GHBullard & Associates LLP
Civil and Traffic Engineering Consultants

Commercial Development
Anglia Business Park, Wattisham Road
Ringshall, Suffolk

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

Date:

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GHB Reference:

246/2021/FRADS

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Flood Risk Assessment (FRA) Checklist	
This document should be attached to the front of the Floor Risk Assessment (FRA) issued to Local Planning Authorities (LPA) in support of a development proposal which may be at risk of flooding. This document is not a substitute for a FRA. Please note, under our responsibilities as a statutory consultee we will review any submitted FRA only in respect to fluvial and tidal risk. Your FRA should also consider other sources of flooding such as surface water, drainage, and ground water flooding.	
1.Development Proposal	
Site name	Anglian Business Park, Wattisham Road, Ringshall, Suffolk, IP14 HX
National Grid Reference (NGR)	TM 022523
Flood Risk Assessment	Reference/Title: 246/2021/FRA P2 Date: January 2022
Existing site use & vulnerability classification	Less Vulnerable (Commercial)
Proposed site use & vulnerability classification	Less Vulnerable (Commercial)
2. Flood Risk	
Flood Zone(s) affecting the site/property	Flood Zone 1
Sources of flooding affecting the site	Low risk pluvial flooding in three localised site areas.
Have you considered flood storage compensation?	N/A
3. Please provide a node map and accompanying table in the Flood Risk Assessment similar to the example given (see Appendix A). You should clearly demonstrate the highest and most representative flood levels for your proposed development. For example, if it is a small extension (< 250 square metres) then approximately 5-10 nodes would be sufficient. For larger sites, approximately 10 to 20 nodes would be appropriate. Refer to Appendix B and D.	
4. Mitigation	
Finished floor levels (in m AOD) for each proposed floor. Have you considered a freeboard for these Finished Floor Levels?***	N/A
Drawing reference showing Finished Floor Levels for proposed development	-
Have you considered suitable internal and external access for safe refuge above the flood level?	-
5. Proximity to the watercourse/ flood defence/ culvert	
Are the proposed developments on, over, under or within 8 metres of a fluvial main river or 16 metres of a tidal main river or flood defence?	No If yes, please provide a cross section drawing in your planning application showing the distance of the proposed development in relation to the watercourse/flood defence/culvert. If yes, this will require a Flood Risk Activity Permit.
Map Many of our flood datasets are available online: Flood Map For Planning (Flood Zone 2, Flood Zone 3 ,Flood Storage Areas, Flood Defences, Areas Benefiting from Defences, , Risk of Flooding from Rivers and Sea, Historic Flood Map, Current Flood Warnings	

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1.0 INTRODUCTION

1.1. This flood risk assessment is being submitted to accompany a detailed planning application for Erection of 20 no. commercial units consisting of Classes E (g) (office and light industrial) and B2 (general industrial) at Anglia Business Park, Ringshall, Suffolk. A site location plan is shown in **Appendix A**.

1.2. This report is produced for the sole use by Anglia Business Park.

1.3. The report includes a thorough review of commercially available flood risk and Environment Agency (EA) supplied data indicating potential sources of flood risk to the site.

1.4. 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.

1.5. The National Planning Policy Framework (NPPF, July 2021), Section 14 (Meeting the challenge of climate change, flooding and coastal change), Paragraph 159 states that:

"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."

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.

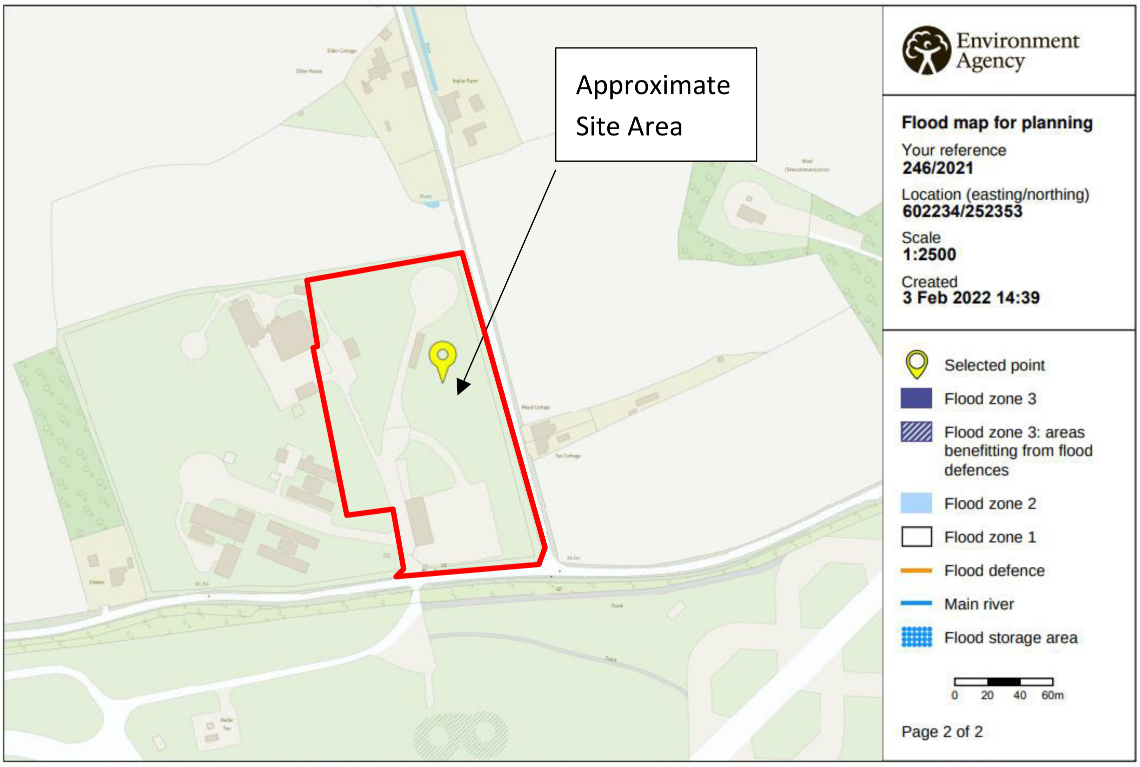

Figure 1.1 – Environment Agency Flood Map (Rivers and Seas)

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, with a low probability of flooding.

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 5);
- *ii.* Tidal (refer to Section 6);
- *iii.* Pluvial (refer to Section 7);
- *iv.* Groundwater (refer to Section 8); and
- *v.* Infrastructure Failure (refer to Section 9).

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 Mid Suffolk Core Strategy (2008), Policy CS 4.

2.7. The Mid Suffolk Core Strategy Focused Review (2012) Policies FC1 and FC1.1.

2.8. The Environment Agency provide standing advice guidance.

2.9. Suffolk County Council, as lead local flood authority, document Suffolk Flood Risk Management Strategy advises on the standards to be used at a local level

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3. EXISTING SITE INFORMATION

3.1. The site is located Wattisham Road, Ringshall, Suffolk. Site location plans are attached in **Appendix A.**

3.2. The site is brownfield comprising four buildings, containers, concrete surfaced access roads, areas of asphalt surfacing, grass and vegetation. The site is currently occupied by an engineering joinery company.

3.3. The site is bound by Wattisham Road to the south, an un-named road with agricultural land beyond to the east, further commercial land use to the west and agricultural land to the north. There are un-named watercourses located at the north, east and south boundaries which were identified during a site visit and observed to be surrounded by dense vegetation.

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

i. Postcode: IP14 2HX

ii. NG Reference: TM022523

iii. The site levels vary from 87.50m AOD to 85.90 with the site generally sloping from west to east at an approximate gradient of 1:89 The topographical site levels are shown on the drawing in **Appendix B**.

iv. The site area is 1.93ha.

v. Existing impermeable area is 0.64ha.

3.5. The existing site layout is shown on the drawing in **Appendix B**.

3.6. The nearest Main River is located 3km north-west of the site, which flows to the River Rat to the north at Stowmarket.

3.7. The site appears to drain via overland flow to the east and a via gullies located within the access road at the west of the site. A concrete outfall arrangement was observed during a site visit, within the watercourse at the north-east corner. It is thought that this serves the site and also the commercial area to the west of the site. It was not possible to survey the outfall due to overgrown vegetation.

3.8. The greenfield runoff rate using FEH methodology is assessed as Q_{bar} = 4.5l/s/ha.

3.9. There are un-named mapped watercourses located 100m north and 375m north-east of the site and a pond indicated 35m north of the site.

3.10. A Phase 1 Desk Study and Preliminary Risk Assessment was carried by Geosphere Environmental which indicates an un-named watercourse located 29m north-east of the site. The report also indicates a sluice or similar was present within the east of the site, which is shown on the topographical survey (refer to **Appendix B**). It is not known what the purpose of this feature is.

3.11. The BGS 1:50,000 scale drift maps in Figure 3.1 shows the form of the superficial deposits.

3.12. The BGS records describe the geology as:

i. Superficial: Lowestoft Formation - Diamicton

ii. Bedrock: Newhaven Chalk Formation - Chalk

3.13. BGS records show there is a borehole record (Ref: TM 05SW/17) located 250m west of the site, along Wattisham Road, which describes the ground conditions to comprise Clay strata to 10m bgl (to a level of 76.6m AOD). The borehole record indicates that no water entries were encountered

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during boring, with a water level at 83.3m AOD recorded within the standpipe at a later date. Refer to **Appendix C** for the borehole log.

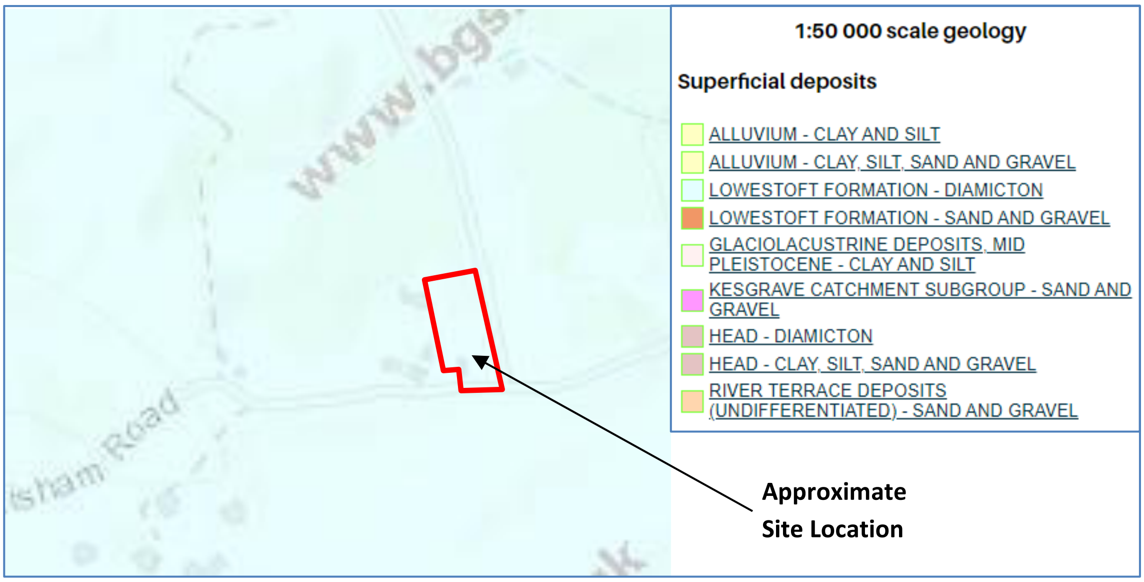

Figure 3.1 - BGS 1:50,000 Scale Superficial Geology Map

3.14. The Environment Agency has mapped Source Protection Zones, and this shows that the site is located over a Zone III Total Catchment; this zone is defined as the total area needed to support the abstraction or discharge from the protected groundwater source.

3.15. Environment Agency Aquifer (Bedrock Geology) mapping shows that the site is located over a Principal Aquifer.

3.16. Environment Agency Superficial Drift Geology Aquifer Designations mapping information shows that the site is over a Secondary (Undifferentiated) Aquifer; these are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value.

3.17. The Environment Agency has mapped groundwater vulnerability and Figure 3.2 shows the site is located over an area of Medium vulnerability.

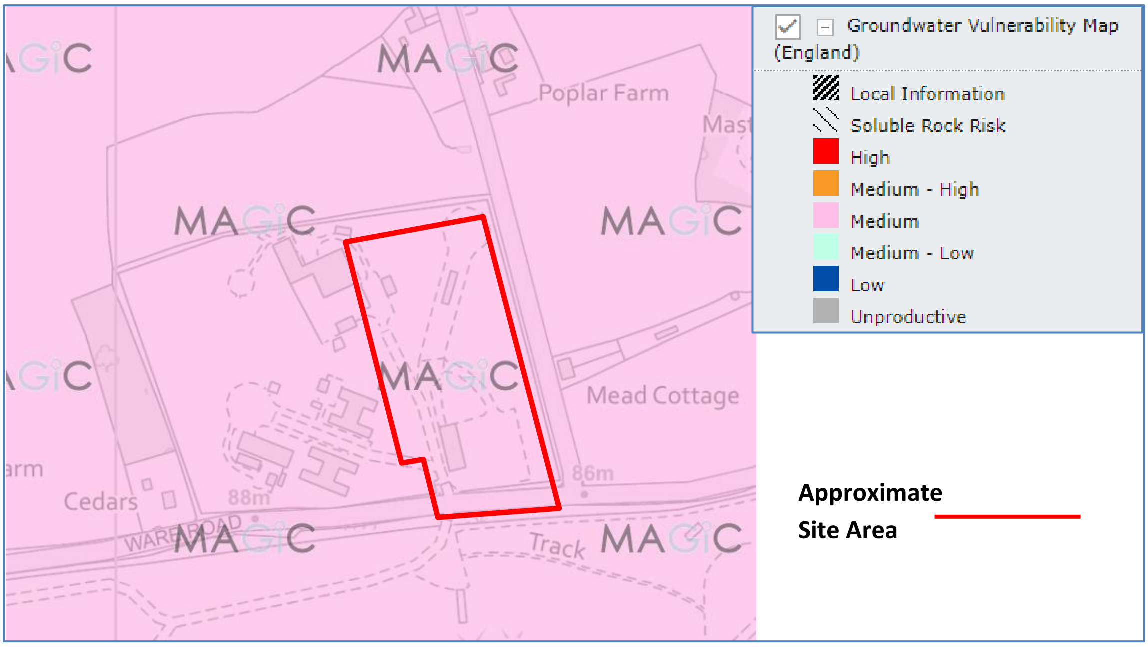

Figure 3.2 – Environment Agency Groundwater Vulnerability Zones

4. PROPOSED DEVELOPMENT

4.1. The proposed development comprises a mix of 20 no. commercial units consisting of Classes E (g) (office and light industrial) and B2 (general industrial). General Industrial units with associated parking areas, access roads and landscaping. The development proposal is attached in **Appendix D**.

4.2. The residential development is classified as '**less vulnerable**'; Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; **offices; general industry, storage and distribution**; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.

4.3. The Environment Agency table below (Table 4.1) shows that the development is appropriate at the site based on the development vulnerability classification within Flood Zone 1.

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 †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:
✓ Development is appropriate
✗ Development should not be permitted.

Table 4.1: Environment Agency Flood Zone/ Classification Table

4.4. The design life of the development is 75 years.

5. FLUVIAL FLOODING

5.1. 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

5.2. The nearest Main River is located 3km north-west of the site.

5.3. Figure 1.1 shows that the site is located within Flood Zone 1 (<0.1% AEP) with a low probability of flooding.

6. TIDAL FLOODING

6.1. Tidal flooding is a risk of water levels from the sea or an estuary exceeding the normal tidal range. This can take the form of:

i. Overtopping of defences

ii. Breaching of defences

iii. Other flows (fluvial surface water) that could pond due to tide locking

iv. Wave action

6.2. As outlined in 5.3, the Environment Agency Flood Map for Rivers and Seas shows the site is located within Flood Zone 1, where the likelihood of fluvial flooding is <0.1% AEP; the site is located too far from the sea to be affected by tidal flooding.

7. PLUVIAL FLOODING

7.1. 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

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

7.3. The Environment Agency have produced maps with risk classifications (Table 7.1) that show the risk of flooding from surface water runoff. A mapping extract for the area is reproduced in Figure 7.1 which shows that the site area is at Very Low risk of flooding with the exception of three localised areas at Low risk. These areas appear to correlate with localised depressions in ground level, with the southern area located where the Sluice is identified. These areas at Low risk will be levelled as part of the development design. It will need to be determined whether the sluice is still in use, and if necessary, the associated network relocated as part of the development detailed drainage design.

Risk Classification	Probability	
Very Low	<0.1%	(<1:1,000)
Low	1%-0.1%	(1:100-1:1000)
Medium	3.3%-1%	(1:30-1:100)
High	>3.3%	(>1:30)

Table 7.1: Surface Water Flooding Classifications

7.4. Figure 7.2 shows the depth of flooding during the medium risk scenario (0.1% AEP to 1% AEP), which shows that the site is not at risk of flooding in this scenario.

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Figure7.1 – Surface water flooding extents

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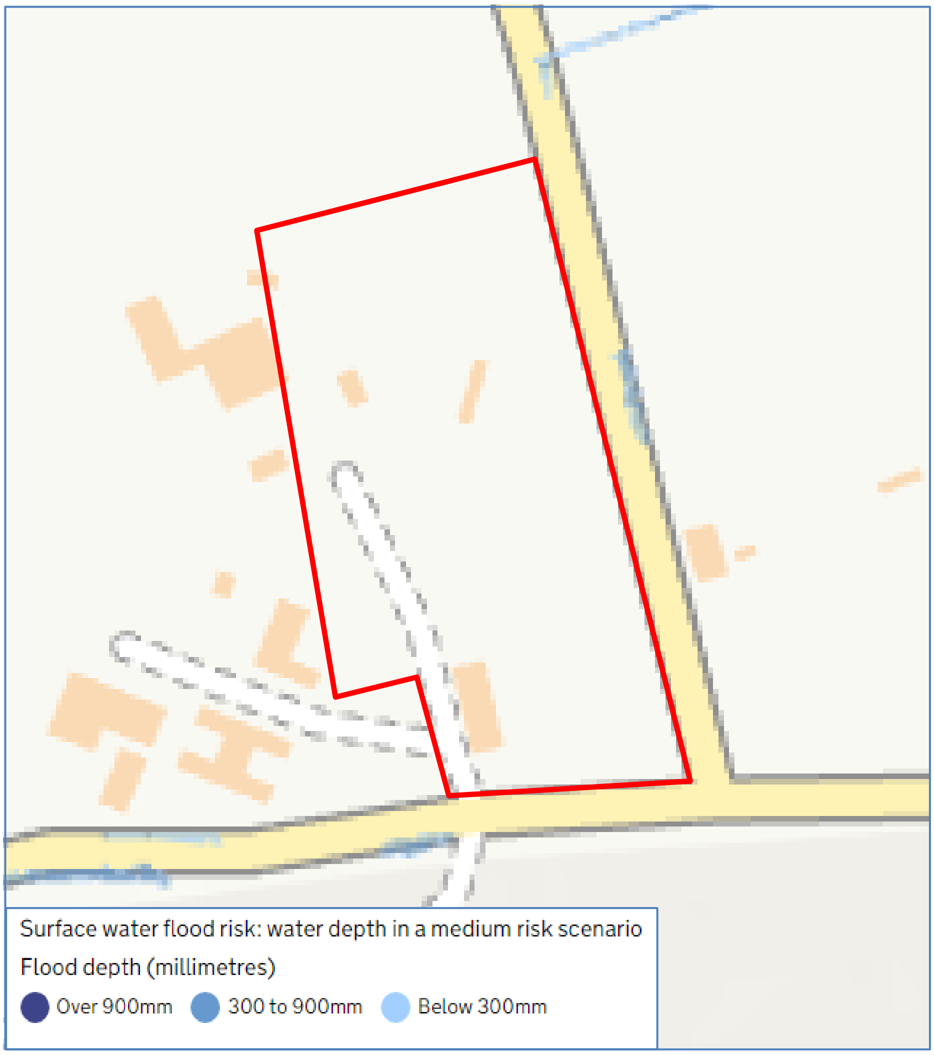

Figure 7.2 – Medium Risk Scenario Surface water flooding extents

8. GROUNDWATER FLOODING

8.1. 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.

8.2. The Environment Agency has mapped groundwater vulnerability and Figure 3.2 shows the site is located over an area of Medium vulnerability.

8.3. Given the soil type, depth to groundwater and the proximity of the watercourses allowing an outlet for groundwater, the risk of water coming up to the surface through the ground at the site is considered to be Low to Medium. Any water that was to rise up to the surface would flow to the watercourse to the east, reducing the risk to Low.

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9. INFRASTRUCTURE FAILURE FLOODING

9.1. 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

9.2. The Environment Agency have mapped the extent of flooding from reservoirs and this indicates that the site is not within the maximum extent of flooding from reservoirs, therefore the risk to the site is very low.

9.3. The risk of flooding from blocked sewers is considered to be very low as any flood water would flow east to the watercourse, following the existing flow paths.

10. CLIMATE CHANGE

10.1. 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.

10.2. 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.

10.3. The climate change allowance predictions of anticipated change applicable to this development are for:

Peak rainfall intensity

Applies across all of England	**Total potential change anticipated for the '2020s' (2015 to 2039)**	**Total potential change anticipated for the '2050s' (2040 to 2069)**	**Total potential change anticipated for the '2080s' (2070 to 2115)**
Upper end	10%	20%	40%
Central	5%	10%	20%

10.4. An allowance should be made to the rainfall in the design of the drainage system in accordance with the climate changes highlighted above, based on Environment Agency guidance.

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DRAINAGE STRATEGY

11. PROPOSED DRAINAGE

11.1. The proposed development comprises a mix of 20 no. commercial units consisting of Classes E (g) (office and light industrial) and B2 (general industrial). General Industrial units with associated parking areas, access roads and landscaping. The development proposal is attached in **Appendix D**.

11.2. The development characteristics are summarised as follows:

- Site Development Area = 1.93ha
- Proposed Impermeable Area = 1.10ha
- $Q_{bar\ FEH}$ (1.1 ha) = 4.95l/s

11.3. The proposed drainage strategy layout and construction details for the development are attached in **Appendix E**.

Surface Water Disposal

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

11.5. 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 runoff in individual catchments, followed finally by site wide drainage solutions. Runoff from the development should not adversely impact upon drainage systems outside of the site boundary.

11.6. 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.

11.7. Based on the BGS site geological information and nearby BGS borehole log, discharge of surface water runoff via infiltration is not considered viable due to the presence of Lowestoft Diamicton (Clay) to depth of 10m bgl. Refer to section 3.11 to 3.13.

11.8. It is proposed that the surface water runoff is discharged to the existing watercourse at the north-east of the site, mimicking the existing system, at a restricted rate of **4.9l/s** (equivalent to the greenfield runoff rate for the proposed impermeable area) via an orifice flow control. This discharge will be via the existing outfall at the north-east of the site or a new outfall subject to a Suffolk County Council S23 Discharge Consent.

11.9. It is proposed that the surface water runoff will be attenuated on site within conveyance swales and an attenuation basin. The building roof areas will discharge via downpipe filter chambers prior to the basin, and the parking and road areas will discharge via swales prior to the basin.

11.10. The drainage strategy drawing in **Appendix E** shows the layout of the attenuation basin and the swales.

11.11. Table 11.1 below summarises how the use of SuDS components has been considered and utilised in this drainage strategy.

SUDS Type	Component Type	Suitable	Explanation/Comments
Source Control	Rainwater Harvesting systems	No	Not feasible with the type and purpose of the buildings.
	Green Roofs	No	Not appropriate for development architectural aesthetics.
	Rain gardens	No	Limited scope to incorporate these due to the development type and layout.
	Permeable Paving	No	Not practical due to the heavy vehicular movements in many of the external impermeable areas.
Infiltration	Soakaway	No	Infiltration is not viable due to the ground geology.
	Filter Drain/Strips	No	
	Infiltration Basin	No	
	Swale	No	
	Tree Pits	No	
Conveyance	Swale	Yes	Swales to convey runoff from parking and road areas.
Detention	Sub-surface Storage	No	Not required as part of the drainage strategy.
	Detention Basin	Yes	To attenuate and cleanse runoff prior to discharge off site.
	Pond	No	Not practical due to maintenance requirements.
	Wetland	No	Lack of open space available.

Table 11.1: Table summarising the use of SuDS components.

Quantity

11.12. Micro-Drainage has been used to design the attenuation basin and swale storage to contain rainfall events up to the 1 in 100 year plus an allowance for 40% climate change with a controlled discharge of **4.9l/s**; the calculations, using FEH data, are attached in **Appendix F.** An allowance for urban creep has not been included for due to the nature of the development and the limited scope to increase the impermeable area.

11.13. The calculations for the 1 in 30 year and the 1 in 100 year plus climate change rainfall events are attached in **Appendix F,** which show the basin and swales can contain the runoff without flooding during these events.

11.14. The water level within the basin for the 1 in 100 year+40%cc event is predicted to be 85.992m AOD (basin volume = 804m^3) and for the 1 in30 year event is 85.731m AOD.

Quality

11.15. 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 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.		

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11.16. The runoff from the roofs will discharge via the attenuation basin and the road and parking areas will discharge to the swales prior to the attenuation basin. It can be seen from tables 26.2 and 26.3 the mitigation indices for the swale and attenuation pond exceed the hazard indices for the road and parking areas (cumulative mitigation indices: TSS = 0.75, Metals = 0.85, Hydrocarbons = 0.9).

Exceedance

11.17. In an exceedance event in which rainfall surpasses the design capacity, the excess will be directed away from vulnerable buildings and infrastructure towards the watercourse at the east as currently occurs.

11.18. The exceedance flow paths are shown on the drawing in **Appendix E**.

11.19. 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.

Foul Water Disposal

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

11.21. There is an existing foul network within the south-east corner of the site; it is proposed that the foul water from the development will discharge to the existing foul sewer subject to Anglian Water consent and infrastructure charges.

12. ADOPTION & MAINTENANCE

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

12.2. It is proposed that the drainage network, swales and attenuation basin will remain in private ownership and will be maintained by the Anglia Business Park site management company.

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

12.4. Guttering, downpipes and trapped gullies should be routinely inspected and cleaned out to minimise debris reaching the swales and basin.

12.5. Maintenance of the swales, attenuation basin and flow control should be undertaken in accordance with Tables attached in **Appendix G**.

12.6. It is also important to prevent construction silt from entering the pipework and attenuation system, and so a Construction Surface Water Management Plan should be developed and implemented by the Contractor during the works.

13. SUMMARY

13.1. It has been demonstrated that the site is located within Flood Zone 1.

13.2. Table 13.1 summarises the probability of the site flooding from the five key sources as listed in PPS25.

<table>
<tr><th>Source</th><th>Description</th><th colspan="2">Risk</th></tr>
<tr><td>Fluvial</td><td>Rivers</td><td rowspan="2">Flood Zone 1</td><td rowspan="2">(<0.1% AEP)</td></tr>
<tr><td>Tidal</td><td>Seas</td></tr>
<tr><td>Pluvial</td><td>Surface Water</td><td>Very Low to Low</td><td>(<0.1% to 1%)</td></tr>
<tr><td>Groundwater</td><td>Aquifers</td><td>Low</td><td>-</td></tr>
<tr><td>Infrastructure failure</td><td>Reservoirs
Blocked Sewers</td><td>Within maximum extent of flooding when there is also flooding from rivers
Very Low</td><td>(Very Low)</td></tr>
</table>

Table 13.1 – Flood Risk Summary

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

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

13.5. Any inflows are to be diverted around the development and passed on.

13.6. Surface water runoff will be attenuated on-site within swales and a basin and then discharged to the existing watercourse at a rate of 4.9 l/s ($Q_{bar\ FEH}$), via an orifice flow control.

13.7. The swales and basin will provide cleansing of the runoff prior to discharge to the watercourse.

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

13.9. Exceedance flow paths will be maintained to the east as currently occurs.

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

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

14. LIST OF APPENDICES

Appendix A	**-**	Site Location Plans
Appendix B	**-**	Existing Site Layout
Appendix C	**-**	BGS Borehole Log
Appendix D	**-**	Development Proposal
Appendix E	**-**	Proposed Drainage Strategy Layout and Details
Appendix F	**-**	Micro-Drainage Calculations
Appendix G	**-**	Maintenance Requirements

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Tel: 01359 235071

APPENDIX A

Site Location Plans

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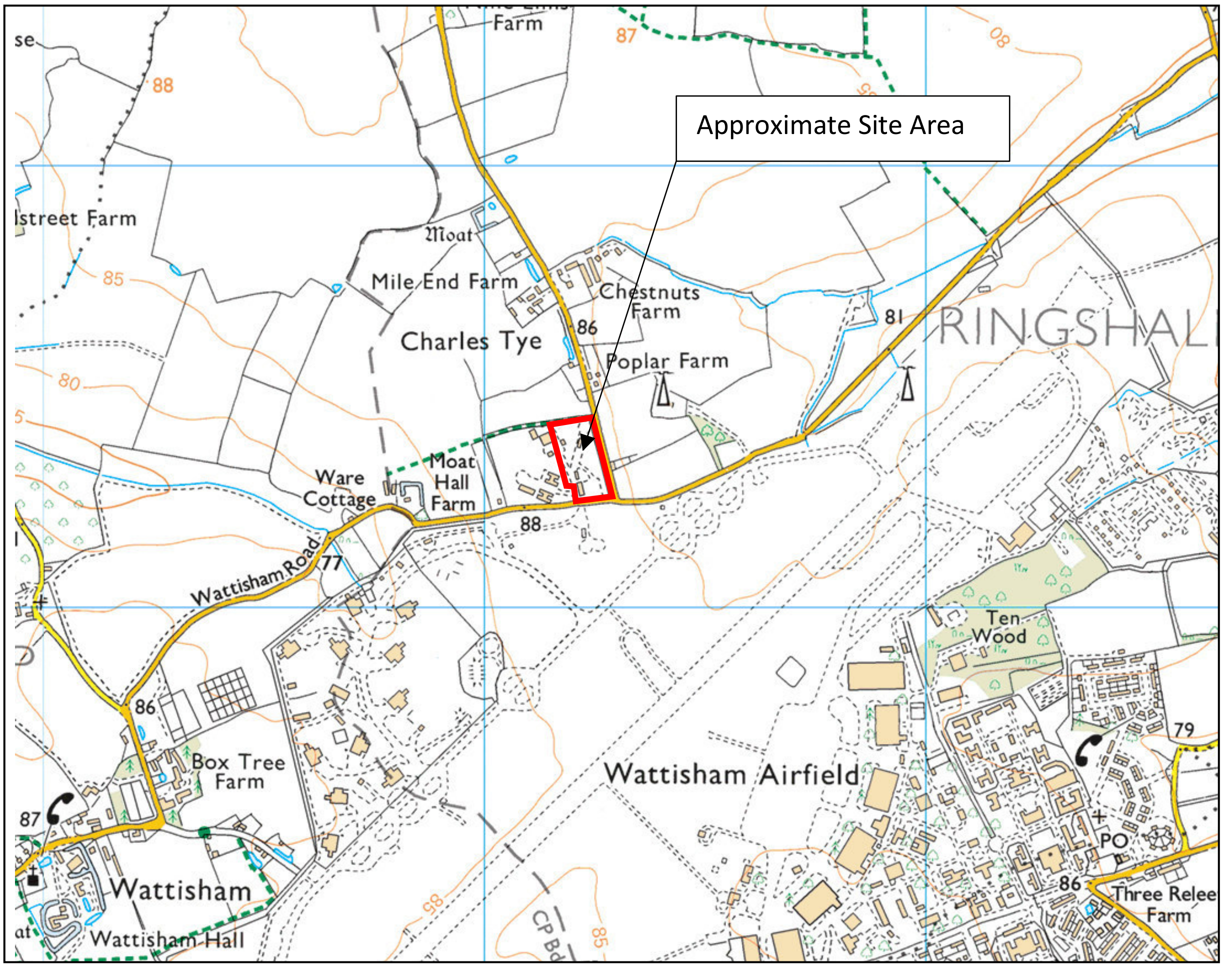
27 Barton Road, Thurston, Suffolk, IP31 3PA
Tel: 01359 235071

246/2021: Anglia Business Park, Wattisham Road, Ringshall, Suffolk, IP14 2HX

Site Location Plan (1 of 2)



NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

This document references the following file:-

Reference Name	Status	Revision
PC-XX-XX-M3-Designer-0001_5442		P01.1

Revisions		Date	Drawn / Chk'd
P01	First Issue.	15/07/21	BM
P02	Red Line Updated.	09/12/21	BM
P03	Red Line Updated.	20/01/22	DL / BM
P04	Planning Issue	28/03/22	DL / BM

Client

Anglia Business Park

Project

Commerical Development, Anglia Business Park, Wattisham Road, Ringshall

Title

Site Location Plan

Project Nº	Drawing Nº	Revision
5442 -	0100	P04

Scale - unless otherwise stated | Issued For

1 : 1250 @ A3 | PLANNING

BS 1192 Ref. | Status

PC-Designer-0100

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FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

APPENDIX B

Existing Site Layout

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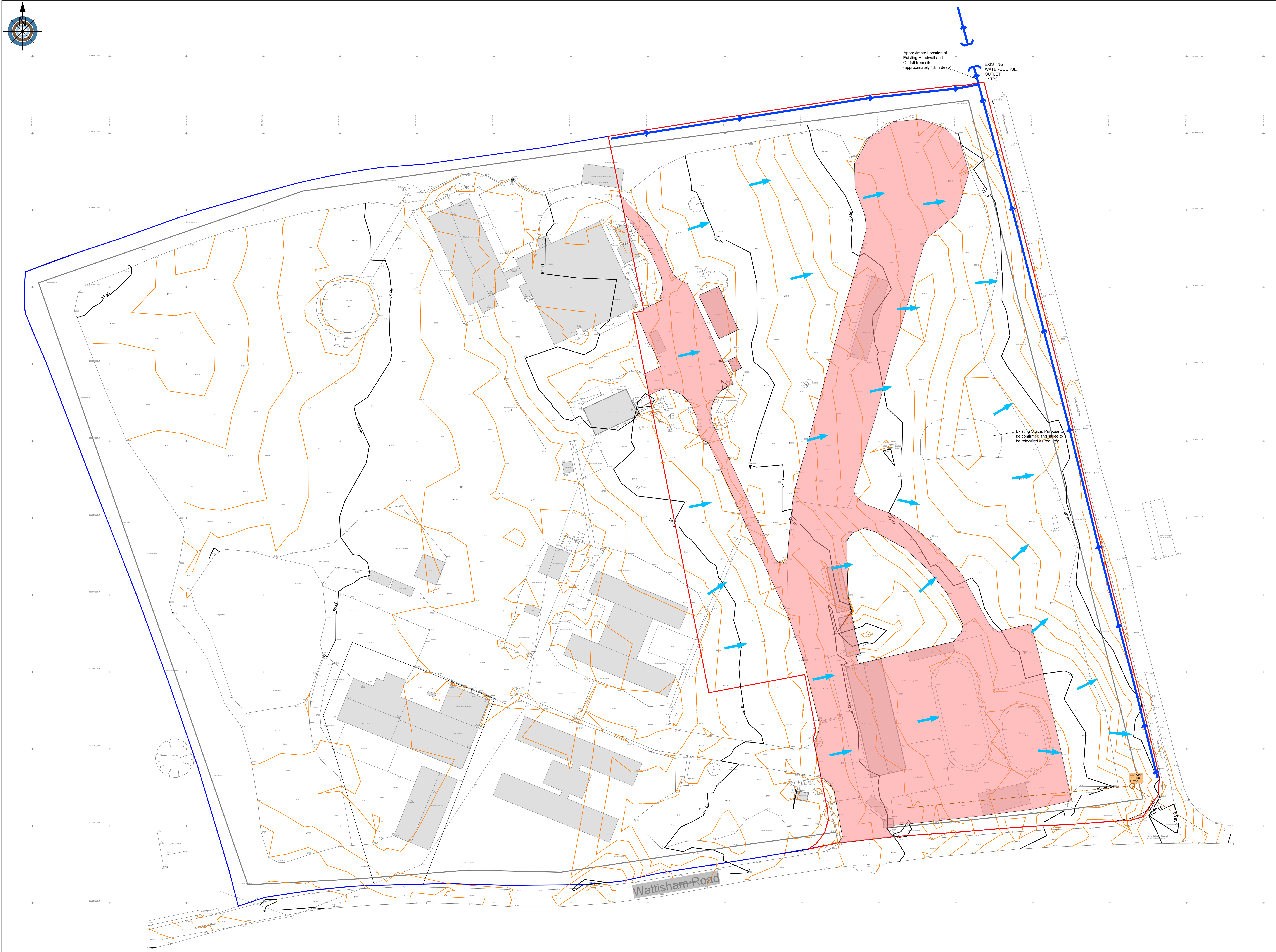

NOTES:

1. This drawing is to be read in conjunction with GHB series 246/2021 drawings and documents and any other relevant project team documents.
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.
3. 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.
4. Existing drainage layout to be surveyed and diverted as required to suit development layout.

Legend-

- Site Boundary- Area: 19,300m^2
- Ownership Boundary- Area: 46,838.2m^2
- Existing Impermeable Area: 6,372.5m^2
- Overland Flowpaths
- Primary Contours (0.5m)
- Secondary Contours (0.1m)
- Existing Open Channel Watercourse
- Indicative Existing Foul Water Network. Level and Location TBC
- Geology: Superficial Strata: Diamicton, Bedrock Strata Newhaven Chalk Formation
- Greenfield: Greenfield run-off rate: 4.5 l/s/ha

Revision	Date	Description
P1	15/02/22	Initial Issue

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Partnership No. OC383830, Registered in England and Wales

Client: ANGLIA BUSINESS PARK LTD.

Project: WATTISHAM ROAD, RINGSHALL

Drawing Title: EXISTING SITE LAYOUT

Scale: 1:500@ A1

Date: FEB 2022 | Drawn: JWT | Checked: JAH

DWG Reference: 246-2021.DWG

Status: FOR INFORMATION

Drawing Number: 246/2021/02 | Revision: P1

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

APPENDIX C

BGS Borehole Log

246/2021: Anglia Business Park, Wattisham Road, Ringshall, Suffolk, IP14 2HX

BGS Borehole Record Ref: TM05SW17 (250m west of the site entrance)

TM 05 SW/17

Department of the Environment ENGINEERING LABORATORY Cardington	Investigation No. FGE/702	Appendix A Sheet No. 31
Airfield Survival Measures	WATTISHAM Royal Air Force	

BOREHOLE LOG

TM 05 SW/17
0198 5219

Borehole No. 44
Ground Level 86·6m above O.D
9th - 11th February 1978

Note:-
1. Shell and auger borehole
2. Casing: 150mm dia. to 1·5m below G.L
3. Standpipe installed to 10m below G.L (11·2·78)

Description of Strata	Legend	Sample	Depth (m)	O.D. (m)	Remarks
[illegible] clayey brown			GL	86·6	No water entries were encountered during boring
[illegible] sandy and silty, brown with occasional small chalk fragments	C	•	0·1	86·5	
[illegible] sandy, grey and brown with small rounded chalk fragments and occasional pockets of sand	WBC	•	0·9	85·7	
		I	2·0	84·6	
			2·5	84·1	
			3·3	83·3	Water level - standpipe (11·5·78)
		↓ (56)	3·7	82·9	
		•	4·0	82·6	
[illegible] sandy, grey with small rounded chalk fragments	BC	I	5·0	81·6	
			5·5	81·1	
		I	6·5	80·1	
			7·0	79·6	
		•			
		I	8·0	78·6	
			8·5	78·1	
		•			
		↓ (75)	9·7	76·9	
			10·0	76·6	End of borehole

APPENDIX D

Development Proposal

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NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

This document references the following file:-

Reference Name	Status	Revision
PC-XX-XX-M3-Designer-0001_5442		P01.1

Revisions		Date	Drawn / Chk'd
P01	First Issue.	28/10/21	AO/BM
P02	Red Line Updated.	09/12/21	BM
P03	Units 20 & 21 Updated.	20/01/22	DL / BM
P04	Hard-standing to existing workshop corrected.	24/01/22	DL
P05	Planning Issue	28/03/22	DL / BM

BUILDING SCHEDULE:

Class E Office	Units 1 - 4	650sqft	x 4
	Units 17 - 19	650sqft	x 3
Class E Light Industrial	Units 5 - 7	1,000sqft	x 3
	Units 11 - 13	1,000sqft	x 3
Class B2 General Industrial	Units 8 - 10	1,950sqft	x 3
	Units 14 - 16	1,950sqft	x 3
Class B2 General Industrial	Unit 20	6,100sqft	x 1
	Total:	28,350sqft	
Demolished Existing Buildings	Total:	1,100sqft	

PARKING SCHEDULE:

Parking Bays	x 84
EV Electric Vehicle Bays	x 18
Disabled Parking Bays	x 6
Cycle Parking	x 18

PLANTING SCHEDULE

- Proposed Tree
- Existing Tree

Application Site - 1.910ha (4.719 acres)

Visibility Splay - 4.5 x 95 metres

N

Client
Anglia Business Park

Project
Commerical Development, Anglia Business Park, Wattisham Road, Ringshall

Title
Site Plan as Proposed - Phase 1

Project Nº	Drawing Nº	Revision
5442 - 0103		P05

Scale - unless otherwise stated	Status	Issued For
1 : 500	@ A1	PLANNING

BS 1192 Ref.
PC-Designer-0103

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Site Plan as Proposed - Phase 1 Master Plan

1 : 500

0 25 50 m

APPENDIX E

Proposed Drainage Strategy Layout and Details

NOTES:

1. This drawing is to be read in conjunction with GHB series 246/2021 drawings and documents and any other relevant project team documents.
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.
3. 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.
4. Existing drainage layout to be surveyed and diverted as required to suit development layout.

Legend-

- Site Boundary- Area: 19,300m^2
- Proposed Flowpath
- Indicative Surface Water Network
- Attenuation Basin
- Swale
- Flow Control- Discharge rate: 4.9 l/s
- Existing Open Channel Watercourse
- Indicative Existing Foul Water Network. Level and Location TBC
- 3m Service Strip/Maintenance Easement

Proposed Impermeable Area Table

Catchment	Measured Area (m^2)
Plots	3116.8
Drives	3902.8
Roads	3999.6
Sub Total-	11019.2

Revision	Date	Description
P2	12/04/22	Layout
P1	17/02/22	Initial Issue

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Client: ANGLIA BUSINESS PARK LTD.

Project: WATTISHAM ROAD, RINGSHALL

Drawing Title: PROPOSED INDICATIVE DRAINAGE SITE PLAN LAYOUT

Scale: 1:500@ A1

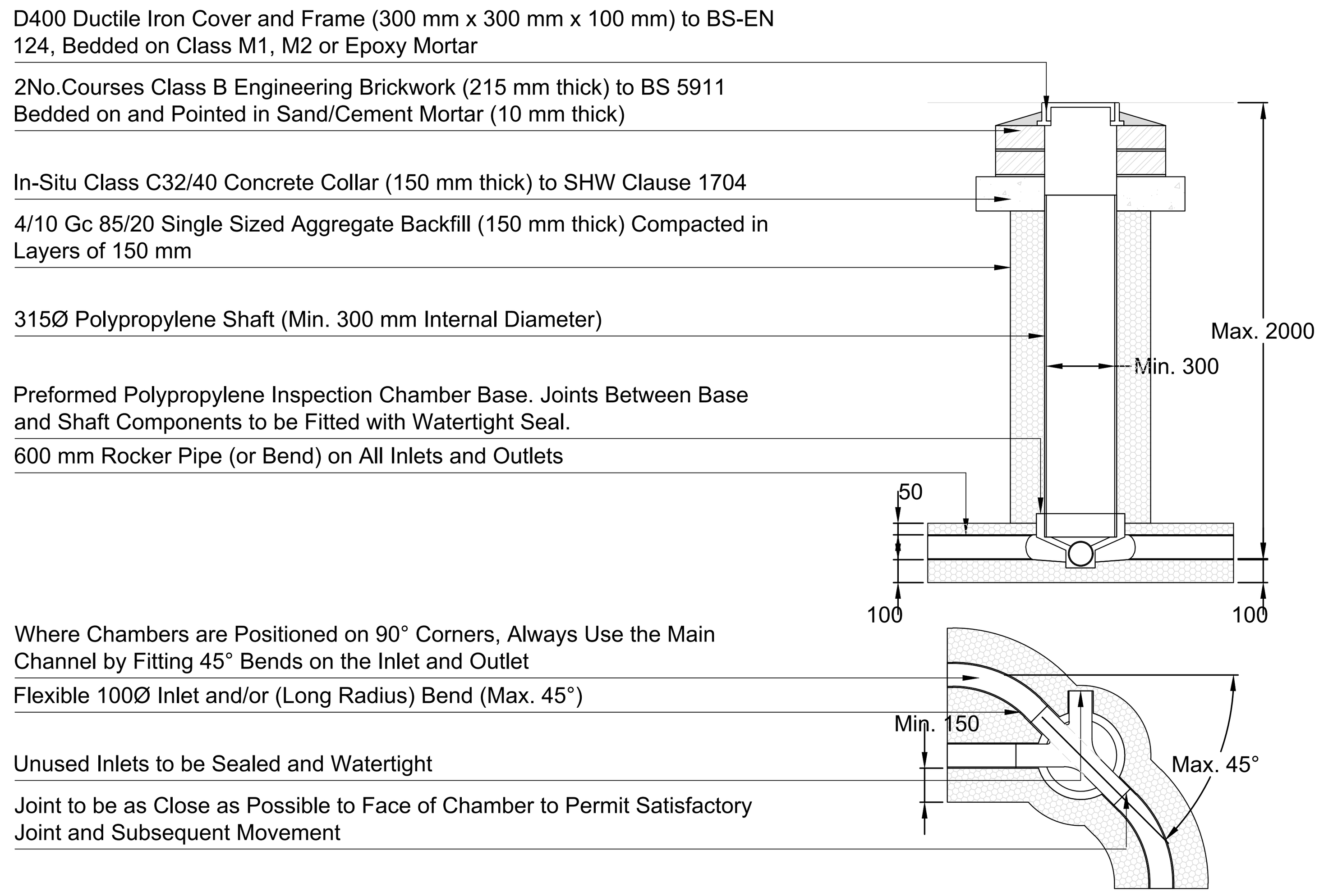
Date: FEB 2022 | Drawn: JWT | Checked: JAH

DWG Reference: 246-2021.DWG

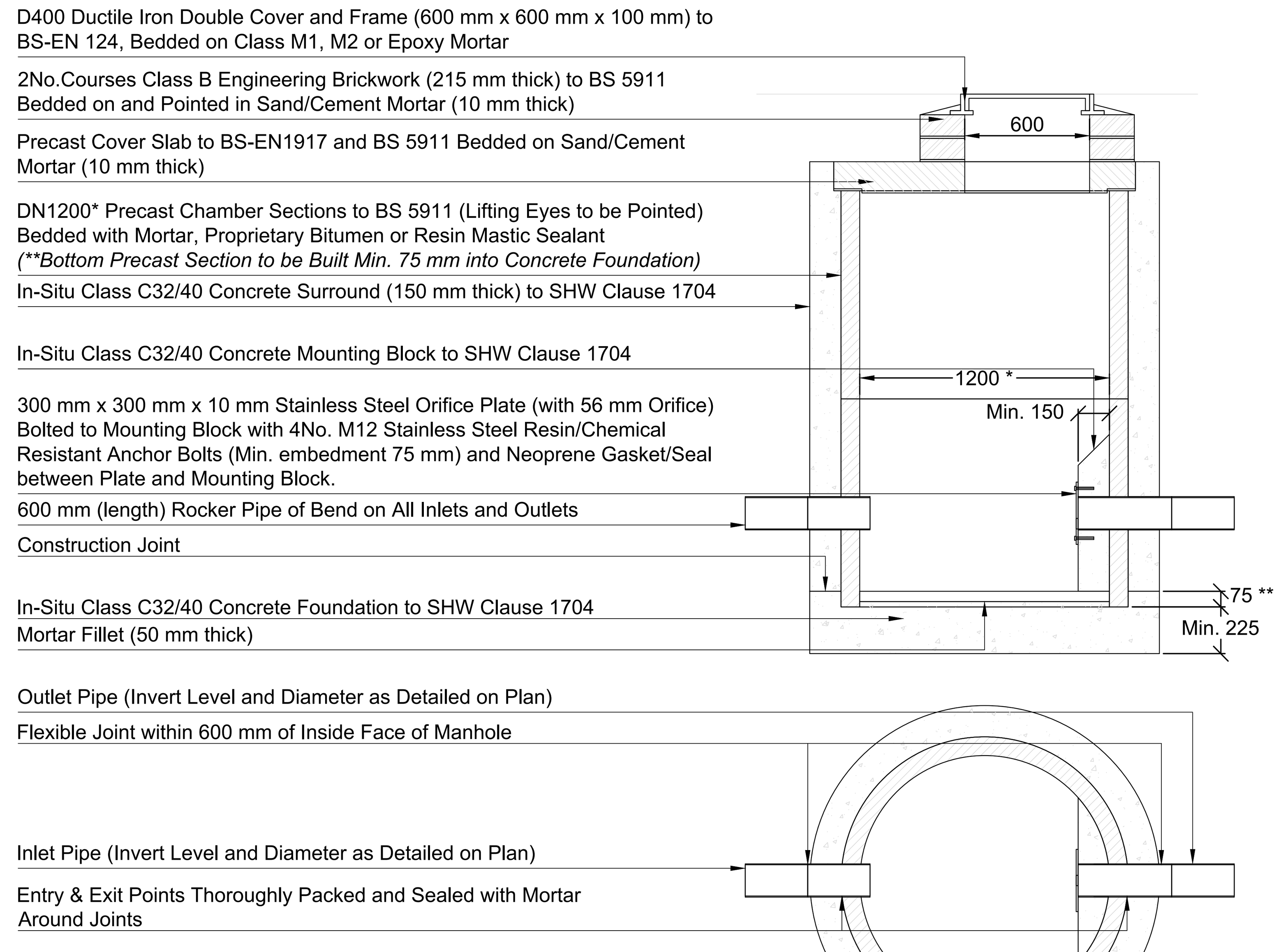
Status: FOR INFORMATION

Drawing Number: 246/2021/03 | Revision: P2

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



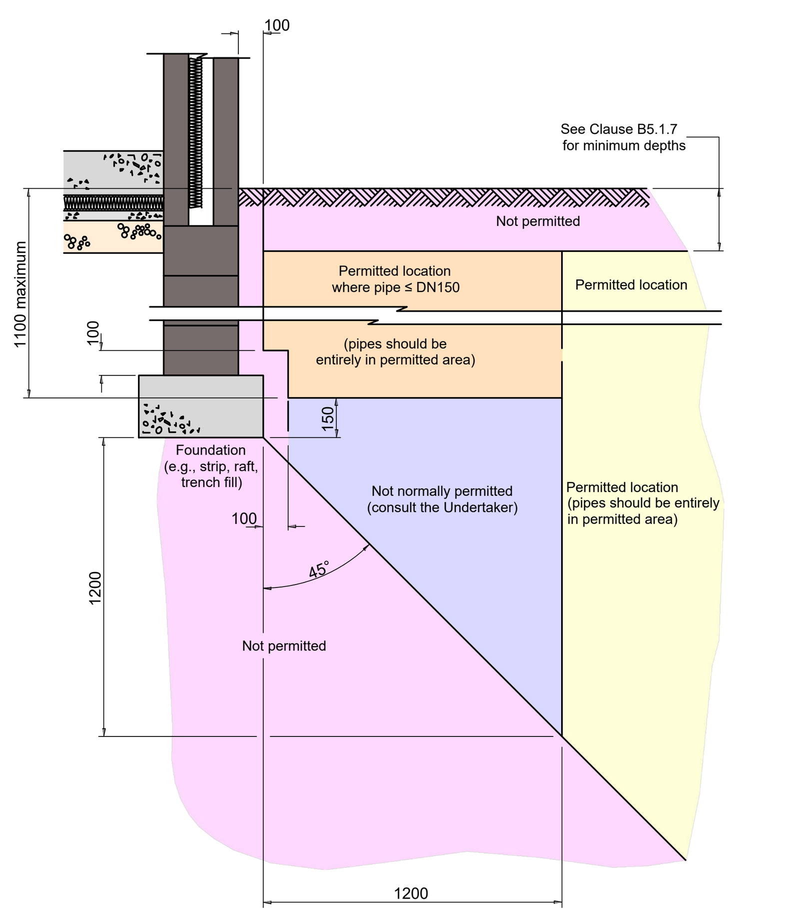
TYPICAL TYPE 4 INSPECTION CHAMBER



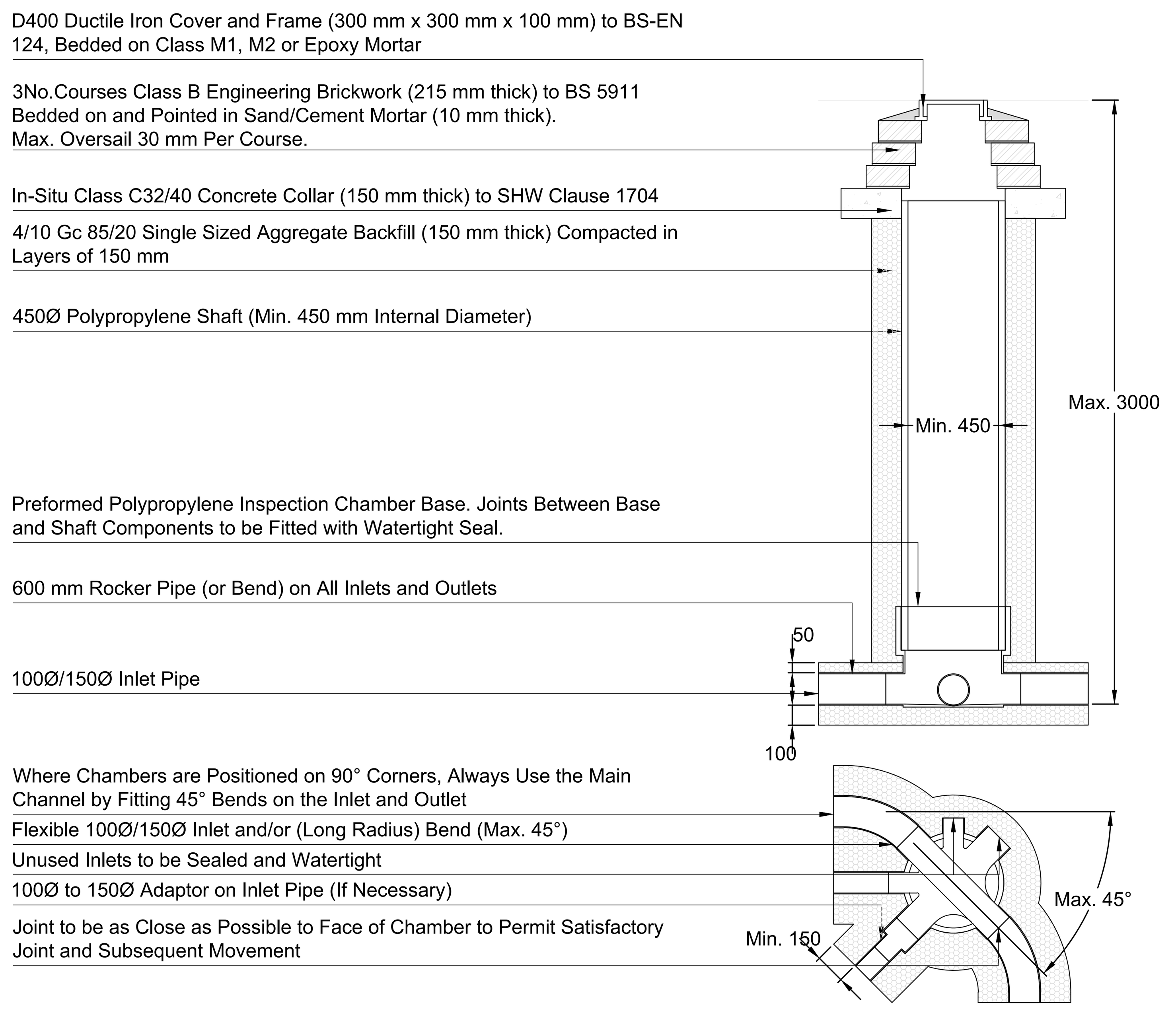
Largest Pipe Diameter	**Internal Diameter of Chamber*
<375	*1200*
375 to 700	*1500*

TYPICAL ORIFICE PLATE FLOW CONTROL CATCHPIT DETAIL

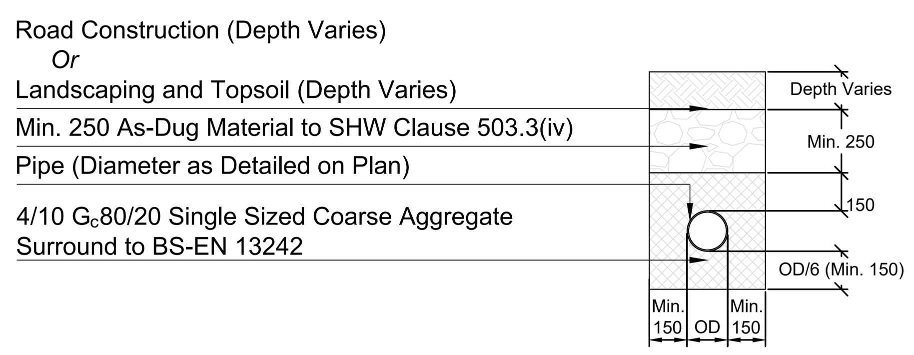
FIGURE B.1
ILLUSTRATION OF THE PERMITTED LOCATION OF ADOPTABLE SEWERS AND LATERAL DRAINS IN PROXIMITY TO BUILDINGS



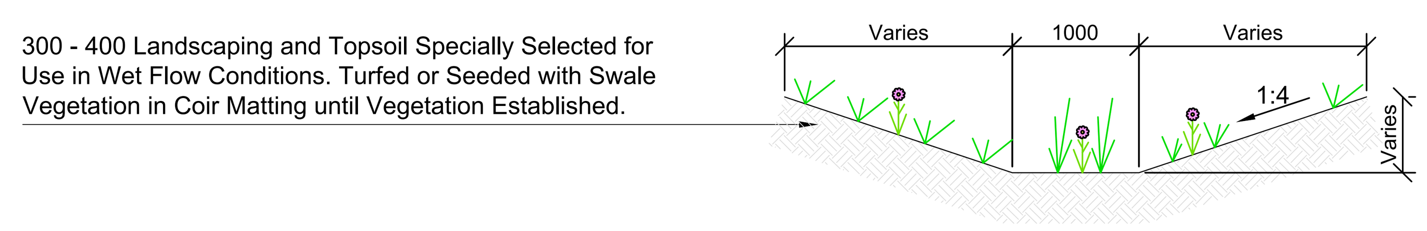
Not to scale, dimensions in millimetres



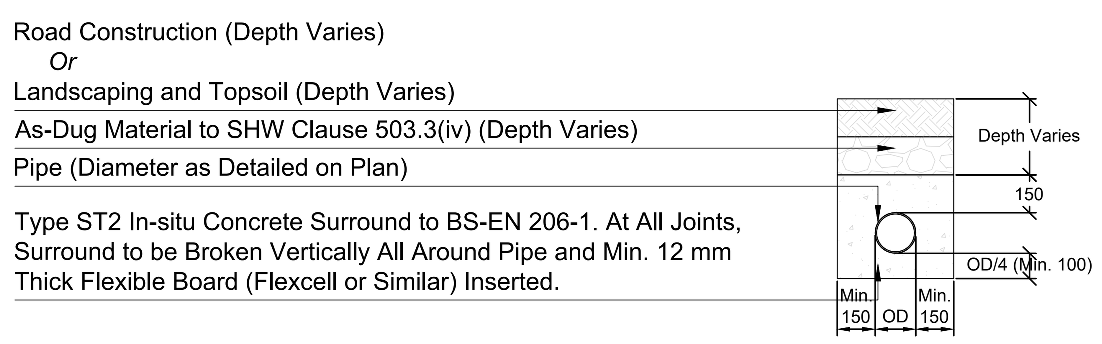
TYPICAL TYPE 3 INSPECTION CHAMBER



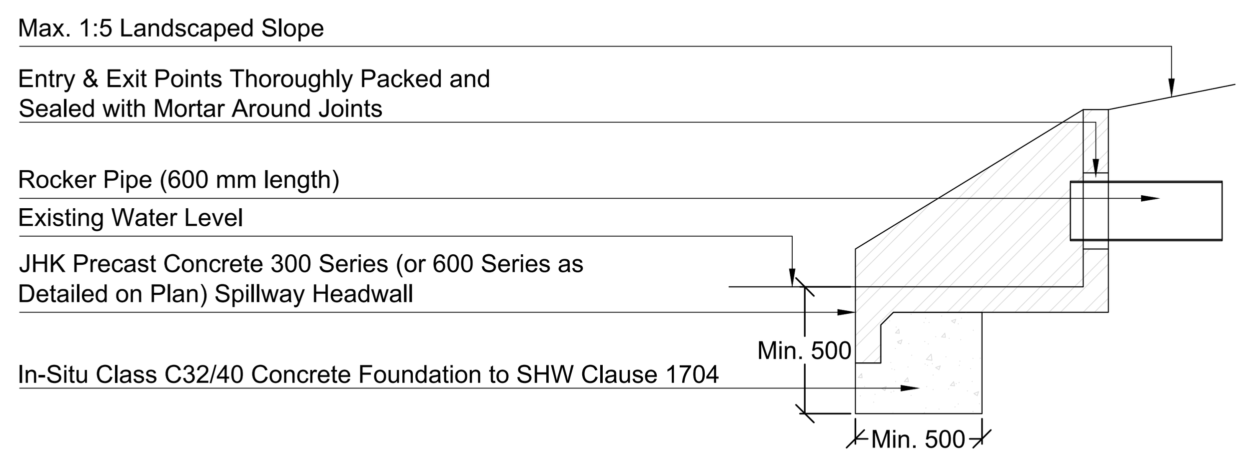
TYPICAL CLASS S PIPE BEDDING CONSTRUCTION DETAIL



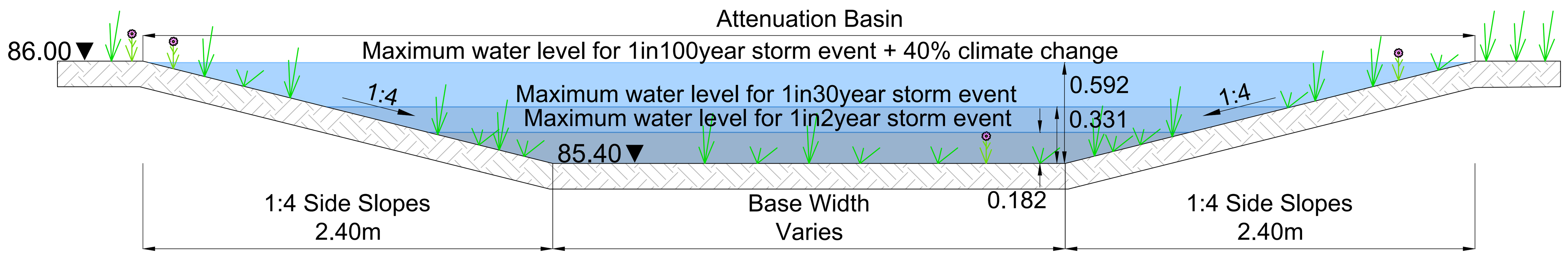
TYPICAL SWALE PROFILE



TYPICAL CLASS Z PIPE BEDDING CONSTRUCTION DETAIL



TYPICAL HEADWALL DETAIL



TYPICAL SECTION: ATTENUATION BASIN

NOTES:
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4. Existing drainage layout to be surveyed and diverted as required to suit development layout.

Revision	Date	Description
P1	17/02/22	Initial Issue

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Partnership No. OC383830, Registered in England and Wales

Client: ANGLIA BUSINESS PARK LTD.

Project: WATTISHAM ROAD, RINGSHALL

Drawing Title: INDICATIVE DRAINAGE STRATEGY CONSTRUCTION DETAILS

Scale: N.T.S @ A1

Date: FEB 2022 | Drawn: JWT | Checked: JAH

DWG Reference: 246-2021.DWG

Status: FOR INFORMATION

Drawing Number: 246/2021/04 | Revision: P1

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

APPENDIX F

Micro-Drainage Calculations

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 602173 252336 TM 02173 52336
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.653	4-8	0.449

Total Area Contributing (ha) = 1.102

Total Pipe Volume (m³) = 171.484

Network Design Table for Storm

« - Indicates pipe capacity < flow
^ - Indicates Time of Concentration is too low and the pipe is not sized using the rainfall

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	50.000	0.400	125.0	0.656	4.00	0.0	0.045	4 \=/	1000	1:4 Swale	🔒
S2.000	34.000	0.600	56.7	0.356	4.00	0.0	0.045	4 \=/	1000	1:4 Swale	🔒
S3.000	2.000	0.013	153.8	0.090	4.00	0.0	0.045	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.86	86.200	0.656	0.0	0.0	0.0	0.45	107.7	88.8
S2.000	0.00	4.85^	86.300	0.356	0.0	0.0	0.0	0.67	160.0	0.0
S3.000	0.00	4.17^	85.500	0.090	0.0	0.0	0.0	0.20	3.5	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.001	5.000	0.100	50.0	0.000	0.00	0.0	0.045	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.001	50.00	6.09	85.400	1.102	0.0	0.0	0.0	0.35	6.2«	149.2

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	86.800	0.600	Junction		S1.000	86.200	1000				
S3	86.900	0.600	Junction		S2.000	86.300	1000				
S3	86.000	0.500	Junction		S3.000	85.500	150				
S4	86.000	0.600	Open Manhole	500	S1.001	85.400	150	S1.000	85.800	1000	400
								S2.000	85.700	1000	300
								S3.000	85.487	150	87
S	86.000	0.700	Open Manhole	0		OUTFALL		S1.001	85.300	150	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.656	0.656	0.656
2.000	-	-	100	0.356	0.356	0.356
3.000	-	-	100	0.090	0.090	0.090
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.102	1.102	1.102

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.001	S	86.000	85.300	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	100	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 602173 252336 TM 02173 52336	Cv (Winter)	0.840
Data Type	Point	Storm Duration (mins)	30

Online Controls for Storm

Orifice Manhole: S4, DS/PN: S1.001, Volume (m^3): 170.5

Diameter (m) 0.056 Discharge Coefficient 0.600 Invert Level (m) 85.400

Storage Structures for Storm

Tank or Pond Manhole: S4, DS/PN: S1.001

Invert Level (m) 85.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1130.0	0.600	1560.4

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 602173 252336 TM 02173 52336	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	2	+0%					86.347	-0.453	0.000
S2.000	S3	15 Winter	2	+0%					86.385	-0.515	0.000
S3.000	S3	120 Winter	2	+0%					85.650	0.000	0.000
S1.001	S4	600 Winter	2	+0%	2/180 Winter				85.582	0.032	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.05		105.9	OK	
S2.000	S3	0.02		57.7	OK	
S3.000	S3	1.05		4.6	FLOOD RISK*	
S1.001	S4	0.42		2.6	FLOOD RISK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 602173 252336 TM 02173 52336 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	30	+0%					86.422	-0.378	0.000
S2.000	S3	15 Winter	30	+0%					86.432	-0.468	0.000
S3.000	S3	60 Winter	30	+0%					85.650	0.000	0.000
S1.001	S4	600 Winter	30	+0%	2/180 Winter				85.731	0.181	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.12		233.8	FLOOD RISK*	
S2.000	S3	0.04		127.5	OK	
S3.000	S3	3.39		14.9	FLOOD RISK*	
S1.001	S4	0.59		3.6	FLOOD RISK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 602173 252336 TM 02173 52336 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	100	+40%					86.495	-0.305	0.000
S2.000	S3	15 Winter	100	+40%					86.480	-0.420	0.000
S3.000	S3	360 Winter	100	+40%					85.650	0.000	0.000
S1.001	S4	720 Winter	100	+40%	2/180 Winter				85.992	0.442	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.21		416.5	FLOOD RISK*	
S2.000	S3	0.08		227.4	FLOOD RISK*	
S3.000	S3	1.71		7.5	FLOOD RISK*	
S1.001	S4	0.80		4.9	FLOOD RISK	

APPENDIX G

Maintenance Requirements

SuDS Element	Orifice Flow Control		
Maintenance Issues	Blockages		
Schedule	Action	Frequency	Responsibility
Regular	Inspect water level within chamber	Quarterly	Private Owner
	Remove chamber mesh screen and inspect	Quarterly	Private Owner
	Inspect up and down stream filter baskets for debris	Quarterly	Private Owner
Occasional	Clean chamber mesh screen	Quarterly	Private Owner
	Clean filter baskets	Annually	Private Owner
Remedial	If blockages occur frequently, rearrange aggregate within baskets	As required	Private Owner

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SuDS Element	Dry Swale		
Maintenance Issues			
Schedule	Action	Frequency	Responsibility
Regular Maintenance	Remove litter and debris	Monthly, or as required	Private owner
	Cut grass- to retain grass height within specified design range	Monthly (during growing season), or as required	Private owner
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required	Private owner
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly	Private owner
	Inspect trench infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required	Private owner
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly	Private owner
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies.	Half yearly	Private owner
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area	Private owner
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required or if bare soil is exposed over 10% or more of the swale treatment area	Private owner
	Relevel uneven surfaces and reinstate design levels	As required	Private owner
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required	Private owner
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required	Private owner
	Remove and dispose of oils or petrol residues using safe standard practices.	As required	Private owner

SuDS Element	Detention Basin		
Maintenance Issues	Siltation and Blockages		
Schedule	**Action**	**Frequency**	**Responsibility**
Regular maintenance	Remove litter and debris	Monthly	Private Owner
	Cut grass- for spillways and access routes	Monthly (during growing season), or as required	Private Owner
	Cut grass- meadow in and around basin.	Half yearly (spring- before nesting season, and autumn)	Private Owner
	Manage other vegetation and remove nuisance plants.	monthly (at start, then as required)	Private Owner
	Inspect inlets, outlets and overflow for blockages and clear if required.	Monthly	Private Owner
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly	Private Owner
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required)	Private Owner
	Check any penstock and other mechanical devices.	Annually	Private Owner
	Tidy all dead growth before start of growing season.	Annually	Private Owner
	Remove sediment from inlets, outlet and forebay.	Annually (or as required)	Private Owner
Occasional maintenance	Reseed areas of poor vegetation growth.	As required	Private Owner
	Prune and trim any trees and remove cuttings	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)	Private Owner
	Remove sediment from inlets, outlets, forebay and re-turfing when required.	As required	Private Owner
Remedial actions	Repair erosion or other damage by re-seeding or re-turfing.	As required	Private Owner
	Re-alignment of rip-rap.	As required	Private Owner
	Repair/rehabilitation of inlets, outlets, and overflows.	As required	Private Owner
	Relevel uneven surfaces and reinstate design levels.	As required	Private Owner