

## flood risk assessment

Little Court, Haverhill Road, Haverhill

CCE/ZA921/FRA-03

February 2021

For CARE (Little Court) Ltd

## **Document Review Sheet**

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Reference	Date	Author	Checked
CCE/ZA821/FRA-01	January 2021	Hſ	RT
CCE/ZA821/FRA-02	January 2021	Hſ	
CCE/ZA821/FRA-03	February 2021	Hſ	

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## **B.** Proposed Site

Proposed Layout Surface water management strategy Catchment plan Sections Maintenance plan Rainfall profile Causeway flow results

## Summary Table

Site location	Little Court, Haverhill Road, Little Wratting, CB9 7UD
	Grid reference 568550, 247028.
Planning application	Full
Existing site	Stables, grassland and scrub.
Site area	Approximately 1.18 ha
Proposed development	Care village.
Flood Zone	1
Reservoir Inundation Zone	None
Surface water flooding	None
Surface water management	On-site treatment and attenuation with restricted discharge to the boundary watercourse.

## 1.0 Introduction

- 1.1 This Flood Risk Assessment (FRA) has been prepared for the use of CARE (Little Court) Ltd to support a planning application for the construction of a dementia care village at land to the south of Haverhill Road, Little Wratting, CB9 7UD. Refer to Figure 1 for the site location.
- 1.2 The proposed development comprises:

"Specialist dementia care village for up to 120 residents, including central amenity building (shop, restaurant, pub, communal hall, treatment/counselling rooms, offices and staff accommodation), club/hobby rooms, vehicle parking, landscaping proposals and associated works."

- 1.3 This assessment takes account of the National Planning Policy Framework (NPPF) and the definitions of sources of flooding within the Flood and Water Management Act (FWMA) 2010. The report has been prepared following a site visit and a review of the West Suffolk Strategic Flood Risk Assessment (SFRA).
- 1.4 The site is approximately 1.18 ha and is centred on Ordnance Survey grid reference 568550, 247028. The majority of the site (some two thirds) is laid to grassland and scrub, with a stable complex and menage area in the north.
- 1.5 The development site falls from approximately 15.0 m AOD in the north to 13.8 m AOD in the south-eastern corner (refer to the topographical survey in Appendix A).
- 1.6 The northern boundary is formed by Haverhill Road. The eastern boundary is marked by a surfaced public footpath (footpath 05). The land to the south of the site is open arable land. The land to the west is currently arable but benefits from permission for residential development.
- 1.7 There is a roadside ditch running along the north of the site which continues west along Haverhill Road. There is an overgrown pond in the north of the site (north of the horse menage). Judging from on and off-site levels (as the site sits on or close to a watershed) the pond serves a limited, local land drainage function.
- 1.8 There is a land drainage ditch midway down the site which runs west to the south of the residential property to the west of the menage and stables. There is also a ditch which forms part of the southern boundary of the site. This ditch is connected (via a pipe) to a ditch/watercourse which runs southwards through the fields to the south of the site. The outgoing pipe from the southern boundary ditch was not visible during the topographical survey but was found during our site visit. The off-site ditch/watercourse runs southwards for approximately 380 m before turning east and entering a culvert beneath footpath 05 (the culvert is included on the topographical survey).
- 1.9 The site lies in Flood Zone 1 (the low probability flood area).

1.10 British Geological Survey (BGS) mapping describes the site geology as diamicton (Boulder Clay) over Chalk. BGS borehole data for the area suggests that the top of the Chalk is more than 20 m deep.

## 2.0 Forms of Flooding

### Watercourses

2.1 As discussed and shown on the Flood Map for Planning (refer to Figure 1) the site sits in Flood Zone 1 (the low probability flood area) and is not considered likely to flood as the result of overtopping from a named or significantly sized watercourse.

## Surface water flooding

2.2 Surface water flood mapping (see Figure 4) shows that the site is not at any notable risk of surface water flooding (which is to be expected given its position in the catchment).

### Surface Water Sewers

2.3 Anglian Water sewer plans (included in Appendix A) show no adopted surface water sewers in the area and hence no associated flood risk.

### Groundwater

2.4 The geology in the area means that groundwater flooding is not a realistic threat for the site.

#### Reservoirs

2.5 The site does not lie in a reservoir inundation area (see Figure 2).

## **3.0** Surface Water Management

- 3.1 As the geology is unlikely to support the effective disposal of surface water via infiltration the proposed surface water management scheme relies on a restricted discharge to the southern boundary ditch. As discussed in Section 1, this ditch is connected to the channel/ditch which runs southwards through the fields to the south of the site. The pipe is not shown on the topographical survey, but was observed during a site visit. If infiltration is found to be effective during the later detailed design stages (for all or part of the site) it will be pursued.
- 3.2 The proposed discharge rate of 3 l/s is made up of half of the calculated brownfield rate and the mean annual greenfield rate (2.3 l/s/ha) for the additional impermeable area. The existing impermeable catchment has been established from measuring the area of buildings within the site boundary. The existing impermeable catchment is 340 m<sup>2</sup> (0.034 ha). The brownfield rate has been calculated using the 1 in 2 year storm with a 15 minute duration. The 1 in 2 year storm is the lowest return period storm supported in Microdrainage when using FEH13 data.

Brownfield runoff calculation = 2.78 x 0.95 x 0.034ha x 34mm = 3.05l/s x 0.5 = 1.53l/s

- 3.3 The proposed management scheme incorporates:
  - Attenuation crates beneath the car park in the north draining the car park and part of the northernmost building. The car park surface will be formed from permeable/porous macadam which will filter water prior to entering the crates (through a stone distribution layer/perforated pipe network).
  - A grassed attenuation basin, approximately 1.2 m deep with 1 in 3 side slopes.
  - Internal footpaths and hard landscaping will be formed from permeable/porous resin bound gravel.
  - The outlet from the basin will be protected by a gabion filter box to prevent debris from entering the flow control chamber. The flow control will also have 'in chamber' protection (a perforated riser/cover).
- 3.4 All proposals are subject to detailed design and the approval of relevant parties.

#### Treatment

3.5 Based on Table 26.2 in the SuDS Manual the overall pollution hazard level for the development is low. The treatment provided by the proposed impermeable hard surfaces and grassed attenuation basin (with filter box) is therefore suitable and exceeds the minimum treatment scores.

#### Maintenance

3.6 The ongoing maintenance of the surface water management scheme will be the responsibility of the site owner/operator. Appendix B includes a maintenance plan.

## 4.0 Conclusions

- 4.1 The proposed development is not considered to be subject to significant or unmanageable flooding from the sources identified in the Flood and Water Management Act 2010 (FWMA).
- 4.2 The surface water management strategy relies on restricted discharge to the boundary watercourse.
- 4.3 The surface water management scheme provides sufficient on-site attenuation to manage the 1 in 100 annual probability storm plus 40 % climate change allowance.
- 4.4 The proposed features provide a suitable level of treatment for the proposed land uses.

## Figures

Site Location Plan
 Flood Zone & Reservoir Inundation Map
 Groundwater Source Protection Zone Map
 Surface Water Flood Map







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## **B. Proposed Site**

Proposed Layout Surface water management strategy Catchment plan Sections Maintenance plan Rainfall profile Causeway flow results

![](_page_20_Figure_0.jpeg)

# Site Plan Proposed

![](_page_20_Picture_2.jpeg)

This drawing is the copyright of the architect JBA. All dimensions and conditions to be verified on site by the relevant Contractor prior to proceeding.

Standard industry solutions apply unless otherwise stated. All dimensions are in millimeters and are to structural faces or centres unless otherwise stated. not to finishes unless unless otherwise stated.

Survey by others. This drawing must be read in conjunction with all other relevant drawings and specifications from the Architect and other consultants. If in doubt, ask.

![](_page_20_Picture_6.jpeg)

Proposed Site Boundary Building

Rev. DD/MM/YY Initials - Description

## Jordan+Bateman Architects

Head Office:T +44 (0)20 7363 88The Gothic BuildingF +44 (0)20 7363 13Chauntry Mills, High Streetjba@jandba.comHaverhill, Suffolk, CB9 8AZ, UKwww.jandba.com

T +44 (0)20 7363 8866 F +44 (0)20 7363 1335

Project:	Little Court
Client:	CARE (Little Court) Ltd
Drawing:	Site Plan Proposed
Date:	29/01/21
Scale:	As indicated @ A1
Drawn By:	LE
Drawing No:	410_00_00_PL_A_1010
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![](_page_21_Figure_0.jpeg)

![](_page_22_Figure_0.jpeg)

![](_page_22_Figure_1.jpeg)

KEY
IMPERMEABLE CATCHMENT AREA FOR AQUACELL CELLULAR STORAGE
IMPERMEABLE CATCHMENT AREA FOR PERMAVOID CELLULAR STORAGE AND BASIN
NOTES
P03CLIENT NAME UPDATED-DP-02/2021P02SW STRATEGY REVISED-DP-02/2021P01SW STRATEGY REVISED-DP-02/2021PEVDESCRIPTIONDEDRCHDATE
Description     De     DR     CH     DATE       DESIGNED BY     DRAWN BY     CHECKED BY       -     DP     -       SCALE @ A1 SIZE     DATE
D.N.S. 22/01/2021 PROJECT TITLE LITTLE COURT, WRATTING ROAD,
CARE (LITTLE COURT) LTD
CANNON CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning
Peek House, 20 Eastcheap London, EC3M 1EB Tel: 020 7717 5870 info@cannonce.co.uk Cambridge House, Lanwades Business Park, Kentford, Newmarket, CB8 7PN Tel: 01638 555107 www.cannonce.co.uk
DRAWING NUMBER ZA921 - PL - SK - 302 P03

![](_page_23_Figure_0.jpeg)

![](_page_23_Figure_1.jpeg)

![](_page_23_Figure_2.jpeg)

TYPICAL SECTION THROUGH DEBRIS FILTER

KEY	
NOTES	
	02/2021
P01 SECTION REMOVED - DP -	02/2021
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- DP -	,
SCALE @ A1 SIZE DATE	
D.N.S. 22/01/2021 PROJECT TITLE	
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HAVERHILL	
DRAWING TITLE	
SECTIONS	
CLIENT	
CONSULTING ENGINEER	S
Highways, Transport & Infrastructure Planni	ng
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Peek House, 20 Eastcheap London, EC3M 1EB Tel: 020 7717 5870 Cambridge House, Lanwa Business Park, Kentfe Newmarket, CB8 7 Tel: 01638 555 info@cannonce.co.uk	des ord, 'PN 107 <b>.uk</b>
Peek House, 20 Eastcheap London, EC3M 1EB Tel: 020 7717 5870 info@cannonce.co.uk DRAWING NUMBER	des ord, IPN 107 .uk REV.
Peek House, 20 Eastcheap London, EC3M 1EB Tel: 020 7717 5870 info@cannonce.co.uk DRAWING NUMBER ZA921 - PL - SK - 301	des ord, PN 107 .uk REV. P02

![](_page_24_Picture_0.jpeg)

Maintenance schedule	Required action	Frequency
Regular maintenance	Removal of litter and debris	Monthly
	Cut grass	Half yearly
	Manage other vegetation	Monthly then as required
	Inspect and clear inlets, outlets, overflows etc	Monthly
	Inspect and repair banks, pipes, headwalls etc	Monthly
	Inspect inlets and basin for silt accumulation	Monthly until able to establish the required silt removal frequency, then in accordance with established frequency
	Manage vegetation in wetter areas (micro-pools etc)	Annually or as established by ecologist/landscape architect
	Tidy dead growth	Annually (as per growing season)
	Remove sediment from traps, forebays etc	Annually
Occasional	Reseed	As required.
maintenance	Prune adjacent trees	Every 2 years, or as otherwise advised
	Silt removal	Every 5 years (depending on the requirement for regular maintenance)
Remedial actions	Repair erosion or other damage	As required
	Repair inlets, outlets and overflows	As required

## Crate Maintenance Maintenance schedule Regular Inspect to ident maintenance and correct (rep Remove debris to the system Check any infiltra percolate into t necessary Remove sedime Remedial Repair/replace actions Monitoring Check that outle in good condition Inspect tank inte present and if re

(2)

1

Maintenance schedule	Required action
Regular	Litter and debris removal
maintenance	Grass cutting
	Upkeep of any other planting
	Inspect the swale bed for any p indication of reduced infiltratio
	Inspect inlets, outlets, overflow condition
	Inspect system for silt (traps, ch surfaces)
Occasional maintenance	Reseed and replant bare areas, for poor growth and failure of p and amend planting, improve s
Remedial	Repair erosion or other damage
actions	Relevel uneven surfaces
	Scarify topsoil, remediate soil to reduction in infiltration
	Remove notable accumulations
	Remove and safely dispose of a residues.

(4)

Maintenance schedule	Required action
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)
Remedial actions	Remedial work to any depressions, rutting and cracked surfacing considered detrimental to the structure performance or a hazard to users, and replace lost jointing material
	Rehabilitation of surface and upper substructure by remedial sweeping
Monitoring	Initial inspection
	Inspect tank internally, remove any sediment if present and if required
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action
	Inspect silt accumulation rates and establish appropriate brushing frequencies
	Monitor inspection chambers

![](_page_24_Picture_8.jpeg)

## **Orifice Maintenance**

Maintenance schedule	Required action
Remedial actions	Repair/replace inlets, or
Monitoring	Check that controls, pro overflows are in good co

Required action	Frequency
ify any area of underperformance pair, improve etc)	Monthly for 3 months then annually
from drained area to prevent entry	Monthly
ration surfaces which allow water to he tanks for blockages, correct as	Annually
nt from traps	Annually/as required
nlets, outlets, overflows, and vents	As required.
ets, inlets, vents, and overflows are on and working as intended	Annually
ernally, remove any sediment if equired	Every 5 years (or more frequently if necessary)

Multichance Schedul     Required action     Frequency Multichance     Attendence     Attendence       Lifter and debris removal     Monthly, as required in minipaction of any other planting in minipaction in infinition in minipaction in infinition in minipaction in infinition of a settlement is a statement in minipaction in infinition of a settlement is a statement in minipaction in infinition of a settlement is a statement in minipaction in infinition of a settlement is a statement in minipaction in infinition in minipaction in infinit	wale / Grass	ed Filter Drain Maintenar	се		
advances         Recent for any controls         Monthly, as recurred by association of educed on finite on formation for frequency by season by	Maintenance	Required ac	tion	Frequency	1 ATTENUATION BASIN
Internance     Grass sorting     Monthly, as required by asked     Percent Additional Section 1       Upberg of any other planting.     Monthly, as required in register of the section 2     Monthly, as required in register of the section 2       Impact the wake bed for any ponding (a possible in register)     Monthly, as required in register of the section 2     Monthly, as required in register of the section 2       Impact the wake bed for any ponding (a possible in register)     Monthly, as required in register of the section 2     Monthly, as required in register of the section 2       Impact the wake bed for any ponding (a possible in register)     Monthly, as required in register of the section 2     As required in register of the section 2       Impact and amend plant that areas, condition and exceed and register of plants to estimate in the section 2     As required in regulared in register of plants to estimate in the section 2     As required in regulared in register of plants to estimate in the section 2       Internet and amend plant that areas, condition and exceed and regulared action in the section 2     As required in regulared in the section 2     Notes       Internet and amend plant that area areas, condition and action in the section 2     As required in the section 2     Notes       Internet and amend plant that areas is mained in the section 2     As required in the section 2     Notes       Internet and and the section 2     Frequency as required in the section 2     As required in the section 2       Internet and andify dipose of any oils o percei in and action 3	schedule Regular	Litter and debris removal		Monthly, as required	2 CELLULAR STORAGE
Upbergo fany other planting     Merthy, then decreasing in requerch, as required by assorn     PERMEABLE FAVING       Impare: the value bad for any ponding (a passible indication of reduced infittration).     Merthy, the neuron by assorn     PERMEABLE FAVING       Impare: the value bad for any ponding (a passible indication of reduced infittration).     Merthy, the neuron condition     Merthy assorn     Merthy indication of reduced infittration).       Impare: the value bad for any ponding (a passible information)     Merthy the neuron condition     Merthy information     Merthy information       Interpret consider     Required and reglate bare area, consider response and amend jalanting, improve any information     As required     Merthy information       Required and reglate bare area, consider response and amend jalanting, improve any information     As required     Merthy information       Required action     Frequency information     As required     Merthy information       residuality interesting     Required action     Frequency information     Merthy information       residuality interesting     Crice a year, after autominitia information     As required       residuality interesting <t< td=""><td>naintenance</td><td>Grass cutting</td><td></td><td>Monthly, as required by season</td><td>3 ROADSIDE SWALE/GRASSED</td></t<>	naintenance	Grass cutting		Monthly, as required by season	3 ROADSIDE SWALE/GRASSED
Impact the value bad for any possible     Monthly, as required       Impact the function of reduced inflation.     Tropect types, possible sources, possi		Upkeep of any other planting		Monthly, then decreasing in frequency, as required by season	4 PERMEABLE PAVING
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isoper tystem for all (traps, chambers and surfaces)     Mail yearity surfaces)     Mail yearity surfaces)       incendiation internance     As required       for soor growth and failure of planes to establish antenned     As required.       Required adom or other dumage (research are furt)     As required.       Required adom or other dumage (research are furt)     As required.       Remove notable accumulations of sudiment     As required.       Remove and safely disposed any oils or petrol     As required.       Remove and safely disposed any oils or petrol     As required.       reschool     frequencys a required, based on site-specific observations of doging or manufacture's recommendations - pay sarticular attention to areas where were runs on top synamical attension to areas where synamical attension to areas where and reguired     As required       endedial action of surface and expensions, rung and closer to every runs of top and reserve any sedment if reserve any sedment if reserve and stability appropriate brushing reserve and stability appropriate brushing reserve and stability appropriate brushing reserve and stability cover flows are in good condition and working as intended topserve another in toppoical scheel attension in the pa		Inspect inlets, outlets, overflo	ows for debris and	Monthly	
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International stations     Repair encodes our stater damage (reseed or re-turf) Relevel anows surfaces     As required.       Sarriy Uppoil, remediate soil to improve any reduction in infinitation     As required.       Remove and safely dispose of any oils or petrol residues     As required.       Remove and safely dispose of any oils or petrol residues     As required.       Remove and safely dispose of any oils or petrol residues     As required.       Remove and safely dispose of any oils or petrol residues     As required.       Repair (research or petrol residues)     Frequency schedule       Bruining and vacuuming thanking over holds suffice.     Frequency research research basis as solid see spacing recommendations - pet yagant state states is an solid recommendations - pet yagant state states is an solid recommendations - pet yagant state states is an solid recommendations - pet yagant states states are is most likely to collect the most sediment       and the space in period basis of the space in period basis of the space in most likely to collect the most sediment       appet solid work to any depressions, running and recommendations - pet yagant state states are is most likely to collect the most sediment       appet to and/or weed generics     Annually       the space to residence of poor opection and/or weed generics     Annually       fore Maintenance     Repair/replace index, outlets, overflows.       fore Maintenance     Repair/replace index, outlets, overflows.       fore Maintenance     Repair/replace index, outlets, overflows.	naintenance	for poor growth and failure of and amend planting, improve	f plants to establish soil etc		
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Remove and safely dispose of any oils or petrol residues.     As required       minimized     Required action     Frequency       schedue     Required action     Frequency       glantenance     Required action     Frequency       (standard cosmetic sweep over whole surface)     Once a year, after autumn leaf fail, or reduced frequency as required, based on site-specific over whole surface)     Once a year, after autumn leaf fail, or reduced frequency as required, based on site-specific over whole surface)       emeredial     Remedial work to any depensions, ruting and cracked surfacing considered upper substructure by performance or a hazard to users, and reglace of soor jointing material     As required       Remedial work to any depensions, ruting and cracked surfacing considered upper substructure by performance or a hazard to users, and reglace of poor operation and/or weed grouper substructure by remedial subscription     Annually       Impect lark internality, requencies     Every 10 to 15 years or as required       Impect lark internality, represent and fir required     Three-monthly, 48 hours after large storms in first ix months       Impect lark internality, requencies     Annually       Impect lark internality, re		Remove notable accumulation	ns of sediment	As required.	
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Inspect silt accumulation rates and establish appropriate brushing frequencies       Annually         Monitor inspection chambers       Annually         fice Maintenance       Annually         Schedule       Required action         Repair/replace inlets, outlets, overflows.       Post Check that controls, protection, outlets, inlets and overflows are in good condition and working as intended         Post Check that controls, protection, outlets, inlets and overflows are in good condition and working as intended       Half         DN.S.       22/01/2021         PROJECT TITLE       DATE         DN.S.       22/01/2021		growth – if required, take remedial action			
appropriate brushing frequencies       Monitor inspection chambers       Annually         fice Maintenance       Frequencies       Image: Constraint of the second of the secon		Inspect silt accumulation rates and establish	Annually		
Monitor inspection chambers       Annually         fice Maintenance       P03       CLIENT NAME UPDATED       -       DP       -       02/20         Maintenance       Required action       Frequency       P03       CLIENT NAME UPDATED       -       DP       -       02/20         P03       OUTFALL RELOCATED       -       DP       -       02/20         P04       OUTFALL RELOCATED       -       DP       -       02/20         P05       OUTFALL RELOCATED       -       DP       -       02/20         P04       OUTFALL RELOCATED       -       DP       -       02/20         P05       OUTFALL RELOCATED       -       DP       -       02/20         P04       OUTFALL RELOCATED       -       DP       -       02/20         P05       OUTFALL RELOCATED       -       DP       -       02/20         REV       DESCRIPTION       DE       DR       CHECKED BY       -         onitoring       Check that controls, protection, outlets, inlets and overflows are in good condition and working as intended       Half       PROJECT TITLE         PROJECT TITLE       PROJECT TITLE       PROJECT TITLE       PROJECT TITLE		appropriate brushing frequencies			
fice Maintenance       Required action       Frequency         Maintenance       Required action       Frequency         schedule       P03       CLIENT NAME UPDATED       -       DP       -       02/20         P03       OUTFALL RELOCATED       -       DP       -       02/20         P04       Schedule       -       DP       -       02/20         P05       CLIENT NAME UPDATED       -       DP       -       02/20         P06       SUFFALL RELOCATED       -       DP       -       02/20         P07       SUFFALL RELOCATED       -       DP       -       02/20         P08       Repair/replace inlets, outlets, overflows.       As       required       DESIGNED BY       DRAWN BY       CHECKED BY         DP       -       -       DP       -       -       DP       -         SCALE @ A1 SIZE       DATE       D.N.S.       22/01/2021       -       PROJECT TITLE       -		Monitor inspection chambers	Annually	1	
screedule       Rev       DESCRIPTION       DE       DR       CH       DATE         emedial actions       Check that controls, protection, outlets, inlets and overflows are in good condition and working as intended       Half       DESIGNED BY       DRAWN BY       CHECKED BY       -         SCALE @ A1 SIZE       DATE         D.N.S.       22/01/2021       PROJECT TITLE	ifice Mainte	enance Required action		Frequency	P03       CLIENT NAME UPDATED       -       DP       -       02/202         P02       OUTFALL RELOCATED       -       DP       -       02/202         P01       SW STRATEGY REVISED       -       DP       -       02/202
Image: constraint on the second se	emedial action	s Repair/replace inlets,	outlets, overflows.	As	DESIGNED BY DRAWN BY CHECKED BY
overflows are in good condition and working as intended Yearly D.N.S. 22/01/2021 PROJECT TITLE	onitoring	Check that controls, p	rotection, outlets, inlet	s and Half	SCALE @ A1 SIZE DATE
		overflows are in good	condition and working	as intended Yearly	
					DRAWING TITLE
DRAWING TITLE					MAINTENANCE PLAN
DRAWING TITLE MAINTENANCE PLAN					CLIENT
DRAWING TITLE MAINTENANCE PLAN CLIENT					CARE (LITTLE COURT) LTD
DRAWING TITLE MAINTENANCE PLAN CLIENT CARE (LITTLE COURT) LTD					
DRAWING TITLE MAINTENANCE PLAN CLIENT CARE (LITTLE COURT) LTD					CANNON CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning
DRAWING TITLE MAINTENANCE PLAN CLIENT CARE (LITTLE COURT) LTD CARE (LITTLE COURT) LTD CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning					Peek House, 20 Eastcheap London, EC3M 1EB Tel: 020 7717 5870 info@cannonce.co.ukCambridge House, Lanwades Business Park, Kentford, Newmarket, CB8 7PN Tel: 01638 555107 www.cannonce.co.ukDRAWING NUMBERREV
DRAWING TITLE MAINTENANCE PLAN CLIENT CARE (LITTLE COURT) LTD CARE (LITTLE COURT) LTD CARE (LITTLE COURT) LTD CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning Peek House, 20 Eastchean London, EXAWING NUMBER Combridge House, Lanwades Business Park, Kentford, Newmarkt, Cen Prin Tei: 2077717 5870 Tei: 2027717 5870 Tei:					ZA921 - PL - SK - 303 P

![](_page_25_Figure_0.jpeg)

![](_page_26_Picture_0.jpeg)

## **Design Settings**

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	$\checkmark$
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	х
Maximum Rainfall (mm/hr)	50.0		

## <u>Nodes</u>

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
BASIN	0.068	5.00	103.500	1350	1.350
CRATES 1	0.255	5.00	105.450	1200	1.910
CRATES 2	0.072	5.00	105.400	1200	1.860
CRATES 3	0.161	5.00	105.250	1200	1.750
CRATES 4	0.045	5.00	105.000	1200	1.500
CRATES 5	0.122	5.00	104.100	1200	1.200
ORIFICE 1			104.750	1200	1.350
ORIFICE 2			103.500	1350	1.365

## <u>Links</u>

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)
1.000	CRATES 1	CRATES 4	25.000	0.600	103.540	103.500	0.040	625.0	300	5.67	50.0
2.000	CRATES 2	CRATES 3	16.000	0.600	103.540	103.500	0.040	400.0	225	5.41	50.0
2.001	CRATES 3	ORIFICE 1	35.000	0.600	103.500	103.400	0.100	350.0	300	6.11	50.0
1.001	CRATES 4	ORIFICE 1	30.000	0.600	103.500	103.400	0.100	300.0	300	6.22	50.0
1.002	ORIFICE 1	CRATES 5	28.000	0.600	103.400	102.900	0.500	56.0	300	6.45	50.0
1.003	CRATES 5	BASIN	34.000	0.600	102.900	102.300	0.600	56.7	300	6.72	50.0
1.004	BASIN	<b>ORIFICE 2</b>	6.000	0.600	102.150	102.135	0.015	400.0	450	6.82	50.0

Name	Vel	Сар	Flow	US	DS	Σ Area	Σ Add	Pro	Pro
	(m/s)	(I/s)	(I/s)	Depth	Depth	(ha)	Inflow	Depth	Velocity
				(m)	(m)		(I/s)	(mm)	(m/s)
1.000	0.621	43.9	43.8	1.610	1.200	0.255	0.0	246	0.705
2.000	0.648	25.7	12.4	1.635	1.525	0.072	0.0	109	0.640
2.001	0.834	59.0	40.0	1.450	1.050	0.233	0.0	181	0.895
1.001	0.902	63.8	51.5	1.200	1.050	0.300	0.0	205	1.000
1.002	2.105	148.8	91.5	1.050	0.900	0.533	0.0	170	2.208
1.003	2.092	147.9	112.4	0.900	0.900	0.655	0.0	197	2.295
1.004	1.010	160.7	124.1	0.900	0.915	0.723	0.0	298	1.111

CAL	JSE	WAY		Cannon C	onsulting En	gineers	File: ZA92 Network: David Pear 03/02/202	1 - ATT Storm rson 21	ENUAT Netwo	TON QB ork	Page 2		
						<u>Pipeline S</u>	chedule						
	Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US De (m	epth 1)	DS CL (m)	DS IL (m)	DS Depth (m)	
	1.000	25.000	625.0	300	CIRCULAR	105.450	103.540	1	.610	105.000	103.500	1.200	
	2.000	35.000	350.0	300	CIRCULAR	105.400	103.540	1	.450	105.250 104.750	103.500	1.525	
	1.001	30.000	300.0	300	CIRCULAR	105.000	103.500	1	.200	104.750	103.400	1.050	
	1.002	28.000	56.0	300	CIRCULAR	104.750	103.400	1	.050	104.100	102.900	0.900	
	1.003	34.000	56.7	300	CIRCULAR	104.100	102.900	0	.900	103.500	102.300	0.900	
	1.004	6.000	400.0	450	CIRCULAR	103.500	102.150	0	.900	103.500	102.135	0.915	
		Link	US Node	Dia (mm)	Node	MH	DS		Dia (mm)	Node	MH		
		1 000	CRATES	1 1200	) Manhole	Adoptab	CRATE	S 4	1200	Manhole	Adoptab	le	
		2.000	CRATES	1200	) Manhole	Adoptab	le CRATE	S 3	1200	Manhole	Adoptab	le	
		2.001	CRATES	3 1200	) Manhole	Adoptab	e ORIFI	CE 1	1200	Manhole	Adoptab	le	
		1.001	CRATES	<u> </u>	) Manhole	Adoptab	e ORIFIC	CE 1	1200	Manhole	Adoptab	le	
		1.002	ORIFIC	E 1 1200	) Manhole	Adoptab	e CRATE	S 5	1200	Manhole	Adoptab	le	
		1.003	CRATES	5 1200	) Manhole	Adoptab	e BASIN		1350	Manhole	Adoptab	le	
		1.004	BASIN	1350	) Manhole	Adoptab	le ORIFIC	CE 2	1350	Manhole	Adoptab	le	

### Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connectio	ons	Link	IL (m)	Dia (mm)
BASIN	103.500	1.350	1350		1	1.003	102.300	300
				$\bigcirc$				
					0	1.004	102.150	450
CRATES 1	105.450	1.910	1200					
				$\bigcirc$				
					0	1.000	103.540	300
CRATES 2	105.400	1.860	1200					
				$\bigcirc$				
					0	2.000	103.540	225
CRATES 3	105.250	1.750	1200		1	2.000	103.500	225
				$\bigcirc$				
					0	2.001	103.500	300
CRATES 4	105.000	1.500	1200		1	1.000	103.500	300
				$\bigcirc$				
					0	1.001	103.500	300
CRATES 5	104.100	1.200	1200		1	1.002	102.900	300
				$\bigcirc$				
					0	1.003	102.900	300
ORIFICE 1	104.750	1.350	1200		1	2.001	103.400	300
				$\bigcirc$	2	1.001	103.400	300
					0	1.002	103.400	300

![](_page_28_Picture_0.jpeg)

## Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connecti	ons	Link	IL (m)	Dia (mm)		
ORIFICE 2	103.500	1.365	1350	$\bigcirc$	1	1.004	102.13	5 450		
				$\bigcirc$						
			<u>Simulat</u>	ion Setting	<u>s</u>					
Rainfall Methodology	FEH-13		Skip	Steady Stat	e x			1 year (	(l/s)	2.0
Winter CV	0.950	Add	itional Sto	orage (m³/ha	a) 20.	0		30 year ( 100 year (	(I/S) (I/S)	5.6 7.5
Analysis Speed	Normal	C	heck Discł	narge Rate(s	5) √	C	heck Disc	harge Volu	ime	х
15 60	180	360	Storm	Durations	2160	1320	720	0 100	80	
30 120	240	480	720	1440	2880	5760	864	0	50	
Retu	Irn Period	Climat	e Change	Addition	al Area	Addit	ional Flo	w		
(	<b>years)</b> 100	(0	2 <b>C %)</b> 40	(A 9	%) 0		(Q %)	0		
		Pre-o	levelopm	ent Dischar	ge Rate	•				
	Sit	e Makeu	n Green	field	Growth	Factor	30 vear	1 95		
	Greenfiel	d Metho	d IH124	G	irowth I	Factor 1	00 year	2.48		
Positive	ly Drained /S	Area (ha AAR (mm	i) 1.000 i) 587			Betterm	ent (%) QBar	0 2.3		
		Soil Inde	x 1			Q 1 ye	ear (l/s)			
		SP Regio	к 0.37 n 6			Q 30 ye Q 100 ye	ear (I/s) ear (I/s)			
G	irowth Fac	tor 1 yea	ır 0.85							
		<u>Node O</u>	RIFICE 1 (	<u> Online Orifi</u>	<u>ce Cont</u>	rol				
Flap	Valve x		Design	Depth (m)	1.200	D Di	scharge (	Coefficient	0.6	500
Replaces Downstrear Invert Lev	nLink √ el(m) 1(	03.400	Desig Dia	n Flow (l/s) ameter (m)	1.5 0.025	5				
		Node O	RIFICE 2 (	Online Orifi	ce Cont	rol				
Elan	Valvo v		Design	Depth (m)	1 000	 in	scharge (	Coefficient	0.6	500
Replaces Downstrear	n Link √	,	Desig	n Flow (l/s)	3.1		scharge	coemcient	0.0	00
Invert Lev	el (m) 10	02.135	Dia	ameter (m)	0.038	3				
	<u>N</u>	lode BAS	IN Depth	/Area Stora	ge Stru	<u>cture</u>				
Base Inf Coefficient (r Side Inf Coefficient (r	n/hr) 0.0 n/hr) 0.0	00000	Safety F Po	actor 2.0 rosity 1.0	ר 0	Time to h	Invert L nalf empt	evel (m) :y (mins)	102.3	300
	Depth	Area	Inf Area	Depth	Area	Inf A	rea			
		1 100 4 1	1 100 4 1							

![](_page_29_Picture_0.jpeg)

Node	CRATES	1 De	pth/	Area	Storage	Structure

Base Inf Coefficie Side Inf Coefficie	ent (m/hi ent (m/hi	r) 0.00000 r) 0.00000	Safet	y Factor Porosity	2.0 0.95	Time to ha	Invert L alf empt	evel (m) y (mins)	103.540	
Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)		
0.000	306.0	0.0	1.200	306.0	0.0	1.201	0.0	0.0		
Node CRATES 2 Depth/Area Storage Structure										

#### Base Inf Coefficient (m/hr)0.00000Safety Factor2.0Invert Level (m)Side Inf Coefficient (m/hr)0.00000Porosity0.95Time to half empty (mins) Base Inf Coefficient (m/hr) 0.00000 Safety Factor 2.0 Invert Level (m) 103.540

Depth	Area	Inf Area	Depth	Area	Inf Area	Depth	Area	Inf Area
(m)	(m²)	(m²)	(m)	(m²)	(m²)	(m)	(m²)	(m²)
0.000	115.5	0.0	1.200	115.5	0.0	1.201	0.0	0.0

## Node CRATES 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	103.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth	Area	Inf Area	Depth	Area	Inf Area	Depth	Area	Inf Area
(m)	(m²)	(m²)	(m)	(m²)	(m²)	(m)	(m²)	(m²)
0.000	61.8	0.0	1.200	61.8	0.0	1.201	0.0	0.0

#### Node CRATES 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	103.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth	Area	Inf Area	Depth	Area	Inf Area	Depth	Area	Inf Area
(m)	(m²)	(m²)	(m)	(m²)	(m²)	(m)	(m²)	(m²)
0.000	85.3	0.0	1.200	85.3	0.0	1.201	0.0	0.0

#### Node CRATES 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	102.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	40

Depth	Area	Inf Area	Depth	Area	Inf Area	Depth	Area	Inf Area
(m)	(m²)	(m²)	(m)	(m²)	(m²)	(m)	(m²)	(m²)
0.000	151.9	0.0	0.300	151.9	0.0	0.301	0.0	0.0

![](_page_30_Picture_0.jpeg)

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### Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	BASIN	472	103.058	0.908	16.5	114.8814	0.0000	SURCHARGED
1440 minute winter	CRATES 1	1410	104.441	0.901	8.6	265.3222	0.0000	SURCHARGED
1440 minute winter	CRATES 2	1410	104.441	0.901	3.3	100.5679	0.0000	SURCHARGED
1440 minute winter	CRATES 3	1410	104.441	0.941	5.2	58.0358	0.0000	SURCHARGED
1440 minute winter	CRATES 4	1410	104.441	0.941	2.8	77.8753	0.0000	SURCHARGED
480 minute winter	CRATES 5	472	103.058	0.158	11.0	23.3110	0.0000	ОК
1440 minute winter	ORIFICE 1	1410	104.441	1.041	2.5	1.1772	0.0000	SURCHARGED
480 minute winter	<b>ORIFICE 2</b>	472	103.058	0.923	3.1	1.3211	0.0000	ОК

Link Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Upstream Depth)	Node		Node	(I/s)	(m/s)		Vol (m³)	Vol (m³)
480 minute winter	BASIN	1.004	ORIFICE 2	3.1	0.110	0.019	0.9507	
1440 minute winter	CRATES 1	1.000	CRATES 4	0.9	0.169	0.022	1.7605	
1440 minute winter	CRATES 2	2.000	CRATES 3	-1.0	0.111	-0.037	0.6363	
1440 minute winter	CRATES 3	2.001	ORIFICE 1	2.5	0.158	0.042	2.4647	
1440 minute winter	CRATES 4	1.001	ORIFICE 1	-1.4	-0.036	-0.022	2.1126	
480 minute winter	CRATES 5	1.003	BASIN	10.9	0.739	0.074	1.8368	
1440 minute winter	ORIFICE 1	Orifice	CRATES 5	1.3				
480 minute winter	ORIFICE 2	Orifice		2.9				101.0