
FOUL WATER	FW		
GULLY	GY		
GATE POST	GP		
GAS VALVE	GV		
INSULATED BLOCK JOINT	IB		
INSPECTION COVER	IC		
INVERT LEVEL	IL		
KERB OUTLET	KO		
LAMPPOST	LP		
LITTER BIN	LB		
MARKER POST	MP		
MILE POST	MS		
POST	PO		
RODDING EYE	RE		
RIDGE HEIGHT	RH		
ROAD NAMEPLATE	RN		
ROAD SIGN	RS		
STOP	ST		
STUMPLEE	SF		
SIGNAL POST	SP		
SLIP SLEEPER LEVEL	SLP		
SIGNALS AND TELECOMS BOX	STB		
SIGNALS AND TELECOMS CABLE	STC		
SIGNALS AND TELECOMS POST	STP		
SIGNAL	SN		
STOP TAP	ST		
STOP VALVE	SV		
STAY	ST		
STORM WATER	SW		

SURVEY STATION



BUSHES



HEDGES



TREES



Height
Species
(Spread to scale)

GATE



SECURITY FENCE	—X—X—	X—X—
FENCE	—O—O—	O—O—
OVERHEAD CABLES	—OH—OH—	OH—OH—
FOUL WATER	—FW—FW—	FW—FW—
GAS MAIN	—GM—GM—	GM—GM—
UG POWER LINE	—PL—PL—	PL—PL—
UG TELECOMS	—ST—ST—	ST—ST—
UG TELEPHONE	—TL—TL—	TL—TL—
WATER MAIN	—WM—WM—	WM—WM—

Control Table				
Station	Description	Eastings	Northings	Height

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A National Grid (OSGB36) coordinate has been established on site via Transformation OSTN15 and Geoid Model OSGM15, a further OS coordinate was used to orientate the survey to Ordnance Grid.	
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Title:

WATERCOURSE SURVEY AT
River Sense
Reach 2
(Cross Sections)

Client:

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Warwickshire B46 3AD



Land - Engineering - Building Surveyors

2 Arden Court, Arden Road, Alcester
Warwickshire, B49 6HN

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E-Mail: info@gcsurveys.co.uk
Web Site: www.gcsurveys.co.uk



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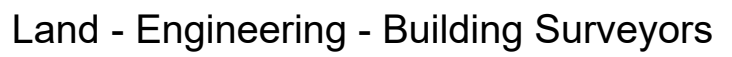
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Title: WATERCOURSE SURVEY AT
River Sense
Reach 2
(Cross Sections)

Client:

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The Library
St. Philip's Courtyard
Coleshill
Warwickshire B46 3AD

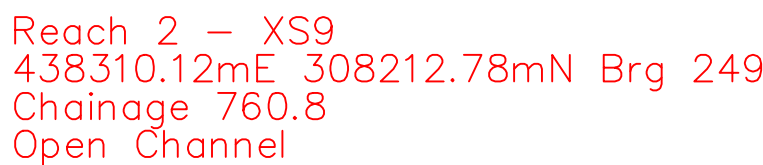


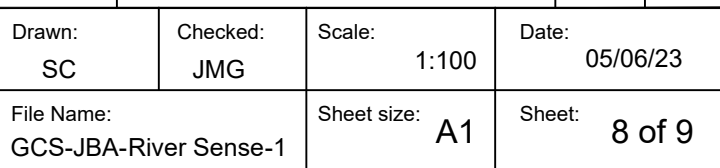
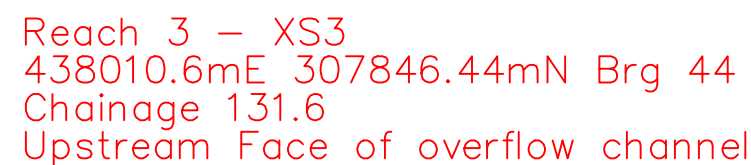
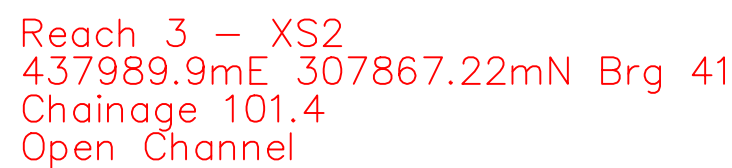
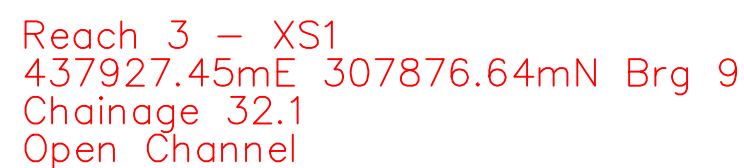
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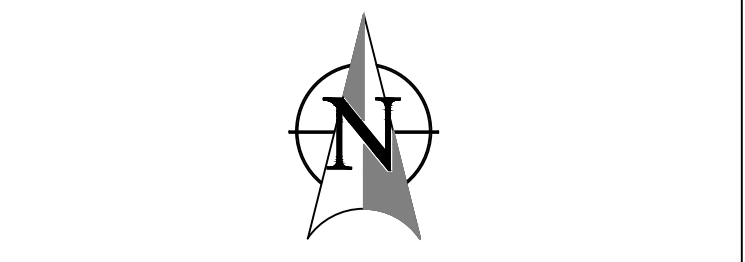
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Notes

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Legend

ARI VALVE	AV	WATER TAP	WT
BOLLARD	BD	TEMPORARY BENCH MARK	TBM
BELL	BL	TELEPHONE CABLE	TCB
BUS	BS	TELEPHONE POST	TEL
BUS ELECTRION COVER	BL	THRESHOLD LEVEL	THL
BT	BT	TRAFFIC LIGHT	TL
BURNED IN INSPECTION COVER	BCV	TOP OF WALL	TOW
DOWN PIPE	DP	TELEGRAPH POLE	TP
DOWN PIPE	DP	VENT PIPE	VP
ELECTRICITY CONTROL BOX	ECB	RAIL WHEEL	WE
EAVES HEIGHT	EH	RAIL WARE	WR
ELECTRICITY MANHOLE	EM	WASHOUT	WO
ELECTRICITY POLE	EP		
ERTH ROD	ER		
FINISHED FLOOR LEVEL	FLL		
FIRE HYDRANT	FH	SURVEY STATION	CS1
FILL WATER	FW		
GULLY	GP		
GATE POST	GP		
GAZE VALVE	GV		
INSULATED BOLT JOINT	IBJ		
INSPECTION COVER	IC		
INVERT LEVEL	IL		
KERB GULLY	KG		
LAMPPOST	LP		
LITTER BIN	LB		
MARKER POST	MP		
MILE POST	MP		
NO	NO		
RODDING EYE	RE		
HEIGHT	RE		
ROAD NAME/PLATE	RN		
ROAD SIGN	RS		
STUP	ST		
SOFFIT LEVEL	SL		
SIGNAL POST	SP		
RAIL RAILER LEVEL	RL		
SIGNALS AND TELECOMS	STB		
SIGNALS AND TELECOMS CABLE	SC		
SIGNALS AND TELECOMS POST	STP		
STOP TAP	ST		
STAY	ST		
STORM WATER	SW		

Control Table	
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Station	Description	Eastings	Northings	Height

Grid and Datum

Grid: OS National Grid **Datum:** Ordnance Datum Newlyn
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A National Grid (OSGB36) coordinate has been established on site via
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No scale factor has been applied to the survey

Title:

WATERCOURSE SURVEY AT
River Sense
Reach 4
(Cross Sections)

Client: _____

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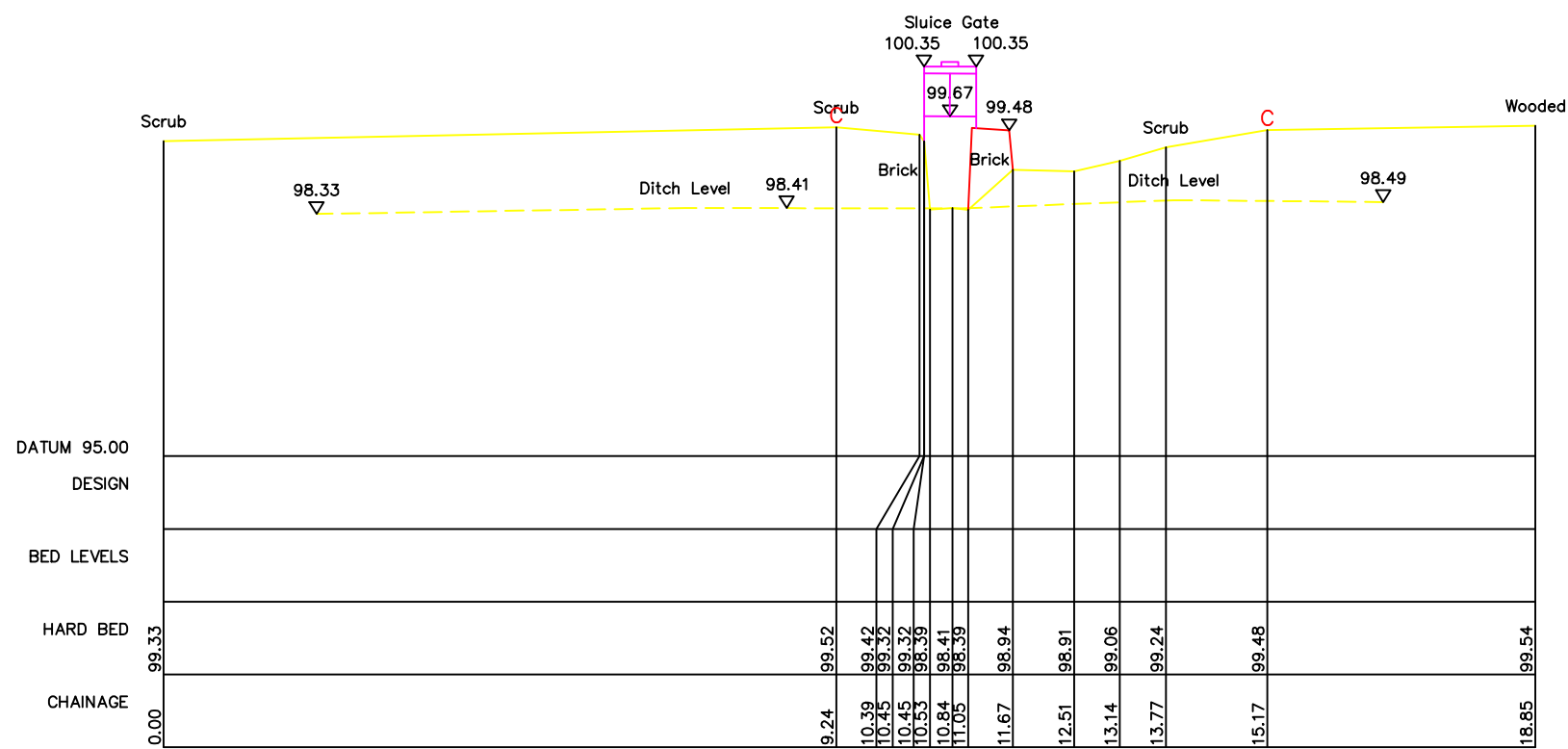

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Drawing No: GCS/JBA/River Sense/1	Rev: -
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File Name: GCS-JBA-River Sense-1	Sheet size: A1	Sheet: 9 of 9
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Reach 4 - XS1
438352.4mE 308013.78mN Brg 30
Chainage 3.8
Upstream Face of Sluice Gate

C Hydrological Assessment

Flood estimation report: Help Out Mill Restaurant, Newton Burgoland

Introduction

This report template is based on a supporting document to the Environment Agency's flood estimation guidelines. It provides a record of the hydrological context, the method statement, the calculations and decisions made during flood estimation and the results.

Contents

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Approval

	Name and qualifications	Date
Method statement prepared by:	Sam Cogan BSc MSc	18/05/2023
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Calculations prepared by:	Sam Cogan BSc MSc	18/05/2023
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Revision History

Revision reference	Date issued	Amendments	Issued to

Abbreviations

AMAX.....	Annual Maximum
AREA	Catchment area (km ²)
BFI.....	Base Flow Index
BFIHOST	Base Flow Index derived using the HOST soil classification
CPRE	Council for the Protection of Rural England
FARL.....	FEH index of flood attenuation due to reservoirs and lakes
FEH	Flood Estimation Handbook
HOST.....	Hydrology of Soil Types
NRFA	National River Flow Archive
POT	Peaks Over a Threshold
QMED	Median Annual Flood (with return period 2 years)
ReFH	Revitalised Flood Hydrograph method
SAAR.....	Standard Average Annual Rainfall (mm)
Tp(0)	Time to peak of the instantaneous unit hydrograph
URBEXT1990	FEH index of fractional urban extent
URBEXT2000	Revised index of urban extent, measured differently from URBEXT1990
WINFAP-FEH.....	Windows Frequency Analysis Package – used for FEH statistical method

Note on flood probability

This document quotes the probability of a flood magnitude in terms of a return period based on analysis of annual maximum (AMAX) floods. The return period of a flood on the AMAX scale is the average interval between AMAX floods of that magnitude or greater. The inverse of the AMAX return period is the annual exceedance probability (AEP).

Return periods are output by the Flood Estimation Handbook (FEH) software and can be expressed more succinctly than AEP. AEP can be helpful when presenting results to non-specialists who may associate the concept of return period with a regular rather than an average interval.

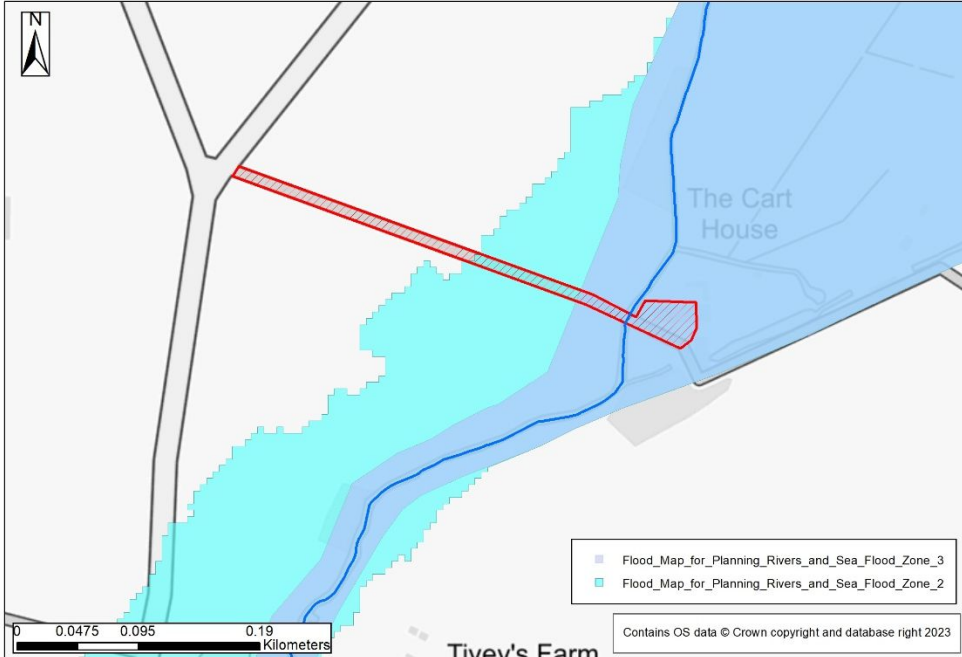
Return period can also be measured on the peaks-over-threshold (POT) scale as the average interval between floods of that magnitude or greater. The difference between AMAX and POT return periods is only important for short return periods (under 10 years).

The table below is provided to enable quick conversion between these different measures.

AMAX return period (years)	n/a	2	5	10	20	30	50	75	100	200	1,000
AEP (%)	n/a	50	20	10	5	3.33	2	1.33	1	0.5	0.1
POT return period (years)	1	1.5	4.5	9.5	20	30	50	75	100	200	1,000

1 Method statement

1.1 Requirements for flood estimates

Overview • Purpose of study • Peak flows or hydrographs? • Range of return periods and locations	Background: The proposed development site is located off of Shackerstone Lane in Newton Burgoland, Leicestershire (NGR: SK 37912 07840). The proposed development consists of the conversion of the ground floor of the existing outbuilding into a 2 bedroom dwelling. The site is surrounded by a mill race and the River Sense, a 'Main River' designated watercourse falling within the remit of the Environment Agency. The Environment Agency's Flood Maps for Planning indicate that the site is fully located within Flood Zone 3.  A review of the EA flood maps suggests the flood extent mapped at the site originates from broadscale modelling techniques and/or out-of-date hydraulic modelling results and thus should not be used to support a site-specific Flood Risk Assessment. Therefore, following a request from the Environment Agency, detailed hydraulic modelling is required to support the application in order to refine and accurately assess fluvial flood risk in relation to the site, assess the residual impact of blockage at the nearest structures to the site and inform whether the proposed conversion is viable on flood risk grounds) and/or if additional flood mitigation measures are required. Objectives: This study seeks to provide a hydrological assessment to quantify fluvial flood risk from the River Sense. Peak flow estimates and hydrographs are required for the two Flood Estimation Points (FEP): • Inflow from the River Sense • Model downstream checkpoint. Peak flow estimates and hydrographs have been derived for the following annual exceedance probabilities (AEPs): • 2-year flood event; • 30-year flood event; • 100-year flood event; • 100-year plus climate change flood event; and
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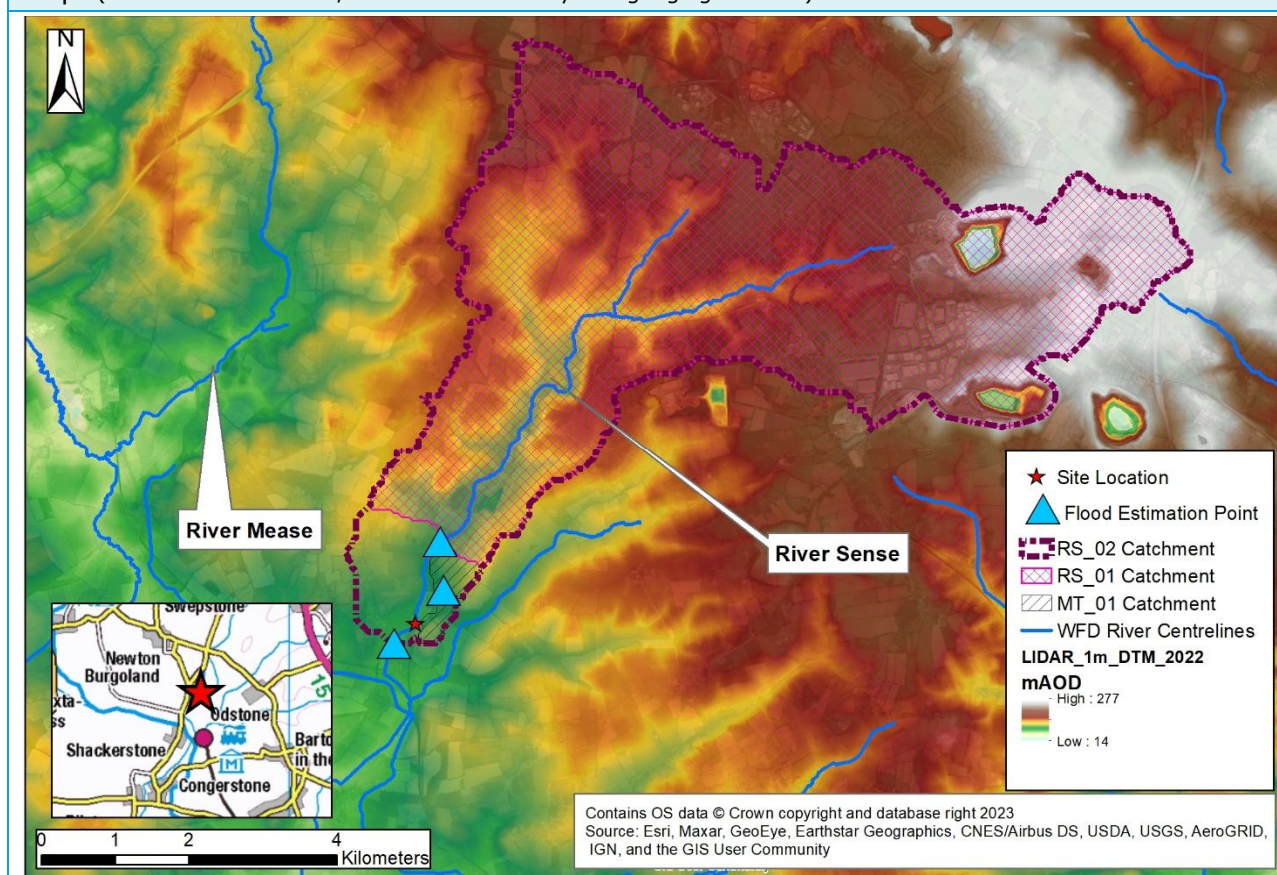
- 1000-year flood event.

Based on July 2021 EA climate change allowance guidance¹, the proposed development site is located within the Tame Anker and Mease Management Catchment. For the '2080' scenario, the climate change uplift is 22%. Peak flows for the Higher Central allowance (30% uplift) are also calculated here.

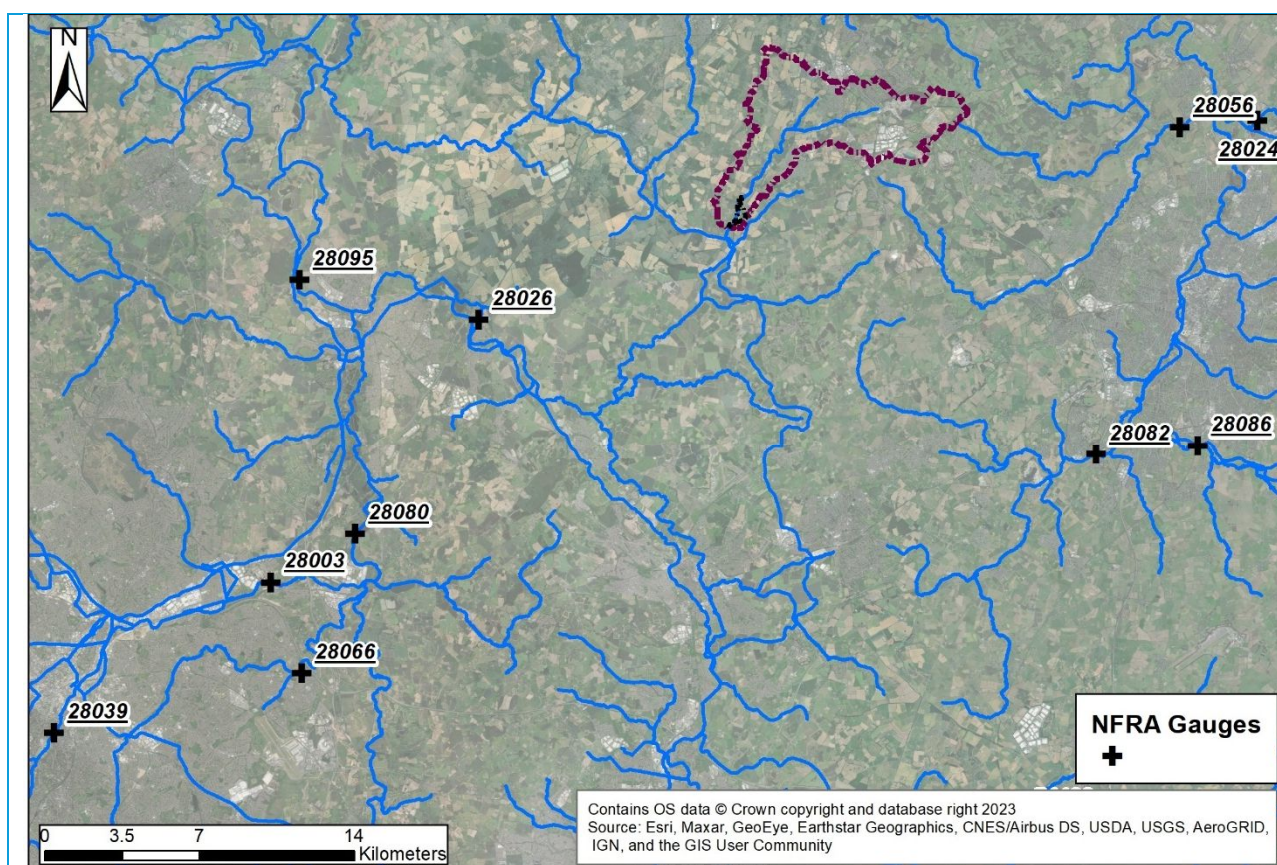
Flow estimates and hydrographs derived from the hydrological analysis will subsequently be incorporated into a 1D-2D hydraulic model capable of simulating flood extents, levels and flows through time in relation to the development site.

1.2 The catchment

Map (Include river network, catchment boundary and gauging stations)



¹ Environment Agency (2023). Guidance: Flood risk assessments: climate change allowances. Accessed 23/01/2023. [Source: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#Select-the-peak-river-flow-allowances-to-use-for-your-assessment>].



Description

Include topography, climate, geology, soils, land use and any unusual features that may affect the flood hydrology.

The River Sense, including contributing watercourses, drains an area of 37 km², up to the downstream model boundary. The general elevation trend of the Sense catchment is a decline from east to south west as land falls from 269 mAOD to 94 mAOD.

Underlying bedrock geology of the Sense catchment consists of:

- Radcliffe member - mudstone
- Tarporley siltstone formation - siltstone, mudstone and sandstone
- Pennine lower coal measures formation - mudstone, siltstone and sandstone
- Gunthorpe member - mudstone

Superficial geology for the catchment consists of:

- Alluvium - clay, silt, sand and gravel
- Thrussington member – diamicton
- Glaciofluvial deposits, mid pleistocene - sand and gravel
- Oadby member – diamicton
- Head - clay, silt, sand and gravel
-

Typical soils across the study catchment are variable, with separate pockets of the upstream catchment containing:

- Freely draining slightly acid loamy soils
- Slightly acid loamy and clayey soils with impeded drainage
- Loamy and clayey floodplain soils with naturally high groundwater
- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils².

The varying nature of the underlying bedrock and superficial geology and soil types would indicate that the fluvial response to rainfall based on soil properties may also be variable. Generally the catchment is considered to be relatively

permeable due to the extensive cover of superficial deposits underlying the catchment (supported by the study catchments having an average BFIHOST19 value of 0.55). The average FEH SPRHOST value across the catchments is low at 35%. The PROPWET value across the study catchments is 0.3. The annual rainfall (SAAR) for the period 1961 – 1990, was 690-694mm, below average compared to the UK average rainfall (1080mm). The catchment is located within the Midlands regional climate. A large portion of the Midlands lies in the 'rain shadow' of the Welsh mountains. This makes the regional climate relatively dry³.

The primary areas of flood risk within the catchment are located along the channels of the River Sense where fluvial flood risk due to channel capacity exceedance would be considered to be the driving mechanism. Based on the Environment Agency Asset Management website⁴, there are no formal, structural flood defences along the River Sense banks in proximity to the study site. In addition, there are areas mapped at high risk of pluvial flooding within the study catchment. These high-risk areas are broadly associated with the location of the watercourses and urbanised areas within the catchment. Pluvial flood risk will not be considered within this study.

The catchment is generally comprised of grassland and agricultural land use. The downstream catchment of the River Sense has a relatively small urban component (URBEXT2000 value = 0.01) that is unlikely to affect the choice of methodology used within this study.

1.3 Source of flood peak data

Source	Version 11.1 of the NRFA Peak Flow Dataset files represents a minor update to version 11 of the database (see release note below). This update sees the addition of FEH2022 DDF data, one suitability change and one station number change. Released on 6th March 2023.
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1.4 Gauging stations (flow or level)

Catchment is ungauged. Gauges listed in this section are relevant gauges to this study.

Water-course	Station name	Gauging authority number	NRFA number	Catchment area (km ²)	Type (rated / ultrasonic / level...)	Start of record and end if station closed
Rea	Rea @ Calthorpe Park	4039	28039	74	Crump weir/Broad-crested weir	07/1965 – Present Day
Rothley Brook	Rothley Brook @ Rothley	4056	28056	94	Flat V/Velocity-area	06/1970 – Present Day

1.5 Data available at each flow gauging station in Table 1.4

Station name	Start and end of NRFA flood peak record	Update for this study?	OK for QMED?	OK for pooling?	Data quality check needed?	Other comments on station and flow data quality
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³ Met Office (2016) Midlands: climate. Accessed 23/01/2023.. [Source: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/midlands_-_climate---met-office.pdf]

⁴ Environment Agency (2002) Asset Information and Maintenance Programme (data.gov.uk)

Rea @ Calthorpe Park	07/1965 – Present Day	N	Y	Y	N	Summer 2007 peak flows under review. Full period of record peak flow data reviewed and released in September 2019 (WINFAP Files v8). High flows gauged from nearby footbridge, but hazardous owing to high velocities. Prone to upstream siltation. Drowns at high flows. At 0.7m the flows go over the broad-crested weir shoulders, but all flows are in bank. Gauged above QMED, good fit to gaugings.and although limited gaugings above QMED, confidence in model derived rating. <u>Gauge Catchment Descriptors from NRFA peak flows dataset, Version 11.1</u> <table><tr><td>Gauge</td><td>28039</td></tr><tr><td>Distance (km)</td><td>73.68</td></tr><tr><td>Area (km2)</td><td>37.5km W</td></tr><tr><td>BFIHOST19</td><td>0.518</td></tr><tr><td>SAAR</td><td>781</td></tr><tr><td>URBEXT2000</td><td>0.4537</td></tr><tr><td>FARL</td><td>0.948</td></tr></table>	Gauge	28039	Distance (km)	73.68	Area (km2)	37.5km W	BFIHOST19	0.518	SAAR	781	URBEXT2000	0.4537	FARL	0.948
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SAAR	781																			
URBEXT2000	0.4537																			
FARL	0.948																			

Rothley Brook @ Rothley	1970 – Present Day	N	Y	Y	N	Unusual flow pattern in Oct 1978 due to drawdown of Thornton Reservoir. Generally good site got high flows but possibility of bypassing on right bank. Full period of record peak flow data reviewed and released in October 2018 (WINFAP Files v7). Two ratings applied across period of record, the most recent is valid from Nov-1997. Difficult to justify the shift in ratings. Some scatter in gaugings in the 0.5-1mASD range (weir drowns at high flows - above 1.1m - starts at 0.5m) but high spot gaugings confirm rating beyond this. Gauged above QMED and gauged to within 13% of AMAX3 <u>Gauge Catchment Descriptors from NRFA peak flows dataset, Version 11.1</u> <table><tr><td>Gauge</td><td>28056</td></tr><tr><td>Distance (km)</td><td>9.7km E</td></tr><tr><td>Area (km2)</td><td>91.9</td></tr><tr><td>BFIHOST19</td><td>0.355</td></tr><tr><td>SAAR</td><td>672</td></tr><tr><td>URBEXT2000</td><td>0.076</td></tr><tr><td>FARL</td><td>0.962</td></tr></table>	Gauge	28056	Distance (km)	9.7km E	Area (km2)	91.9	BFIHOST19	0.355	SAAR	672	URBEXT2000	0.076	FARL	0.962
Gauge	28056																			
Distance (km)	9.7km E																			
Area (km2)	91.9																			
BFIHOST19	0.355																			
SAAR	672																			
URBEXT2000	0.076																			
FARL	0.962																			
Tabulate any updated or revised flood peak series in the Annex. Give link/reference to any further data quality checks carried out.					-															

1.6 Other data available and how it has been obtained

Type of data	Data relevant to this study?	Data available ?	Source of data	Details
Check flow gaugings (if planned to review ratings)	N/A	N/A	-	No rating updates are currently requested by the scope.
Historic flood data Include chronology and interpretation of flood history in Annex or separate report.	Yes	Yes	Environment Agency WMS	There are no recorded historic incidences within proximity to the site from the River Sense.
			Chronology of British Hydrological Events	There are no historical records of flooding at Newton Burgoland or Sweptstone on the CBHE website.

Flow or river level data for events	Yes	No	-	Catchment is ungauged.
Rainfall data for events	No	No	Shoothill Gauge map	There are no raingauges located within the Willow Brook catchment. No flood event analysis is included within the scope
Potential evaporation data	No	No	-	No flood event analysis in scope.
Results from previous studies	Yes	No	-	No previous studies undertaken in the area.
Other data or information (e.g. groundwater, tides, channel widths, low flow statistics)	-	-	-	-

1.7 Hydrological understanding of catchment

Outline the conceptual model, addressing questions such as: - Where are the main sites of interest? - What is likely to cause flooding at those locations? (peak flows, flood volumes, backwater effects, combinations of peaks, groundwater, snowmelt, tides...) - Might those locations flood from runoff generated on part of the catchment only, e.g. downstream of a reservoir? - Is there a need to consider temporary debris dams or NFM features that could collapse?	The site at Shackerstone Lane, Newton Burgoland (NGR: SK 37912 07840) is to be assessed in terms of fluvial flood risk in relation to and the River Sense, a 'Main River' designated watercourse as the Environment Agency's Flood Maps for Planning indicate that the site is fully located within Flood Zone 3. The primary risk to the site will likely be channel exceedance from the River Sense.
Any unusual catchment features to take into account? e.g. - highly permeable – avoid ReFH if BFIHOST>0.65, consider permeable catchment adjustment for statistical method if SPRHOST<20% - highly urbanised – seek local flow data; consider method that can account for differing sewer and topographic catchments - pumped watercourse – consider lowland catchment version of rainfall-runoff method - major reservoir influence (FARL<0.90) – consider flood routing, extensive floodplain storage – consider choice of method carefully	There is a disused mill channel included within the model reach. Upon a site inspection the disused mill channel is closed off from the main watercourse. Therefore the channel would not receive flows from the River Sense however the channel would receive flows from the topographic catchment. There are no other unusual catchment features to take into account during this study.

1.8 Initial choice of approach

Is FEH appropriate? (it may not be for extremely heavily urbanised or complex catchments) If not, describe other methods to be used.	Yes
Initial choice of method(s) and reasons How will hydrograph shapes be derived if needed?	Peak flows Peak flow estimates will be derived from application of FEH methods. ReFH2 methodology will be compared with FEH

Will the catchment be split into sub-catchments? If so, how?	Statistical for estimating peak flows. The favoured peak flow estimates are provided alongside justification for their adoption in subsequent sections. <u>Hydrographs</u> Hydrographs for the model will be derived using the ReFH2 model. ReFH2 hydrographs will be scaled to the favoured peak flow estimates explored within this study.
Software to be used (with version numbers)	FEH Web Service ⁵ / WINFAP v5 ⁶ / ReFH2.3

⁵ CEH 2015. The Flood Estimation Handbook (FEH) Online Service, Centre for Ecology & Hydrology, Wallingford, Oxon, UK.

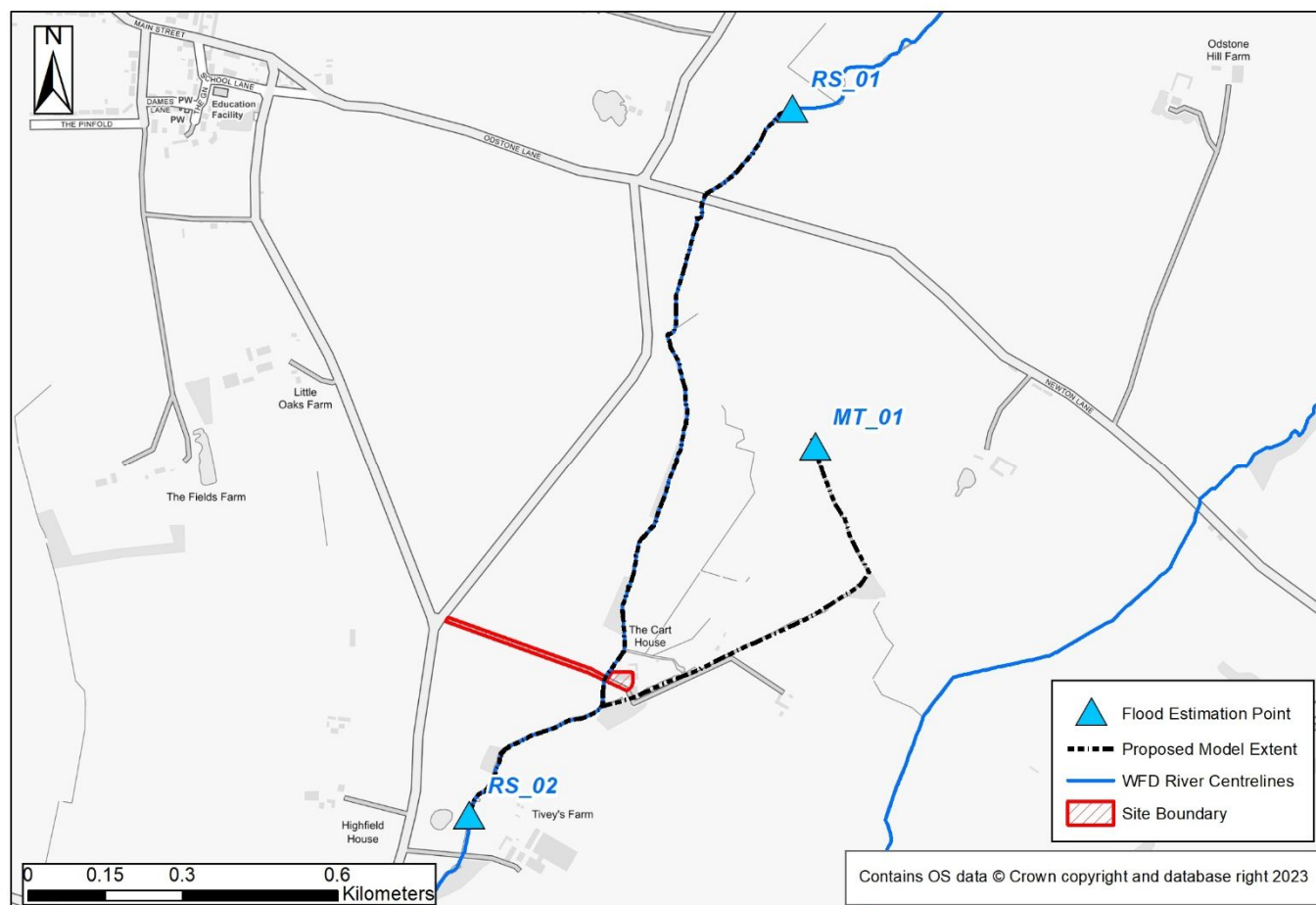
⁶ WINFAP-FEH v5 © Wallingford HydroSolutions Limited 2018.
KOU_JBAU_XX_00_RP_HO_0001_S1_P2_JBA FEH calculation record

2 Locations where flood estimates required

The table below lists the locations of subject sites. The site codes listed below are used in all subsequent tables to save space.

2.1 Summary of subject sites

Figure 2.1

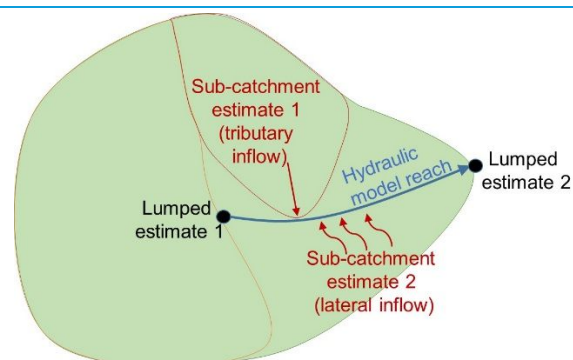


Site code	Type of estimate L: lumped catchment S: Sub-catchment	Watercourse	Name or description of site	Easting	Northing	AREA on FEH CD-ROM (km ²)	Revised AREA if altered
Due to the catchment size of MT_01, peak flows will only be calculated for this catchment within Section 6 of the FEH calculation report utilising ReFH2, in line with Phase 2 of the small catchments research, SC090031 (Stewart and others, 2019)							
RS_01	L	River Sense	River Sense - model inflow	308944	308944	33.52	34.42
MT_01	L	Disconnected mill channel	Disconnected mill channel – model inflow	438000	307850	0.51	-
RS_02	L	River Sense	River Sense – downstream checkpoint.	307576	307576	35.77	36.66

Note: Lumped catchments (L) are complete catchments draining to points at which design flows are required.

Sub-catchments (S) are catchments or intervening areas that are being used as inputs to a semi-distributed model of the river system. There is no need to report any design flows for sub-catchments, as they are not relevant: the relevant result is the hydrograph that the sub-catchment is expected to contribute to a design flood event at a point further downstream in the river system. This will be recorded within the hydraulic model output files. However, catchment descriptors and ReFH model parameters should be recorded for sub-catchments so that the results can be reproduced.

The schematic diagram illustrates the distinction between lumped and sub-catchment estimates.



2.2 Important catchment descriptors at each subject site (incorporating any changes made)

Site code	FARL	PROPWET	BFIHOST 19	DPLBAR (km)	DPSBAR (m/km)	SAAR (mm)	URBEXT 2000 ⁷	FPEXT
RS_01	0.991	0.30	0.551	6.95	34.7	694	0.100	0.086
MT_01	1.00	0.30	0.362	0.85	23.3	637	0.000	0.222
RS_02	0.992	0.30	0.550	7.20	33.6	690	0.093	0.094

2.3 Checking catchment descriptors

Record how catchment boundary was checked and describe any changes (add maps if needed)	The catchment boundaries have been reviewed against Ordnance Survey mapping and 50m contours. 1m LiDAR data and 50m terrain LiDAR data were consulted. Modifications to the natural catchment boundaries were considered necessary to one of the exported catchments to reflect the natural topography more accurately.
Record how other catchment descriptors were checked and describe any changes. Include before/after table if necessary.	A qualitative sense check was carried out for BFIHOST and FARL. The DPLBAR value was modified using the standard modification equation ($\text{Area}^{0.548}$). Catchment descriptors checked against Cranfield University (2021). Cranfield Soil and Agrifood Institute: Soils and British Geological Society (2021). Geology of Britain viewer. Underlying bedrock geology of the catchment is generally composed of mudstone, siltstone and sandstone with superficial deposits of clay, silt, sand and gravel. Typical soils across the study catchment are variable with a mixture of freely draining soils, soils with impeded drainage, floodplain soils and slowly permeable soils⁸. The BFIHOST19 value of 0.55 is considered representative of the variable nature of the catchment.
Version of URBEXT	URBEXT1990 / URBEXT2000
Method for updating of URBEXT	CPRE formula from FEH Volume 4 / CPRE formula from 2006 CEH report on URBEXT2000
Source of BFIHOST	BFIHOST19 was used in the ReFH2 calculations, since the current release (ReFH2.3) was calibrated using BFIHOST19, and also in the FEH Statistical method, since this has been found to improve the results ⁹ .

⁷ URBEXT2000 values have not been changed except to update the value to the current year.

⁸ British Geological Society (2021). UK Soil Observatory Map Viewer. Accessed: 16/11/2022. [Source: mapapps2.bgs.ac.uk/ukso/home.html].

⁹ Griffin, A., Young, A. and Stewart, E. (2019). Revising the BFIHOST catchment descriptor to improve UK flood frequency estimates. Hydrology Research.

3 Statistical method

3.1 Overview of estimation of QMED at each subject site

Site code	QMED from CDs (m ³ /s)	Final method	Data transfer						Urban adjustment factor (UAF)	Final estimate of QMED (m ³ /s)
			NRFA numbers for donor sites used (see 3.3)	Distance between centroids d _{ij} (km)	Power term, a	Moderated QMED adjustment factor, (A/B) ^a	If more than one donor			
							Weight	Weighted ave. adjustment		
RS_01	4.3	DT	28056	9.788	0.383	0.914	0.5	1.004	1.133	4.9
			28039	50.328	0.168	1.102	0.5			
RS_02	4.5	DT	28056	9.897	0.382	0.915	0.5	1.004	1.124	5.1
			28039	49.960	0.169	1.102	0.5			
Are the values of QMED spatially consistent?						Yes, QMED increases sensibly moving downstream.				
Method used for urban adjustment for subject and donor sites						WINFAP-FEHV4				
Parameters used for WINFAP v4 urban adjustment if applicable										
Impervious fraction for built-up areas, IF				Percentage runoff for impervious surfaces, PR _{imp}				Method for calculating fractional urban cover, URBAN		
0.3				0.7 (70%)				From URBEXT ₂₀₀₀		
Notes										
Methods: AM – Annual maxima; POT – Peaks over threshold; DT – Data transfer (with urban adjustment); CD – Catchment descriptors alone (with urban adjustment); BCW – Catchment descriptors and bankfull channel width (add details); LF – Low flow statistics (add details). When QMED is estimated from POT data, it should also be adjusted for climatic variation. Details should be added below.										
The QMED adjustment factor A/B for each donor site is given in Table 3.2. This is moderated using the power term, a, which is a function of the distance between the centroids of the subject catchment and the donor catchment. The final estimate of QMED is (A/B) ^a times the initial estimate from catchment descriptors.										
If more than one donor has been used, use multiple rows for the site and give the weights used in the averaging. Record the weighted average adjustment factor in the penultimate column.										
Important note on urban adjustment										
The method used to adjust QMED for urbanisation published in Kjeldsen (2010) ¹⁰ in which PRUAF is calculated from BFIHOST is not correctly applied in WINFAP-FEH v3.0.003. Significant differences occur only on urban catchments that are highly permeable.										

¹⁰ Kjeldsen, T. R. (2010). Modelling the impact of urbanization on flood frequency relationships in the UK. Hydrol. Res. **41**. 391-405.

3.2 Search for donor sites for QMED (if applicable)

Comment on potential donor sites Include a map if necessary. Note that donor catchments should usually be rural.	A number of potential donor catchments for this study were identified using the NFRA website as there are no donor catchments available within the study catchments. Two were taken forward for further consideration as a potential donor catchment: • 28056 - Rothley Brook @ Rothley • 28039 - Rea @ Calthorpe Park Both catchments were identified by NFRA as potentially suitable due to a mixture of proximity and on hydroclimatological similarities to the study catchments. Upon assessment of catchments descriptors, it was considered that a combination of both catchments with equal weighting would be suitable for a donor catchment due to the variance in catchment descriptors in the study catchments.
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3.3 Donor sites chosen and QMED adjustment factors

NRFA no.	Reasons for choosing	Method (AM or POT)	Adjustment for climatic variation ?	QMED from flow data (A)	QMED from catchment descriptors (B)	Adjustment ratio (A/B) *
28039	Hydroclimatological similarities and location within close proximity to the study catchment.	AM	No	31.7	10.7	1.78
28056	Hydroclimatological similarities and location within close proximity to the study catchment.	AM	No	12.1	14.2	0.79
28086	NA – not chosen due to difference in catchment characteristics	-	-	21.3	18.4	1.12
28082	NA – not chosen due to difference in catchment characteristics	-	-	16.3	18.6	0.84
28026	NA – not chosen due to difference in catchment characteristics	-	-	49.2	37.3	1.21
54102	NA – not chosen due to difference in catchment characteristics	-	-	13.6	13.3	1.02
* After application of separate 'de-urbanisation' factors to the observed QMED values.						

3.4 Derivation of pooling groups

Several subject sites may use the same pooling group.

Name of group	Site code from whose descriptor s group was derived	Subject site treated as gauged? (enhanced single site analysis)	Changes made to default pooling group, with reasons	Weighted average L-moments, L-CV and L-skew, (before urban adjustment)
RS_02 Pooling	RS_02	No	<u>Removed</u> 7011 (Black Burn @ Pluscarden Abbey) – Highly rural 38020 (Cobbins Brook @ Sewardstone Road) – Highly impermeable <u>Added</u> 26003 (Foston Beck @ Foston Mill)	L-CV: 0.276, L-SKEW: 0.157.

Note: Pooling groups were derived using the procedures from Science Report SC050050 (2008).

3.5 Derivation of flood growth curves at subject sites

Site code	Method (SS, P, ESS, J)	If P, ESS or J, name of pooling group (Error! Reference source not found.)	Distribution used and reason for choice	Note any urban adjustment or permeable adjustment	Parameters of distribution (location, scale and shape after adjustments)	Growth factor for 100-year return period
RS_01	P	RS_02 Pooling	GL Distribution recommended by WINFAP software and is the preferred distribution for UK catchments.	WINFAP-FEHV4	Location: 1.000 Scale: 0.267 Shape: -0.174	2.88
RS_02	P	RS_02 Pooling			Location: 1.000 Scale: 0.268 Shape: -0.173	2.88

Notes

Methods: SS – Single site; P – Pooled; ESS – Enhanced single site; J – Joint analysis

A pooling group (or ESS analysis) derived at one gauge can be applied to estimate growth curves at a number of ungauged sites. Each site may have a different urban adjustment, and therefore different growth curve parameters. Urban adjustments are all carried out using the method of Kjeldsen (2010).

Growth curves were derived using the procedures from Science Report SC050050 (2008).

3.6 Flood estimates from the statistical method

Site code	Flood peak (m ³ /s) for the following return periods (in years)					
	50% AEP	3.3% AEP	1% AEP	1% AEP + 22% Climate change allowance Central	1% AEP + 30% Climate change allowance Higher	0.1% AEP
RS_01	4.9	10.9	14.1	17.2	18.4	22.4
RS_02	5.1	11.3	14.7	17.9	19.1	23.3

4 Revitalised flood hydrograph 2 (ReFH2) method

4.1 Parameters for ReFH2 model

In accordance with research findings, all catchments with URBEXT2000 up to 0.30 were modelled as if they were rural. Research on flood estimation in small catchments¹¹ found that flood frequency estimates on such catchments were more accurate if the catchment was treated as rural. This reflects the difficulty of generalising the complex and locally-specific effects that urban development has on flood flows.

All catchments					Only extremely heavily urbanised catchments
Site code	Method	C _{max} (mm)	T _p _{rural} (hours)	BL (hours)	Area of catchment modelled as urban (km ²)
RS_01	CD	478.8	7.43	57.16	-
RS_02	CD	477.55	7.66	57.54	-
Link to details of any lag or flood event analysis		-			
Version of the ReFH2 model applied		ReFH2.3 using the water balance option. This treats BR (baseflow recharge) as a state variable rather than a parameter, setting it automatically in order to conserve volume. The values of BR vary with return period and so are not reported here.			
Parameters for urban runoff model		The impervious fraction of urban areas, IF, was kept at its default of 0.4. The impervious runoff factor, IRF, (which can also be interpreted as the fraction of the impervious surface that is positively drained) was kept at its default of 0.7. The depression storage was kept at its default of 0.5mm. Tp for runoff from areas modelled as positively drained was calculated as 0.75 times Tp _{rural} .			
Methods: OPT: Optimisation from fitting to observed flow data, BR: Baseflow recession fitting, CD: Catchment descriptors, DT: Data transfer (give details)					

4.2 Design events for ReFH2 method: Lumped catchments

Site code	Urban or rural	Season of design event (summer or winter) ¹²	Storm duration (hours)
RS_01	Rural	Winter	14:45:00
RS_02	Rural	Winter	14:45:00
Are the storm durations likely to be changed in the next stage of the study, e.g. by optimisation within a hydraulic model?		Storm Duration stated in the table is the Critical Storm Duration (CSD) for each individual Flood Estimation Point, determined through sensitivity testing of a range of durations within ReFH2 to determine the duration that produced the highest flow. The storm duration is used	

¹¹ Stewart, Lisa, Duncan Faulkner, Giuseppe Formetta, Adam Griffin, Tracey Haxton, Ilaria Prosdoci, Gianni Vesuviano and Andy Young (2021). Estimating flood peaks and hydrographs for small catchments (Phase 2). Report – SC090031/R0, Environment Agency.

¹² Winter Profile used in line with Pg 109 in Environment Agency (2020) Flood estimation guidelines: Technical guidance 197_08 (Version 5).

here to undertake 'worst case' scenario flow comparisons between ReFH2 and FEH Statistical for each individual flow point.

For modelling purposes, the design storm duration used for final model use will be the average design storm duration derived between the two FEP's along the River Sense as the watercourse which is considered to be the primary source of risk to the study site.

The model hydrographs will be derived to a Critical Storm Duration of 14:45:00.

4.3 Flood estimates from the ReFH2 method

Note: This table is for recording results for lumped catchments. There is no need to record peak flows from sub-catchments or intervening areas that are being used as inputs to a semi-distributed model of the river system.

Site code	Flood peak (m ³ /s) for the following return periods (in years)					
	50% AEP	3.3% AEP	1% AEP	1% AEP + 22% Climate change allowance Central	1% AEP + 30% Climate change allowance Higher	0.1% AEP
RS_01	4.4	8.5	12.0	14.6	15.6	21.0
RS_02	4.6	8.9	12.5	15.3	16.3	21.9

5 Discussion and summary of results

5.1 Comparison of results from different methods

This table compares peak flows from various methods with those from the FEH Statistical method at example sites for two key return periods. Blank cells indicate that results for a particular site were not calculated using that method.

Site code	Ratio of peak flow to FEH Statistical peak	
	Return period 2 years	Return period 100 years
	ReFH2	ReFH2
RS_01	0.89	0.85
RS_02	0.90	0.85

5.2 Final choice of method

Choice of method and reasons Include reference to type of study, nature of catchment and type of data available.	Flows derived through the application of the ReFH2 model were compared with those derived from the FEH statistical method. Flows derived from the FEH Statistical methodology are shown to be up to 22% greater than flows derived from ReFH2 methodology. LIT 11832 Flood Estimation Guidelines (2022) v4 states that the statistical method is based on a much larger dataset of flood events and has been more directly calibrated to reproduce flood frequency on UK catchments, therefore it is often preferable over design event (rainfall-runoff) approaches. The FEH statistical method in this case also benefits from the availability of directly gauged flood flow data for the larger catchment inflows, whereas the ReFH2 estimates are based on broad-scale catchment descriptor methods, with a typically larger uncertainty. The preferred method for peak flows is the FEH Statistical method. The Statistical method is valid for up to a 150-year AEP approximately and less certain for rarer events. Therefore, peak flows derived using the FEH Statistical method for the 1000-year event has been adjusted to apply the growth factor derived from ReFH2 methodology (often referred to as the “Hybrid” approach) for FEP’s where the ReFH2 growth factor will result in a greater peak flow. If the 0.1% peak flow is greater without the ReFH2 growth factor applied, the peak flow will remain as is. For MT_01 (discontinued mill channel), due to the catchment size, peak flows were calculated for this catchment using ReFH2 to the Critical Storm Duration of 14:45:00 as a further extension of the “Hybrid” approach. Guidance on choice of method for flood estimation on small catchments (defined within the guidance as catchments under 25km²) was developed in Science Project SC090031: Estimating flood peaks and hydrographs for small catchments. In accordance with the report on Phase 1 (Faulkner and others, 2012) it was recommend that the flood estimates on small catchments are derived from FEH methods (Statistical or ReFH2) and not from older methods. In addition, Phase 2 of the small catchments research, SC090031 (Stewart and others, 2019) found that on average the ReFH2 method gave a slightly reduced bias and lower factorial standard error than FEH Statistical when estimating QMED on small catchments.
How will the flows be applied to a hydraulic model? If relevant. Will model inflows be adjusted to achieve a match with lumped flow estimates, or	The single catchment inflow will be distributed along the model reach at locations where RS_01 has been identified in Figure 2.1. The inflow hydrograph and peak flow obtained using the FEH method will be taken forward for modelling purposes. During the modelling phase of this study, if it is found that a lateral inflow is required, flows for the lateral area will be derived by manually deriving the

will the model be allowed to route inflows?	lateral catchment and flows will be calculated using manually derived catchment descriptors. For modelling purposes, hydrographs for both FEP's will be derived to the Critical Storm Duration of 14:45:00 (Average storm duration of RS_01 and RS_02). Hydrographs for modelling purposes are located within Annex C.
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5.3 Assumptions, limitations and uncertainty

List the main assumptions made (specific to this study)	The main assumptions are: -The data used for the derivation of local design flow estimates are accurate. -The design peak flows derived are representative of those that would be observed during flood events; -The catchment boundaries and descriptors have been assumed to be representative; -The pooling group used to derive peak flow estimates is representative of the subject catchment; -Design hydrographs generated using the ReFH2 model are representative of those that would be observed during typical flood events. -Peak flows, rather than hydrograph volumes, are assumed to be the main control on flood risk at the site.									
Discuss any particular limitations, e.g. applying methods outside the range of catchment types or return periods for which they were developed.	Limitations are generic to the methods used.									
Give what information you can on uncertainty in the results, e.g. confidence limits from Kjeldsen (2014).	No published methods of calculating confidence intervals exist for ReFH hydrological models; therefore, the uncertainty for each of these watercourses is difficult to quantify. The uncertainty will depend on many factors, for example, how unusual the study catchment is relative to the pooling group and donor catchment, and the uncertainty in flow measurement at other gauges. However, a UK average measure of uncertainty has been produced by Kjeldsen (2014). The 95% confidence limits for a 1% AEP flood estimate are: • Without donor adjustment of QMED: 0.42 – 2.37 times the best estimate • With donor adjustment of QMED: 0.45 – 2.25 times the best estimate A recently published R&D project into FEH, local data and uncertainty (Environment Agency funded consortium of JBA, CEH and others) established that the following range of a 95% confidence interval is to be expected per design flood for a rural site (numbers quoted are multipliers): <table><tr><td>AEP</td><td>No donor</td><td>1 donor</td></tr><tr><td>50%</td><td>0.48 – 2.10</td><td>0.50 – 2.02</td></tr><tr><td>1%</td><td>0.45 – 2.23</td><td>0.47 – 2.12</td></tr></table>	AEP	No donor	1 donor	50%	0.48 – 2.10	0.50 – 2.02	1%	0.45 – 2.23	0.47 – 2.12
AEP	No donor	1 donor								
50%	0.48 – 2.10	0.50 – 2.02								
1%	0.45 – 2.23	0.47 – 2.12								
Comment on the suitability of the results for future studies, e.g. at nearby locations or for different purposes.	These flow estimates were derived specifically for this study. They should not be used elsewhere without at least being reviewed for suitability.									
Give any other comments on the study, e.g. suggestions for	Confidence could be improved through installation of hydrometric monitoring and event hydrometric data.									

additional work.	
------------------	--

5.4 Checks

Are the results consistent, for example at confluences?	Yes, results are considered sensible in that they increase with downstream distance where applicable.
What do the results imply regarding the return periods of floods during the period of record?	No data is available in regards to flood events applicable to the site. No flow gauges or active raingauges are available within the study catchment, therefore no comparison with previous events can be undertaken at this stage.
What is the range of 100-year growth factors? Is this realistic?	The 1% AEP growth factor for each of the methods are: - FEH Statistical: 2.88 - ReFH2: 2.73 The typical range is 2.1 to 4.0 (based on FSR regional growth curves) therefore the 1% AEP growth factor for all FEP's are inside the typical range for both flow estimation methodologies.
If 1000-year flows have been derived, what is the range of ratios for 1000-year flow over 100-year flow?	The 0.1%/ 1% AEP event growth factor for each of the methods are: - FEH Statistical: 1.58-1.59. - ReFH2: 1.75-1.76.
How do the results compare with those of other studies? Explain any differences and conclude which results should be preferred.	No other studies complete with estimated peak flows are available at time of writing.
Are the results compatible with the longer-term flood history?	This will be determined at the modelling stage.
Describe any other checks on the results	-

5.5 Final results

Site code	Flood peak (m ³ /s) for the following return periods (in years)					
	50% AEP	3.3% AEP	1% AEP	1% AEP + 22% Climate change allowance Central	1% AEP + 30% Climate change allowance Higher	0.1% AEP
RS_01	4.9	10.9	14.1	17.2	18.4	24.8*
MT_01	0.2	0.4	0.6	0.7	0.8	1.0
RS_02	5.1	11.3	14.7	17.9	19.1	25.7*
* ReFH2 growth factor applied						

If flood hydrographs are needed for the next stage of the study, where are they provided? (e.g. give filename of spreadsheet, hydraulic model, or reference to table below)	Annex B.
---	----------

6 Annex A: Pooling Group

UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

Date of creation: 18-05-2023 09:00:16
Software: WINFAP Version: 5.0.8181 (30330)
Peak Flow dataset: Peak Flow Dataset 11.1.1
Supplementary data used: No

Site details

Site number: 1254805810
Site name: RS_02
Site location: SK 37600 07600
Easting: 437600
Northing: 307600
Catchment area: 35.77 km²
SAAR: 690 mm
BFIHOST19: 0.550
FPEXT: 0.094
FARL: 0.992
URBEXT2000: 0.0930

Analysis settings

At-site data

At-site data present: No

Urbanisation settings

User defined: No
Urban area: 5.21 km²
PRimp: 70.00%
Impervious Factor: 0.300
UAF: 1.12332

Growth curve settings

Distance Measure Method: Standard
Pooling group URBEXT2000 Threshold: 0.150
Deurbanise Pooling Group L-moments: Yes

QMED settings

Use at-site data: No
Method: User Defined

Growth curve data and results

Pooling Group

Station	Distance	Years of data	QMED AM	L-CV Observed	L-CV Deurbanised	L-SKEW Observed	L-SKEW Deurbanised	Discordancy
36011 (Stour Brook @ Sturmer)	0.486	51	6.780	0.288	0.305	0.179	0.162	0.368
41020 (Bevern Stream @ Clappers Bridge)	0.521	52	13.780	0.201	0.203	0.166	0.164	1.613
26013 (Driffield Trout Stream @ Driffield)	0.559	11	2.700	0.281	0.282	0.196	0.195	2.758
33054 (Babingley @ Castle Rising)	0.589	45	1.136	0.229	0.229	0.183	0.182	0.809
30006 (Slea @ Leasingham Mill)	0.616	36	1.858	0.306	0.314	0.194	0.187	0.300
36004 (Chad Brook @ Long Melford)	0.655	54	4.873	0.301	0.302	0.170	0.169	0.620
33032 (Heacham @ Heacham)	0.678	53	0.449	0.297	0.298	0.129	0.128	0.449
39089 (Gade @ Bury Mill)	0.692	48	0.622	0.231	0.236	0.084	0.079	0.295
30013 (Heighington Beck @ Heighington)	0.700	45	0.653	0.367	0.385	0.438	0.422	2.384
53017 (Boyd @ Bitton)	0.701	48	13.908	0.240	0.242	0.081	0.079	0.233
26003 (Foston Beck @ Foston Mill)	0.727	60	1.779	0.250	0.251	-0.007	-0.008	1.171
Total		503						

Short records Discordant No Pooling No Pooling, no QMED

Pooling Group Rejected Stations

Station	Distance	Years of data	QMED AM	L-CV Observed	L-CV Deurbanised	L-SKEW Observed	L-SKEW Deurbanised
38020 (Cobbins Brook @ Sewardstone Road)	0.475	50	7.523	0.329	0.340	0.325	0.316
7011 (Black Burn @ Pluscarden Abbey)	0.670	9	5.205	0.491	0.491	0.521	0.521

Growth curve L-moments

Rural L-CV: 0.276 Urban L-CV: 0.262
Rural L-Skewness: 0.157 Urban L-Skewness: 0.173

Rural fitted parameters

Distribution	Location	Scale	Shape	H	Bound
GL	1.000	0.285	-0.157		-0.815
GEV	0.839	0.440	0.020		22.969
KAP3	0.920	0.353	-0.077	-0.400	-3.686

Urban fitted parameters

Distribution	Location	Scale	Shape	H	Bound
GL	1.000	0.269	-0.173		-0.554
GEV	0.850	0.409	-0.004		-91.607
KAP3	0.925	0.330	-0.096	-0.400	-2.500

Goodness of fit

GL: 0.4700 *

GEV: -1.7821

P3: -2.5483

GP: -6.6107

KAP3: -0.3747 *

** Distribution gives an acceptable fit (absolute Z value < 1.645)*

Heterogeneity

Standardised test value H2: 1.1723

The pooling group is possibly heterogeneous and a review of the pooling group is optional.

Standardised growth curves

Rural

Return period	GL	GEV	KAP3
2	1.000	1.000	1.000
5	1.442	1.490	1.463
10	1.749	1.808	1.778
20	2.068	2.109	2.093
25	2.176	2.204	2.196
30	2.266	2.280	2.281
50	2.531	2.492	2.524
75	2.755	2.658	2.722
100	2.922	2.775	2.866
200	3.356	3.052	3.225
500	4.005	3.412	3.729
1000	4.560	3.680	4.134

Urban

Return period	GL	GEV	KAP3
2	1.000	1.000	1.000
5	1.421	1.465	1.440
10	1.718	1.774	1.745
20	2.031	2.072	2.055
25	2.137	2.167	2.157
30	2.227	2.244	2.242
50	2.490	2.459	2.486
75	2.715	2.629	2.687
100	2.884	2.750	2.834
200	3.325	3.040	3.204
500	3.992	3.425	3.731
1000	4.572	3.717	4.162

QMED data and results

QMED

Rural: 5.000 m³/s

Urban: 5.617 m³/s

Flood Frequency Curve

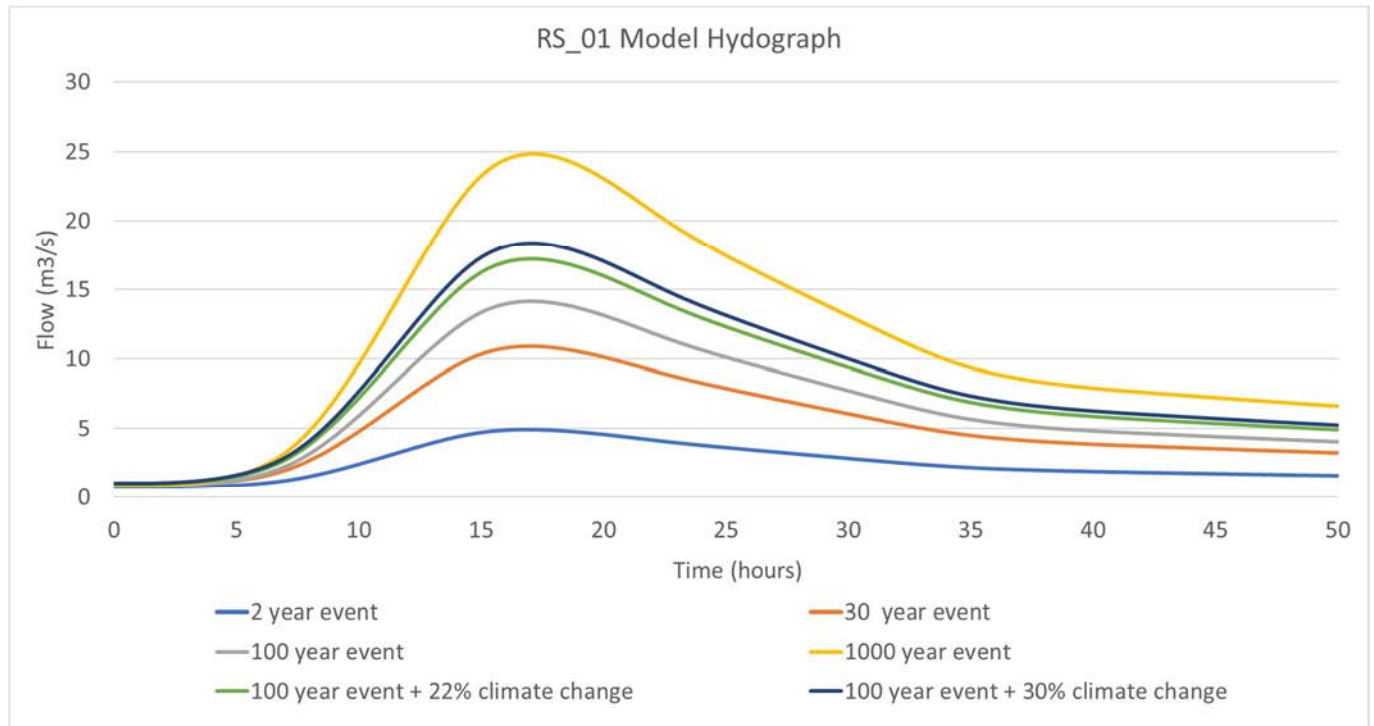
Rural Flood Frequency Curve

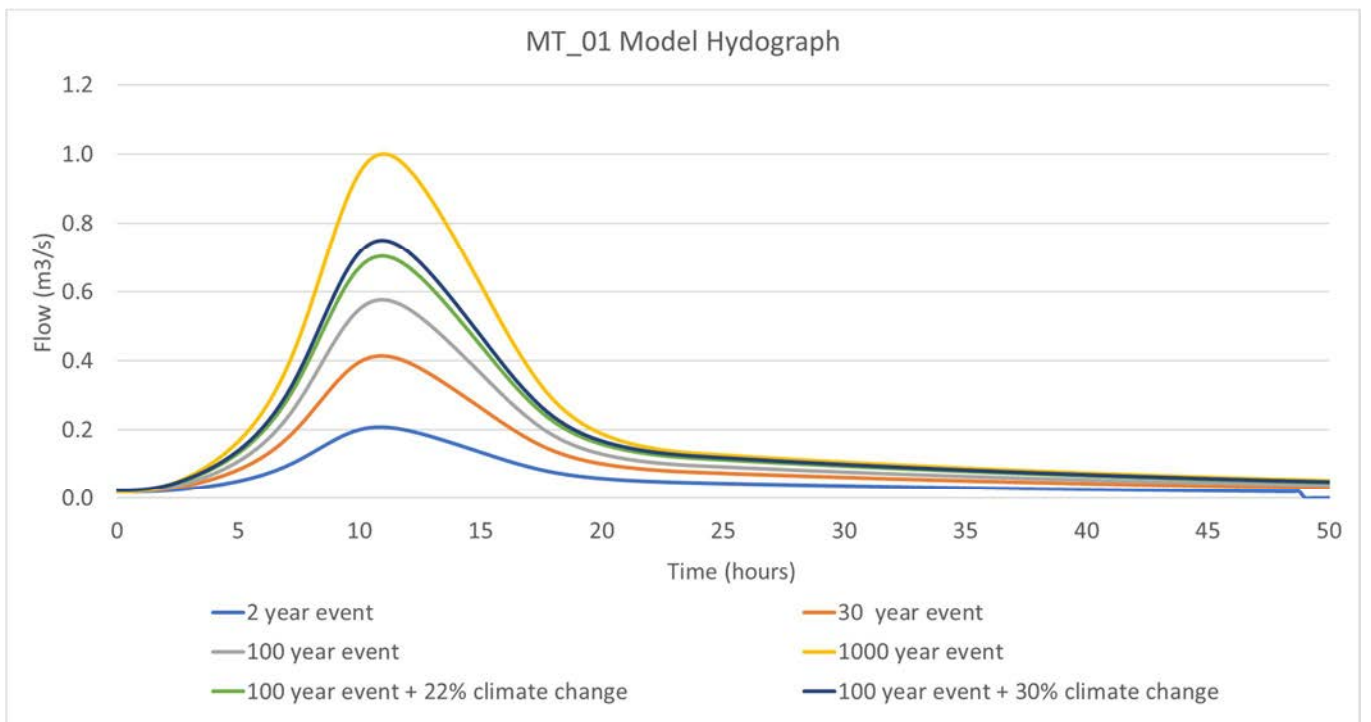
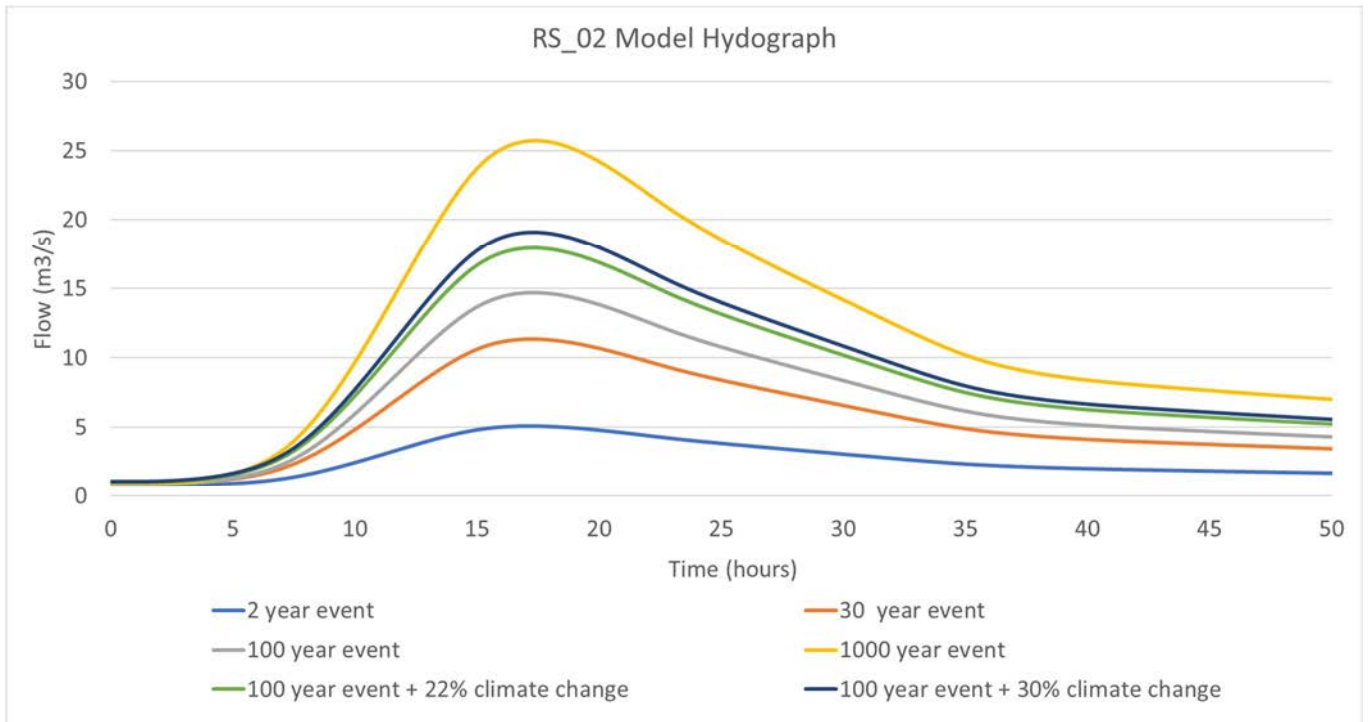
Return period	GL (m ³ /s)	GEV (m ³ /s)	KAP3 (m ³ /s)
2	5.000	5.000	5.000
5	7.210	7.449	7.317
10	8.744	9.040	8.891
20	10.341	10.545	10.464
25	10.881	11.018	10.979
30	11.332	11.401	11.404
50	12.656	12.460	12.618
75	13.777	13.290	13.609
100	14.612	13.873	14.329
200	16.780	15.260	16.126
500	20.023	17.062	18.646
1000	22.801	18.402	20.671

Urban Flood Frequency Curve

Return period	GL (m ³ /s)	GEV (m ³ /s)	KAP3 (m ³ /s)
2	5.617	5.617	5.617
5	7.979	8.229	8.090
10	9.647	9.967	9.803
20	11.406	11.638	11.542
25	12.004	12.170	12.116
30	12.506	12.603	12.592
50	13.988	13.810	13.961
75	15.250	14.766	15.090
100	16.197	15.444	15.915
200	18.673	17.076	17.994
500	22.423	19.237	20.957
1000	25.677	20.877	23.376

7 Annex B: Design Hydrograph





Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

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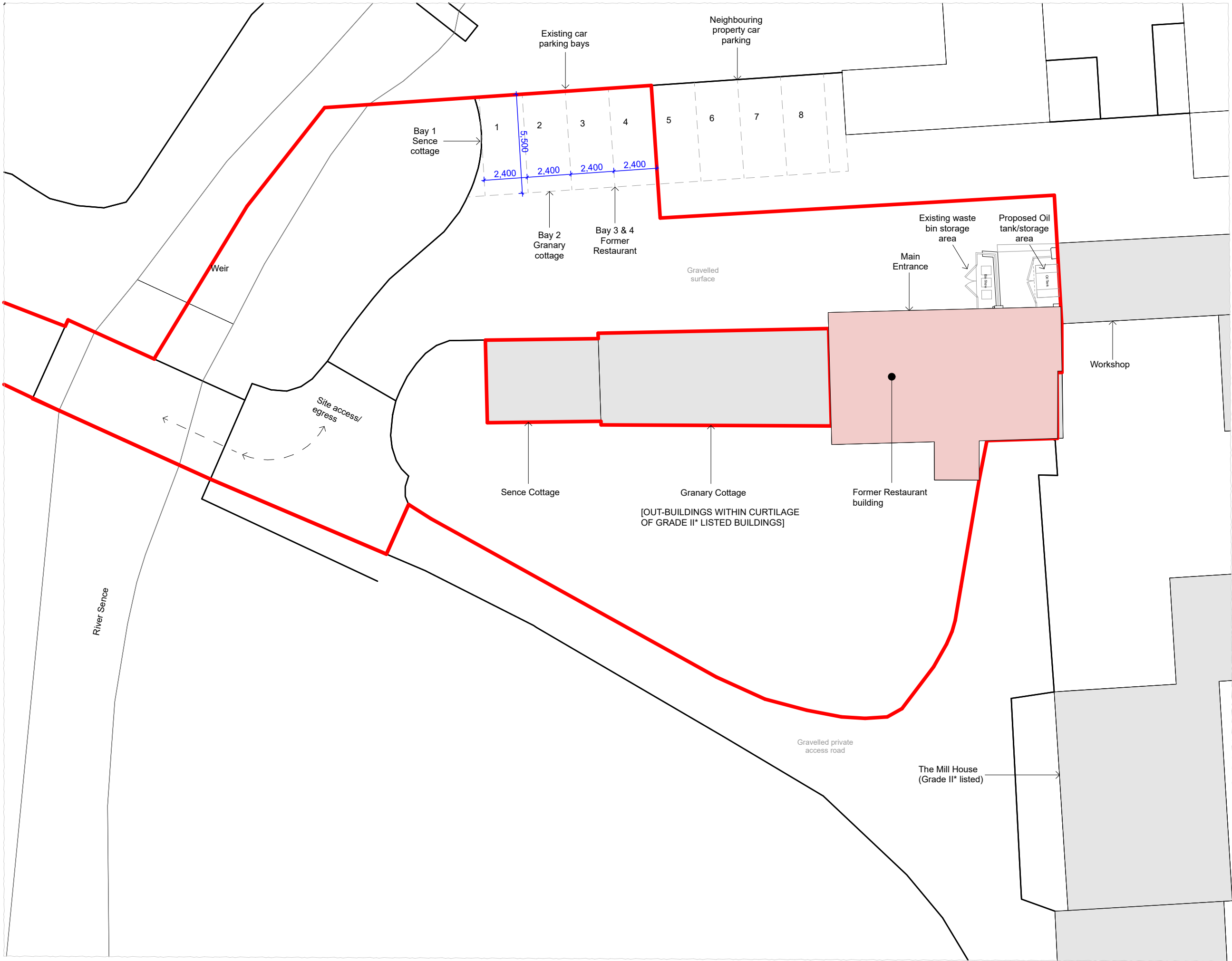
Jeremy Benn Associates Limited

Registered in England 3246693

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
ISO 45001: 2018



D The proposal



Proposed Site Plan
Scale - 1:200@A3

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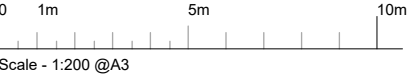
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- Key
- Existing buildings within site boundary
 - Proposed area of development
 - Proposed site development boundary

05	02.02.23	Proposed Oil tank/storage area added	JC	RT
04	19.01.23	Boundary line around Sence & Granary Cottage indicated	JC	RT
03	25.11.22	Car park boundary and notes added	JC	RT
02	24.11.22	Site boundary updated	JC	RT
01	06.10.22	First Issue	JC	RT
Rev	Date	Comment	Dr	Ch

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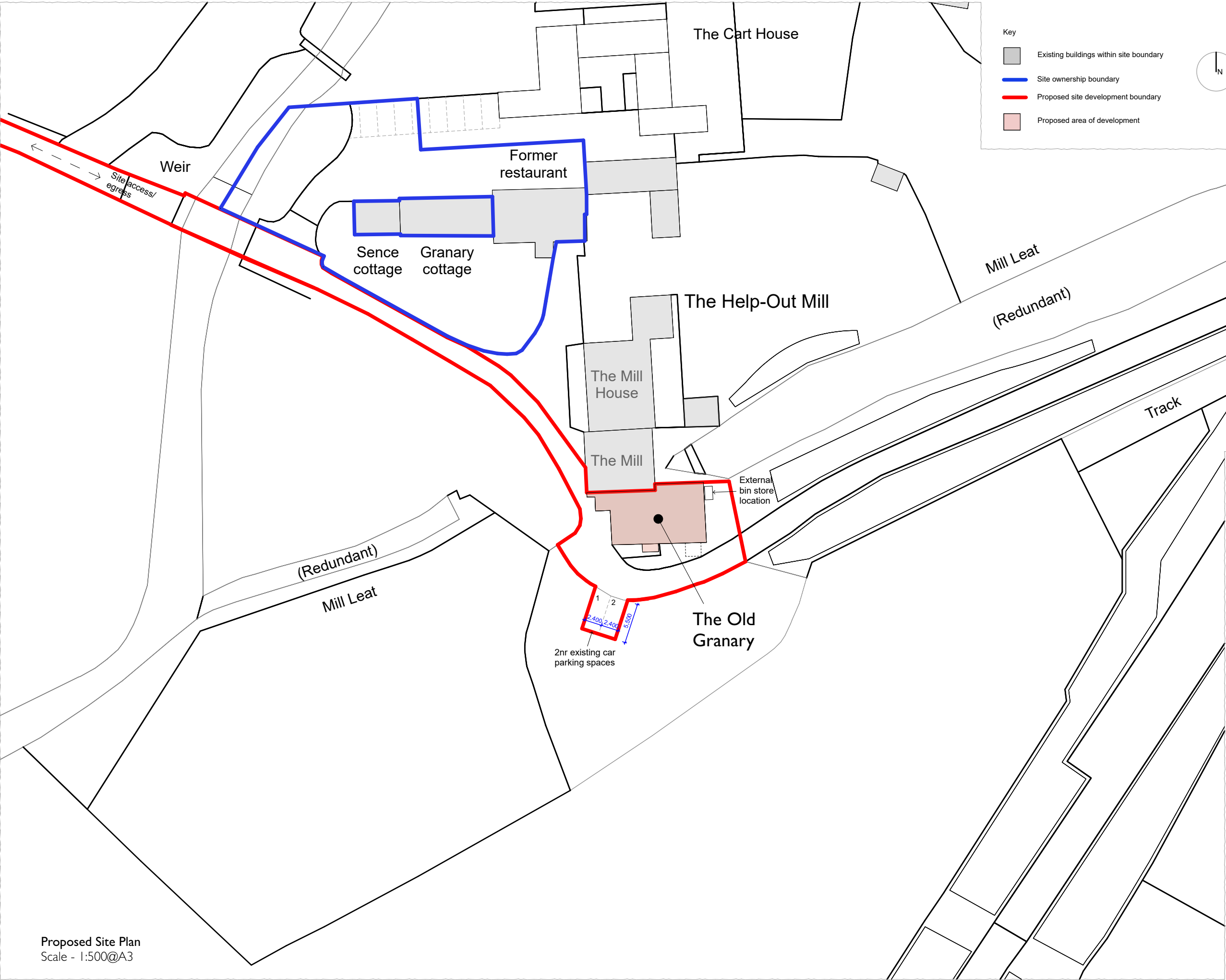
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architecture@gwp-arch.com | www.gwp-arch.com

GWPA Ref (504)-2219

Job Title
Help Out Mill, Shackerstone Nuneaton

Client
Mr and Mrs Garnett

Former Restaurant - Proposed Site Plan			
Name (504)-2219-GWP-00-DR-A-(PA)-0002			
Scale	1:200@A3	Revision	P05
Drawn/Checked	JC/RT	First Issue	06.10.22
Drawing Status	S - WIP		
BIMcloud: DESKTOP-H2C1QHA - BIMcloud Basic for Archicad 26/504-2219-GWP-XK-ZZ-M3-A-1B-P01_Help Out Mill			



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05	20.01.23	Scale updated	JC	RT
04	19.01.23	Boundary line around Sence & Granary Cottage indicated	JC	RT
03	25.11.22	Car park boundary and notes added	JC	RT
02	24.11.22	Site boundary updated	JC	RT
01	04.10.22	First Issue	JC	RT
Rev	Date	Comment	Dr	Ch



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architecture@gwp-arch.com | www.gwp-arch.com

GWPA Ref (504)-2219

Job Title
Help Out Mill, Shackerstone
Nuneaton

Client

Mr and Mrs Garnett

The Old Granary - Proposed Site
Plan

Name (504)-2219-GWP-01-00-DR-A-(PA)-0010

Scale 1:500@A3 Revision P05

Drawn/Checked JC/RT First Issue 04.10.22

Drawing Status S - WIP

/Volumes/Data/CAD/(504)-2219-Help Out Mills, Nuneaton/A_Architects_(GWP)/Model/
504-2219-GWP-XX-ZZ-M3-A-1B-P01_Help Out Mill.pln

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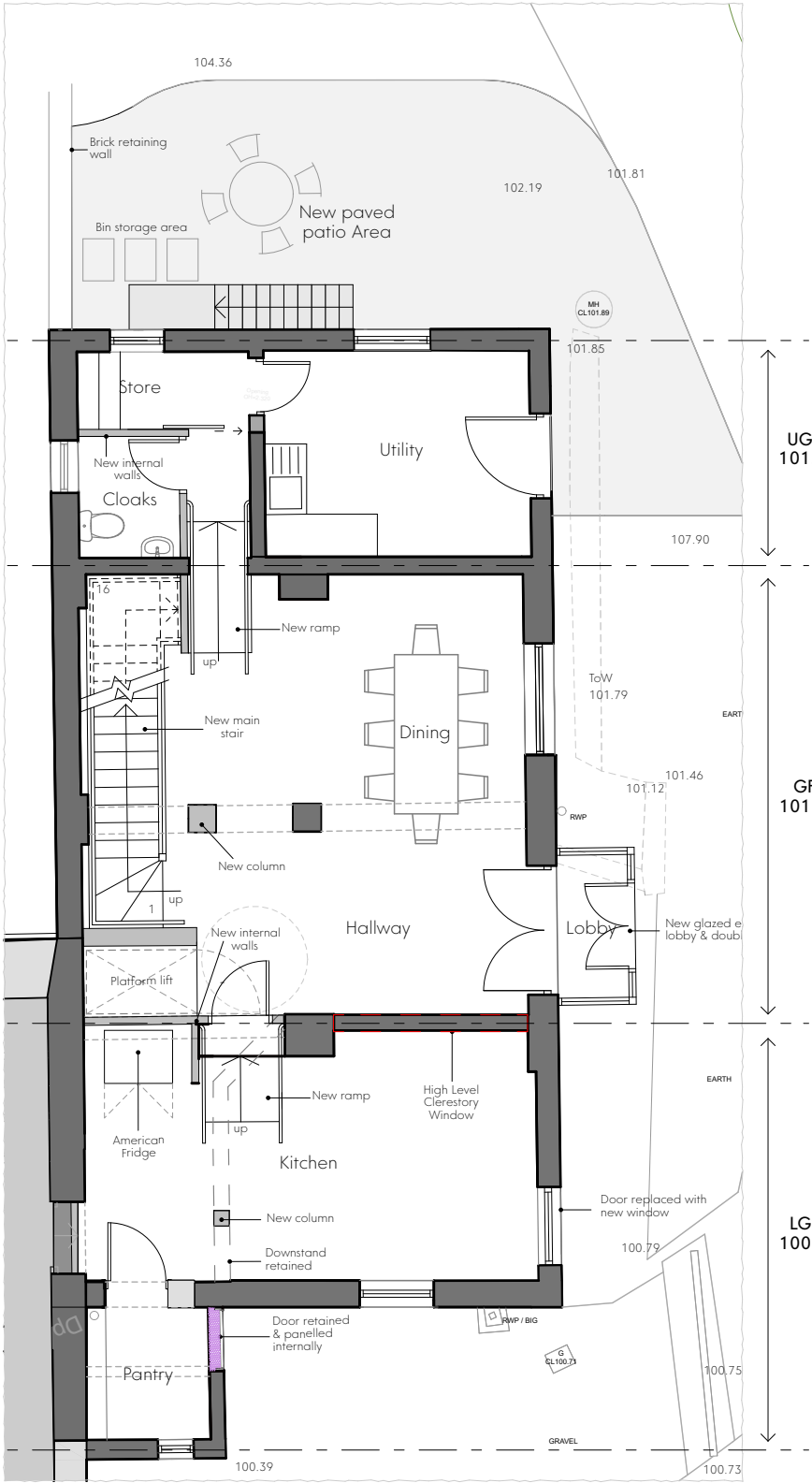
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Written dimensions should be taken.

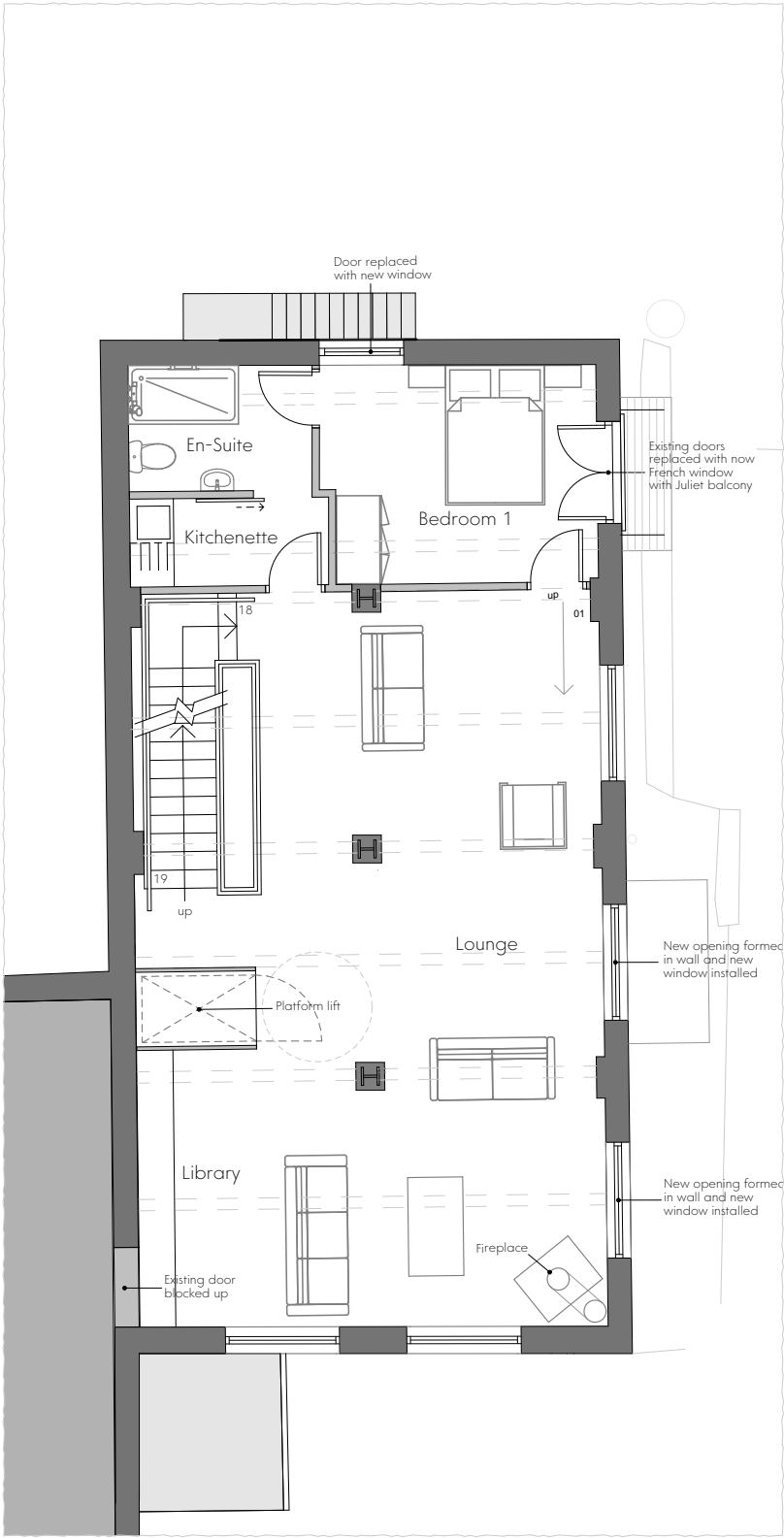
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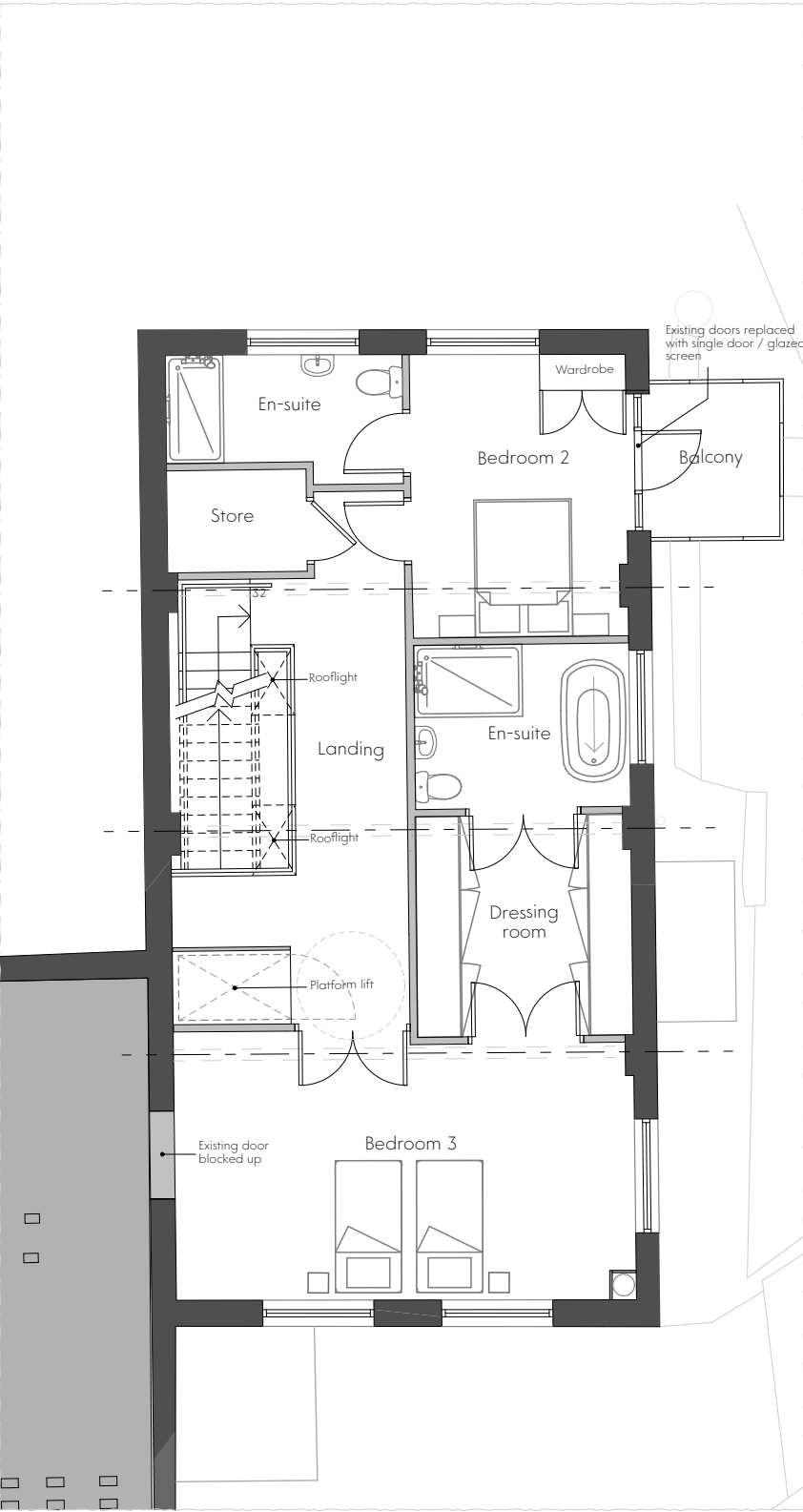
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Proposed Ground Floor Plan
Scale - 1:100@A3



Proposed First Floor Plan
Scale - 1:100@A3



Proposed Second Floor Plan
Scale - 1:100@A3

05	06.01.23	Levels Added	NMS	JC
04	25.11.22	Staircase and first floor layout updated	JC	RT
03	24.11.22	Drawing updated	JC	RT
02	15.11.22	Patio area updated	JC	RT
01	30.09.22	First Issue	JC	RT
Rev	Date	Comment	Dr	Ch

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GWPA Ref: (504)-2219

Job Title: Help Out Mill, Shackerstone Nuneaton

Client: Mr and Mrs Garnett

The Old Granary - Proposed Floor Plans

Name (504)-2219-GWP-01-00-DR-A-(PA)-001

Scale	1:100@A3	Revision	P05
Drawn/Checked	JC/RT	First Issue	30.09.22
Drawing Status	S - WIP		

/Volumes/Data/CAD/(504)-2219-Help Out Mills, Nuneaton/A_Architects_(GWP)/Model/504-2219-GWP-XX-ZZ-M3-A-18-P01_Help Out Mill.pjn

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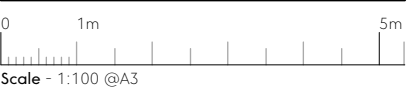
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Written dimensions should be taken.

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- Key
- Existing wall elements
 - New proposed wall elements

04	27.01.23	Oil tank storage area added to front of property	JC	RT
03	25.11.22	Note added to external store / privy & door ID01 removed	JC	RT
02	30.09.22	Layout Updates	JC	RT
01	07.09.22	First Issue	DC	RT
Rev	Date	Comment	Dr	Ch



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GWPA Ref (504)-2219

Job Title Help Out Mill, Shackerstone Nuneaton

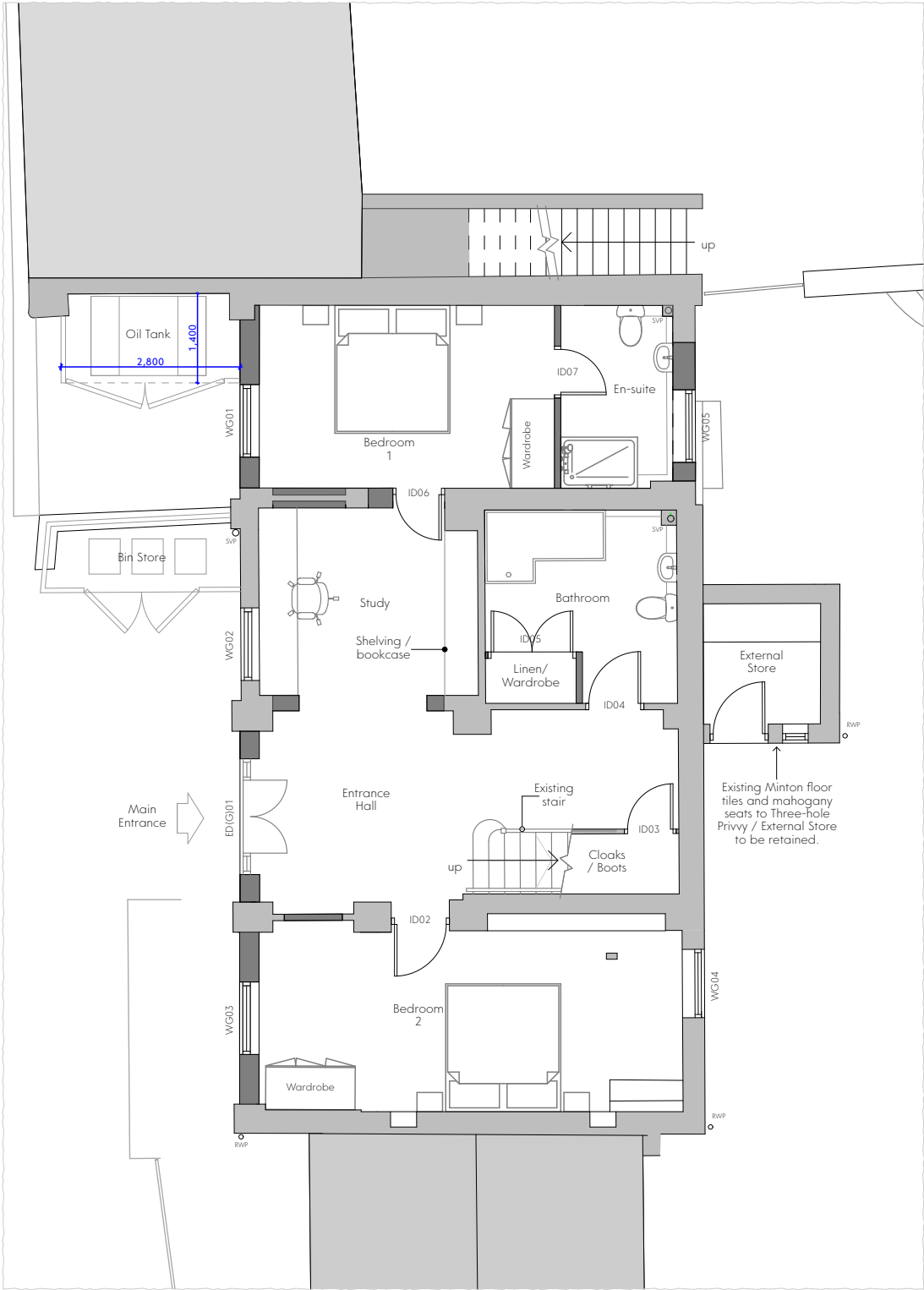
Client

Mr and Mrs Garnett

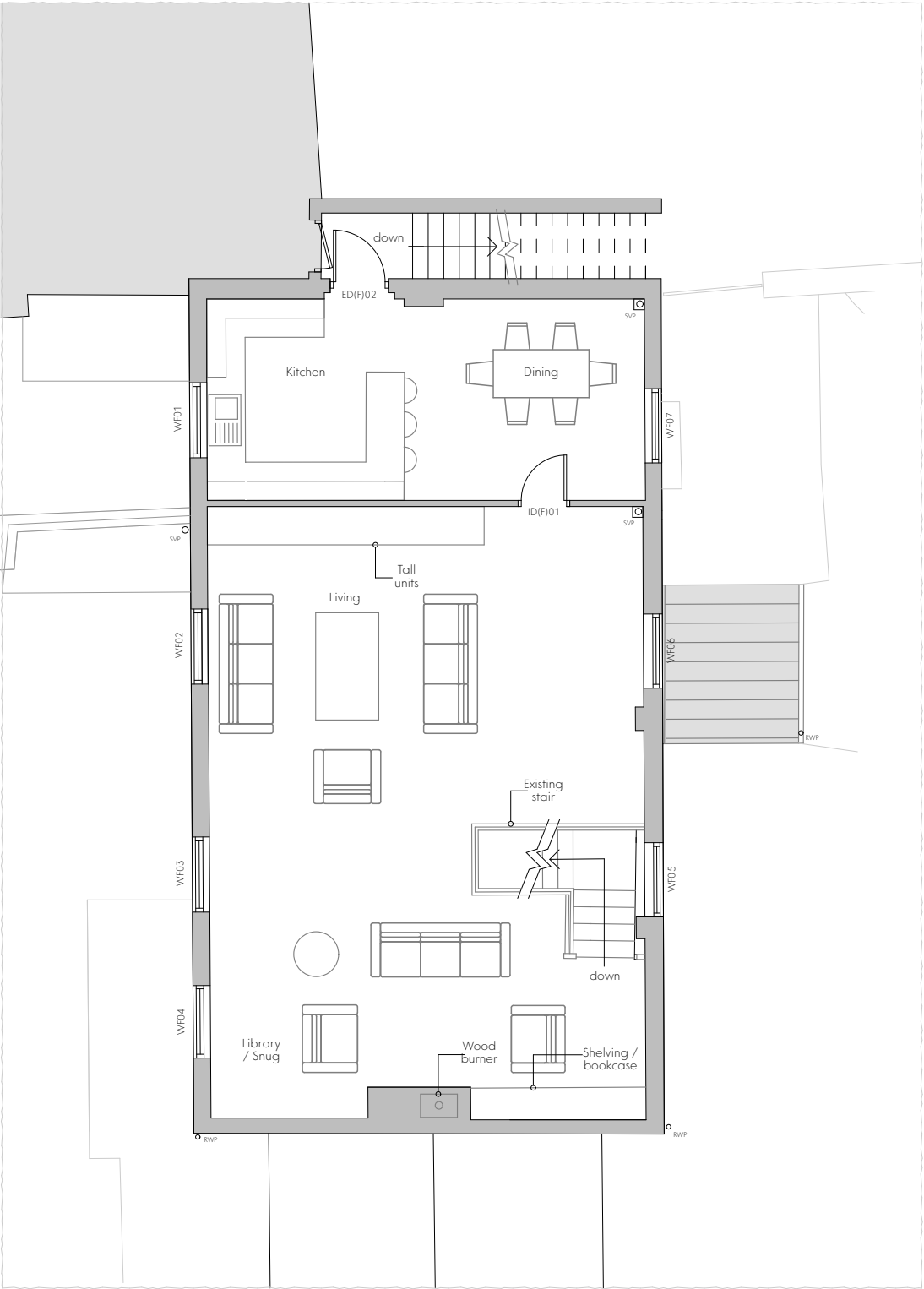
Former Restaurant - Proposed Floor Plans

Name (504)-2219-GWP-01-DR-A-(PA)-0005			
Scale	1:100@A3	Revision	P04
Drawn/Checked	NMS/RT	First Issue	07.09.22
Drawing Status	S - WIP		

/Volumes/Data/CAD/(504)-2219-Help Out Mills, Nuneaton/A_Architects_(GWP)/Model/504-2219-GWP-XX-ZZ-M3-A-18-P01_Help Out Mill.rvt



Proposed Ground Floor Plan
Scale - 1:100@A3



Proposed First Floor Plan
Scale - 1:100@A3

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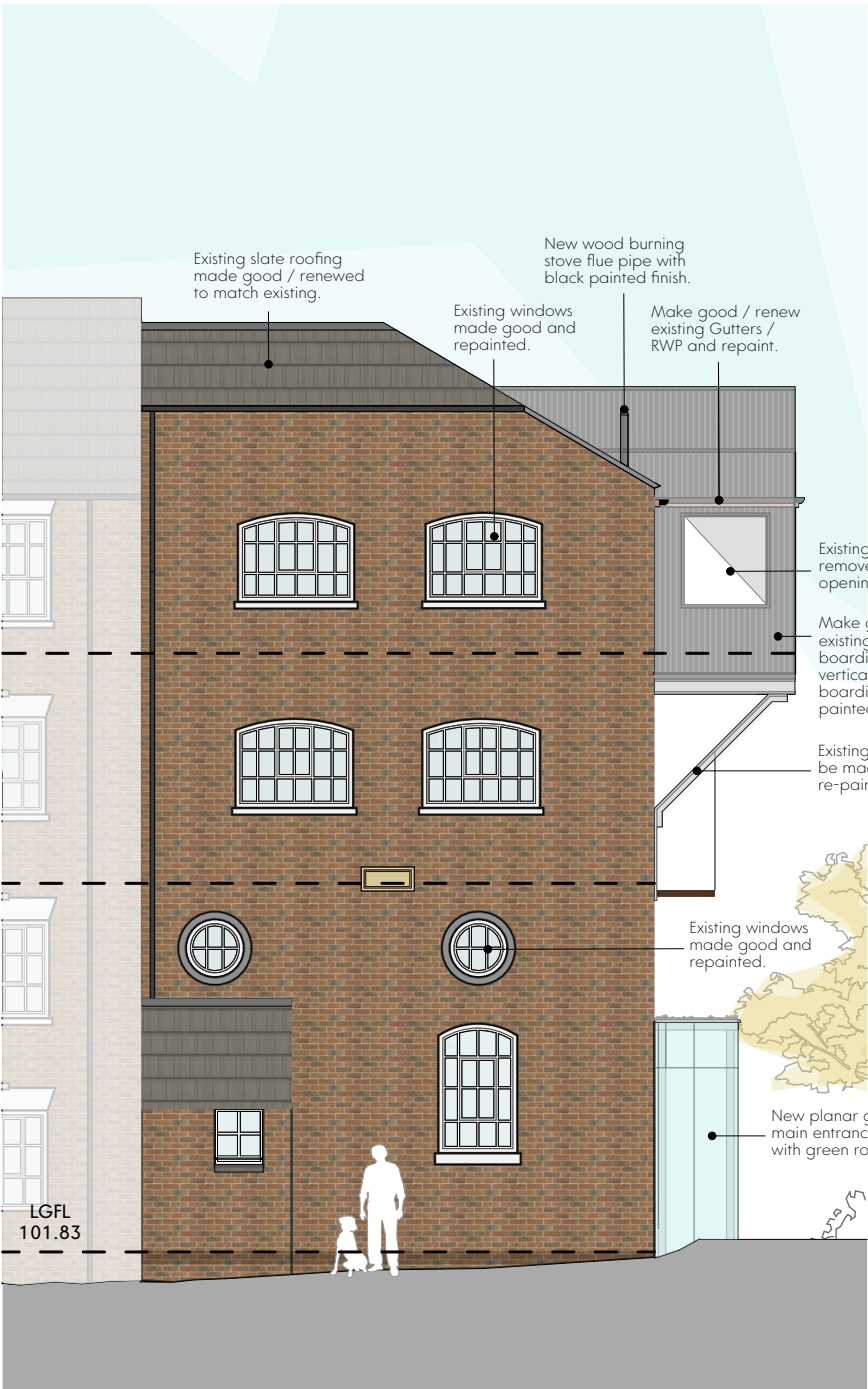
Do not scale off drawing.

Do not take digital dimensions from this drawing.

Any discrepancies to be reported to the Architect.



Proposed South Elevation
Scale - 1:100@A3



Proposed West Elevation
Scale - 1:100@A3

04	06.01.23	Levels Added	NMS	JC
03	25.11.22	Drawing updated	JC	RT
02	15.11.22	Drawing updated	JC	RT
01	30.09.22	First Issue	NMS	JC
Rev	Date	Comment	Dr	Ch

GWPA

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Job Title: Help Out Mill, Shackerstone Nuneaton

Client: Mr and Mrs Garnett

The Old Granary - Proposed South & West Elevations

Name (504)-2219-GWP-01-00-DR-A-(PA)-001!

Scale	1:100@A3	Revision	P04
Drawn/Checked	NMS/JC	First Issue	30.09.22
Drawing Status	S - WIP		

/Volumes/Data/CAD/(504)-2219-Help Out Mills, Nuneaton/A_Architects_(GWP)/Model/504-2219-GWP-XX-ZZ-M3-A-18-P01_Help Out Mill.dgn

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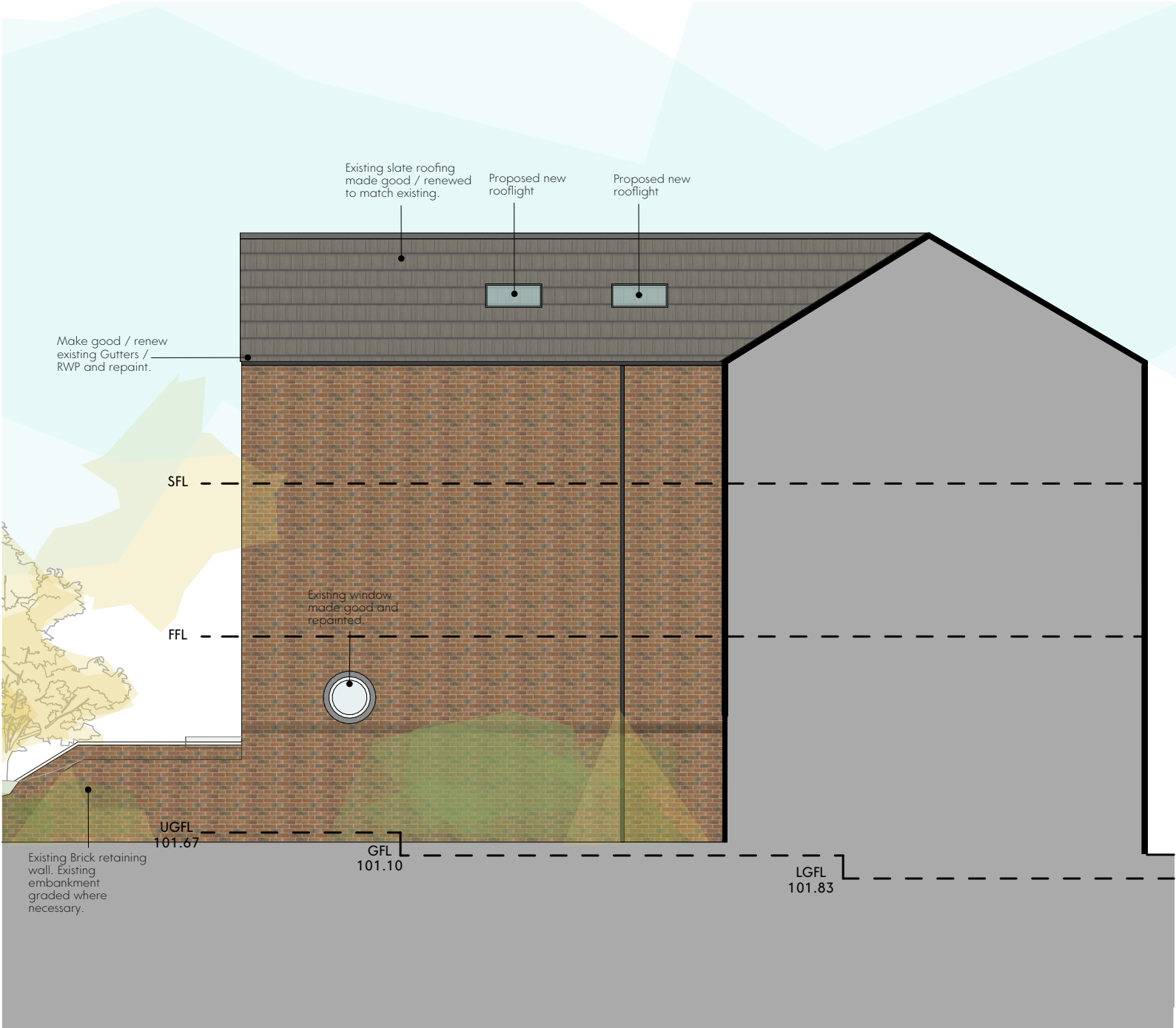
Contractors must verify all dimensions at the job before commencing any work or making shop drawings.

Written dimensions should be taken.

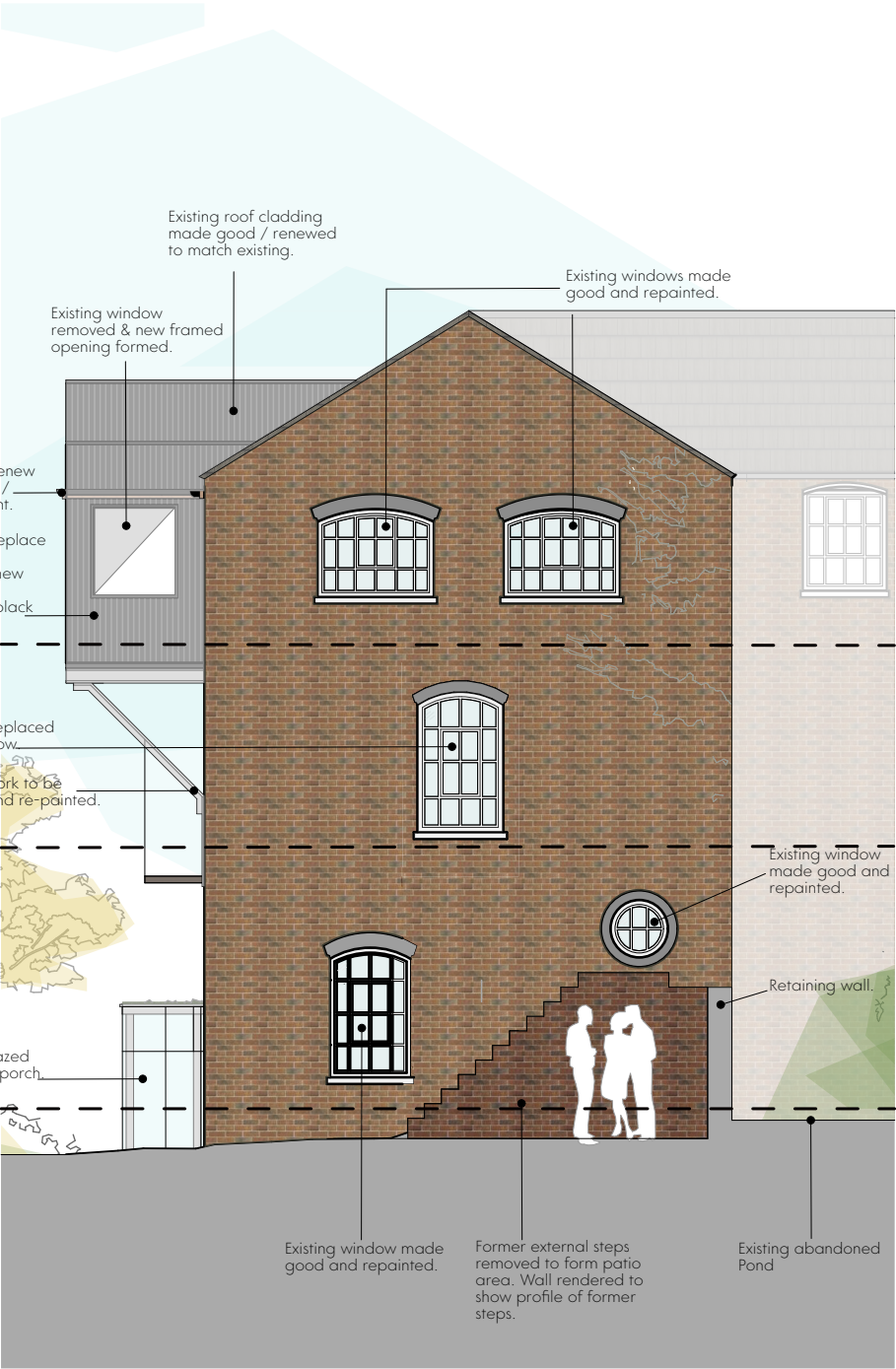
Do not scale off drawing.

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Any discrepancies to be reported to the Architect.



Proposed North Elevation
Scale - 1:100@A3



Proposed East Elevation
Scale - 1:100@A3

05	06.01.23	Levels Added	NMS	JC
04	28.11.22	East elev window updated	JC	RT
03	25.11.22	Rooflights added to north elevation	JC	RT
02	15.11.22	Drawing updated	JC	RT
01	30.09.22	First Issue	NMS	JC
Rev	Date	Comment	Dr	Ch



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GWPA Ref (504)-2219

Job Title Help Out Mill, Shackerstone Nuneaton

Client

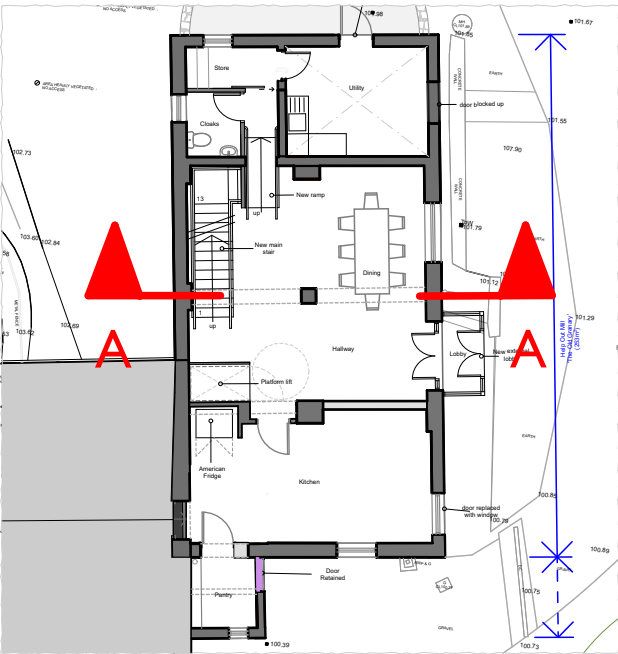
Mr and Mrs Garnett

The Old Granary - Proposed North & East Elevations

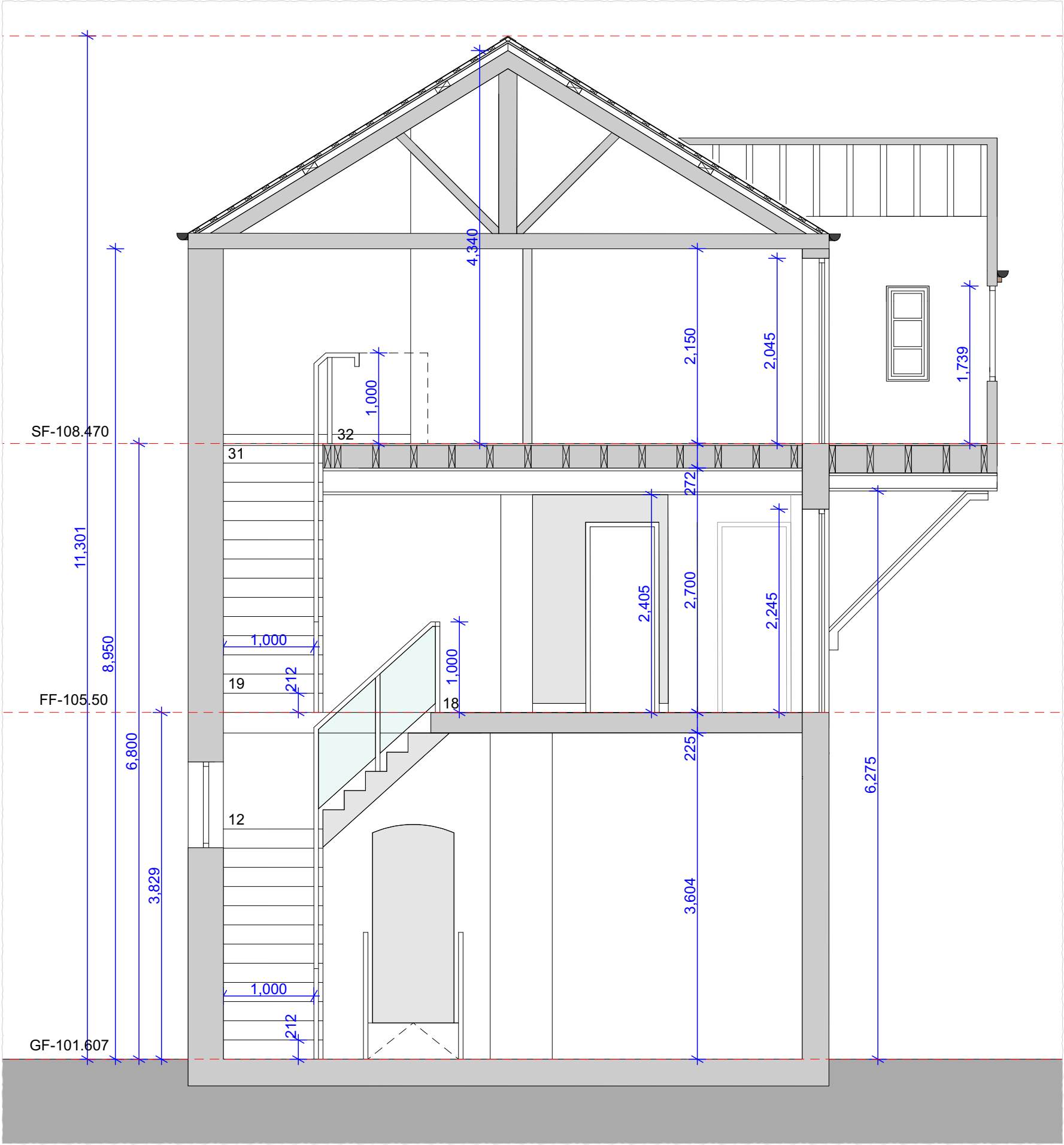
Name (504)-2219-GWP-01-00-DR-A-(PA)-001

Scale	1:100@A3	Revision	P05
Drawn/Checked	NMS/JC	First Issue	30.09.22
Drawing Status	S - WIP		

/Volumes/Data/CAD/(504)-2219-Help Out Mills, Nuneaton/A_Architects_(GWP)/Model/504-2219-GWP-XX-ZZ-M3-A-18-P01_Help Out Mill.pln



Key Plan
Scale - 1:200@A3



Proposed Cross Section A-A
Scale - 1:50@A3



Proposed North Elevation
1:100 @ A3



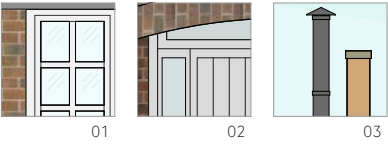
Proposed South Elevation
1:100 @ A3



Proposed West Elevation
1:100 @ A3

Key:

- 01 - New timber windows, to be installed and painted to match existing. See proposed plans Ref: (PA)-0005 for new window locations.
- 02 - New Timber double door with glazed side and top panels to replace existing glazed folding doors.
- 03 - New wood burning stove chimney flue to be installed in existing chimney breast and alongside existing chimney pots.



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Rev	Date	Comment	Dr	Ch
01	08.09.22	First Issue	DC	RT
02	06.10.22	Layout updated	NMS	RT
03	27.01.23	Oil tank storage area added to North elevation	JC	RT

GWP Job Reference	(504)-2219
Job Title	Help Out Mill, Shackerstone Nuneaton
Client	Mr and Mrs Garnett

Name	(504)-2219-GWP-01-01-DR-A-(PA)-0007
Scale	1:100@A3
Revision	P03
Drawn/Checked	NMS / RT
First Issue	07.09.22
Drawing Status	S - WIP



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E Structure Log

Included in model? (state reason if not):	Yes																								
Model Label	SENCE_1_16370_BB																								
Type:	Arch Bridge																								
How has structure been modelled?	The structure was modelled as a BB bridge unit using ESTRY. The following modelling parameters were used: <table border="1"> <tbody> <tr><td>ID</td><td>SENCE_1_16370_BB</td></tr> <tr><td>Type</td><td>BB</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>6.70000</td></tr> <tr><td>n_nF_Cd</td><td>NULL</td></tr> <tr><td>US_Invert</td><td>98.56000</td></tr> <tr><td>DS_Invert</td><td>-99999.00000</td></tr> <tr><td>Form_Loss</td><td>0.001</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_ID_2D</td><td>NULL</td></tr> </tbody> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_1_16370_BB	Type	BB	Ignore	F	UCS	T	Len_or_ANA	6.70000	n_nF_Cd	NULL	US_Invert	98.56000	DS_Invert	-99999.00000	Form_Loss	0.001	pBlockage	NULL	Inlet_Type	NULL	Conn_ID_2D	NULL
ID	SENCE_1_16370_BB																								
Type	BB																								
Ignore	F																								
UCS	T																								
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Form_Loss	0.001																								
pBlockage	NULL																								
Inlet_Type	NULL																								
Conn_ID_2D	NULL																								
	Upstream Face, looking Downstream 																								
	Downstream face, looking Upstream 																								

Included in model? (state reason if not):	Yes																																								
Model Label	SENCE_1_16071_C																																								
Type:	Circular culvert																																								
How has structure been modelled?	The structure was modelled as a C culvert unit using ESTRY. The following modelling parameters were used: <table border="1"> <tbody> <tr><td>ID</td><td>SENCE_1_16071_C</td></tr> <tr><td>Type</td><td>C</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>3.00000</td></tr> <tr><td>n_nF_Cd</td><td>0.035</td></tr> <tr><td>US_Invert</td><td>96.63000</td></tr> <tr><td>DS_Invert</td><td>96.63000</td></tr> <tr><td>Form_Loss</td><td>NULL</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_1D_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>0.55</td></tr> <tr><td>Height_or_</td><td>NULL</td></tr> <tr><td>Number_of</td><td>3</td></tr> <tr><td>HConF_or_W</td><td>NULL</td></tr> <tr><td>WConF_or_W</td><td>1.00000</td></tr> <tr><td>EntryC_or_</td><td>0.5</td></tr> <tr><td>ExitC_or_W</td><td>1.00000</td></tr> </tbody> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_1_16071_C	Type	C	Ignore	F	UCS	T	Len_or_ANA	3.00000	n_nF_Cd	0.035	US_Invert	96.63000	DS_Invert	96.63000	Form_Loss	NULL	pBlockage	NULL	Inlet_Type	NULL	Conn_1D_2D	NULL	Conn_No	NULL	Width_or_D	0.55	Height_or_	NULL	Number_of	3	HConF_or_W	NULL	WConF_or_W	1.00000	EntryC_or_	0.5	ExitC_or_W	1.00000
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Ignore	F																																								
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n_nF_Cd	0.035																																								
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pBlockage	NULL																																								
Inlet_Type	NULL																																								
Conn_1D_2D	NULL																																								
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Height_or_	NULL																																								
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HConF_or_W	NULL																																								
WConF_or_W	1.00000																																								
EntryC_or_	0.5																																								
ExitC_or_W	1.00000																																								
	Upstream Face, looking Downstream  gcsurveys.co.uk																																								

Downstream face, looking Upstream



Included in model? (state reason if not):	Yes																																								
Model Label	SENCE_1_15405_BB																																								
Type:	Foot Bridge																																								
How has structure been modelled?	The structure was modelled as a BB bridge unit using ESTRY. The following modelling parameters were used: <table border="1"> <tbody> <tr><td>ID</td><td>SENCE_1_15405_BB</td></tr> <tr><td>Type</td><td>BB</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>1.00000</td></tr> <tr><td>n_nF_Cd</td><td>NULL</td></tr> <tr><td>US_Invert</td><td>93.40000</td></tr> <tr><td>DS_Invert</td><td>-99999.00000</td></tr> <tr><td>Form_Loss</td><td>0.001</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_ID_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>NULL</td></tr> <tr><td>Height_or_</td><td>NULL</td></tr> <tr><td>Number_of</td><td>NULL</td></tr> <tr><td>HConF_or_W</td><td>0</td></tr> <tr><td>WConF_or_W</td><td>0</td></tr> <tr><td>EntryC_or_</td><td>NULL</td></tr> <tr><td>ExitC_or_W</td><td>NULL</td></tr> </tbody> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_1_15405_BB	Type	BB	Ignore	F	UCS	T	Len_or_ANA	1.00000	n_nF_Cd	NULL	US_Invert	93.40000	DS_Invert	-99999.00000	Form_Loss	0.001	pBlockage	NULL	Inlet_Type	NULL	Conn_ID_2D	NULL	Conn_No	NULL	Width_or_D	NULL	Height_or_	NULL	Number_of	NULL	HConF_or_W	0	WConF_or_W	0	EntryC_or_	NULL	ExitC_or_W	NULL
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pBlockage	NULL																																								
Inlet_Type	NULL																																								
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Conn_No	NULL																																								
Width_or_D	NULL																																								
Height_or_	NULL																																								
Number_of	NULL																																								
HConF_or_W	0																																								
WConF_or_W	0																																								
EntryC_or_	NULL																																								
ExitC_or_W	NULL																																								
	Downstream Face, looking Upstream 																																								

Included in model? (state reason if not):	No: This was due to the fact it was causing an instability and its small size and length made it meant it wouldn't make much of an impact on the model's results.																																																												
Model Label	SENCE_1_15384_																																																												
Type:	Stone Weir																																																												
How has structure been modelled?	The structure was not included in the model and was instead modelled as an open channel using ESTRY. The following modelling parameters were used: <table> <tr><td>ID</td><td>SENCE_1_15384</td></tr> <tr><td>Type</td><td>S</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>0</td></tr> <tr><td>n_nF_Cd</td><td>1.00000</td></tr> <tr><td>US_Invert</td><td>-99999.00000</td></tr> <tr><td>DS_Invert</td><td>-99999.00000</td></tr> <tr><td>Form_Loss</td><td>NULL</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_ID_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>NULL</td></tr> <tr><td>Height_or_</td><td>NULL</td></tr> <tr><td>Number_of</td><td>NULL</td></tr> <tr><td>HConF_or_W</td><td>NULL</td></tr> <tr><td>WConF_or_W</td><td>NULL</td></tr> <tr><td>EntryC_or_</td><td>NULL</td></tr> <tr><td>ExitC_or_W</td><td>NULL</td></tr> <tr><td>eS1</td><td>NULL</td></tr> <tr><td>eS2</td><td>NULL</td></tr> <tr><td>eN1</td><td>NULL</td></tr> <tr><td>eN2</td><td>NULL</td></tr> <tr><td>eN3</td><td>NULL</td></tr> <tr><td>eN4</td><td>NULL</td></tr> <tr><td>eN5</td><td>NULL</td></tr> <tr><td>eN6</td><td>NULL</td></tr> <tr><td>eN7</td><td>NULL</td></tr> <tr><td>eN8</td><td>NULL</td></tr> </table>	ID	SENCE_1_15384	Type	S	Ignore	F	UCS	T	Len_or_ANA	0	n_nF_Cd	1.00000	US_Invert	-99999.00000	DS_Invert	-99999.00000	Form_Loss	NULL	pBlockage	NULL	Inlet_Type	NULL	Conn_ID_2D	NULL	Conn_No	NULL	Width_or_D	NULL	Height_or_	NULL	Number_of	NULL	HConF_or_W	NULL	WConF_or_W	NULL	EntryC_or_	NULL	ExitC_or_W	NULL	eS1	NULL	eS2	NULL	eN1	NULL	eN2	NULL	eN3	NULL	eN4	NULL	eN5	NULL	eN6	NULL	eN7	NULL	eN8	NULL
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eN6	NULL																																																												
eN7	NULL																																																												
eN8	NULL																																																												

Upstream Face, looking downstream



Included in model? (state reason if not):	Yes
Model Label	SENCE_1_15380_R
Type:	Three rectangular culverts

How has structure been modelled?

The structure was modelled as three separate R culvert units (B1, B2, B3) using ESTRY. The following modelling parameters were used:

B1:

ID	SENCE_1_15380_B1
Type	R
Ignore	F
UCS	T
Len_or_ANA	5.20000
n_nF_Cd	0.035
US_Invert	93.39000
DS_Invert	93.38000
Form_Loss	0.001
pBlockage	NULL
Inlet_Type	NULL
Conn_ID_2D	NULL
Conn_No	NULL
Width_or_D	1.69000
Height_or_	0.94
Number_of	NULL
HConF_or_W	NULL
WConF_or_W	NULL
EntryC_or_	NULL
ExitC_or_W	NULL
eS1	NULL
eS2	NULL
eN1	NULL
eN2	NULL
eN3	NULL
eN4	NULL
eN5	NULL
eN6	NULL
eN7	NULL
eN8	NULL

B2:

ID	SENCE_1_15380_B2
Type	RW
Ignore	F
UCS	T
Len_or_ANA	5.20000
n_nF_Cd	0.035
US_Invert	93.10000
DS_Invert	93.00000
Form_Loss	0.001
pBlockage	NULL
Inlet_Type	NULL
Conn_ID_2D	NULL
Conn_No	NULL
Width_or_D	1.55000
Height_or_	1.24000
Number_of	NULL
HConF_or_W	0.6
WConF_or_W	0.9
EntryC_or_	0.5
ExitC_or_W	0.1
eS1	NULL
eS2	NULL
eN1	11.43000
eN2	0.57
eN3	0.72
eN4	100.00000
eN5	NULL
eN6	NULL
eN7	NULL
eN8	NULL

B3:

ID	SENCE_1_15380_B3
Type	R
Ignore	F
UCS	T
Len_or_ANA	5.20000
n_nF_Cd	0.035
US_Invert	93.19000
DS_Invert	93.19000
Form_Loss	0.001
pBlockage	NULL
Inlet_Type	NULL
Conn_ID_2D	NULL
Conn_No	NULL
Width_or_D	1.59000
Height_or_	1.19000
Number_of	NULL
HConF_or_W	NULL
WConF_or_W	NULL
EntryC_or_	NULL
ExitC_or_W	NULL
eS1	NULL
eS2	NULL
eN1	NULL
eN2	NULL
eN3	NULL
eN4	NULL
eN5	NULL
eN6	NULL
eN7	NULL
eN8	NULL

Upstream Face, looking downstream



Downstream Face, looking west



Included in model? (state reason if not):	No: The structure was not included in the model due to it's short length and the fact it wasn't considered a proper bridge. It was considered not to have an impact on the results.
Model Label	SENCE_1_15258
Type:	Foot Bridge

How has structure been modelled?

and was modelled as 3 open channels using ESTRY, due to the length between this cross section and the next section. The following modelling parameters were used:

ID	SENCE_1_15258_Upper
Type	S
Ignore	F
UCS	T
Len_or_ANA	0
n_nF_Cd	1.00000
US_Invert	-99999.00000
DS_Invert	-99999.00000
Form_Loss	NULL
pBlockage	NULL
Inlet_Type	NULL
Conn_ID_2D	NULL
Conn_No	NULL
Width_or_D	NULL
Height_or_	NULL
Number_of	NULL
HConF_or_W	NULL
WConF_or_W	NULL
EntryC_or_	NULL
ExitC_or_W	NULL
eS1	NULL
eS2	NULL
eN1	NULL
eN2	NULL
eN3	NULL
eN4	NULL
eN5	NULL
eN6	NULL
eN7	NULL
eN8	NULL

ID	SENCE_1_15258_Middle
Type	S
Ignore	F
UCS	T
Len_or_ANA	0
n_nF_Cd	1.00000
US_Invert	-99999.00000
DS_Invert	-99999.00000
Form_Loss	NULL
pBlockage	NULL
Inlet_Type	NULL
Conn_ID_2D	NULL
Conn_No	NULL
Width_or_D	NULL
Height_or_	NULL
Number_of	NULL
HConF_or_W	NULL
WConF_or_W	NULL
EntryC_or_	NULL
ExitC_or_W	NULL
eS1	NULL
eS2	NULL
eN1	NULL
eN2	NULL
eN3	NULL
eN4	NULL
eN5	NULL
eN6	NULL
eN7	NULL
eN8	NULL

ID	SENCE_1_15258_Lower
Type	S
Ignore	F
UCS	T
Len_or_ANA	0
n_nF_Cd	1.00000
US_Invert	-99999.00000
DS_Invert	-99999.00000
Form_Loss	NULL
pBlockage	NULL
Inlet_Type	NULL
Conn_ID_2D	NULL
Conn_No	NULL
Width_or_D	NULL
Height_or_	NULL
Number_of	NULL
HConF_or_W	NULL
WConF_or_W	NULL
EntryC_or_	NULL
ExitC_or_W	NULL
eS1	NULL
eS2	NULL
eN1	NULL
eN2	NULL
eN3	NULL
eN4	NULL
eN5	NULL
eN6	NULL
eN7	NULL
eN8	NULL

Overtopping of the structure was represented within the 2D domain.

Upstream Face, looking Downstream



Included in model? (state reason if not):	Yes																																																												
Model Label	SENCE_2_915_I																																																												
Type:	Irregular culvert																																																												
How has structure been modelled?	The structure was modelled as a I culvert unit using ESTRY. The following modelling parameters were used: <table> <tr><td>ID</td><td>SENCE_2_915_I</td></tr> <tr><td>Type</td><td>I</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>25.00000</td></tr> <tr><td>n_nF_Cd</td><td>0.04</td></tr> <tr><td>US_Invert</td><td>98.98000</td></tr> <tr><td>DS_Invert</td><td>-99999.00000</td></tr> <tr><td>Form_Loss</td><td>0</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_1D_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>NULL</td></tr> <tr><td>Height_or_</td><td>NULL</td></tr> <tr><td>Number_of</td><td>1</td></tr> <tr><td>HConF_or_W</td><td>0.6</td></tr> <tr><td>WConF_or_W</td><td>0.9</td></tr> <tr><td>EntryC_or_</td><td>0.5</td></tr> <tr><td>ExitC_or_W</td><td>0.1</td></tr> <tr><td>eS1</td><td>NULL</td></tr> <tr><td>eS2</td><td>NULL</td></tr> <tr><td>eN1</td><td>NULL</td></tr> <tr><td>eN2</td><td>NULL</td></tr> <tr><td>eN3</td><td>NULL</td></tr> <tr><td>eN4</td><td>NULL</td></tr> <tr><td>eN5</td><td>NULL</td></tr> <tr><td>eN6</td><td>NULL</td></tr> <tr><td>eN7</td><td>NULL</td></tr> <tr><td>eN8</td><td>NULL</td></tr> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_2_915_I	Type	I	Ignore	F	UCS	T	Len_or_ANA	25.00000	n_nF_Cd	0.04	US_Invert	98.98000	DS_Invert	-99999.00000	Form_Loss	0	pBlockage	NULL	Inlet_Type	NULL	Conn_1D_2D	NULL	Conn_No	NULL	Width_or_D	NULL	Height_or_	NULL	Number_of	1	HConF_or_W	0.6	WConF_or_W	0.9	EntryC_or_	0.5	ExitC_or_W	0.1	eS1	NULL	eS2	NULL	eN1	NULL	eN2	NULL	eN3	NULL	eN4	NULL	eN5	NULL	eN6	NULL	eN7	NULL	eN8	NULL
ID	SENCE_2_915_I																																																												
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pBlockage	NULL																																																												
Inlet_Type	NULL																																																												
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eN8	NULL																																																												

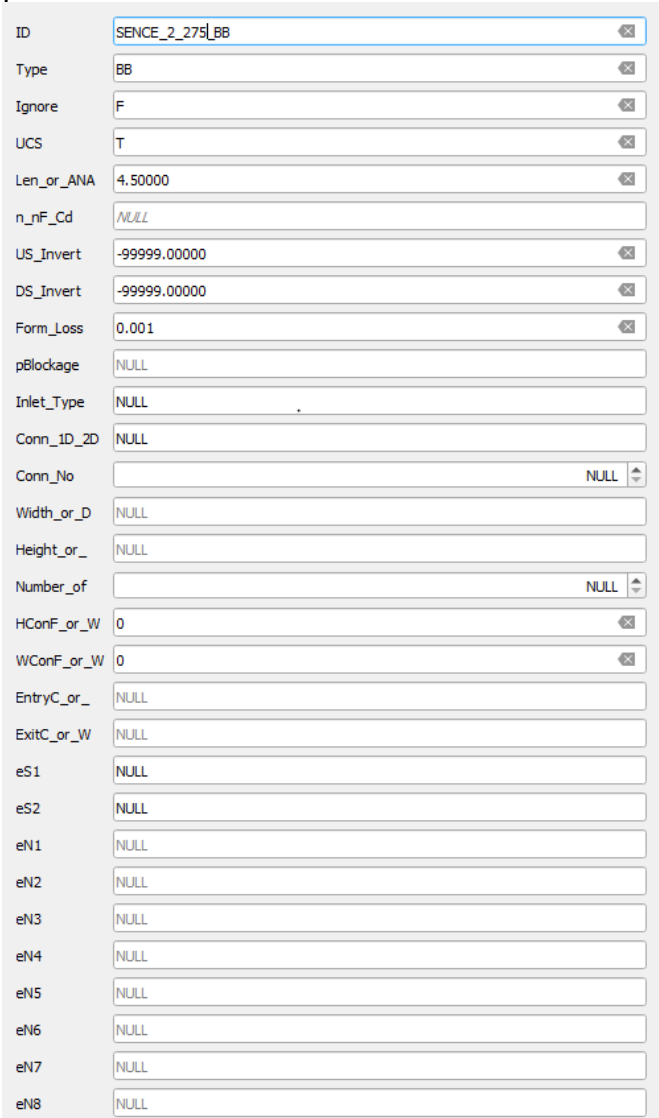
Upstream Face, looking Downstream



Included in model? (state reason if not):	Yes																																																												
Model Label	SENCE_2_915_I																																																												
Type:	Irregular culvert																																																												
How has structure been modelled?	The structure was modelled as a I culvert unit using ESTRY. The following modelling parameters were used: <table> <tr><td>ID</td><td>SENCE_2_915_I</td></tr> <tr><td>Type</td><td>I</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>25.00000</td></tr> <tr><td>n_nF_Cd</td><td>0.04</td></tr> <tr><td>US_Invert</td><td>98.98000</td></tr> <tr><td>DS_Invert</td><td>-99999.00000</td></tr> <tr><td>Form_Loss</td><td>0</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_1D_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>NULL</td></tr> <tr><td>Height_or_</td><td>NULL</td></tr> <tr><td>Number_of</td><td>1</td></tr> <tr><td>HConF_or_W</td><td>0.6</td></tr> <tr><td>WConF_or_W</td><td>0.9</td></tr> <tr><td>EntryC_or_</td><td>0.5</td></tr> <tr><td>ExitC_or_W</td><td>0.1</td></tr> <tr><td>eS1</td><td>NULL</td></tr> <tr><td>eS2</td><td>NULL</td></tr> <tr><td>eN1</td><td>NULL</td></tr> <tr><td>eN2</td><td>NULL</td></tr> <tr><td>eN3</td><td>NULL</td></tr> <tr><td>eN4</td><td>NULL</td></tr> <tr><td>eN5</td><td>NULL</td></tr> <tr><td>eN6</td><td>NULL</td></tr> <tr><td>eN7</td><td>NULL</td></tr> <tr><td>eN8</td><td>NULL</td></tr> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_2_915_I	Type	I	Ignore	F	UCS	T	Len_or_ANA	25.00000	n_nF_Cd	0.04	US_Invert	98.98000	DS_Invert	-99999.00000	Form_Loss	0	pBlockage	NULL	Inlet_Type	NULL	Conn_1D_2D	NULL	Conn_No	NULL	Width_or_D	NULL	Height_or_	NULL	Number_of	1	HConF_or_W	0.6	WConF_or_W	0.9	EntryC_or_	0.5	ExitC_or_W	0.1	eS1	NULL	eS2	NULL	eN1	NULL	eN2	NULL	eN3	NULL	eN4	NULL	eN5	NULL	eN6	NULL	eN7	NULL	eN8	NULL
ID	SENCE_2_915_I																																																												
Type	I																																																												
Ignore	F																																																												
UCS	T																																																												
Len_or_ANA	25.00000																																																												
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eN6	NULL																																																												
eN7	NULL																																																												
eN8	NULL																																																												

Upstream Face, looking Downstream



Included in model? (state reason if not):	Yes
Model Label	SENCE_2_275_BB
Type:	Road Bridge
How has structure been modelled?	The structure was modelled as a BB Bridge unit using ESTRY. The following modelling parameters were used:  Overtopping of the structure was represented within the 2D domain.

Upstream Face, looking Downstream



Included in model? (state reason if not):	Yes																																																												
Model Label	SENCE_2_242_R																																																												
Type:	Culvert																																																												
How has structure been modelled?	The structure was modelled as a Rectangular culvert unit using ESTRY. The following modelling parameters were used: <table border="1"> <tbody> <tr><td>ID</td><td>SENCE_2_242_R</td></tr> <tr><td>Type</td><td>RW</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>44.00000</td></tr> <tr><td>n_nF_Cd</td><td>0.035</td></tr> <tr><td>US_Invert</td><td>98.71000</td></tr> <tr><td>DS_Invert</td><td>98.71000</td></tr> <tr><td>Form_Loss</td><td>NULL</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_ID_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>1.04000</td></tr> <tr><td>Height_or_</td><td>0.78</td></tr> <tr><td>Number_of</td><td>2</td></tr> <tr><td>HConF_or_W</td><td>0.6</td></tr> <tr><td>WConF_or_W</td><td>0.9</td></tr> <tr><td>EntryC_or_</td><td>0.5</td></tr> <tr><td>ExitC_or_W</td><td>1.00000</td></tr> <tr><td>eS1</td><td>NULL</td></tr> <tr><td>eS2</td><td>NULL</td></tr> <tr><td>eN1</td><td>7.68000</td></tr> <tr><td>eN2</td><td>0.98</td></tr> <tr><td>eN3</td><td>NULL</td></tr> <tr><td>eN4</td><td>100.00000</td></tr> <tr><td>eN5</td><td>NULL</td></tr> <tr><td>eN6</td><td>NULL</td></tr> <tr><td>eN7</td><td>NULL</td></tr> <tr><td>eN8</td><td>NULL</td></tr> </tbody> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_2_242_R	Type	RW	Ignore	F	UCS	T	Len_or_ANA	44.00000	n_nF_Cd	0.035	US_Invert	98.71000	DS_Invert	98.71000	Form_Loss	NULL	pBlockage	NULL	Inlet_Type	NULL	Conn_ID_2D	NULL	Conn_No	NULL	Width_or_D	1.04000	Height_or_	0.78	Number_of	2	HConF_or_W	0.6	WConF_or_W	0.9	EntryC_or_	0.5	ExitC_or_W	1.00000	eS1	NULL	eS2	NULL	eN1	7.68000	eN2	0.98	eN3	NULL	eN4	100.00000	eN5	NULL	eN6	NULL	eN7	NULL	eN8	NULL
ID	SENCE_2_242_R																																																												
Type	RW																																																												
Ignore	F																																																												
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Len_or_ANA	44.00000																																																												
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eN5	NULL																																																												
eN6	NULL																																																												
eN7	NULL																																																												
eN8	NULL																																																												

Upstream Face, looking Downstream



gcsurveys.co.uk

Included in model? (state reason if not):	Yes																																																												
Model Label	SENCE_2_171_SG																																																												
Type:	Sluice gate																																																												
How has structure been modelled?	The structure was modelled as an SG Sluice Gate unit using ESTRY. The following modelling parameters were used: <table border="1"> <tr><td>ID</td><td>SENCE_2_171_SG</td></tr> <tr><td>Type</td><td>SG</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>NULL</td></tr> <tr><td>n_nF_Cd</td><td>0.6</td></tr> <tr><td>US_Invert</td><td>98.66000</td></tr> <tr><td>DS_Invert</td><td>98.66000</td></tr> <tr><td>Form_Loss</td><td>NULL</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_1D_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>0.51</td></tr> <tr><td>Height_or_</td><td>0.93</td></tr> <tr><td>Number_of</td><td>0</td></tr> <tr><td>HConF_or_W</td><td>NULL</td></tr> <tr><td>WConF_or_W</td><td>NULL</td></tr> <tr><td>EntryC_or_</td><td>NULL</td></tr> <tr><td>ExitC_or_W</td><td>NULL</td></tr> <tr><td>eS1</td><td>NULL</td></tr> <tr><td>eS2</td><td>NULL</td></tr> <tr><td>eN1</td><td>NULL</td></tr> <tr><td>eN2</td><td>NULL</td></tr> <tr><td>eN3</td><td>NULL</td></tr> <tr><td>eN4</td><td>NULL</td></tr> <tr><td>eN5</td><td>NULL</td></tr> <tr><td>eN6</td><td>NULL</td></tr> <tr><td>eN7</td><td>NULL</td></tr> <tr><td>eN8</td><td>NULL</td></tr> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_2_171_SG	Type	SG	Ignore	F	UCS	T	Len_or_ANA	NULL	n_nF_Cd	0.6	US_Invert	98.66000	DS_Invert	98.66000	Form_Loss	NULL	pBlockage	NULL	Inlet_Type	NULL	Conn_1D_2D	NULL	Conn_No	NULL	Width_or_D	0.51	Height_or_	0.93	Number_of	0	HConF_or_W	NULL	WConF_or_W	NULL	EntryC_or_	NULL	ExitC_or_W	NULL	eS1	NULL	eS2	NULL	eN1	NULL	eN2	NULL	eN3	NULL	eN4	NULL	eN5	NULL	eN6	NULL	eN7	NULL	eN8	NULL
ID	SENCE_2_171_SG																																																												
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eN8	NULL																																																												

Upstream Face, looking Downstream



Included in model? (state reason if not):	Yes																																																												
Model Label	SENCE_2_69_C																																																												
Type:	Culvert																																																												
How has structure been modelled?	The structure was modelled as a C Circular culvert unit using ESTRY. The following modelling parameters were used: <table border="1"> <tr><td>ID</td><td>SENCE_2_171_SG</td></tr> <tr><td>Type</td><td>SG</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>NULL</td></tr> <tr><td>n_nF_Cd</td><td>0.6</td></tr> <tr><td>US_Invert</td><td>98.66000</td></tr> <tr><td>DS_Invert</td><td>98.66000</td></tr> <tr><td>Form_Loss</td><td>NULL</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_1D_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>0.51</td></tr> <tr><td>Height_or_</td><td>0.93</td></tr> <tr><td>Number_of</td><td>0</td></tr> <tr><td>HConF_or_W</td><td>NULL</td></tr> <tr><td>WConF_or_W</td><td>NULL</td></tr> <tr><td>EntryC_or_</td><td>NULL</td></tr> <tr><td>ExitC_or_W</td><td>NULL</td></tr> <tr><td>eS1</td><td>NULL</td></tr> <tr><td>eS2</td><td>NULL</td></tr> <tr><td>eN1</td><td>NULL</td></tr> <tr><td>eN2</td><td>NULL</td></tr> <tr><td>eN3</td><td>NULL</td></tr> <tr><td>eN4</td><td>NULL</td></tr> <tr><td>eN5</td><td>NULL</td></tr> <tr><td>eN6</td><td>NULL</td></tr> <tr><td>eN7</td><td>NULL</td></tr> <tr><td>eN8</td><td>NULL</td></tr> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_2_171_SG	Type	SG	Ignore	F	UCS	T	Len_or_ANA	NULL	n_nF_Cd	0.6	US_Invert	98.66000	DS_Invert	98.66000	Form_Loss	NULL	pBlockage	NULL	Inlet_Type	NULL	Conn_1D_2D	NULL	Conn_No	NULL	Width_or_D	0.51	Height_or_	0.93	Number_of	0	HConF_or_W	NULL	WConF_or_W	NULL	EntryC_or_	NULL	ExitC_or_W	NULL	eS1	NULL	eS2	NULL	eN1	NULL	eN2	NULL	eN3	NULL	eN4	NULL	eN5	NULL	eN6	NULL	eN7	NULL	eN8	NULL
ID	SENCE_2_171_SG																																																												
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Len_or_ANA	NULL																																																												
n_nF_Cd	0.6																																																												
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Form_Loss	NULL																																																												
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Conn_1D_2D	NULL																																																												
Conn_No	NULL																																																												
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eN7	NULL																																																												
eN8	NULL																																																												

Upstream Face, looking Downstream



Included in model? (state reason if not):	Yes																																																												
Model Label	SENCE_3_132_WW																																																												
Type:	Weir Unit																																																												
How has structure been modelled?	The structure was modelled as a WW weir unit using ESTRY. The following modelling parameters were used: <table border="1"> <tr><td>ID</td><td>SENCE_3_132_WW</td></tr> <tr><td>Type</td><td>WW</td></tr> <tr><td>Ignore</td><td>F</td></tr> <tr><td>UCS</td><td>T</td></tr> <tr><td>Len_or_ANA</td><td>NULL</td></tr> <tr><td>n_nF_Cd</td><td>NULL</td></tr> <tr><td>US_Invert</td><td>99.35000</td></tr> <tr><td>DS_Invert</td><td>94.69000</td></tr> <tr><td>Form_Loss</td><td>NULL</td></tr> <tr><td>pBlockage</td><td>NULL</td></tr> <tr><td>Inlet_Type</td><td>NULL</td></tr> <tr><td>Conn_1D_2D</td><td>NULL</td></tr> <tr><td>Conn_No</td><td>NULL</td></tr> <tr><td>Width_or_D</td><td>NULL</td></tr> <tr><td>Height_or_</td><td>NULL</td></tr> <tr><td>Number_of</td><td>NULL</td></tr> <tr><td>HConF_or_W</td><td>NULL</td></tr> <tr><td>WConF_or_W</td><td>NULL</td></tr> <tr><td>EntryC_or_</td><td>NULL</td></tr> <tr><td>ExitC_or_W</td><td>NULL</td></tr> <tr><td>eS1</td><td>NULL</td></tr> <tr><td>eS2</td><td>NULL</td></tr> <tr><td>eN1</td><td>NULL</td></tr> <tr><td>eN2</td><td>NULL</td></tr> <tr><td>eN3</td><td>NULL</td></tr> <tr><td>eN4</td><td>NULL</td></tr> <tr><td>eN5</td><td>NULL</td></tr> <tr><td>eN6</td><td>NULL</td></tr> <tr><td>eN7</td><td>NULL</td></tr> <tr><td>eN8</td><td>NULL</td></tr> </table> Overtopping of the structure was represented within the 2D domain.	ID	SENCE_3_132_WW	Type	WW	Ignore	F	UCS	T	Len_or_ANA	NULL	n_nF_Cd	NULL	US_Invert	99.35000	DS_Invert	94.69000	Form_Loss	NULL	pBlockage	NULL	Inlet_Type	NULL	Conn_1D_2D	NULL	Conn_No	NULL	Width_or_D	NULL	Height_or_	NULL	Number_of	NULL	HConF_or_W	NULL	WConF_or_W	NULL	EntryC_or_	NULL	ExitC_or_W	NULL	eS1	NULL	eS2	NULL	eN1	NULL	eN2	NULL	eN3	NULL	eN4	NULL	eN5	NULL	eN6	NULL	eN7	NULL	eN8	NULL
ID	SENCE_3_132_WW																																																												
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eN7	NULL																																																												
eN8	NULL																																																												

Upstream Face, looking Downstream



Included in model? (state reason if not):	No: Sluice gate appeared closed on survey photos and didn't look like it was currently in use.
Model Label	SENCE_4
Type:	Sluice Gate
How has structure been modelled?	This was instead modelled as a 2d_zln wit 2d_zpts set to elevations specified on walls on survey.
	Upstream Face, looking Downstream 

F Sensitivity Analysis

The hydraulic model was tested for sensitivity to key model parameters which might impact flood risk at the proposed development site. This included the following scenarios:

- Increased flows by 20%.
- Increasing the manning's n values by 20%. This was done for both the ESTRY 1D channel and 2D TUFLOW domain.
- Increasing the downstream boundary by 250mm in the 1D domain.

F.1 Sensitivity to flow for fluvial model results

Figure E-1 shows the changes in peak water level compared to the baseline 100-year event when an increase of 20% is applied to all inflows.

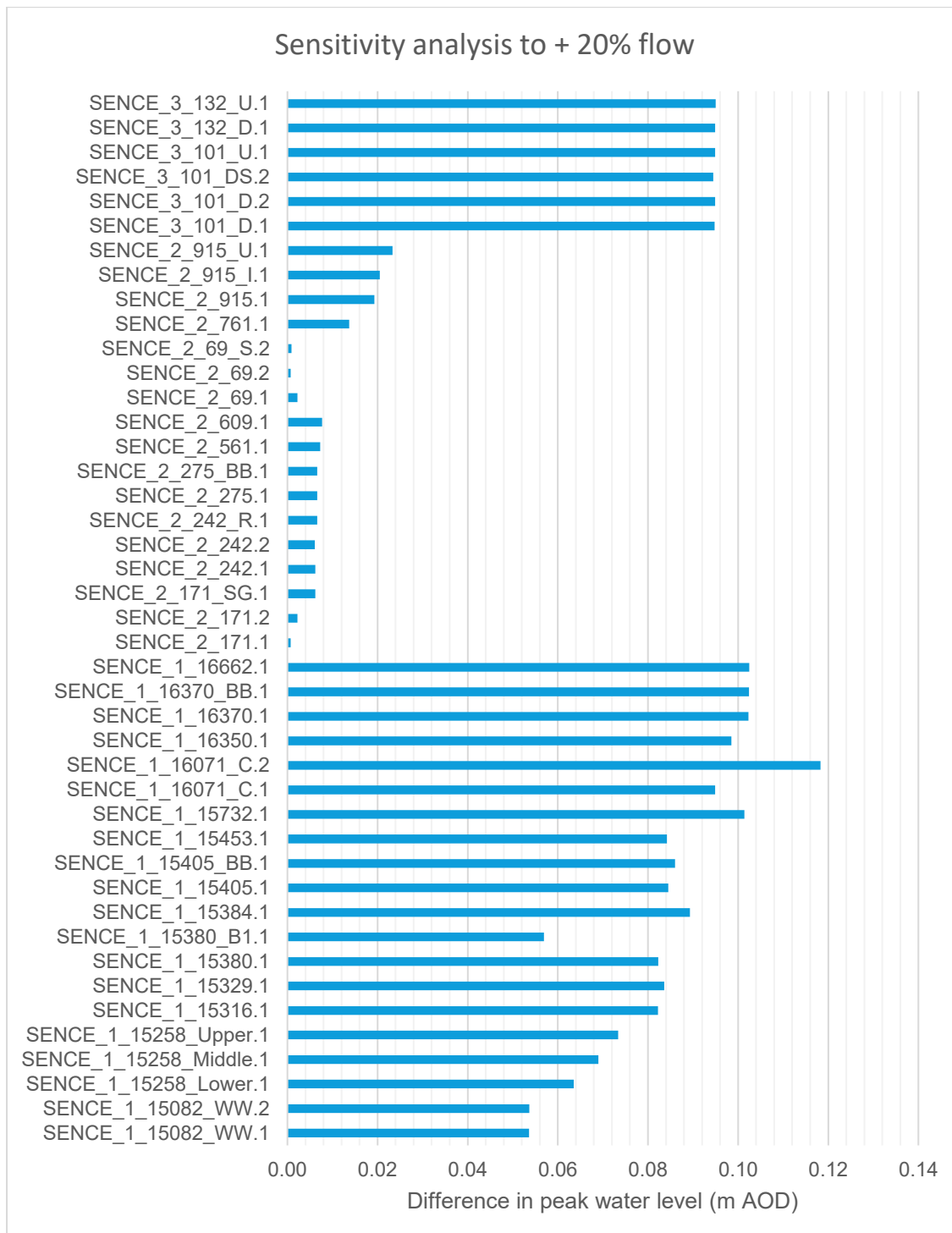


Figure E-1: Sensitivity to changes of + 20% in flow

Figure E-1 shows that, when flows are increased by 20%, the maximum increase in peak water level at the site is approximately 0.12m. Insignificant changes in peak flood extents indicates that, the model is considered to be moderately sensitive to the changes made to the flows applied to the 1D domain.

F.2 Sensitivity to roughness for fluvial model results

Figure E-2 shows the changes in peak water level compared to the baseline 100-year event when an increase of +20% is applied Manning's 'n' in both the 1D and 2D domains.

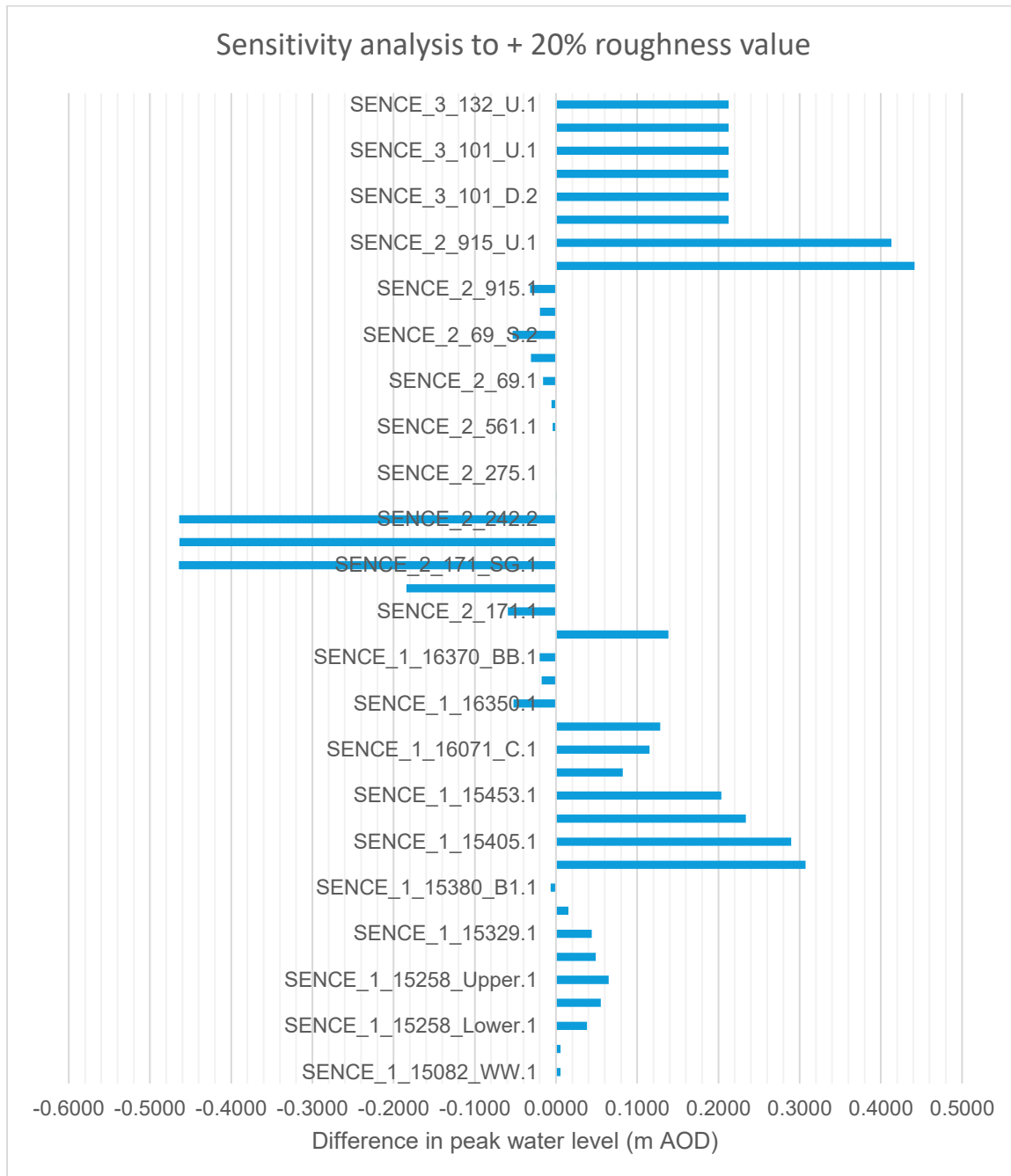


Figure E-2: Sensitivity to changes of + 20% in roughness

Figure E-2 shows that, when roughness values are increased by 20%, the maximum increase in peak water level is 0.44m at node SENCE_2_915_I.1 located approximately 760m upstream of the site and the maximum decrease in water level is -0.46m at node locations SENCE_2_242.2, SENCE_2_242.1 and SENCE_2_171.SG.1 located approximately 100m upstream of the site. The changes in peak flood extents indicates that, the model is considered to be relatively insensitive to the roughness values applied to the 1D and 2D domains within the site boundary.

F.3 Sensitivity to downstream boundary conditions for fluvial model results

Figure E-3 shows the changes in peak water level compared to the baseline 100-year event when an increase when a 250mm increase in water level is applied at the downstream boundary.

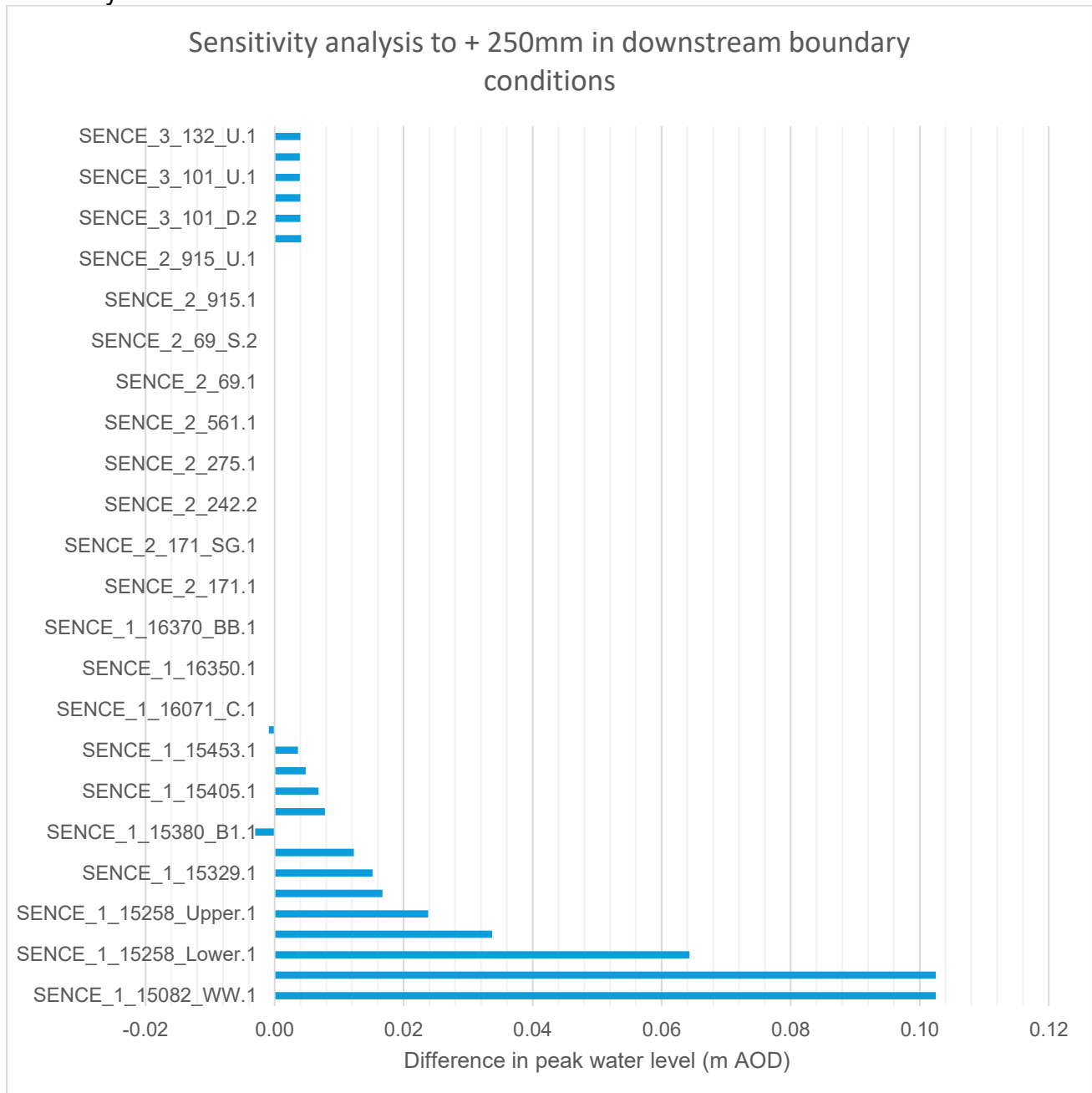


Figure E-3: Sensitivity analysis for +250mm in water level at the downstream boundary

Figure E-3 indicates that a 250mm increase in water level at the downstream boundary increases the peak water level of approximately 0.08m in areas downstream of the site on the River Sence watercourse. This does not impact in water levels at the site. As a result, the model is considered to be moderately insensitive to changes in downstream boundary conditions within the site.

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James Stockdale

From: Anthony Benney <anthony.benney@cescoltd.co.uk>
Sent: 19 December 2022 10:08
To: James Stockdale
Subject: RE: Help Out Mills, Shackerstone- Flood History

Hello James – yes, happy to assist.

I purchased Help Out Mill estate some 30 years ago from the WATHES family and currently occupy the building opposite the former restaurant. During the time I have lived there none of the buildings have flooded. At the time of purchase, the WATHES family confirmed that during the 16 years of their ownership, none of the buildings flooded.

The only watercourse with running water is the river Sence that runs along the western boundary of the estate. The lower watercourse that runs along the northern boundary now simply drains the adjacent fields. Since Severn Trent demolished the upstream weir in 1990 and the landowner of the fields filled in the mill stream for much of its length, the upper watercourse is only ever damp now. Anecdotally, the man-made upper watercourse bank was breached in the 1950's when a former boiler-house used to generate steam was removed. The damage was swiftly repaired.

The restaurant was established in 1982 by the WATHES family. It has never flooded.

During my 30 years, flood water has never affected access to the site or access to the site, this includes the period of the Christmas 2015 floods. In conjunction with the adjacent farms, we take care to see that the river Sence watercourse is regularly cleared of any fallen timber and remains free-running.

I hope this helps.

Best regards, Anthony Benney

The Tack Rooms
Help Out Mill
Shackerstone Lane
Shackerstone
Leicestershire
CV13 0BT

From: James Stockdale <james.stockdale@adeptcsce.com>
Sent: 19 December 2022 09:46
To: anthony.benney@cescoltd.co.uk
Cc: kevin2garnett@gmail.com; Richard Townend <r.townend@gwp-arch.com>; Erol Erturan <erol.erturan@adeptcsce.com>
Subject: Help Out Mills, Shackerstone- Flood History

Good morning, Anthony,

I am compiling a Flood Risk Assessment for the Restaurant site and have been informed by our clients, Kevin and Susan Garnett, that you live in the adjacent building.

Please can you tell me if the buildings have suffered from flooding from the adjacent watercourses? If so when and to what depth?

There are anecdotal reports of the Help Out Mills Restaurant flooding on line, was this the case?

Other than the buildings has flood water at all affected the site or access to the site?

Was the site affected by the Christmas 2015 floods?

Thankyou for your time, I look forward to hearing from you

Kind regards

James Stockdale *BEng*
Principal Engineer
Adept Civil and Structural Consulting Engineers

T: 0113 239 4518 M:07972772500

W: www.adeptcsce.com



Richard Parker

From: Richard Elam <richard@mobcad.co.uk>
Sent: 01 November 2023 20:30
To: Richard Townend; Jonathan Cook
Subject: Help out mills

Hi Richard

I write to confirm that the survey completed at Help out Mills, was set to GPS Ordinance Datum by using GPS equipment on the stations used for the survey. This was checked across the site and the levels correlated. The survey data on the riverbed survey was cross referenced too which had been set by other surveyors and the levels again correlated.

If you have any further queries or there is a specific level the EA can reference that they are checking against we would be more than happy to examine this.

Many thanks

Richard Elam BEM
ACIOB IMaPS
Director



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