GHBullard & Associates LLP
Civil and Traffic Engineering Consultants

Residential Development on

Land to the Rear of Daisyley Lane.

FLOOD RISK ASSESSMENT & DRAINAGE STATEMENT

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P1

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Prepared By:

[redacted]

Elizabeth Rahim, M.Eng (Hons.) CEng MICE
Associate, G.H. Bullard & Associates LLP

Checked By:

[redacted]

Jeff Horner, B.Eng (Hons.)
Partner, G.H. Bullard & Associates LLP

CONTENTS

G.H. Bullard & Associates LLP,
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071

1. INTRODUCTION

1.1. This Flood Risk Assessment and Drainage Statement is being submitted to accompany a planning application for erection of three new residential dwellings within the rear garden of Daisyley House. A location plan is shown in Appendix A.

1.2. The report is produced for the sole use by Earlswood Homes Ltd.

1.3. The information provided within this report is based on the best available data currently recorded or provided by a third party. The accuracy of this report is therefore not guaranteed and does not obviate the need to make additional appropriate searches, inspections and enquiries.

1.4. An illustrative site layout plan (refer to Appendix B) showing how this quantum of development can be accommodated on the site is submitted with the application but is an indicative layout only and does not form part of the application as such. However, this flood risk assessment and drainage strategy has been prepared on the basis of the illustrative site layout to demonstrate that this quantum of development can be undertaken without it being at risk from flooding or from increasing flood risk of other land.

1.5. The National Planning Policy Framework (NPPF, February 2019), Section 14 (Meeting the challenge of climate change, flooding and coastal change), Paragraph 155 states that:

"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."

1.6. The NPPF recommends the Environment Agency (EA) Flood Maps as a starting point for Flood Risk Assessment. An extract from the EA Flood maps is reproduced in Figure 1.1 below.

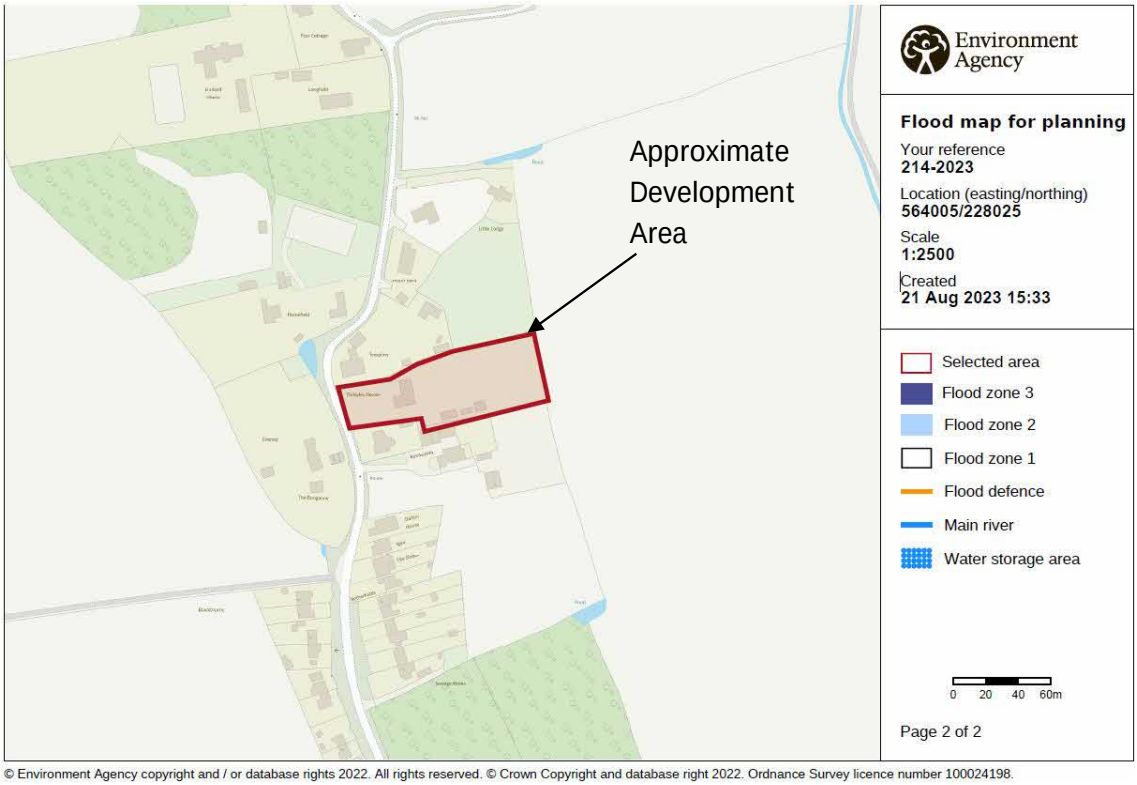


Figure 1.1 – EA Flood Map (Rivers and Seas)

1.7. The Environment Agency has produced standing guidance for developments dependent on their size and location. As can be seen from Figure 1.1 above, the site is located within Flood Zone 1, low risk.

1.8. Industry best practice requires assessment of all flooding sources to be carried out. Despite this document having now been superseded by the NPPF, Figure 3.2 of the "PPS25: Development and Flood Risk" (PPS25) Practice Guide lists five key sources of flooding:

i. Fluvial (refer to Section 6);
ii. Tidal (refer to Section 7);
iii. Pluvial (refer to Section 8);
iv. Groundwater (refer to Section 9); and
v. Infrastructure Failure (refer to Section 10).

2. POLICY CONTEXT

2.1. The purpose of the planning system is to contribute to the achievement of sustainable development – NPPF, Paragraph 7

2.2. At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development which does not change the statutory status of the development plan as the starting point for decision making – NPPF, Paragraph 12

2.3. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere – NPPF, Paragraph 159.

2.4. The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding – NPPF, Paragraph 162.

2.5. Following the Sequential Test, both elements of the Exception Test will have to be passed for development to be allocated or permitted – NPPF, Paragraph 165.

2.6. The Local Planning Authority, Uttlesford District Council Local Plan 2005 policy GEN3 – Flood Protection.

2.7. The Environment Agency provide standing advice guidance.

2.8. Essex County Council, as lead local flood authority, document Sustainable Drainage Design Guide for Essex.

3. EXISTING SITE INFORMATION

3.1. The site is located to the north of Lindsell. A site layout plan is attached in Appendix B.

3.2. The site is currently a garden and is deemed to be a greenfield.

3.3. The site can be located from the following information:

i. Postcode: CM6 3QL
ii. The site falls to the northeast corner at approximately gradient of 1in40.
iii. The area is 0.46ha.

3.4. The BGS records describe the geology as Boulder Clay approximately 25m thick, over sand and gravel.

3.5. The existing property foul drainage is to a septic tank and periodically emptied by tanker, as there is no public sewer in the area.

3.6. The surface water run-off drains to the watercourse to the rear of the property. This watercourse flows south to north, as demonstrated by the LiDAR generated contours on plan in Appendix C. It then connects to a watercourse approximately 110m from the site that flows east. This outfalls to Daisyley Brook, approximately 230m from the site, and flows south.

3.7. The watercourse adjacent the site is approximately 0.8m deep.

4. PROPOSED DEVELOPMENT

4.1. The proposal is to construction three individual dwellings within the rear garden of Daisyley House, with vehicle access from the lane to the south of the existing dwelling.

4.2. The flood risk vulnerability classification is more vulnerable; Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.

4.3. The Environment Agency table below (Table 4.1) shows that the development of the site does not require the application of the Exception Test and is appropriate at the site location.

Flood Zones	**Flood Risk Vulnerability Classification**				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

Table 4.1: Environment Agency Flood Zone/ Classification Table

4.4. The design life of the dwellings is deemed to be 100 years.

5. CLIMATE CHANGE

5.1. The National Planning Policy Framework (NPPF) sets out how the planning system should help to minimise vulnerability and provide resilience to the impacts of climate change.

5.2. The climate change allowances are predictions of anticipated change for:

i. Peak river flow by river basin district

ii. Peak rainfall intensity

iii. Sea level rise

iv. Offshore wind speed and extreme wave height.

5.3. The climate change allowances are predictions of anticipated change for this site is peak rainfall at 45% for peak rainfall. No other climate change allowances affect the site.

6. FLUVIAL FLOODING

6.1. Fluvial flooding is the flooding associated with rivers. This can take the form of:

i. Inundation of floodplains from rivers and watercourses

ii. Inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels

iii. Overtopping of defences

iv. Breaching of defences

v. Blockages of culverts

vi. Blockages of flood channels or corridors

6.2. The nearest watercourse is 230m to the east known as Daisyley Brook and the site is considerably elevated above the riverbanks.

7. TIDAL FLOODING

7.1. Tidal flooding is a risk of water levels from the sea or an estuary exceeding the normal tidal range. This site is too far from the coast for any tidal effect.

8. PLUVIAL FLOODING

8.1. Pluvial flooding is a risk of overland flows and ponding associated with extreme rainfall events. This can take the form of:

i. Sheet run-off from adjacent land (urban or rural)

ii. Surcharged sewers

8.2. As rain falls everywhere within the United Kingdom, there will always be a residual risk of flooding from extreme rainfall events.

8.3. The Environment Agency has produced maps with risk classifications that show the risk of flooding from surface water run-off. The maps show that the site is at very low risk of surface water flooding (<0.1% AEP).

8.4. The Environment Agency have produced maps with risk classifications that show the risk of flooding from surface water runoff.

8.5. An extract for the area showing the extent of flooding in the Medium Risk Scenario is reproduced in Figure 6.1 below.

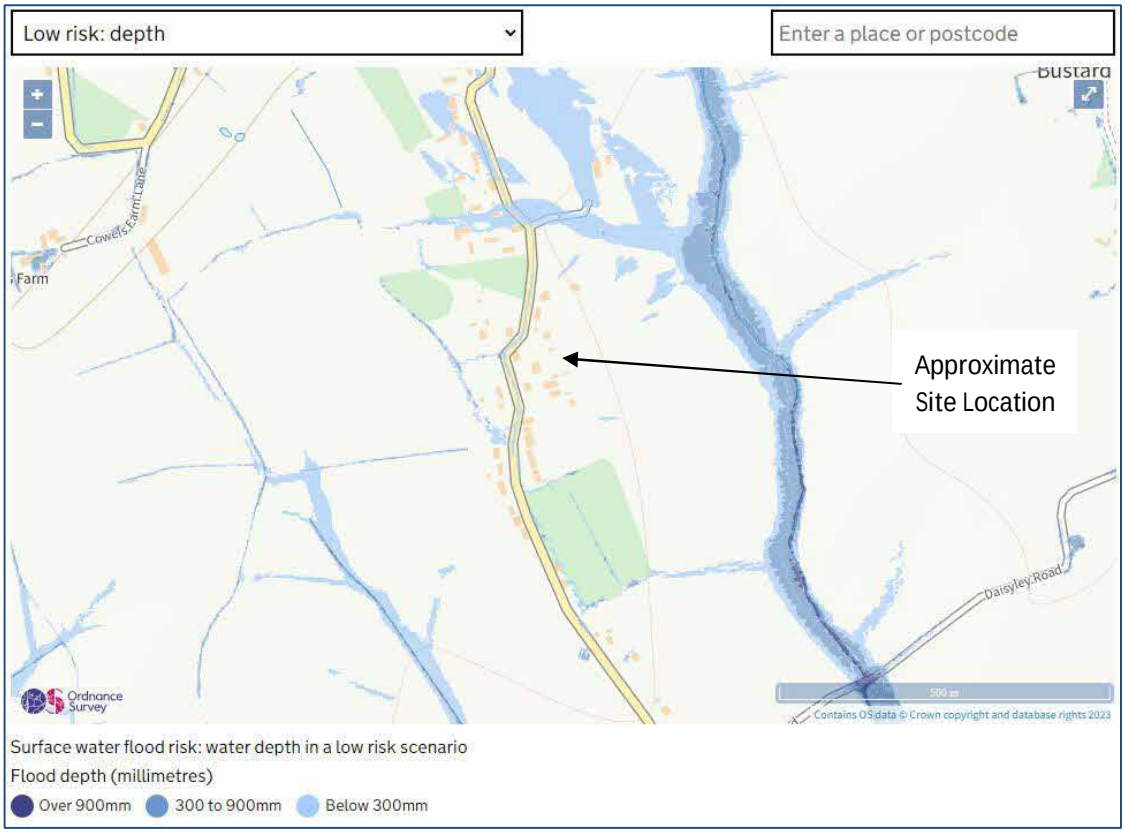


Figure 9.1 – Surface water flooding extents 0.1% to 1%

8.6. The site is not affect by surface water flooding.

9. GROUNDWATER FLOODING

9.1. Groundwater flooding is a risk of the water table rising after prolonged rainfall to emerge above ground level remote from a watercourse. It is most likely to occur in low lying areas underlain by aquifers of high vulnerability.

9.2. Due to the thick boulder clay layer and the elevation of the site above the watercourse, it is very unlikely that the site will suffer from groundwater flooding.

10. INFRASTRUCTURE FAILURE FLOODING

10.1. Infrastructure failure flooding is a risk of collapse, failure or surcharging of man-made structures and drainage systems. This could take the form of:

i. Reservoirs
ii. Canals
iii. Burst water mains
iv. Blocked sewers
v. Failed pumping stations

10.2. The Environment Agency have mapped failure of reservoirs and this indicates there are no near effects of reservoir failure, therefore the risk to the site is low. Given that the site is 3.5km from an embanked main river, any breach or overtopping of these embankments would have a minimal effect on the site.

10.3. The risk of flooding from blocked sewers is considered to be very low as any flood water would flow to the existing watercourses located at the site.

11. SEQUENTIAL TEST

11.1. The local planning authority (LPA) may require this test to see if there are any reasonably available sites in the area at a lower flood risk on which the development could take place.

11.2. The scope of the sequential test is set by the LPA, unless this site is allocated within the local development plan.

11.3. This report deals with sequential approach within the proposed site boundaries.

11.4. This site has a very low risk of flooding therefore it is deemed to have met the Sequential Test.

12. EXCEPTION TEST

12.1. The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

12.2. The site is within flood zone 1 and therefore the exception test is not required.

DRAINAGE STRATEGY

13. PROPOSED DRAINAGE

13.1. The proposed development comprises the erection of three dwellings on a greenfield site.

13.2. The greenfield rate based on the proposed impermeable area is Q_1 = 0.5l/s, Q_{30} = 1.4l/s, Q_{100} = 2.1l/s. However, due to the risk of blockages, the discharge rate is limited by a 50mm orifice. Refer to the Greenfield calculations in Appendix D.

Surface Water Disposal

13.3. In accordance with Government and Local Plan Policies and the requirements of the Building Regulations, surface water run-off from the development will be drained at source in a sustainable way by making full use of Sustainable Drainage Systems (SuDS) where possible.

13.4. The SuDS hierarchy dictates that infiltration at source is considered first. After infiltrating at source has been considered, the next stage is to deal with run-off in individual catchments, followed finally by site wide drainage solutions. Run-off from the development should not adversely impact upon drainage systems outside of the site boundary.

13.5. Detailed surface water drainage design should take into account all three key SuDS principles in equal measure:

i. Reducing peak quantity;
ii. Improving quality; and
iii. Providing amenity and biodiversity value.

13.6. Given the ground conditions in the area, infiltration is not considered a viable drainage option. The Q_{bar} rate of 0.5l/s is not considered to be a practical discharge rate for this form of development from a blockage point of view and so it is proposed that the surface water runoff will be discharged to the nearby watercourse at a rate controlled by a 50mm orifice.

13.7. The runoff from the roof areas will use conventional gutters and downpipes to downpipe filter chambers. From there, the roof water is piped to below ground storage crates.

13.8. The road run-off will drain to filter trench off-lets and then to the storage crates. From here the run-off will be restricted by an orifice flow control, then piped to a bagged headwall into the watercourse. The proposed drainage layout is attached in Appendix E.

13.9. The proposed development has the riparian right to connect to the watercourse.

Quantity

13.10. Micro-Drainage has been used to design the geo-cellular crates, assessing the volumes associated with the 1% AEP (1 in 100 year) event plus an allowance for 45% climate change and allows for 10% urban creep. At volumetric run-off of 1 has been applied. The rainfall data used is FSR as FEH gave a lower peak volume. The calculations are attached in Appendix F.

13.11. The geo-cellular crates will require a storage volume of 61m^3 to attenuate for the 1% AEP (1 in 100 year) event plus an allowance of 45% for climate change. Refer to Appendix E for the layout drawing.

13.12. The system achieves half drain time within 24 hours and therefore is ready for the subsequent storm.

Quality

13.13. The water discharging to the watercourse must be cleansed and therefore treatment processes are introduced through the drainage network. These have been assessed using the simple qualitative method and index approach in accordance with Chapter 26 of the Ciria SuDS Manual C753, where the hazard of low to medium is mitigated with the various SuDS components to equal or exceed the hazard indices. Refer to Tables 26.2 and 26.3 below which show the hazard and mitigation indices associated with the proposed drainage scheme.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

13.14. The roof water hazard level is low and will pass through down pipe filter chambers before reaching the geo-cellular storage. The detention basin prior to discharging to the watercourse, and as can be seen from the above tables, the mitigation indices exceed the hazard indices.

13.15. The runoff from the roads and driveways will discharge to a filter drain prior to discharge to the geo-cellular crates and then to the watercourse.

13.16. It can be seen from the above tables, the mitigation indices for this drainage process equal or exceed the hazard indices for this runoff.

Exceedance

13.17. In an exceedance event in which rainfall surpasses the design capacity, there should be no vulnerable buildings at risk of flooding.

13.18. Site ground levels will be locally contoured to deflect water away from building thresholds, with floor levels being set at least 150mm above surrounding ground levels. The exceedance flow path will be directed around the building and towards the existing watercourses, mimicking the current flow path.

13.19. The exceedance paths have been shown on the layout plan in Appendix E.

14. ADOPTION & MAINTENANCE

14.1. It is important to establish the adopting responsibilities at an early stage to define the requirement and how these meet the standards.

14.2. As this is a small development of 3 dwellings there will be shared responsibility for the drainage system, as there is likely to be for the incidental landscape areas and access road.

14.3. Maintenance of the system will include for frequent inspections and regular intervals of cleansing.

15. FOUL DRAINAGE

15.1. Part H of The Building Regulations (2010) 2015 Edition states that "Foul drainage should be connected to a public foul or combined sewer wherever this is reasonably practicable".

15.2. A search of the Anglian Water public sewer assets has been undertaken and is shown in Appendix G. It confirms that there are no near public sewers to the site.

15.3. The current dwelling uses a septic tank, which are not acceptable for new builds and therefore the preferred method is to use a packaged treatment plant for each dwelling. The treated effluent will discharge individually to the watercourse to the east.

16. SUMMARY

16.1. It has been demonstrated that the site is located within Flood Zone 3, in an area that benefits from Flood Protection.

16.2. Table 12.1 summarises the probability of the site flooding from the five key sources as listed in PPS25.

Source	Description	Risk	
Fluvial	Rivers	Flood Zone 1 in an area benefitting from Flood Defences	(<0.1%)
Tidal	Seas		
Pluvial	Surface Water	Very Low	(<0.1%)
Groundwater	Aquifers	Low	-
Infrastructure failure	Reservoirs Blocked Sewers	Outside maximum extent of flooding Very Low	(Very Low)

Table 12.1 – Flood Risk Summary

16.3. Following the standing advice from the Environment Agency, the development will be safe for its lifetime without increasing flood risk elsewhere.

16.4. Run-off from this development will be discharged to a watercourse at a restricted flow rate, utilising a geo-cellular crate (61m^3) for attenuation.

16.5. As the local watercourses form part of the Burnt Fen IDB who maintain the level of drainage protection through the use of pumping stations, the risk from groundwater flooding is considered to be low.

16.6. The exceedance flow is directed away from vulnerable buildings and infrastructure and outflows along its original path.

16.7. In accordance with government policy, SuDS will be used on site, where possible, and surface water drainage of the site will be carried out in a sustainable way.

16.8. As long as maintenance of the new drainage systems are correctly carried out, the risk of flooding and the subsequent risks from infrastructure failure or pluvial means, is very low.

16.9. The Environment Agency accepts that extreme floods will occur, and it will never be possible to eliminate flood risk altogether.

16.10. It is considered that the risk of flooding to the site has been adequately considered and therefore development of the site with the proposed drainage system does not pose an unacceptable flood risk either to occupants of the site or to others off site.

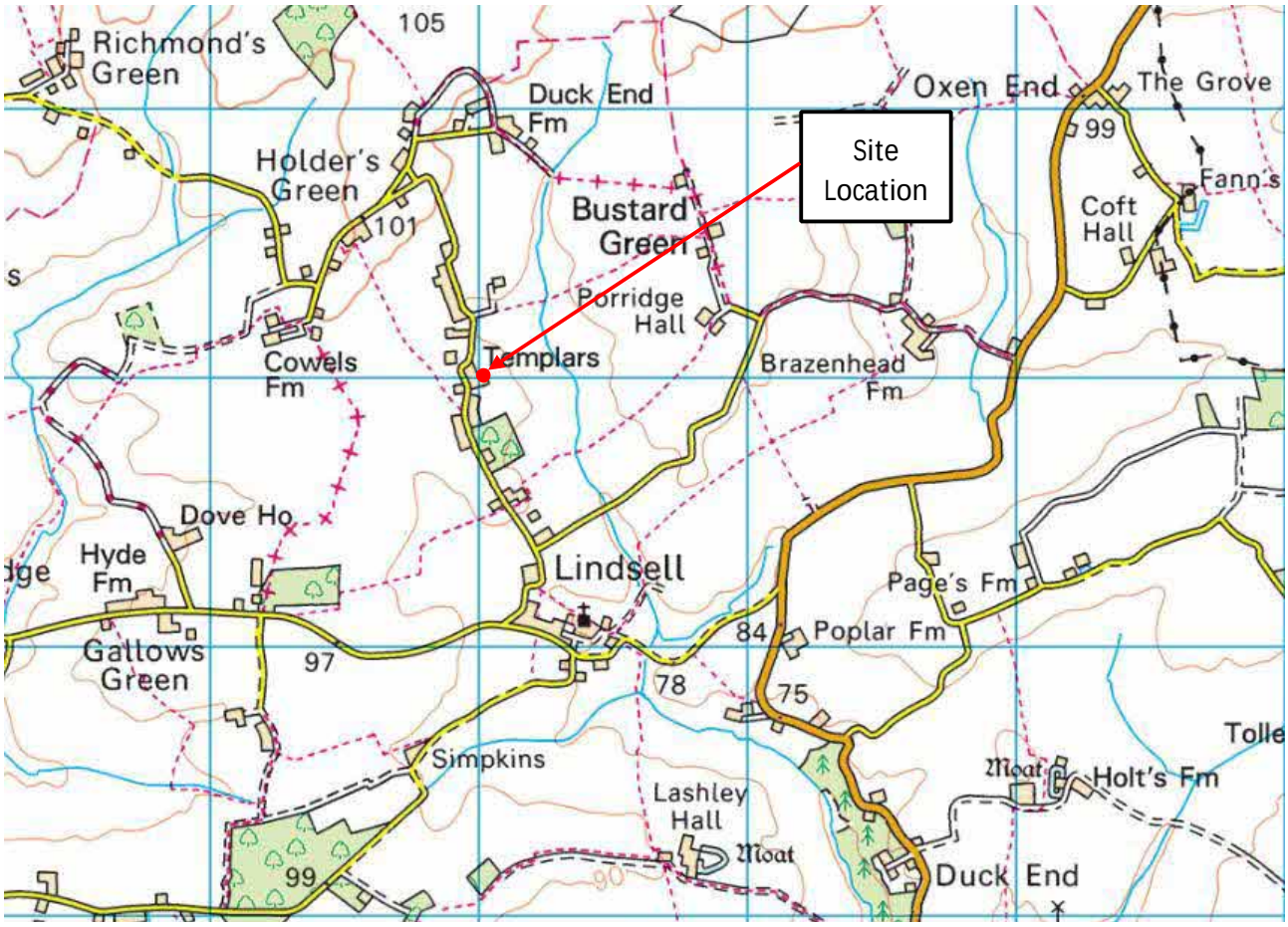
16.11. Foul water will be processed by a package treatment plant and the treated effluent will discharge to the watercourse.

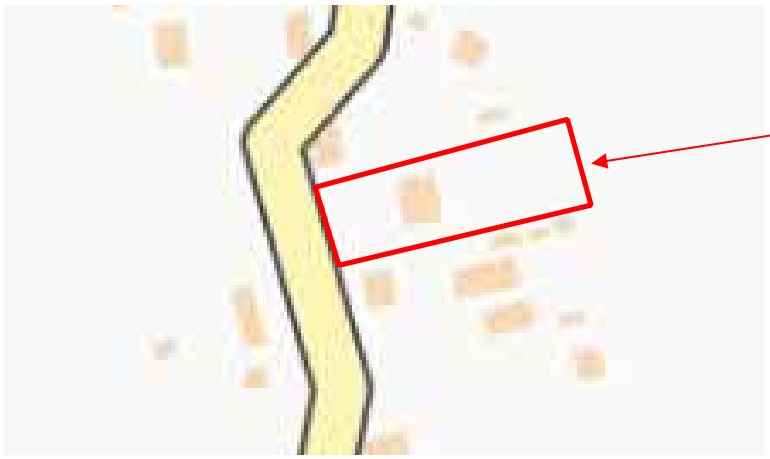
17. LIST OF APPENDICES

Appendix A - Location Plan
Appendix B - Proposed Layout Plan
Appendix C - Existing Site Plan
Appendix D - Greenfield Rate Calculations
Appendix E - Proposed Drainage Layout
Appendix F - Micro-Drainage Calculations
Appendix G - Anglian Water Asset Records

APPENDIX A

Location Plan





G.H. Bullard & Associates LLP,
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071

APPENDIX B

Proposed Layout Plan

G.H. Bullard & Associates LLP,
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071

Site Layout Plan as Proposed

1 : 500

NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

This document references the following file:-

Reference Name	Status	Revision
PC-XX-XX-M3-Designer-0001_6049		P01.1

Revisions		Date	Drawn / Chk'd
P01	First Issue	26/07/23	AO/SE
P02	Arboric ulturist Issue	03/08/23	AO/SE
P03	Carport amendment	07/09/23	AO/SE
P04	Tree removed	08/09/23	AO/SE
P05	HT1 Orientation Amendment	18/09/23	LM / SE
P06	Red Line Amended	21/09/23	SE

- Green Space
- Private Garden Land
- Permeable Paving
- Paving
- Tarmac
- Cobblestone

Note: Cycle storage in garage

0 Meters 25 50 1 : 500

Client

Earlswood Homes

Project

Proposed Residential Development, Land to Rear of Daisylea House

Title

Site Layout Plan as Proposed

Project Nº	Drawing Nº	Revision
6049 - 0102		P06

Scale -unless otherwise stated: As indicated @ A3

Issued For: PRELIMINARY

Status

BS 1192 Ref.

PC-Designer-0102

The Old Steelyard
Poplar Lane
Sproughton
Ipswich
IP8 3HL
t: 01473 689 532
www.klharchitects.com

APPENDIX C

Existing Site Plan

G.H. Bullard & Associates LLP,
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071

Drawing Number Geo23-054_T

LEGEND

AV	Air Valve	ME	Manhole Electricity
BB	Belisha Beacon	MF	Manhole Foul
BI	Illum.Bollard	MH	Manhole General
BL	Bollard	MK	Marker Post
BM	Bench Mark	MRF	Metal Railing Fence
BP	Brick Pillar	MS	Manhole Surface Water
BPS	Block Paving Slabs	MW	Water Supply/Meter
BRK	Brick	NB	Notice Board
BS	Bus Stop/Shelter	OHC	Over Head Cable
BW	Brick Wall	P	Post
BRW	Brick Retaining Wall	PB	Post Box
CB	Telephone Box	PI	Pipe
CBF	Close Boarded Fence	RE	Rodding Eye
CC	CCTV Camera	RG	Road Gulley
Ce	Cats Eye	RN	Road Name Plate
CL	Cover Level	RP	Reflector Post
CLF	Chain Link Fence	PRF	Post & Rail Fence
CONC	Concrete	RS	Road Sign
CPS	Concrete Paving Slabs	PWF	Post & Wire Fence
CW	Concrete Wall	Sap	Sapling
CRW	Concrete Ret. Wall	SMP	Sheet Metal Piling
DK	Drop Kerb	SL	Soffit Level
EB	Electricity Box	Stu	Stump
EP	Electricity Pole	SP	Sign Post
FB	Flower Bed	SV	Stop Valve
FH	Fire Hydrant	SW	Stay Wire
FL	Flood Light	TH	Threshold Level
FS	Flag Staff	TL	Traffic Light
FP	Footpath	TP	Telegraph Pole
G	Gully	TPS	Tactile Paving
HW	Headwall	TSR	Tubular Steel Railings
IC	Inspection Cover	TV	Cable TV Point
IL	Invert Level	TC	Traffic Camera
IRF	Iron Railing Fence	TW	Top of wall
KW	Kerb Weir Inlet	VP	Vent
LB	Litter Bin	WL	Water level
LP	Lamp Post	WMF	Wire Mesh Fence
MB	Manhole Telecom	WO	Washout
MC	Manhole Cable	WPR	Wooden Post & Rail

NOTES

1. The Grid is OSGB 36 using OSTN15 & OSGB15 on the OS Active Network
2. All levels are related to OS Datum (Newlyn)
3. Contours are shown at 0.25m intervals

Rev	Date	Description	Checked

geopoint.
Geospatial Engineering & Surveying

Client	Earlswood Homes
Project	Daisyley House, Lindsell, Dunmow, Uttlesford, Essex, CM6 3QL
Title	Topographical Survey
Drawing No.	Geo23-054_T
Scale	1/200 @ A0
Date	19/05/2023
Drawn	DGK
Checked	AS
Approved	DGK

Geopoint Ltd.
Unit 8
Jupiter House
Calleva Park
Aldermaston
Reading

APPENDIX D

Greenfield Calculations

G.H. Bullard & Associates LLP,
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071

GHBullard & Associates LLP
Civil and Traffic Engineering Consultants
27 Barton Road,
Thurston
Suffolk,
IP31 3PA
Tel: 01359 235071
Fax: 01359 231138
Web-site:
www.ghbullard.co.uk

Project	Job ref
Lindsell Daisylea House	214-2023
Design Element	Calc sheet no. ref
Q_{bar} from FEH data	

Drawing ref	Calc by	Date	Check by	Date
	JAH	########	JAH	########

Ref	Calculations	Output

Input values into blue boxes only: Example

FEH (Institute of Hydrology, 1999)
Estimation of Median Flood

Catchment area=	1	ha
SAAR	583	mm
FARL	1	
$BFIHOST_{19}$	0.347	

$QMED_{rural}$	Median annual flood for a rural area (m^3/s)
AREA	Catchment area (km^2)
SAAR	Standard average annual rainfall (1961-1990) (mm)
BFIHOST	Base flow index based on soil type map

Revised Kjeldson et al (2008) Method

$$QMED = 8.3062 \cdot AREA^{0.8510} \cdot 0.1536^{\frac{1000}{SAAR}} \cdot FARL^{3.4451} \cdot 0.0460^{BFIHOST^2}$$

QM 8 0 0 1 1

QM 4.57964 l/s

			Output
		Q_{med} =	4.6 l/s/ha
Qmed to Qbar conversion factor	1.12	Q_{bar} =	5.1 l/s/ha

Growth Factors		l/s/ha		
Q1	0.87	4.46	Q_1 =	4.5 l/s/ha
Q30	2.45	12.57	Q_{30} =	12.6 l/s/ha
Q100	3.56	18.26	Q_{100} =	18.3 l/s/ha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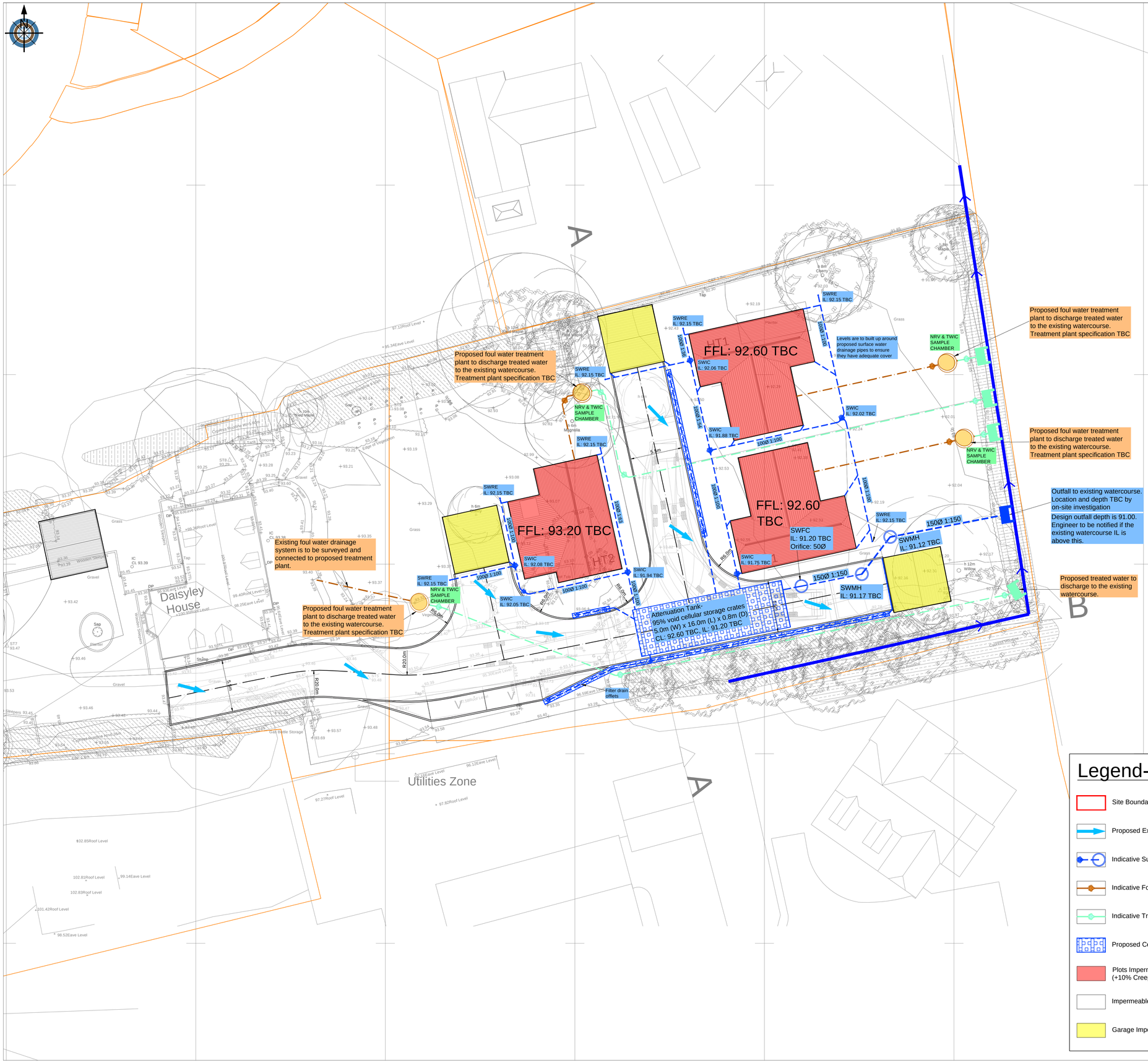
			Output
		Q_{bar} =	0.6 l/s
Impermeable area	0.1135 ha	Q_1 =	0.5 l/s
		Q_{30} =	1.4 l/s
		Q_{100} =	2.1 l/s

APPENDIX E

Proposed Drainage Plan

G.H. Bullard & Associates LLP,
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071



Legend-

- Site Boundary- Area: 2,862m²
- Proposed Exceedance Flowpath
- Indicative Surface Water Network
- Indicative Foul Water Network
- Indicative Treated Water Network
- Proposed Cellular Storage Attenuation Tank
- Plots Impermeable Area- Total: 350m² (+10% Creep: 35m²)
- Impermeable Block Paving Area- Total: 675m²
- Garage Impermeable Area- Total: 110m²

NOTES:

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2. Preliminary Issue - This drawing is not to be used for construction or detailed pricing purposes. Any work undertaken before approvals are received (in writing) are at risk of abortive works.
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   564028.8940, 228028.8738 and Scale 0.001.
4. This drawing has been prepared solely for the purpose of obtaining a Planning Consent based on information available and planning requirements at the date of issue only.

Rev	Rev Date	Description	Drawn	Chck'd
P2	19/09/23	Filtration trenches replacing gullies	JWT	JAH
P1	21/08/23	Initial Issue	JWT	JAH

GHBullard & Associates LLP
Civil and Traffic Engineering Consultants
27 Barton Road,
Thurston,
Suffolk,
IP31 3PA
T: (01359) 235071
F: (01359) 231138
W: http://www.ghbullard.co.uk
Partnership No. OC383830, Registered in England and Wales

Client: EARLSWOOD HOMES

Project: DAISYLEY HOUSE, LINDSELL

Drawing Title: INDICATIVE SURFACE & FOUL WATER DRAINAGE SITE LAYOUT

Status: FOR INFORMATION

Scale: 1:200 @ A1

Created: AUG 2023 | Drawn: JWT

DWG Reference: 214-2023.DWG | Checked: JAH

Drawing Number: 214/2023/02 | Revision: P2

P# = Preliminary, C# = Construction, AB# = As Built

D400 Ductile Iron Double Cover and Frame (600 mm x 600 mm x 100 mm) to BS-EN 124, Bedded on Class M1, M2 or Epoxy Mortar

2No.Courses Class B Engineering Brickwork (215 mm thick) to BS 5911 Bedded on and Pointed in Sand/Cement Mortar (10 mm thick)

Precast Cover Slab to BS-EN1917 and BS 5911 Bedded on Sand/Cement Mortar (10 mm thick)

DN1200* Precast Chamber Sections to BS 5911 (Lifting Eyes to be Pointed) Bedded with Mortar, Proprietary Bitumen or Resin Mastic Sealant
*(**Bottom Precast Section to be Built Min. 75 mm into Concrete Foundation)*

In-Situ Class C32/40 Concrete Surround (150 mm thick) to SHW Clause 1704

In-Situ Class C32/40 Concrete Mounting Block to SHW Clause 1704

300 mm x 300 mm x 10 mm Stainless Steel Orifice Plate (with 50 mm Orifice) Bolted to Mounting Block with 4No. M12 Stainless Steel Resin/Chemical Resistant Anchor Bolts (Min. embedment 75 mm) and Neoprene Gasket/Seal between Plate and Mounting Block.

600 mm (length) Rocker Pipe of Bend on All Inlets and Outlets

Construction Joint

In-Situ Class C32/40 Concrete Foundation to SHW Clause 1704

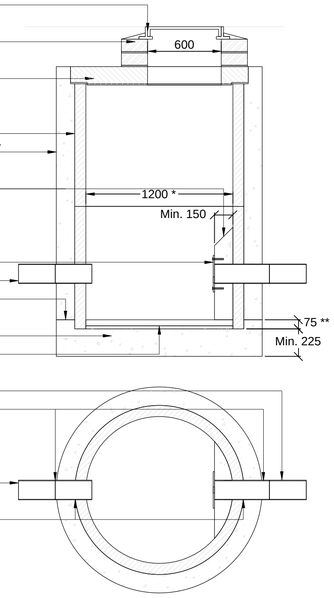
Mortar Fillet (50 mm thick)

Outlet Pipe (Invert Level and Diameter as Detailed on Plan)

Flexible Joint within 600 mm of Inside Face of Manhole

Inlet Pipe (Invert Level and Diameter as Detailed on Plan)

Entry & Exit Points Thoroughly Packed and Sealed with Mortar Around Joints



Largest Pipe Diameter	**Internal Diameter of Chamber*
<375	*1200*
375 to 700	*1500*

TYPICAL ORIFICE PLATE FLOW CONTROL CATCHPIT DETAIL

D400 Ductile Iron Cover and Frame (300 mm x 300 mm x 100 mm) to BS-EN 124, Bedded on Class M1, M2 or Epoxy Mortar

3No.Courses Class B Engineering Brickwork (215 mm thick) to BS 5911 Bedded on and Pointed in Sand/Cement Mortar (10 mm thick). Max. Oversail 30 mm Per Course.

In-Situ Class C32/40 Concrete Collar (150 mm thick) to SHW Clause 1704

4/10 Gc 85/20 Single Sized Aggregate Backfill (150 mm thick) Compacted in Layers of 150 mm

450Ø Polypropylene Shaft (Min. 450 mm Internal Diameter)

Preformed Polypropylene Inspection Chamber Base. Joints Between Base and Shaft Components to be Fitted with Watertight Seal.

600 mm Rocker Pipe (or Bend) on All Inlets and Outlets

100Ø/150Ø Inlet Pipe

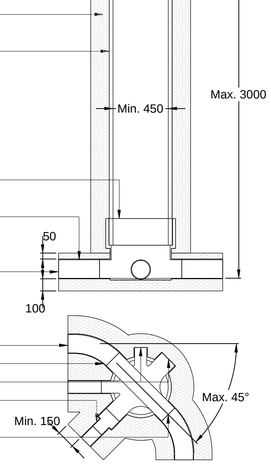
Where Chambers are Positioned on 90° Corners, Always Use the Main Channel by Fitting 45° Bends on the Inlet and Outlet

Flexible 100Ø/150Ø Inlet and/or (Long Radius) Bend (Max. 45°)

Unused Inlets to be Sealed and Watertight

100Ø to 150Ø Adaptor on Inlet Pipe (If Necessary)

Joint to be as Close as Possible to Face of Chamber to Permit Satisfactory Joint and Subsequent Movement



TYPICAL TYPE 3 INSPECTION CHAMBER

Trafficked Area Construction

Type 1 Non-Frost Susceptible Granular Material to SHW Clause 803 and 804.

100 2/6.3 Gc80/20 Washed Aggregate Surround to BS-EN 13242

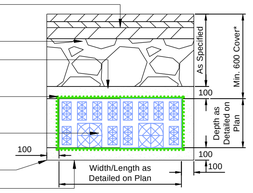
Line with Impermeable Geomembrane. Seal to Manufacturers Recommendations.

Polystorm Inspect (or Equivalent Approved) Cellular Storage Units 1.0m (L) x 0.50m (W) x 0.40m (D). Laid in Staggered Courses.

Virgin Ground. Where CBR <5%, Install Capping to Provide Suitable Foundation Permitting Stated Miniumum Cover.

100 2/6.3 Gc80/20 Washed Aggregate Surround to BS-EN 13242

* Minimum Cover for <6000kg. No Heavy Loading Above 6000kg.



TYPICAL POLYSTORM INSPECT ATTENUATION CRATES (IN TRAFFICKED AREAS) CONSTRUCTION DETAIL

D400 Ductile Iron Cover and Frame (300 mm x 300 mm x 100 mm) to BS-EN 124, Bedded on Class M1, M2 or Epoxy Mortar

2No.Courses Class B Engineering Brickwork (215 mm thick) to BS 5911 Bedded on and Pointed in Sand/Cement Mortar (10 mm thick)

In-Situ Class C32/40 Concrete Collar (150 mm thick) to SHW Clause 1704

4/10 Gc 85/20 Single Sized Aggregate Backfill (150 mm thick) Compacted in Layers of 150 mm

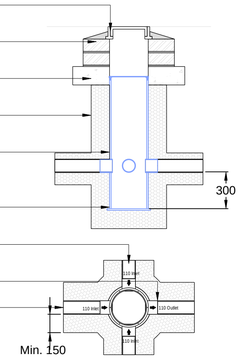
315Ø Polyethylene Shaft (Min. 289 mm Internal Diameter)

Preformed Polyethylene Catchpit Chamber Base. Joints Between Base and Shaft Components to be Fitted with Watertight Seal.

Unused Inlets to be Sealed and Watertight

Joint to be as Close as Possible to Face of Chamber to Permit Satisfactory Joint and Subsequent Movement

Flexible 100Ø Inlet and/or (Long Radius) Bend (Max. 45°)



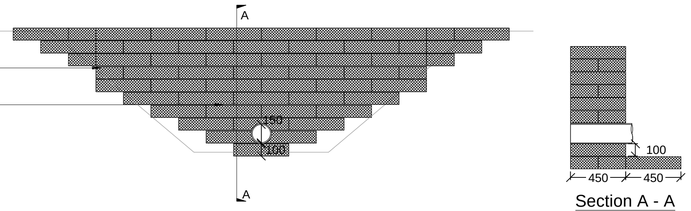
TYPICAL 315mm INSPECTION CATCH PIT CHAMBER

Existing Ditch Alignmnet

Hessian Sandbags (760x300 unfilled) to be Filled with ST1 Concrete and to an Average of 450x225x100 when Filled.

600mm Diameter Pipe. Material As Per Plan and Sections and Installed In Accordance With Manufacturer's Guidance.

NOTE: Existing Ditch to be Cleared of Silt and Debris to Ensure Suitable Foundation for Proposed Culvert



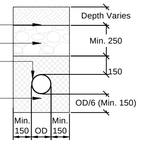
TYPICAL 600Ø CONCRETE FILLED SANDBAG HEADWALL CONSTRUCTION DETAIL

Road Construction (Depth Varies)
Or
Landscaping and Topsoil (Depth Varies)

Min. 250 As-Dug Material to SHW Clause 503.3(iv)

Pipe (Diameter as Detailed on Plan)

4/10 G_c80/20 Single Sized Coarse Aggregate Surround to BS-EN 13242



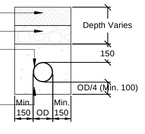
TYPICAL CLASS S PIPE BEDDING CONSTRUCTION DETAIL

Road Construction (Depth Varies)
Or
Landscaping and Topsoil (Depth Varies)

As-Dug Material to SHW Clause 503.3(iv) (Depth Varies)

Pipe (Diameter as Detailed on Plan)

Type ST2 In-situ Concrete Surround to BS-EN 206-1. At All Joints, Surround to be Broken Vertically All Around Pipe and Min. 12 mm Thick Flexible Board (Flexcell or Similar) Inserted.

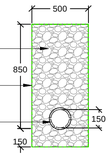


TYPICAL CLASS Z PIPE BEDDING CONSTRUCTION DETAIL

Nominal 40mm Gravel with 35% Void

Filter drain trench to be Wrapped in Impermeable Geotextile Separator

150Ø Fully Perforated Pipe



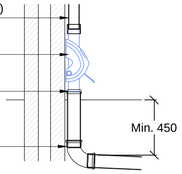
TYPICAL FILTER DRAIN TRENCH CONSTRUCTION DETAIL

Rainwater Downpipe (Diameter as Specified by Architect)

3P-Technik Rainus Downpipe Filter (200700UK) or Equivalent Approved

80/100 Downpipe Adaptor (if Required)

87.5° Bend (Diameter to Match Outlet Pipe)



TYPICAL DOWNPIPE FILTER DETAIL

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Rev	Rev Date	Description	Drawn	Chck'd
P1	21/08/23	Initial Issue	JWT	JAH

GHBullard & Associates LLP
Civil and Traffic Engineering Consultants
27 Barton Road,
Thurston,
Suffolk,
IP31 3PA
T: (01359) 235071
F: (01359) 231138
W: http://www.ghbullard.co.uk
Partnership No. OC383830, Registered in England and Wales

Client:
EARLSWOOD HOMES

Project:
DAISYLEY HOUSE, LINDSELL

Drawing Title:
INDICATIVE
SURFACE & FOUL WATER DRAINAGE
CONSTRUCTION DETAILS

Status: FOR INFORMATION
Scale: N.T.S @ A1
Created: AUG 2023
Drawn: JWT
DWG Reference: 214-2023.DWG
Checked: JAH
Drawing Number: 214/2023/03
Revision: P1

P# = Preliminary, C# = Construction, AB# = As Built

APPENDIX F

Micro Drainage Calculations

G.H. Bullard & Associates LLP,
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 144 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	91.701	0.501	0.0	3.6	3.6	38.1	O K
30 min Summer	91.835	0.635	0.0	4.1	4.1	48.3	O K
60 min Summer	91.942	0.742	0.0	4.4	4.4	56.4	O K
120 min Summer	91.991	0.791	0.0	4.6	4.6	60.1	O K
180 min Summer	91.995	0.795	0.0	4.6	4.6	60.4	O K
240 min Summer	91.986	0.786	0.0	4.6	4.6	59.7	O K
360 min Summer	91.951	0.751	0.0	4.4	4.4	57.1	O K
480 min Summer	91.912	0.712	0.0	4.3	4.3	54.1	O K
600 min Summer	91.874	0.674	0.0	4.2	4.2	51.2	O K
720 min Summer	91.837	0.637	0.0	4.1	4.1	48.4	O K
960 min Summer	91.770	0.570	0.0	3.9	3.9	43.4	O K
1440 min Summer	91.666	0.466	0.0	3.5	3.5	35.4	O K
2160 min Summer	91.558	0.358	0.0	3.0	3.0	27.2	O K
2880 min Summer	91.486	0.286	0.0	2.7	2.7	21.7	O K
4320 min Summer	91.397	0.197	0.0	2.2	2.2	15.0	O K
5760 min Summer	91.347	0.147	0.0	1.8	1.8	11.2	O K
7200 min Summer	91.317	0.117	0.0	1.6	1.6	8.9	O K
8640 min Summer	91.297	0.097	0.0	1.4	1.4	7.3	O K
10080 min Summer	91.283	0.083	0.0	1.3	1.3	6.3	O K
15 min Winter	91.702	0.502	0.0	3.6	3.6	38.1	O K
30 min Winter	91.837	0.637	0.0	4.1	4.1	48.4	O K
60 min Winter	91.945	0.745	0.0	4.4	4.4	56.6	O K
120 min Winter	91.994	0.794	0.0	4.6	4.6	60.3	O K
180 min Winter	91.992	0.792	0.0	4.6	4.6	60.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.171	0.0	40.1	18
30 min Summer	91.419	0.0	52.8	32
60 min Summer	57.224	0.0	66.3	62
120 min Summer	34.620	0.0	80.2	104
180 min Summer	25.465	0.0	88.5	134
240 min Summer	20.359	0.0	94.4	168
360 min Summer	14.780	0.0	102.8	236
480 min Summer	11.781	0.0	109.2	306
600 min Summer	9.873	0.0	114.4	374
720 min Summer	8.542	0.0	118.8	440
960 min Summer	6.792	0.0	125.9	570
1440 min Summer	4.909	0.0	136.5	822
2160 min Summer	3.543	0.0	147.9	1188
2880 min Summer	2.808	0.0	156.2	1556
4320 min Summer	2.020	0.0	168.6	2252
5760 min Summer	1.598	0.0	177.9	2992
7200 min Summer	1.332	0.0	185.3	3680
8640 min Summer	1.147	0.0	191.5	4408
10080 min Summer	1.011	0.0	196.8	5144
15 min Winter	139.171	0.0	40.1	18
30 min Winter	91.419	0.0	52.8	32
60 min Winter	57.224	0.0	66.3	60
120 min Winter	34.620	0.0	80.2	112
180 min Winter	25.465	0.0	88.5	140

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	91.975	0.775	0.0	4.5	4.5	58.9	O K
360 min Winter	91.924	0.724	0.0	4.4	4.4	55.0	O K
480 min Winter	91.870	0.670	0.0	4.2	4.2	50.9	O K
600 min Winter	91.818	0.618	0.0	4.0	4.0	46.9	O K
720 min Winter	91.770	0.570	0.0	3.9	3.9	43.3	O K
960 min Winter	91.687	0.487	0.0	3.5	3.5	37.0	O K
1440 min Winter	91.565	0.365	0.0	3.0	3.0	27.7	O K
2160 min Winter	91.453	0.253	0.0	2.5	2.5	19.2	O K
2880 min Winter	91.386	0.186	0.0	2.1	2.1	14.2	O K
4320 min Winter	91.318	0.118	0.0	1.6	1.6	8.9	O K
5760 min Winter	91.285	0.085	0.0	1.3	1.3	6.5	O K
7200 min Winter	91.270	0.070	0.0	1.1	1.1	5.3	O K
8640 min Winter	91.263	0.063	0.0	0.9	0.9	4.8	O K
10080 min Winter	91.258	0.058	0.0	0.8	0.8	4.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	20.359	0.0	94.4	178
360 min Winter	14.780	0.0	102.8	254
480 min Winter	11.781	0.0	109.2	326
600 min Winter	9.873	0.0	114.4	398
720 min Winter	8.542	0.0	118.8	464
960 min Winter	6.792	0.0	125.9	598
1440 min Winter	4.909	0.0	136.5	852
2160 min Winter	3.543	0.0	147.9	1212
2880 min Winter	2.808	0.0	156.3	1584
4320 min Winter	2.020	0.0	168.6	2288
5760 min Winter	1.598	0.0	177.9	2992
7200 min Winter	1.332	0.0	185.3	3664
8640 min Winter	1.147	0.0	191.5	4368
10080 min Winter	1.011	0.0	196.8	5112

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.116

Time (mins) From:	To:	Area (ha)
0	4	0.116

Model Details

Storage is Online Cover Level (m) 92.600

Cellular Storage Structure

Invert Level (m) 91.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	80.0	80.0	0.800	80.0	115.6	0.801	0.0	115.6

Orifice Outflow Control

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 91.200

APPENDIX G

Anglian Water Asset Records

G.H. Bullard & Associates LLP,
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071

Scale: 1:1250 | Date: 14/08/23 | Wastewater Plan A0
Map Centre: 563953,227976 | Our Ref: 1249717 - 1 | Powered by digdat

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

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station

*(Colour denotes effluent type)

josh.tasker@ghbullard.co.uk

214-2023

love every drop anglianwater