Reid Jones partnership

Consulting Civil &
Structural Engineers

FLOOD RISK ASSESSMENT AND DRAINAGE STATEMENT

PROPOSED DEVELOPMENT AT SHACKLETONS GARDEN CENTRE, CHATBURN, CLITHEROE

SHACKLETONS GARDEN CENTRE LIMITED

Project No.: 10301				
Issue Date	**Revision**	**Status**	**Issued By**	**Checked By**
18.03.20	01		S Dop	SJ Reid
02.11.21	02		S Dop	SJ Reid
24.11.21	03		S Dop	SJ Reid

[redacted]

CONTENTS

1.0 INTRODUCTION

1.0.1 Reid Jones Partnership has been commissioned by Shackletons Garden Centre Limited to prepare a Flood Risk Assessment and Drainage Statement for a proposed expansion of the retail development at Clitheroe Road, Chatburn, Clitheroe, BB7 4JY.

1.0.2 The site lies within the civil parish of Chatburn, within the district of Ribble Valley Borough Council, in Lancashire County Council.

1.0.3 The Flood Risk Assessment and Drainage Statement is in support of the planning application submission for the development.

1.1 Site Context

1.1.1 The site comprises approximately 2.4 hectares of land, housing the existing Shackletons Home and Garden store, with associated car parks, storage areas and an area of agricultural land to the south-east.

1.2 Legislative Context

1.2.1 Planning requirements for the development require a flood risk assessment and site specific drainage strategy or statement to demonstrate that the drainage scheme proposed is in compliance with both the NPPF/NPPG and Non-Statutory Technical Standards.

1.2.2 As the site is located within Flood Zone 1, this report will focus on the drainage strategy of the site and outline the appropriate mitigation measures to ensure there will be no significant increase in flood risk to the site or surrounding area as a result of the development.

1.3 Site Description and Location

1.3.1 The development location is shown on Figure 1 below.

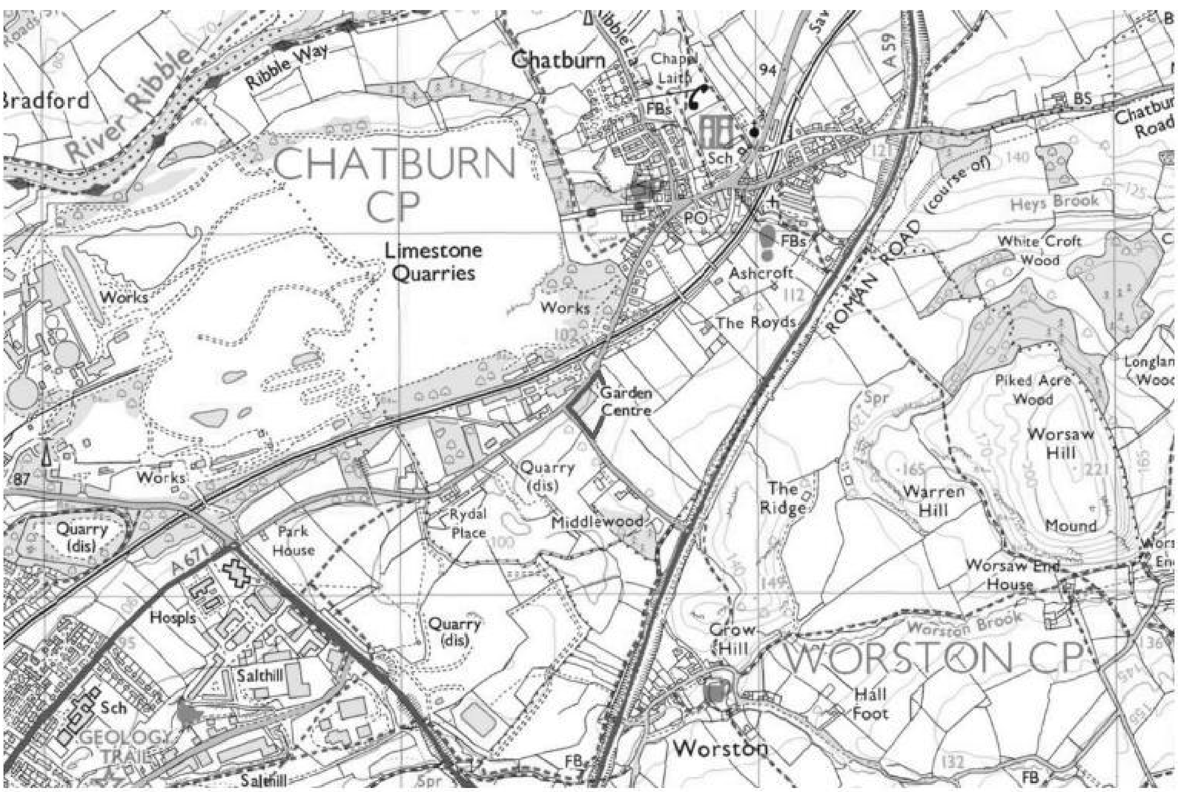


Figure 1 – Site Location Plan

1.3.2 The site covers an area of 2.4 hectares and houses the existing Shackletons Garden Centre building, storage areas, car parks and access roads and an area of agricultural land to the south-east.

1.3.3 The site lies between Clitheroe Road to the north-west, Worston Road to the south-west and agricultural land to the north-east and south-east. The main site entrance is off Clitheroe Road, while service access is provided off Worston Road.

1.3.4 The site is centred at Ordnance Survey reference 376567 E, 443518 N.

1.3.5 The nearest main rivers are Heys Brook, approximately 650m to the north-east of the site and Worston Brook, approximately 1km to the south.

1.3.6 British Geological Survey (BGS) maps indicate superficial deposits of till (Devensian – Diamicton) overlying bedrock of Limestone and Mudstone (Clitheroe Limestone Formation And Hodder Mudstone Formation (undifferentiated) - Mudstone).

1.3.7 The site is steeply sloping, falling towards the north-west. The existing site topography is shown on Reid Jones Partnership drawing No. 10301-100 (Appendix A).

1.4 Development Proposals

1.4.1 Planning permission is sought for an extension to the retail building, and associated car parking and landscaping to suit. Customer access will remain off Clitheroe Road, but the entrance will be moved to the east approximately 11 metres. Service access is also proposed further up Worston Road, to allow for the building expansion. The proposed layout of the site is shown on Stanton Andrews Architects drawing No. 1859/PL01 A (Appendix B).

1.5 Sequential Test and Exception Test

1.5.1 NPPG describes the principles of the Sequential Test, which aims to steer new development to areas with the lowest probability of flooding. The Sequential Test is a decision-making tool designed to ensure that sites at little or no risk of flooding are developed in preference to areas at higher risk.

1.5.2 As the site is within Flood Zone 1, the lowest risk zone, the development is considered 'appropriate'. Therefore, the Sequential Test is passed and the Exception Test is not required.

2.0 THIRD PARTY CONSULTANTS

2.1 Statutory Authorities

2.1.1 Information from the following Statutory Authorities has been examined to inform the flood risk assessment and provide a drainage strategy:

- Lancashire County Council (LCC)
- Ribble Valley Borough Council
- Environment Agency (EA)
- United Utilities (UU)

2.1.2 Some of the information and records received are contained within Appendix C (flood maps) and Appendix D (sewer record plan).

3.0 FLOOD RISK TO THE SITE

3.1 Fluvial and Tidal Flooding

3.1.1 The site is not located in proximity to a coastline or tidally influenced river therefore flood risk from tidal sources is considered to be low.

3.1.2 The site is entirely within Flood Zone 1, therefore fluvial flood risk is considered to be low.

3.2 Groundwater Flooding

3.2.1 Ribble Valley Borough Council's SFRA notes:

> "Following consultation with the EA, no evidence of groundwater flooding in the area has been identified. While no risk has been demonstrated, this is not to say that unrecorded groundwater flooding events may have taken place or that groundwater flooding may not occur in the future, but using the best available information they are not considered to be a significant risk at this time."

3.2.2 There are no historic records of groundwater flooding to the site.

3.2.3 Any groundwater strikes will be noted when on-site borehole/site investigations are carried out.

3.2.4 As there are no records of groundwater flooding on the site, the groundwater flood risk is considered to be low.

3.3 Surface Water Flooding

3.3.1 The Environment Agency's long term flood risk map shows areas to the south-east and north-east of the existing building to be at medium to low risk of flooding due to surface water.

3.3.2 Flooding to the building has been experienced due to inadequate surface drainage points allowing surface water runoff from existing hard standings to pond against the building.

3.3.3 Assessment of the site topography shows all ground levels fall towards the existing building.

3.3.4 The existing pluvial flood risk is therefore considered to be medium.

3.3.5 The proposal is to extend the retail building and provide car parking and landscaped areas, that will allow for re-modelling of site levels and provision of adequate surface water drainage points and sub-surface attenuation.

3.4 Flooding from Public Sewers

3.4.1 With reference to the United Utilities sewer record drawing, Appendix D, the area is not served by any public sewers draining by gravity. There is a rising main located within Clitheroe Road. There are no public sewers located on the site and flooding from public sewers is therefore considered to be low.

3.5 Flooding from Artificial Sources

3.5.1 There are no canals or reservoirs in proximity to the site. Therefore, flooding from artificial sources is considered to be low.

3.6 Summary of Potential Sources

3.6.1 The site is located within Flood Zone 1 and is at low risk from sources of flooding including tidal, fluvial, groundwater, sewer related and from artificial sources. However, there is an existing, up to medium risk, of flooding from surface water. It is proposed that the risk of surface water flooding to the building is reduced to "very low" by appropriate design of the new extension, external levels and surface water drainage.

3.6.2 Information to support this statement has been gathered from online EA flood maps, Lancashire and Blackpool Local Flood Risk Management Strategy, Ribble Valley Borough Council's Strategic Flood Risk Assessment (SRFA) and UU sewer records.

4.0 FLOOD RISK FROM THE SITE

4.0.1 There is an existing flood risk from the site, as noted in LCC's letter of 13 September 2019 (Appendix E).

4.0.2 One cause is surface water flooding as described in 3.3. In addition to the on-site risk, surface water is not being captured adequately from the car park and this water is flowing down the access road and off-site onto the public highway.

4.0.3 A second cause is the drainage of the existing roof, at the south-western boundary, where gutters discharge rainwater into chutes which discharge onto the rear of the grass verge. This rainwater crosses the verge and onto the footway and therefore discharges onto the highway.

4.0.4 It is proposed that the risk of surface water flooding from the site is reduced by re-design of the access road, external levels, surface water drainage points and below ground drainage.

4.0.5 The flood risk from the site will also be reduced by limiting runoff from the proposed development to a greenfield runoff rate.

5.0 HYDRAULIC ASSESSMENT

5.1 Existing Drainage

5.1.1 The garden centre is served by an existing private drainage network, with separate systems for foul and surface water.

5.1.2 Foul drainage from existing WCs and the kitchen is treated by on-site package sewage treatment plants, sited adjacent to the main building entrance.

5.1.3 The treated effluent combines with the on-site surface water system before discharging into a private sewer in the footway (termed the "suff" (sic) by site employees) at an existing manhole (denoted EX2).

5.1.4 Investigations have been carried out into both the on-site surface water drainage and the private sewer. The findings are indicated on RJP drawing No. 101 and Stanton Andrews drawing No. SK.05 (Appendix F).

5.1.5 The on-site surface water system was largely silted up or manholes were inaccessible at the time, leading to limited data.

5.1.6 However, the sewer in the footway was recorded as 150mm diameter and was able to be traced upstream from manhole EX2, to the north-east of the site entrance, to an existing manhole (denoted EX3). The incoming pipe to EX3 crossed under the highway from the north and was noted to be "collapsed" by the drainage company carrying out the investigation.

5.1.7 It was also traced in the footway from EX2 towards the corner of Worston Road to an existing manhole (denoted EX1).

5.1.8 At least one road gulley was noted to be connected into the sewer.

5.1.9 The outlet from EX2 crossed under the highway in a north-westerly direction to an existing manhole in the highway, adjacent to the kerb (EX4).

5.1.10 From EX4, the pipe size was recorded to be 225mm diameter, and the outlet was indicated to head in a westerly direction.

5.1.11 Following the initial investigation detailed above, further work was undertaken to determine the route of the sough and the surface water discharge off-site at the at north end of the site.

5.1.12 The results of the further investigation are indicated on Stanton Andrews drawing No. SK.05 (Appendix F), and show via dye tracing that the on-site drainage system discharges to the watercourse on the Pendle Trading Estate via the sough.

5.1.13 An estimate has been made of the runoff from the existing site. RJP drawing No. 100 shows the areas of impermeable and permeable areas on which the estimate is based.

5.1.14 Firstly, a calculation of the existing greenfield runofff has been made for the undeveloped and soft paved areas of the site (an area of 1.08 ha), yielding a runoff of 9 l/s for a 1 in 1 year return period.

5.1.15 Secondly, due to limited data for the existing on-site surface water network, runoff from the existing impermeable areas (1.27 ha) has been estimated for a flat rate rainfall of 50mm/hr, yielding a value of 177 l/s.

5.1.16 Thus a pre-development whole site runoff rate can be estimated to be 186 l/s for a flat rate rainfall of 50mm/hr or 1 in 1 year event.

5.1.17 As noted, the only known discharge point for this existing runoff and runoff from the highways is the sough which discharges to an open watercourse.

6.0 PROPOSED DRAINAGE

6.0.1 The proposed development is to be drained on a separate system of drainage.

6.1 Foul Water

6.1.1 Due to the external works improvements to the existing building entrance, is it proposed that the existing foul treatment plants are replaced with a modern packaged wastewater treatment plant, sized to treat all foul flows from the site.

6.1.2 It is anticipated that the treated effluent from the proposed packaged treatment works may be connected into the existing network at an unrestricted rate.

6.2 Surface Water

6.2.1 The design of the surface water drainage has been considered in line with the SUDS hierarchy:

- Infiltration to ground
- Discharge to a watercourse
- Discharge to public sewer

6.2.2 Following ground investigation by Sub Surface Consultants Ltd, it has been demonstrated that the underlying strata renders the site unsuitable for soakaway drainage (see letter report reference TP/7256, 6 July 2021).

6.2.3 The site is not in proximity to any main rivers. The nearest open watercourse is approximately 200m away across Clitheroe Road, within Pendle Trading Estate. There is an existing private sewer (the sough as described in 5.1, and Stanton Andrews drawing No. SK.05, Appendix F), which serves the site and discharges to this watercourse.

6.2.4 The only public sewer in proximity to the site, is the rising main within Clitheroe Road.

6.2.5 As the existing surface water from the site discharges to a watercourse, it is proposed that the surface water discharge from the development is limited to a greenfield runoff and discharged into the same watercourse via the existing sough.

6.2.6 This follows the SUDS hierarchy and will provide an improvement to existing situation, as detailed below.

6.2.7 Greenfield runoffs have been calculated for the proposed development area, as shaded grey on RJP drawing No. 10301-101 (Appendix F) and are given in Appendix G. The 1 in 1 year greenfield runoff is calculated to be 10.4 l/s and the 1 in 100 year greenfield runoff is 24.9 l/s. Q_{BAR} is calculated to be 12.0 l/s.

6.2.8 To mitigate off-site flooding, it is recommended that the proposed surface water system is designed to contain a 1 in 100 year rainfall event, with an increase of 40% allowed for climate change. For ease of preliminary calculation, a discharge limit of Q_{BAR} has been set, in order to calculate preliminary attenuation requirements.

6.2.9 As indicated on drawing No. 10301-101 and 102 (Appendix F), a preliminary total volume of storage of 1425m^3 is required to contain flows from a 1 in 100 year event (plus 40% climate change), with flow controls on outlets as appropriate to limit off-site discharge. The storage may be provided in the form of attenuation crates, as indicated in blue. Alternatively, at design stage, other SUDS measures such as permeable paving may be considered, with an open graded sub-base providing water storage volume. However, it should be noted that the site is steeply sloping and use of permeable paving as attenuation will require baffle details to prevent flooding out of the paving at the lower end of the site.

6.2.10 Preliminary surface water network calculations are provided in Appendix H. Due to site levels it has been assumed that the north and south sides of the site will drain separately around the existing building, and therefore each network has been limited to a discharge of 6 l/s.

6.2.11 An estimate of the runoff from the existing roof has been made (based on a measured area of 4674 m2 for the existing building which is to remain unchanged). A figure of 65 l/s is calculated for a flat rate rainfall of 50 mm/hr.

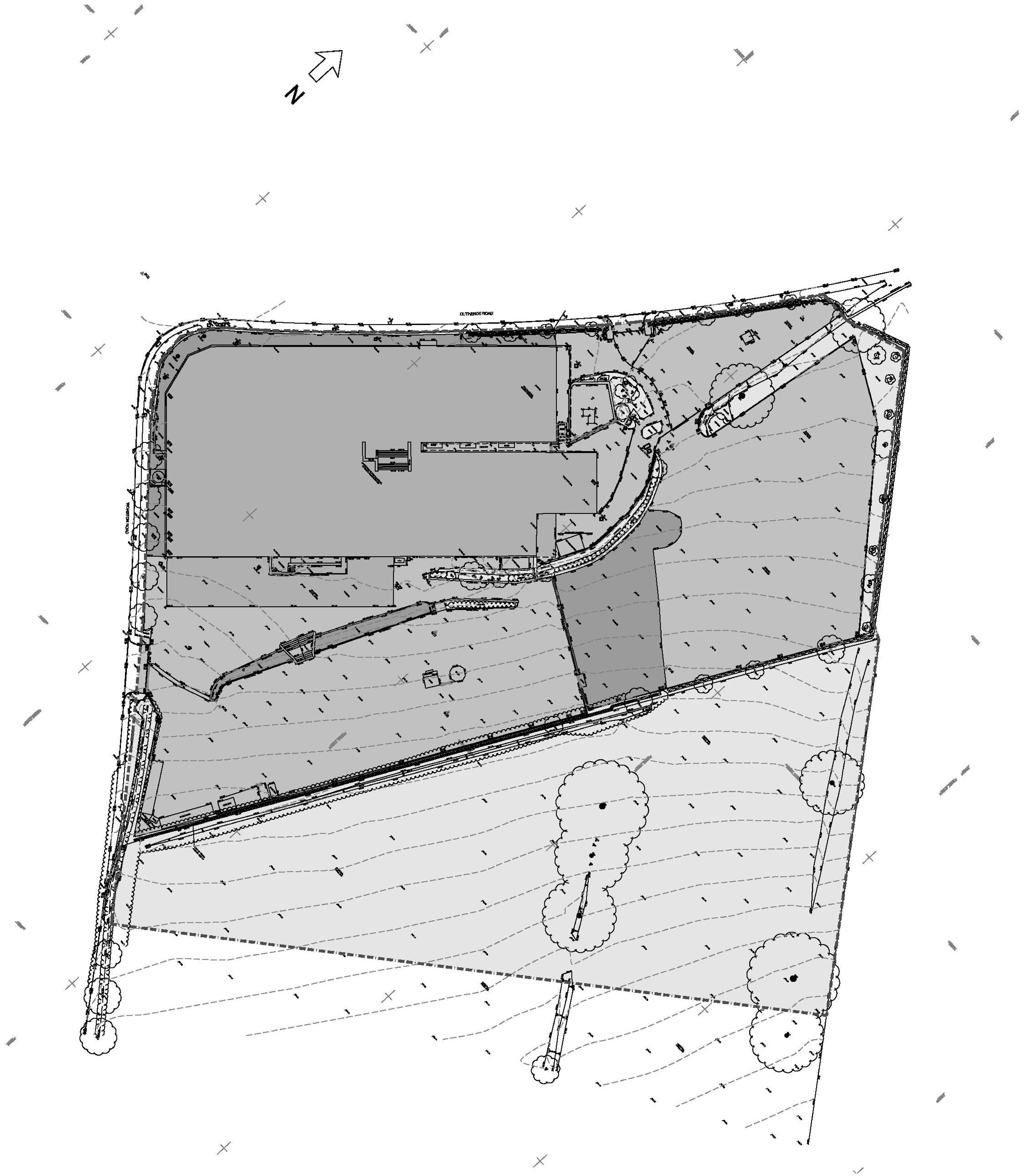
6.2.12 When added to the 1 in 1 year greenfield runoff from the areas to be redeveloped (10.4 l/s), it can be estimated that the post-development site runoff is in the order of 75 l/s, for a flat rate rainfall of 50mm/hr or 1 in 1 year event. This is however a lower bound figure, as some areas of the site are to remain greenfield/soft paved, and have not been taken into consideration when calculating the greenfield runoff for the proposed development areas. By inspection, allowing 10 l/s for additional greenfield areas, the post-development total runoff rate for the site may be estimated to be approximately 85 l/s (again for a flat rate rainfall of 50mm/hr or 1:1 year event).

6.2.13 When compared to the existing pre-development whole site runoff rate of 186 l/s (for a flat rate rainfall of 50mm/hr or 1 in 1 year event, see 5.1.16) the betterment for the whole site can be calculated to be in the order of 45%. This betterment will be achieved by limiting all re-developed areas to greenfield runoff rates.

6.2.14 As previously stated, the pre-development runoff is carried to the watercourse in Pendle Trading Estate via the sough – a private culvert/pipe system passing under third party land. It should be noted that riparian owners are responsible for the maintenance of drainage capacity on their land, and the proposed scheme reduces the maximum off-site surface water discharge to the sough.

APPENDIX A

Reid Jones Partnership drawing No. 10301-100



0 10 20 30 40 50 METRES

SCALE BAR 1:500

PRELIMINARY DRAWING.
NOT FOR CONSTRUCTION.

NOTES

1. THIS DRAWING IS BASED ON SURVEY OPERATIONS DRAWING NO. 19B058/001A.

KEY	TOTAL AREA (ha)
EXISTING PERMEABLE/ PLANTED/UNDEVELOPED AREA	0.95
EXISTING GRAVEL/SLATE CHIPPINGS	0.13
EXISTING HARD PAVED SURFACING	0.80
EXISTING ROOVES (EXISTING DEVELOPMENT TO REMAIN)	0.47
TOTAL SITE AREA	2.35

Rev	Details	Drawn By	Chk/App By	Date
P2	EXISTING PERMEABLE AND IMPERMEABLE AREAS HIGHLIGHTED	SD	SJR	28.10.21
P1	ISSUED FOR INFORMATION	SD	SJR	04.03.20

Client:

SHACKLETONS GARDEN CENTRE LIMITED

Project:

PROPOSED DEVELOPMENT AT SHACKLETONS GARDEN CENTRE, CHATBURN

Title:

EXISTING SITE TOPOGRAPHY

Issued For:

INFORMATION

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Scale: 1:500 @ (A1)

Project No:	Drawing No:	Issue:
10301	100	P2

APPENDIX B

Stanton Andrews Architects drawing No. 1859/PL01 A

roof and site plan

'as existing' drawings based on information provided by others - no measured survey of the property has been undertaken by the architect.

this drawing is to be read in conjunction with all relevant consultants and specialists drawings. the architect is to be notified of any discrepancies before proceeding.
do not scale from this drawing. all dimensions are to be checked on site.
this drawing is subject to copyright.

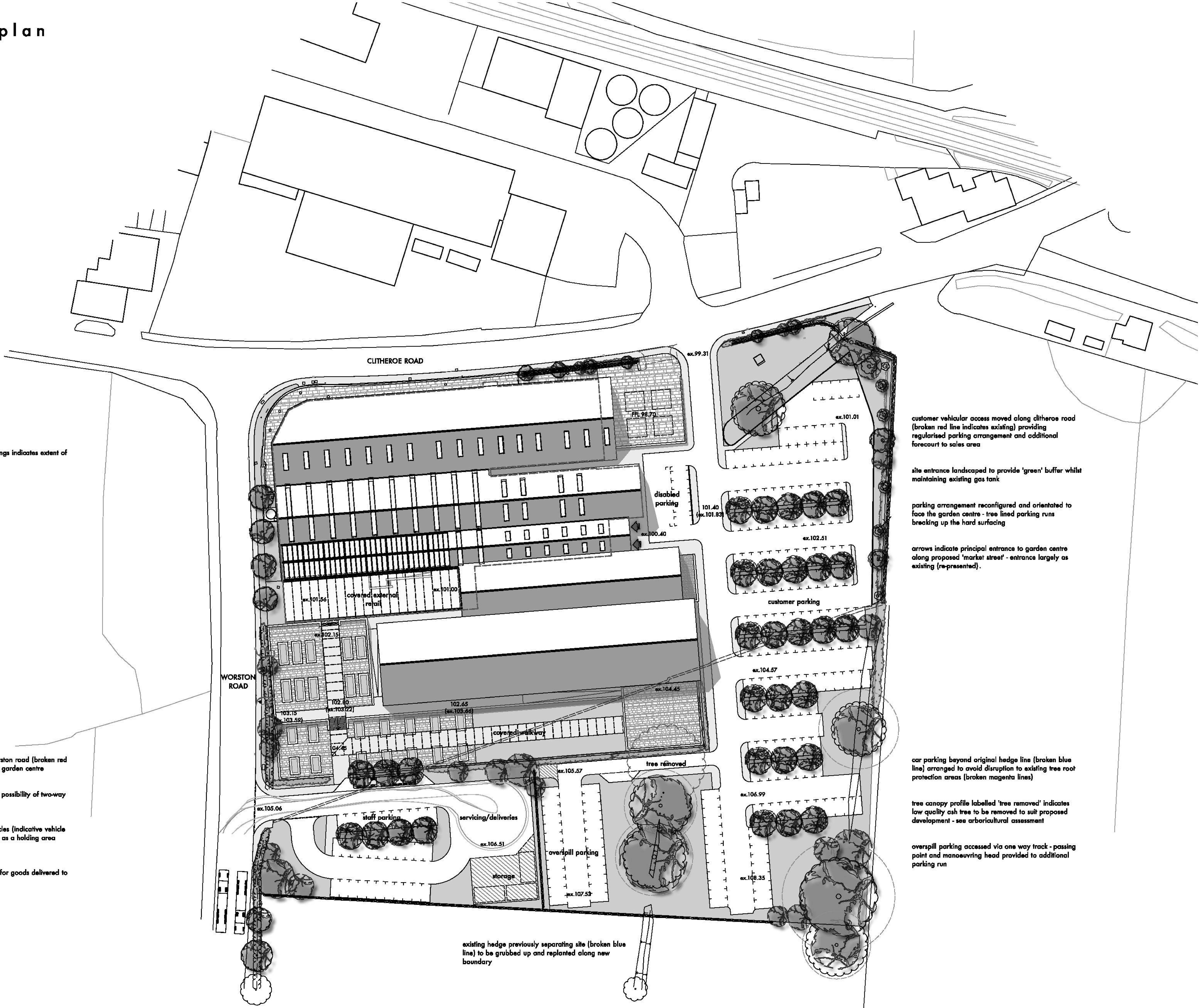
broken red line surrounding the garden centre buildings indicates extent of existing arrangement (including polytunnels)

staff and servicing/delivery access moved along worston road (broken red line indicates existing) to suit proposed extensions to garden centre

service yard to incorporate delivery bay to maintain possibility of two-way traffic

turning head sized to accommodate articulated vehicles (indicative vehicle tracking illustrated in grey) - turning head to operate as a holding area should it be neccessary at busy periods

hatched area to service yard indicates storage area for goods delivered to site. broken lines indicate pallets/containers



customer vehicular access moved along clitheroe road (broken red line indicates existing) providing regularised parking arrangement and additional forecourt to sales area

site entrance landscaped to provide 'green' buffer whilst maintaining existing gas tank

parking arrangement reconfigured and orientated to face the garden centre - tree lined parking runs breaking up the hard surfacing

arrows indicate principal entrance to garden centre along proposed 'market street' - entrance largely as existing (re-presented).

car parking beyond original hedge line (broken blue line) arranged to avoid disruption to existing tree root protection areas (broken magenta lines)

tree canopy profile labelled 'tree removed' indicates low quality ash tree to be removed to suit proposed development - see arboricultural assessment

overspill parking accessed via one way track - passing point and manoeuvring head provided to additional parking run

0m 10m 20m 30m 40m 50m scale

A issued for pre-app 19.07.2019

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architects

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w stantonandrews.co.uk

shackletons home & garden
chatburn

proposed site plan

drg.no. 1859 / PL01 rev. A

drawn. db date. july 19 scale. 1 to 500 @ A1

APPENDIX C

Flood Maps

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
shackletons	**376563/443533**	**4 Mar 2020 12:23**

Your selected location is in flood zone 1, an area with a low probability of flooding.

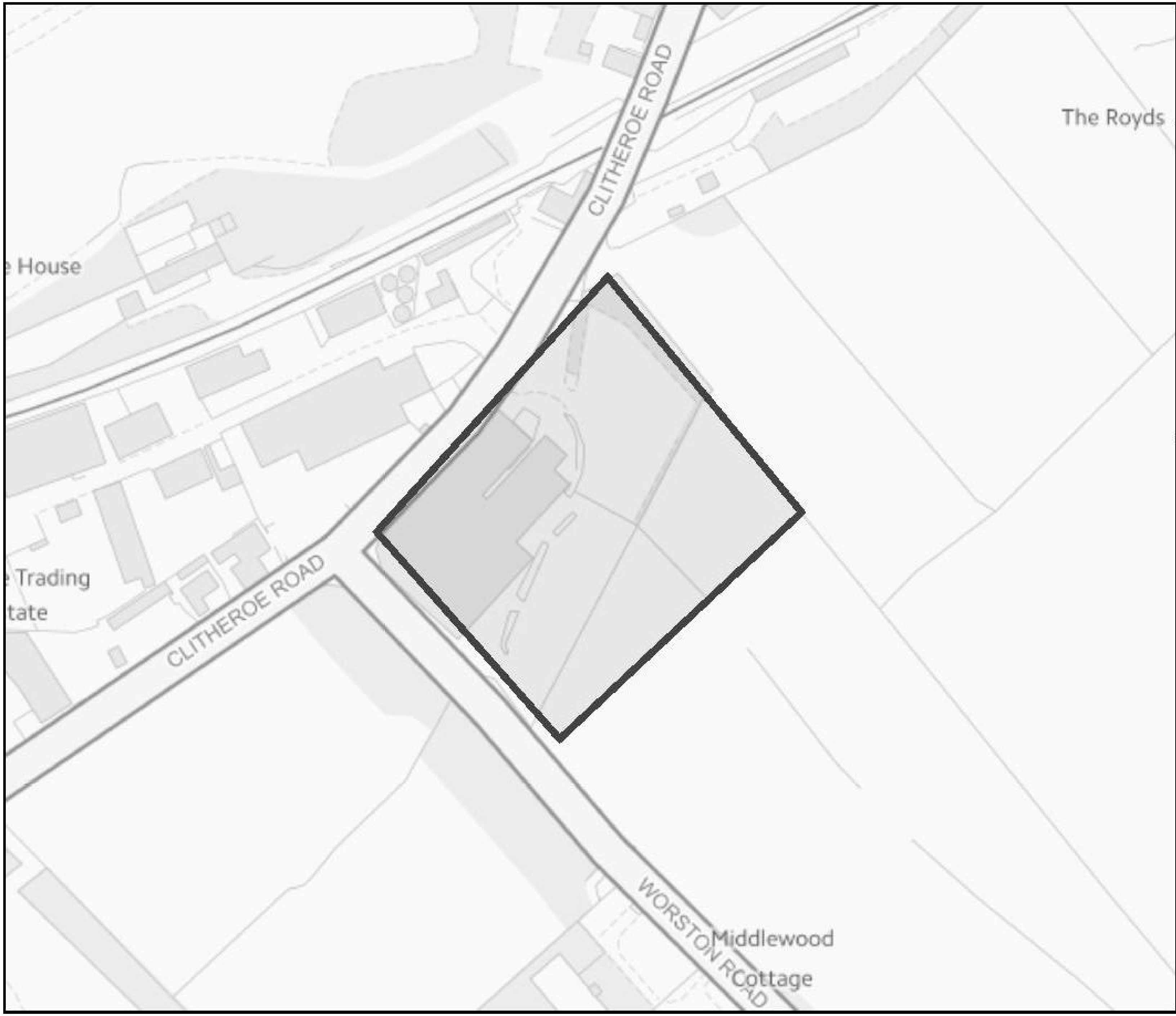
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
shackletons

Location (easting/northing)
376563/443533

Scale
1:2500

Created
4 Mar 2020 12:23

Selected area

Flood zone 3

Flood zone 3: areas benefitting from flood defences

Flood zone 2

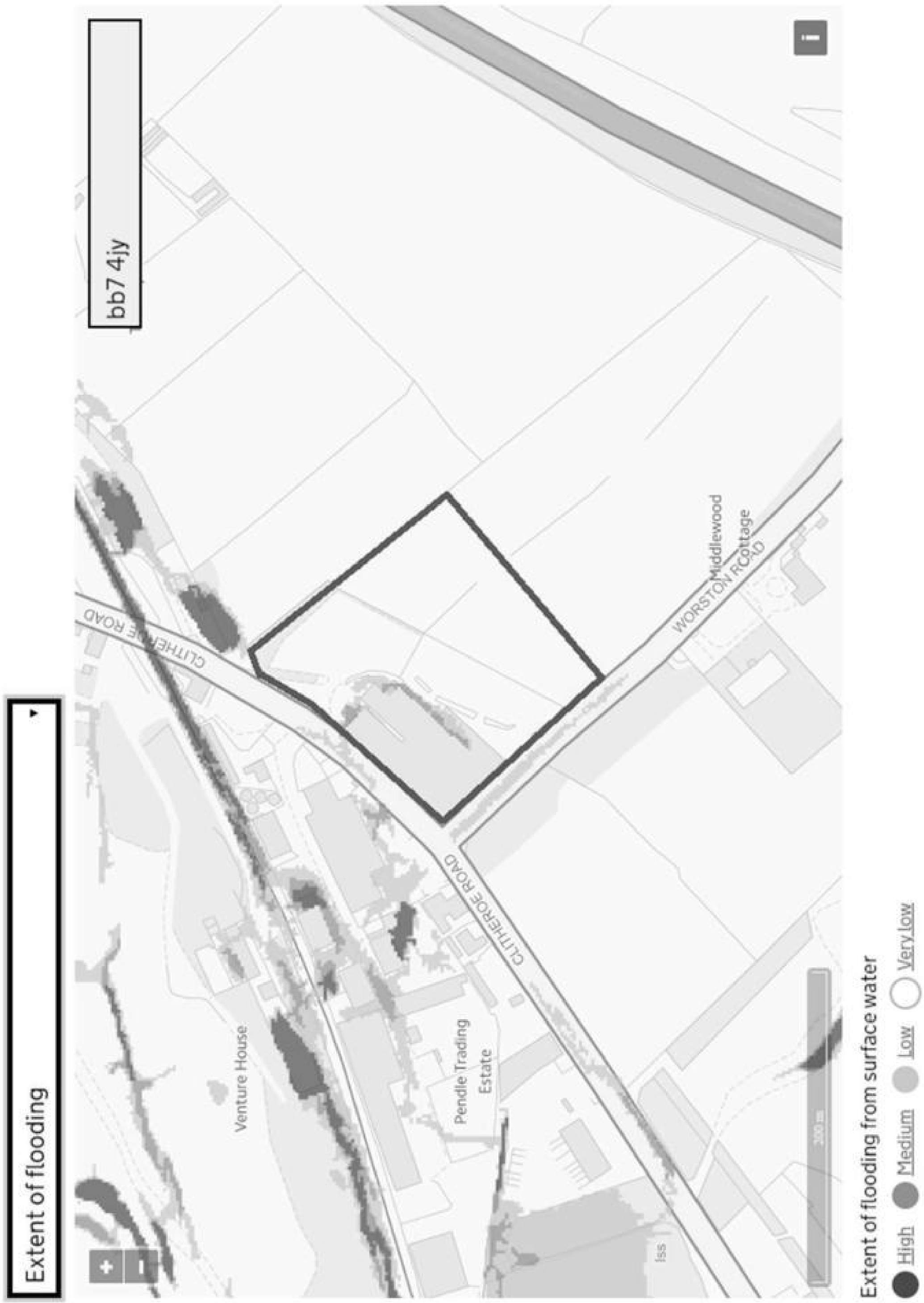
Flood zone 1

Flood defence

Main river

Flood storage area

0 20 40 60m



Flooding Due to Surface Water

APPENDIX D

United Utilities Sewer Records

United Utilities
helping life flow smoothly

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

[redacted]

E-mail: propertysearches@uuplc.co.uk

Reid Jones Partnership

9 Orrell Road
9 Orrell Road,
Orrell, Lancashire
WN5 8EY

FAO:

Your Ref: Shackleton's Garden Centre
Our Ref: UUPS-ORD-150980
Date: 13/02/2020

Dear Sirs

Location: SHACKLETONS GARDEN CENTRE CLITHEROE ROAD, CHATBURN, CLITHEROE, BB7 4JY

I acknowledge with thanks your request dated 12/02/2020 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

[redacted]

UUWaterLtd/041/03-15

United Utilities Water Limited
Registered in England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

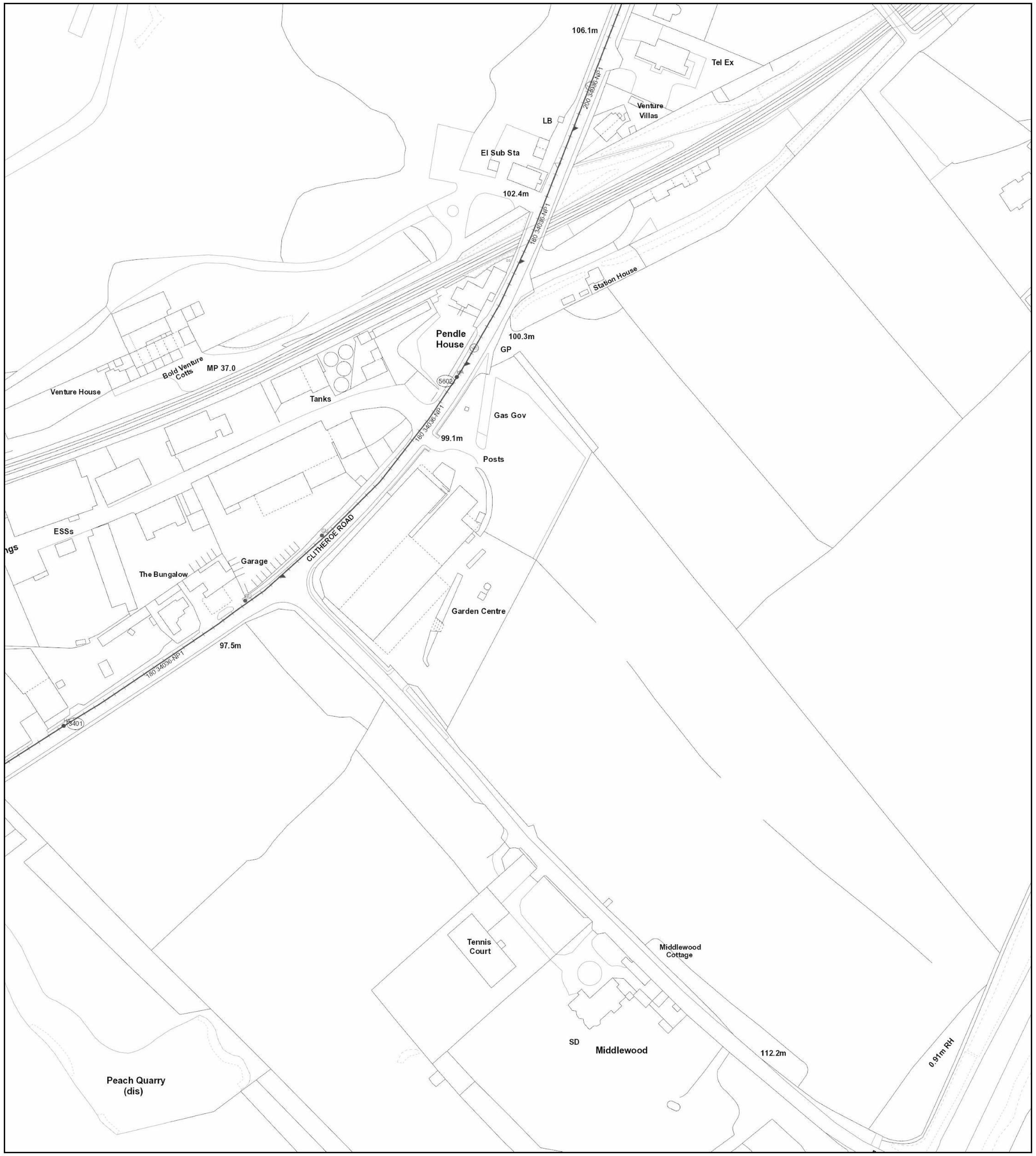
TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

United Utilities Water Limited
Registered in England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP



The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad	Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

LEGEND

Abandoned | Foul | Surface Water | Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

All point assets follow the standard colour convention:
red - combined   blue - surface water
brown - foul   purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO Foul
SW Surface Water
CO Combined
OV Overflow

SEWER SHAPE

CI Circular
EG Egg
OV Oval
FT Flat Top
RE Rectangular
SQ Square
TR Trapezoidal
AR Arch
BA Barrel
HO HorseShoe
UN Unspecified

SEWER MATERIAL

AC Asbestos Cement
BR Brick
PE Polyethylene
RP Reinforced Plastic Matrix
CO Concrete
CSB Concrete Segment Bolted
CSU Concrete Segment Unbolted
CC Concrete Box Culverted
PSC Plastic / Steel Composite
GRC Glass Reinforced Plastic
DI Ductile Iron
PVC Polyvinyl Chloride
CI Cast Iron
SI Spun Iron
ST Steel
VC Vitrified Clay
PP Polypropylene
PF Pitch Fibre
MAC Masonry, Coursed
MAR Masonry, Random
U Unspecified

Address or Site Reference:

SHACKLETONS GARDEN CENTRE CLITHEROE ROAD,
CHATBURN,
CLITHEROE,
BB7 4JY

Scale: 1:1250 **Date:** 13/02/2020

Sheet: 1 of 1

Printed by: Property Searches

SEWER RECORDS

United Utilities
helping life flow smoothly

APPENDIX E

Lancashire County Council Letter Ref LHS/GC/2019/RV12/HH/MC

Lancashire County Council

Shackletons Garden Centre
Clitheroe Road
Chatburn
Clitheroe
BB7 4JY

Phone: 0300 123 6780
Email: highways@lancashire.gov.uk
Your ref:
Our ref: LHS/GC/2019/RV12/HH/MC

Date: 13 September 2019

Dear Sir/Madam

HIGHWAYS ACT 1980, SECTION 151/SECTION 163
WATER FLOWING ONTO THE HIGHWAY - WORSTON ROAD, CHATBURN

It has been brought to my attention that water is flowing off your land and onto the highway at the following location, contrary to the Highways Act 1980:

Worston Road, Chatburn

I understand that the land in question is in your ownership or lease.

Water flowing off your land and onto the highway will pose a hazard to highway users, especially during the winter period.

Consequently this may result in emergency visits by the gritter or the gully emptier to deal with highway hazards and the cost of any emergency visits made will be recharged to you. Also, if there are any claims made by highway users as a consequence of your water on the highway, they will be redirected to you.

Therefore, in the interest of public safety, I must insist that you make urgent arrangements for the drainage issue to be resolved and to prevent water from your land flowing onto the highway.

Please keep me updated with your plan of action or if you wish to discuss the situation further please do not hesitate to contact me via the above number, or in writing quoting the above reference.

Yours faithfully

[redacted]

Hilary J Hargreaves EngTech MICE
Highways Operational Engineer
Highways and Transport
Lancashire County Council

Phil Barrett
Director of Highways and Transport
Cuerden Way • Bamber Bridge • Preston • PR5 6BS

APPENDIX F

Stanton Andrews drawing No. SK.05
Reid Jones Partnership drawing No. 10301-101 and 10301-102

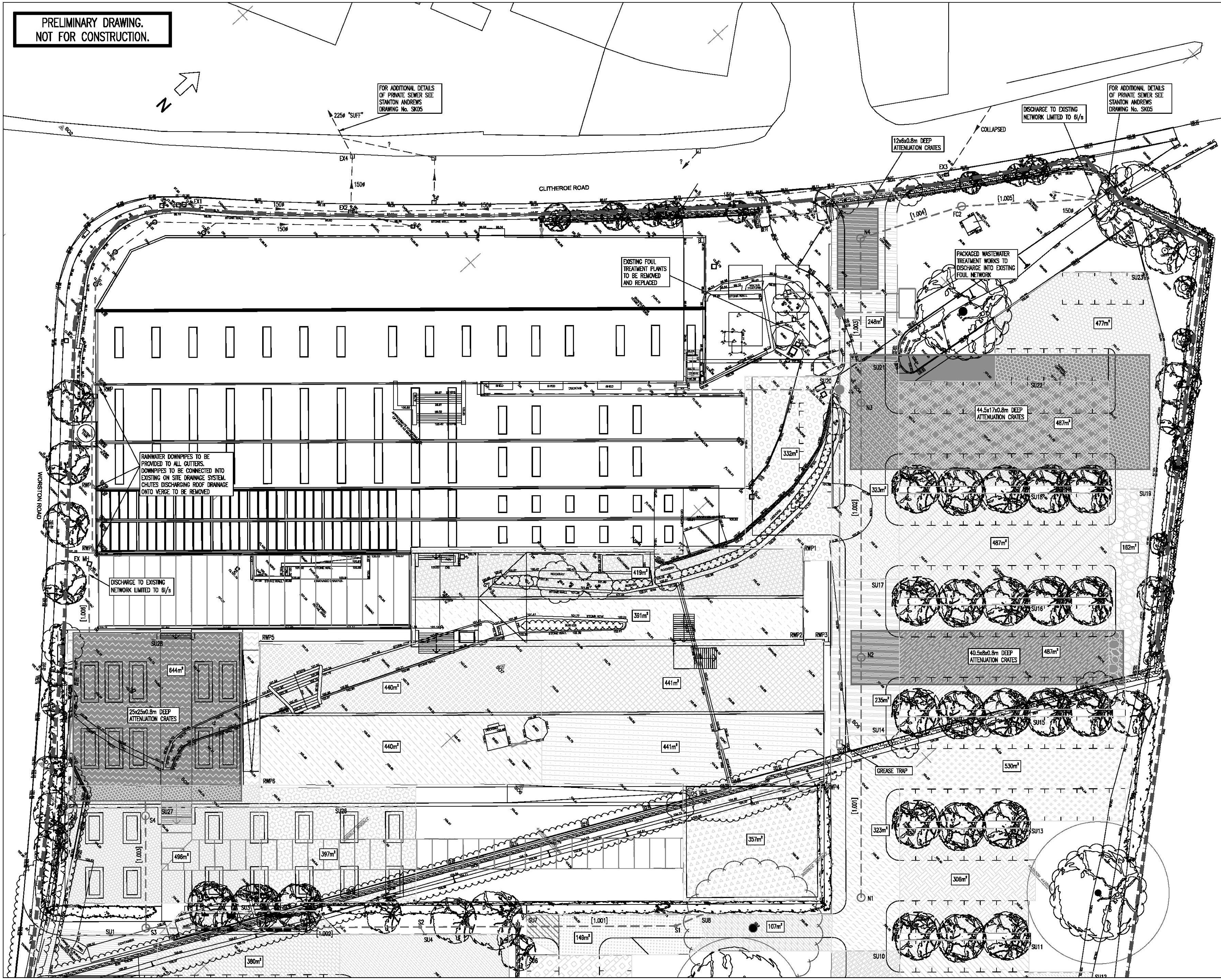
Excerpt from 1888 survey showing railway sidings and original road arrangement

revision	date	note
-	Nov 21	issued for information

stanton andrews
architects
44 york street clitheroe BB7 2DL
t. 01200 444490 e. mail@stantonandrews.co.uk w. stantonandrews.co.uk
Chartered Practice

project	project number	drawing number
shackletons home & garden	18.59	SK.05
name: Sough drainage		

scale	date	status	revision
1 to 1000 @ A1	11.21	planning	-



KEY:

EXISTING DRAINS
PROPOSED SW DRAIN (INDICATIVE)
PROPOSED FW DRAIN (INDICATIVE)
PROPOSED ACO SLOT DRAIN
SU PROPOSED SUMP UNIT
RWP PROPOSED RAIN WATER PIPE

441m² PROPOSED DEVELOPMENT AREAS

Rev	Details	Drawn By	Ckd/App By	Date
P3	DRAINAGE AMENDED TO INCLUDE RESULTS OF FURTHER SURVEY WORK.	SD	SJR	23.11.21
P2	DRAWING SCALE AMENDED. PROPOSED DRAINAGE NETWORK REFERENCES ADDED. EXISTING DRAINAGE AND KEY ADDED.	SD	SJR	29.10.21
P1	ISSUED FOR INFORMATION	SD	SJR	18.03.20

Client:

SHACKLETONS GARDEN CENTRE LIMITED

Project:

PROPOSED DEVELOPMENT AT SHACKLETONS GARDEN CENTRE, CHATBURN

Title:

PROPOSED DRAINAGE GENERAL ARRANGEMENT SHEET 1 OF 2

Issued For:

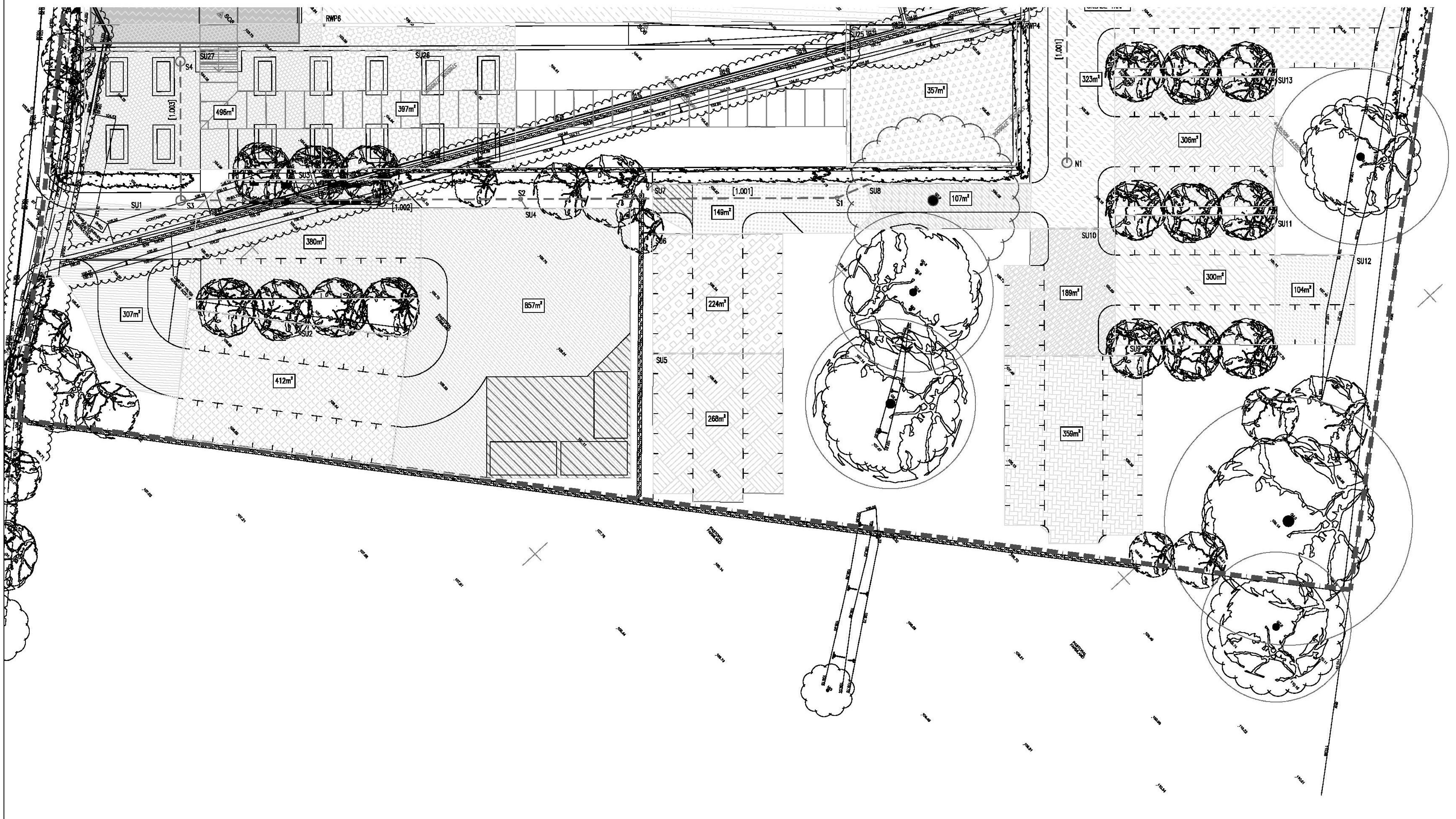
INFORMATION

Reid Jones partnership
Consulting Civil & Structural Engineers
9 Orrell Road, Orrell, Wigan, WN5 8EY, Tel 01942 216006
3 Cross Street, Preston, PR1 3LT, Tel 01772 496007
E-mail enq@reidjonespartnership.co.uk
Web address www.reidjonespartnership.co.uk

Scale: 1:250 @ (A1)

Project No:	Drawing No:	Issue:
10301	101	P3

PRELIMINARY DRAWING.
NOT FOR CONSTRUCTION.



KEY:
EXISTING DRAINS
PROPOSED SW DRAIN (INDICATIVE)
PROPOSED FW DRAIN (INDICATIVE)
PROPOSED ACO SLOT DRAIN
SU PROPOSED SUMP UNIT
RWP PROPOSED RAIN WATER PIPE
441m² PROPOSED DEVELOPMENT AREAS

Rev	Details	Drawn By	Chk/App By	Date
P1	ISSUED FOR INFORMATION	SD	SJR	29.10.21

Client:
SHACKLETONS GARDEN CENTRE LIMITED

Project:
PROPOSED DEVELOPMENT AT SHACKLETONS GARDEN CENTRE, CHATBURN

Title:
PROPOSED DRAINAGE GENERAL ARRANGEMENT SHEET 2 OF 2

Issued For:
INFORMATION

Reid Jones partnership
Consulting Civil & Structural Engineers

9 Orrell Road
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WN5 8EY
Tel 01942 216006

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Web address www.reidjonespartnership.co.uk

Scale: 1:250 @ (A1)

Project No:	Drawing No:	Issue:
10301	102	P1

APPENDIX G

Greenfield Runoff Rate Estimations

Pre-development (1.08 ha)
Post-development (1.25 ha)

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Sarah Dop
Site name:	SHACKLETONS
Site location:	CLITHEROE

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.88729° N
Longitude:	2.35824° W
Reference:	2352222987
Date:	Oct 28 2021 10:44

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.08

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	1258	1258
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	10.35	10.35
1 in 1 year (l/s):	9.01	9.01
1 in 30 years (l/s):	17.6	17.6
1 in 100 year (l/s):	21.53	21.53
1 in 200 years (l/s):	24.54	24.54

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Sarah Dop
Site name:	Shackletons
Site location:	Chatburn

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.88722° N
Longitude:	2.35818° W
Reference:	1620177058
Date:	Mar 06 2020 17:11

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 1.25

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1258	1258
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	11.98	11.98
1 in 1 year (l/s):	10.42	10.42
1 in 30 years (l/s):	20.37	20.37
1 in 100 year (l/s):	24.92	24.92
1 in 200 years (l/s):	28.4	28.4

APPENDIX H

Reid Jones Partnership Surface Water Network Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	2.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.011	2.00	105.900	450	376593.154	443505.625	1.125
S2	0.150	2.00	105.500	450	376567.516	443477.584	1.439
S3	0.110	2.00	105.100	450	376540.007	443447.495	1.724
S4	0.089	2.00	104.450	450	376527.698	443458.749	1.355
ATT	0.192	2.00	102.150	1	376518.044	443472.515	1.200
FC1			102.150	1200	376504.818	443468.478	1.433
EX MH			101.380	1200	376494.516	443477.992	1.200

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	S1	S2	37.995	0.600	104.775	104.136	0.639	59.5	225	2.37	50.0
1.002	S2	S3	40.769	0.600	104.061	103.376	0.685	59.5	300	2.71	50.0
1.003	S3	S4	16.678	0.600	103.376	103.095	0.281	59.4	300	2.84	50.0
1.004	S4	ATT	16.814	0.600	103.095	100.950	2.145	7.8	300	2.89	50.0
1.005	ATT	FC1	13.828	0.600	100.950	100.717	0.233	59.3	300	3.00	50.0
1.006	FC1	EX MH	14.023	0.600	100.717	100.180	0.537	26.1	300	3.08	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.001	1.699	67.6	1.5	0.900	1.139	0.011	0.0
1.002	2.041	144.3	21.8	1.139	1.424	0.161	0.0
1.003	2.044	144.5	36.7	1.424	1.055	0.271	0.0
1.004	5.648	399.2	48.8	1.055	0.900	0.360	0.0
1.005	2.044	144.5	74.8	0.900	1.133	0.552	0.0
1.006	3.088	218.3	74.8	1.133	0.900	0.552	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	37.995	59.5	225	Circular	105.900	104.775	0.900	105.500	104.136	1.139
1.002	40.769	59.5	300	Circular	105.500	104.061	1.139	105.100	103.376	1.424
1.003	16.678	59.4	300	Circular	105.100	103.376	1.424	104.450	103.095	1.055
1.004	16.814	7.8	300	Circular	104.450	103.095	1.055	102.150	100.950	0.900
1.005	13.828	59.3	300	Circular	102.150	100.950	0.900	102.150	100.717	1.133
1.006	14.023	26.1	300	Circular	102.150	100.717	1.133	101.380	100.180	0.900

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	S1	450	Manhole	Adoptable	S2	450	Manhole	Adoptable
1.002	S2	450	Manhole	Adoptable	S3	450	Manhole	Adoptable
1.003	S3	450	Manhole	Adoptable	S4	450	Manhole	Adoptable
1.004	S4	450	Manhole	Adoptable	ATT	1	Manhole	Adoptable
1.005	ATT	1	Manhole	Adoptable	FC1	1200	Manhole	Adoptable
1.006	FC1	1200	Manhole	Adoptable	EX MH	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	376593.154	443505.625	105.900	1.125	450				
						0	1.001	104.775	225
S2	376567.516	443477.584	105.500	1.439	450	1	1.001	104.136	225
						0	1.002	104.061	300
S3	376540.007	443447.495	105.100	1.724	450	1	1.002	103.376	300
						0	1.003	103.376	300
S4	376527.698	443458.749	104.450	1.355	450	1	1.003	103.095	300
						0	1.004	103.095	300
ATT	376518.044	443472.515	102.150	1.200	1	1	1.004	100.950	300
						0	1.005	100.950	300
FC1	376504.818	443468.478	102.150	1.433	1200	1	1.005	100.717	300
						0	1.006	100.717	300
EX MH	376494.516	443477.992	101.380	1.200	1200	1	1.006	100.180	300

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.200	Additional Storage (m^3/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
100	40	0	0

Node FC1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	100.717	Product Number	CTL-SHE-0115-6000-1000-6000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.0	Min Node Diameter (mm)	1200

Node ATT Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	100.950
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	625.0	0.0	0.800	625.0	0.0	0.801	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	S1	9	104.802	0.027	2.1	0.0042	0.0000	OK
15 minute summer	S2	9	104.155	0.093	30.9	0.0149	0.0000	OK
15 minute summer	S3	9	103.512	0.136	52.0	0.0216	0.0000	OK
15 minute summer	S4	9	103.207	0.112	69.0	0.0179	0.0000	OK
480 minute winter	ATT	344	101.105	0.155	17.2	92.1328	0.0000	OK
480 minute winter	FC1	352	101.126	0.409	14.1	0.4624	0.0000	SURCHARGED
15 minute summer	EX MH	1	100.180	0.000	6.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	S1	1.001	S2	2.0	0.755	0.029	0.0990	
15 minute summer	S2	1.002	S3	30.9	1.250	0.214	1.0124	
15 minute summer	S3	1.003	S4	51.9	1.899	0.359	0.4591	
15 minute summer	S4	1.004	ATT	70.0	5.542	0.175	0.2316	
60 minute summer	ATT	1.005	FC1	19.3	0.409	0.133	0.6086	
480 minute winter	FC1	Hydro-Brake®	EX MH	6.0				185.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	9	104.824	0.049	7.2	0.0078	0.0000	OK
15 minute summer	S2	9	104.277	0.216	105.3	0.0343	0.0000	OK
15 minute summer	S3	9	103.915	0.539	173.5	0.0857	0.0000	SURCHARGED
15 minute summer	S4	9	103.308	0.213	228.7	0.0339	0.0000	OK
720 minute winter	ATT	675	101.704	0.754	38.9	447.7263	0.0000	SURCHARGED
720 minute winter	FC1	675	101.704	0.986	12.6	1.1157	0.0000	SURCHARGED
15 minute summer	EX MH	1	100.180	0.000	6.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.001	S2	7.2	0.866	0.106	0.6192	
15 minute summer	S2	1.002	S3	101.5	1.526	0.703	2.5424	
15 minute summer	S3	1.003	S4	170.5	2.543	1.180	1.0333	
15 minute summer	S4	1.004	ATT	230.3	6.299	0.577	0.6173	
60 minute summer	ATT	1.005	FC1	23.7	0.427	0.164	0.9738	
15 minute summer	FC1	Hydro-Brake®	EX MH	6.0				88.7

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	2.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
N1	0.095	2.00	106.000	450	376608.732	443528.752	1.125
N2	0.289	2.00	103.700	1200	376582.499	443552.925	1.125
N3	0.260	2.00	101.300	1200	376554.656	443578.580	1.125
N4	0.032	2.00	99.800	1	376536.610	443595.076	1.275
FC2	0.025	2.00	99.800	1200	376530.114	443588.168	1.305
EX MH			98.640	1200	376511.857	443571.364	1.275

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	N1	N2	35.672	0.600	104.875	102.575	2.300	15.5	225	2.18	50.0
1.002	N2	N3	37.860	0.600	102.575	100.175	2.400	15.8	225	2.37	50.0
1.003	N3	N4	24.449	0.600	100.175	98.675	1.500	16.3	225	2.49	50.0
1.004	N4	FC2	9.483	0.600	98.525	98.495	0.030	316.1	375	2.65	50.0
1.005	FC2	EX MH	24.813	0.600	98.495	97.365	1.130	22.0	150	2.84	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.001	3.339	132.8	12.9	0.900	0.900	0.095	0.0
1.002	3.311	131.6	52.0	0.900	0.900	0.384	0.0
1.003	3.257	129.5	87.3	0.900	0.900	0.644	0.0
1.004	1.013	111.9	91.6	0.900	0.930	0.676	0.0
1.005	2.158	38.1	95.0	1.155	1.125	0.701	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	35.672	15.5	225	Circular	106.000	104.875	0.900	103.700	102.575	0.900
1.002	37.860	15.8	225	Circular	103.700	102.575	0.900	101.300	100.175	0.900
1.003	24.449	16.3	225	Circular	101.300	100.175	0.900	99.800	98.675	0.900
1.004	9.483	316.1	375	Circular	99.800	98.525	0.900	99.800	98.495	0.930

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	N1	450	Manhole	Adoptable	N2	1200	Manhole	Adoptable
1.002	N2	1200	Manhole	Adoptable	N3	1200	Manhole	Adoptable
1.003	N3	1200	Manhole	Adoptable	N4	1	Manhole	Adoptable
1.004	N4	1	Manhole	Adoptable	FC2	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.005	24.813	22.0	150	Circular	99.800	98.495	1.155	98.640	97.365	1.125

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.005	FC2	1200	Manhole	Adoptable	EX MH	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
N1	376608.732	443528.752	106.000	1.125	450	0	1.001	104.875	225
N2	376582.499	443552.925	103.700	1.125	1200	1	1.001	102.575	225
						0	1.002	102.575	225
N3	376554.656	443578.580	101.300	1.125	1200	1	1.002	100.175	225
						0	1.003	100.175	225
N4	376536.610	443595.076	99.800	1.275	1	1	1.003	98.675	225
						0	1.004	98.525	375
FC2	376530.114	443588.168	99.800	1.305	1200	1	1.004	98.495	375
						0	1.005	98.495	150
EX MH	376511.857	443571.364	98.640	1.275	1200	1	1.005	97.365	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.200	Additional Storage (m^3/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	40	0	0

Node FC2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	98.495	Product Number	CTL-SHE-0115-6000-1000-6000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.0	Min Node Diameter (mm)	1200

Node N3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	100.175	Product Number	CTL-SHE-0110-5500-1000-5500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.5	Min Node Diameter (mm)	1200

Node N2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	102.575	Product Number	CTL-SHE-0132-8000-1000-8000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.0	Min Node Diameter (mm)	1200

Node N2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	102.575
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	324.0	0.0	0.800	324.0	0.0	0.801	0.0	0.0

Node N3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	100.175
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	756.5	0.0	0.800	756.5	0.0	0.801	0.0	0.0

Node N4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.525
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	72.0	0.0	0.800	72.0	0.0	0.801	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	N1	8	104.939	0.063	18.3	0.0101	0.0000	OK
240 minute winter	N2	164	102.748	0.173	17.4	53.3716	0.0000	OK
1440 minute winter	N3	1020	100.382	0.207	10.2	148.7618	0.0000	OK
1440 minute winter	N4	990	98.688	0.163	5.7	11.1167	0.0000	OK
1440 minute winter	FC2	990	98.687	0.192	5.8	0.2173	0.0000	SURCHARGED
15 minute summer	EX MH	1	97.365	0.000	2.7	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	N1	1.001	N2	18.7	3.015	0.141	0.2487	
240 minute winter	N2	Hydro-Brake®	N3	7.6				
1440 minute winter	N3	Hydro-Brake®	N4	5.4				
1440 minute winter	N4	1.004	FC2	5.7	0.229	0.051	0.4863	
1440 minute winter	FC2	Hydro-Brake®	EX MH	5.8				351.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	N1	8	104.960	0.085	34.5	0.0136	0.0000	OK
360 minute winter	N2	264	102.932	0.357	24.2	110.3133	0.0000	SURCHARGED
1440 minute winter	N3	1140	100.569	0.394	14.4	283.8755	0.0000	SURCHARGED
960 minute winter	N4	735	98.847	0.322	6.5	22.0186	0.0000	OK
960 minute winter	FC2	735	98.847	0.352	6.0	0.3979	0.0000	SURCHARGED
15 minute summer	EX MH	1	97.365	0.000	4.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	N1	1.001	N2	35.0	3.200	0.264	0.4627	
360 minute summer	N2	Hydro-Brake®	N3	8.0				
480 minute winter	N3	Hydro-Brake®	N4	5.5				
600 minute winter	N4	1.004	FC2	6.0	0.179	0.053	0.9166	
1440 minute summer	FC2	Hydro-Brake®	EX MH	6.0				413.1

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	N1	8	104.989	0.114	62.1	0.0182	0.0000	OK
480 minute winter	N2	368	103.623	1.048	35.5	247.5792	0.0000	FLOOD RISK
1440 minute winter	N3	1560	100.970	0.795	19.4	572.2593	0.0000	SURCHARGED
720 minute winter	N4	690	99.385	0.860	7.8	54.7542	0.0000	SURCHARGED
720 minute winter	FC2	690	99.383	0.888	6.1	1.0049	0.0000	SURCHARGED
15 minute summer	EX MH	1	97.365	0.000	5.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	N1	1.001	N2	62.2	3.303	0.468	0.8446	
480 minute winter	N2	Hydro-Brake®	N3	8.2				
120 minute winter	N3	Hydro-Brake®	N4	5.5				
15 minute summer	N4	1.004	FC2	-10.8	-0.500	-0.097	0.3501	
60 minute winter	FC2	Hydro-Brake®	EX MH	6.0				100.6