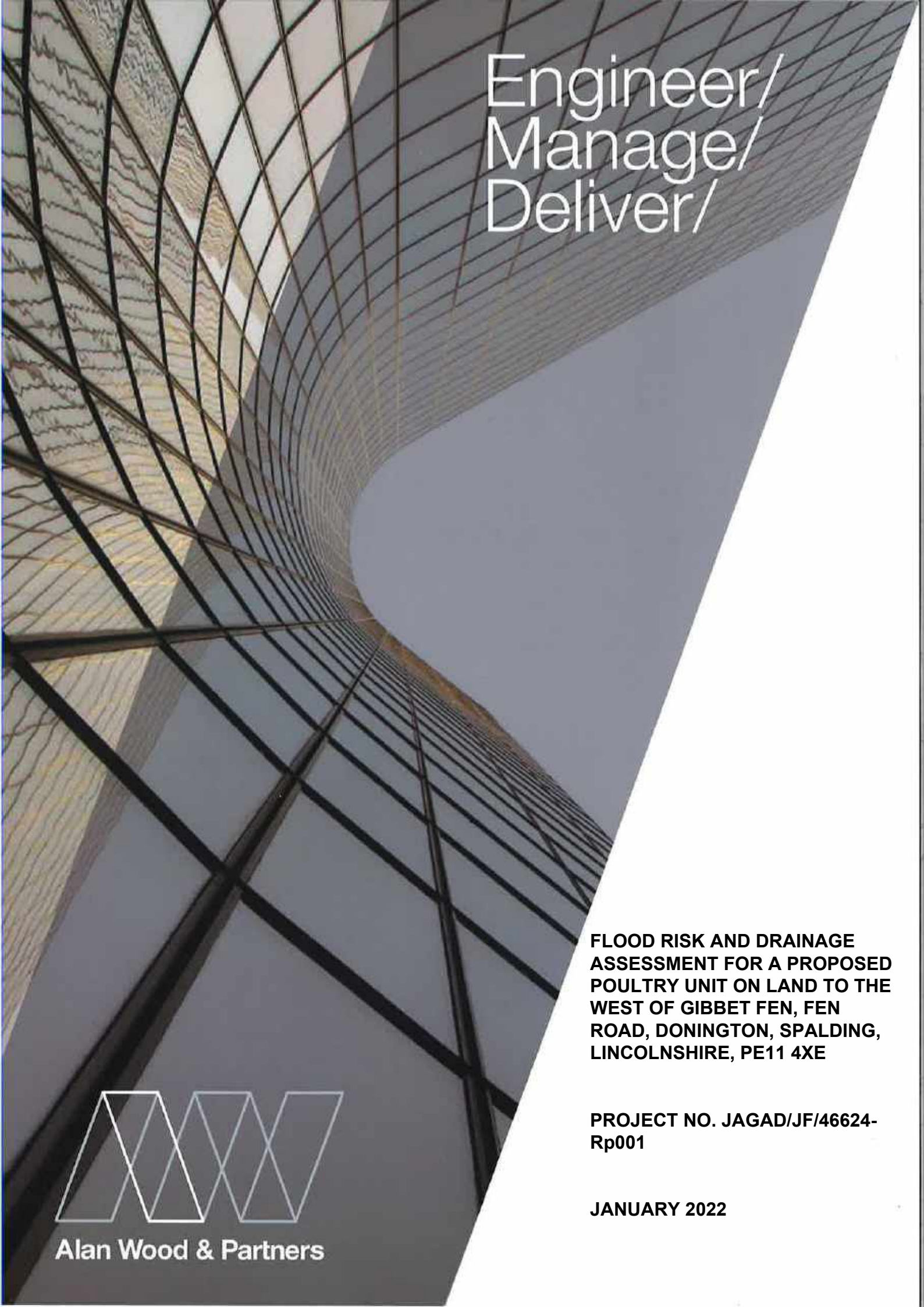




Engineer/ Manage/ Deliver/

**FLOOD RISK AND DRAINAGE
ASSESSMENT FOR A PROPOSED
POULTRY UNIT ON LAND TO THE
WEST OF GIBBET FEN, FEN
ROAD, DONINGTON, SPALDING,
LINCOLNSHIRE, PE11 4XE**

**PROJECT NO. JAGAD/JF/46624-
Rp001**

JANUARY 2022



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POULTRY UNIT ON LAND TO THE WEST OF GIBBET FEN, FEN ROAD,
DONINGTON, SPALDING, LINCOLNSHIRE, PE11 4XE**

Prepared by: A Dunn



Signed:

Date: 14th January 2022

Approved by: J Gibson, MEng (Hons), CEng, CWEM MCIWEM
Civil Engineering Director



Signed:

Date: 14th January 2022

Issue	Revision	Revised by	Approved by	Revised Date

For the avoidance of doubt, the parties confirm that these conditions of engagement shall not and the parties do not intend that these conditions of engagement shall confer on any party any rights to enforce any term of this Agreement pursuant of the Contracts (Rights of third Parties) Act 1999.

The Appointment of Alan Wood & Partners shall be governed by and construed in all respects in accordance with the laws of England & Wales and each party submits to the exclusive jurisdiction of the Courts of England & Wales.

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APPENDICES

Appendix A : Site Layout Drawings

Appendix B : Hydraulic Model Study

Appendix C : Drainage Strategy Drawings

Appendix D : Surface Water Exceedance Flood Routing Drawing

Appendix E : CIRIA SuDS Manual Water Quality Matrix Outputs

1.0 **INTRODUCTION**

1.1 **Background**

1.1.1 Alan Wood & Partners were commissioned by Clarke Group Construction Ltd to prepare a Flood Risk and Drainage Assessment for a proposed poultry unit development on land to the west of Gibbet Fen, Fen Road to the west of Donington, Spalding, Lincolnshire in support of an application for planning consent.

1.1.2 A Flood Risk and Drainage Assessment (FRDA) for the proposed development is required to assess the development's risk from flooding and the suitability of the site in terms of drainage.

1.2 **Layout of Report**

1.2.1 Section 1 provides an introduction to the FRDA, explains the layout of this FRDA and provides an introduction to flood risk and the latest guidance on development and flood risk in England.

1.2.2 Section 2 provides an introduction to the site. The site description is based upon a desktop study and information provided by the developer. In order to obtain further information on flood risk, consultation was undertaken with the Environment Agency.

1.2.3 Section 3 of this report details the development proposals and considers the development proposals in relation to the current planning policy on development and flood risk in England (and what type of development is considered appropriate in different flood risk zones). National Planning Policy Framework (NPPF): and its associated Technical Guidance (Communities and Local Government, March 2012) is the current planning policy on flood risk in England, and an introduction to NPPF is provided below.

1.2.4 Section 4 considers the drainage arrangements for the proposed development.

1.2.5 Section 5 considers the operation and maintenance requirements for the proposed development.

1.2.6 Section 6 of this report considers the flood risk to site, and the potential for the development proposals to impact on flood risk. The assessment of flood risk is based on the latest planning policy and utilises all the information gathered in the preparation of the report.

1.2.7 Section 7 of this report provides details of any recommendations for further work to mitigate against possible flooding.

1.2.8 Section 8 of this report provides a summary of the report.

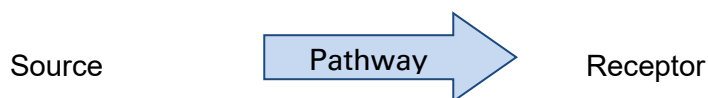
1.3 Flood Risk

1.3.1 Flood risk takes account of both the probability and the consequences of flooding.

1.3.2 Flood risk = probability of flooding x consequences of flooding

1.3.3 Probability is usually interpreted in terms of the return period, e.g. 1 in 100 and 1 in 200 year event, etc. In terms of probability, there is a 1 in 100 (1%) chance of one or more 1 in 100 year floods occurring in a given year. The consequences of flooding depends on how vulnerable a receptor is to flooding.

The components of flood risk can be considered using a source-pathway-receptor model.



1.3.4 Sources constitute flood hazards, which are anything with the potential to cause harm through flooding (e.g. rainfall extreme sea levels, river flows and canals). Pathways represent the mechanism by which the flood hazard would cause harm to a receptor (e.g. overtopping and failure of embankments and flood defences, inadequate drainage and inundation of floodplains). Receptors comprise the people, property, infrastructure and ecosystems that could potentially be affected should a flood occur.

1.4 National Planning Policy Framework

1.4.1 General

1.4.1.1 NPPF and its associated Technical Guidance replaces Planning Policy Statement 25 and provides guidance on how to evaluate sites with respect to flood risk.

1.4.1.2 A summary of the requirements of NPPF is provided below.

1.4.2 Sources of Flooding

1.4.2.1 NPPF requires an assessment to flood risk to consider all forms of flooding and lists six forms of flooding that should be considered as part of a flood risk assessment. These forms of flooding are listed in Table 1, along with an explanation of each form of flooding.

Table1: Forms of flooding

Flooding from Rivers (Fluvial Flooding)
Watercourses flood when the amount of water in them exceeds the flow capacity of the river channel. Flooding can either develop gradually or rapidly, depending on the characteristics of the catchment. Land use, topography and the development can have a strong influence on flooding from rivers.
Flooding from the Sea (Tidal Flooding)
Flooding to low-lying land from the sea and tidal estuaries is caused by storm surges and high tides. Where tidal defences exist, they can be overtopped or breached during a severe storm, which may be more likely with climate change.
Flooding from Land (Pluvial Flooding)
Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. In developed areas this flood water can be polluted with domestic sewage where foul sewers surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be taken into account in spatial planning for urban developments. Flooding can be exacerbated if development increases the percentage of impervious area.

Flooding from Groundwater
Groundwater flooding occurs when groundwater levels rise above ground levels (i.e. groundwater issues). Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). Chalk is the most extensive source of groundwater flooding.
Flooding from Sewers
In urban areas, rainwater is frequently drained into sewers. Flooding can occur when sewers are overwhelmed by heavy rainfall, and become blocked. Sewer flooding continues until the water drains away.
Flooding from Other Artificial Sources (i.e. reservoirs, canals, lakes and ponds)
Non-natural or artificial sources of flooding can include reservoirs, canals and lakes. Reservoir or canal flooding may occur as a result of the facility being overwhelmed and /or as a result of dam or bank failure.

1.4.3 Flood Zones

- 1.4.3.1 For river and sea flooding, the NPPF uses four Flood Zones to characterise flood risk. These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences, and are detailed in Table 2.

Table 2: Flood zones

Flood Zone	Definition
1	Low probability (less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium probability (between 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year).
3a	High probability (1 in 100 or greater annual probability of river flooding (>1%) in any year or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).
3b	This zone comprises land where water has to flow or be stored in times flood. Land which would flood with an annual probability of 1 in 20 (5%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

1.4.4 Vulnerability

1.4.4.1 The NPPF classifies the vulnerability of developments to flooding into five categories. These categories are detailed in Table 3.

Table 3: Flood risk vulnerability classification

Flood Risk Vulnerability Classification	Examples of Development Types
Essential Infrastructure	- Essential utility infrastructure including electricity generating power stations and grid and primary substations - Wind turbines
Highly Vulnerable	- Police stations, ambulance stations, fire stations, command centres and telecommunications installations required to be operational during flooding. - Emergency dispersal points. - Basement dwellings. - Caravans, mobile homes and park homes intended for permanent residential use.
More Vulnerable	- Hospitals. - Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non-residential uses for health services, nurseries and educational establishments. - Sites used for holiday or short-let caravans and camping.
Less Vulnerable	- Building used for shops, financial, professional and other services, restaurants and cafes, hot foot takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable" and assembly and leisure. - Land and buildings used for agriculture and forestry.
Water Compatible	- Docks, marinas and wharves. - Water based recreation (excluding sleeping accommodation). - Lifeguard and coastguard stations. - Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.

- 1.4.4.2 Based on the vulnerability of a development, NPPF states within what Flood Zones(s) the development is appropriate. The flood risk vulnerability and Flood Zone 'compatibility' of developments is summarised in Table 4.

Table 4: Flood risk vulnerability and flood zone compatibility

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test	✓	✓
	3a	Exception Test	✓	x	Exception Test	✓
	3b	Exception Test	✓	x	x	x

1.4.5 The Sequential Test, Exception Test and Sequential Approach

- 1.4.5.1 The Sequential Test is a risk-based test that should be applied at all stages of development and aims to steer new development to areas with the lowest probability of flooding (Zone 1). This is applied by the Local Planning Authority by means of a Strategic Flood Assessment (SFRA).

- 1.4.5.2 The SFRA and NPPF may require the Exception Test to be applied to certain forms of new development. The test considers the vulnerability of the new development to flood risk and, to be passed, must demonstrate that:

- There are sustainability benefits that outweigh the flood risk and;
- The new development is safe and does not increase flood risk elsewhere.

- 1.4.5.3 The Sequential Approach is also a risk based approach to development. In a development site located in several Flood Zones or with other flood risk, the sequential approach directs the most vulnerable types of development towards areas of least risk within the site.

1.4.6 Climate Change

- 1.4.6.1 There is a planning requirement to account for climate change in the proposed design. The recommended allowances should be based on the most relevant guidance from the Environment Agency and the Lead Local Flood Authority.

1.4.7 Sustainable Drainage

- 1.4.7.1 The key planning objectives in NPPF are to appraise, manage and where possible, reduce flood risk. Sustainable Drainage Systems (SuDS) provide an effective way of achieving some of these objectives, and NPPF and Part H of the Building Regulations (DTLR 2002) direct developers towards the use of SuDS wherever possible.
- 1.4.7.2 The surface water drainage has been designed in accordance with current CIRIA C753 SuDS Manual guidelines.

2.0 EXISTING SITE DESCRIPTION

2.1 Location

- 2.1.1 The site occupies land to the west of the village of Donington, Lincolnshire.
- 2.1.2 The site lies approximately 1.8km to the west of the centre of the village of Donington, approximately 8.7km to the south east of the village of Heckington, approximately 13km to the north west of Spalding and approximately 15km to the south west of Boston.
- 2.1.3 An aerial photograph and location plan are included in Figures 1 and 2 below, which identify the location of the site.

Figure 1: Aerial Photograph



- | | |
|-------|---|
| 2.3.1 | The site lies within an area of extensive agricultural land. |
| 2.3.2 | The A52 is situated approximately 0.7km to the south of the development, which will provide access to the site. |
| 2.3.3 | There is a small open drainage ditch along the northern site boundary adjacent to the Spalding to Sleaford railway lines. |
| 2.3.4 | There is an open agricultural drainage ditch to the south west of the development site. |
| 2.3.5 | There is an open agricultural drainage ditch crossing the site (Old Swimmer Dam Drain). |

- 2.3.6 There is a large open drain along the north western site boundary (Hammond Beck).
- 2.3.7 South Forty Foot Drain is situated approximately 1.5km to the west of the site.
- 2.3.8 The River Welland is situated approximately 12km to the south east of the site.
- 2.3.9 The River Witham is situated approximately 15km to the north east of the site.
- 2.3.10 The coastline of The Wash is situated approximately 20km to the east of the site.

2.4 Topography

- 2.4.1 A topographic survey of the development site has not been undertaken at this stage.
- 2.4.2 However, Lidar data covering the area of the development site has been obtained.
- 2.4.3 Over the full area of the development, existing ground levels are shown to vary from approximately 1.74m to 2.65m OD(N).
- 2.4.4 Over the footprint of the new buildings, the existing ground levels are shown to vary from approximately 1.53m to 2.28m OD(N), with an average ground level of approximately 1.80m OD(N).

2.5 Ground Conditions

- 2.5.1 A desktop study of the British Geological Survey map reveals that the local geology comprises superficial deposits of Alluvium – Clay, Silt and Sand overlying bedrock comprising Peterborough Formation – Mudstone.
- 2.5.2 Local borehole records reveal the underlying strata to comprise glacial clays extending to a depth of 30m below ground level.

-
- 2.5.3 The ground conditions are therefore unsuitable for soakaways/infiltration methods to be utilised for the disposal of surface water run-off from the development.
- 2.5.4 A study of the groundwater maps in the region shows that the proposed development does not overlay an aquifer. The groundwater vulnerability in the area of the development is classed as 'unproductive'.

3.0 **PROPOSED DEVELOPMENT**

3.1 **Proposed Development**

3.1.1 The proposed development comprises the construction of a new poultry unit to include the following:-

- 6 new poultry buildings with control room annexes
- Amenity building
- Plant room
- Dead bird store
- Water tank
- Gas tanks
- Generator
- Feed Bins
- Concrete paving
- Unsurfaced hardstanding for access, car parking and vehicle manoeuvres
- 2 No. agricultural worker dwellings
- Improvements to site access

3.1.2 Indicative layout drawings of the proposed development are included in Appendix A.

3.2 **Flood Risk**

3.2.1 In terms of flood risk vulnerability, the construction of buildings to be used for agriculture is classed as 'Less Vulnerable' development, whilst the construction of buildings for residential use is classed as 'More Vulnerable' development (Table 3).

3.2.2 In terms of flood zone compatibility, the construction of 'Less Vulnerable' development is considered appropriate in Flood Zone 1, Flood Zone 2 and Flood Zone 3a, whilst the construction of 'More Vulnerable' development is considered to be appropriate in Flood Zone 1 and requires a Sequential Test to justify developing the site in Flood Zone 3a (Table 4).

4.0 **DRAINAGE ASSESSMENT**

4.1 **General**

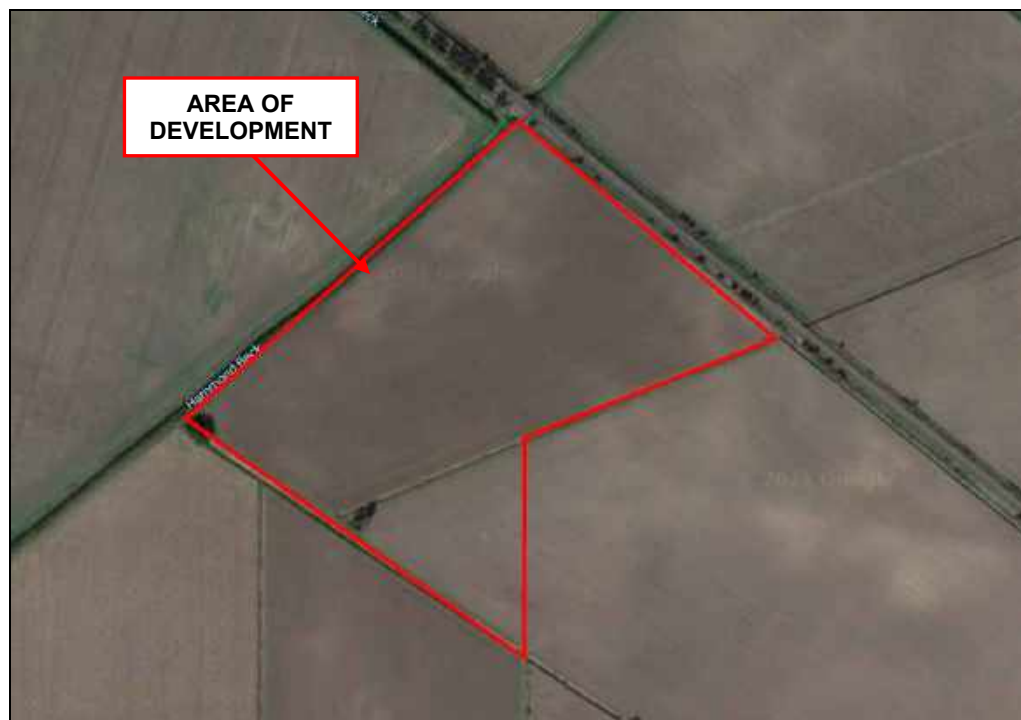
- 4.1.1 The surface water drainage has been designed in accordance with current CIRIA C753 SuDS Manual guidelines.

4.2 **Surface Water Drainage**

4.2.1 **Existing Site**

- 4.2.1.1 From the aerial photograph included in Figure 3, it can be seen that the area of the development site currently comprises agricultural land, which will discharge surface water at an agricultural run-off rate.

Figure 3: Aerial Photograph



4.2.2 **Run-off Destination**

- 4.2.2.1 Requirement H3 of the Building Regulations establishes a preferred hierarchy for disposal of surface water. Consideration should firstly be given to soakaway, infiltration, watercourse, surface water sewer and combined sewer in that priority order.

- 4.2.2.2 The existing ground conditions are considered to be unsuitable for the disposal of surface water run-off to soakaways/infiltration trenches (See Section 2.5).
- 4.2.2.3 The second preferred option would be to discharge the surface water run-off from the development to a watercourse.
- 4.2.2.4 Investigations have revealed that there is an open drainage ditch in proximity to the development site into which the surface water run-off could be discharged.
- 4.2.2.5 It is therefore proposed that the surface water run-off from the development is discharged into this drainage ditch, which lies within the jurisdiction of Black Sluice Internal Drainage Board, for which formal consent will be required.

4.2.3 Flood Risk

- 4.2.3.1 For new developments, the current design criteria required for the surface water drainage will need to be based upon a 1 in 100 year storm event, with an additional allowance to account for climate change resulting from global warming. There should be no above ground flooding for the 1 in 30 year return period and no property flooding or off site flooding from the critical 1 in 100 year storm event, with the additional allowance to account for climate change.

4.2.4 Climate Change

- 4.2.4.1 An additional allowance of 40% has been included in the design to account for climate change resulting from, global warming in accordance with Lincolnshire County Council SuDS guidelines.

4.2.5 Urban Creep

- 4.2.5.1 The project is an agricultural development under the control of a single owner and consequently there is no requirement to allow an additional 10% to the calculated impermeable areas for urban creep within the drainage design.

4.2.6 Peak Flow Control

- 4.2.6.1 Based upon the site layout drawing, the developable site area becoming impermeable in the form of roofs and areas of paving which will need to be positively drained has been calculated at approximately 1.86 hectares, with the remainder of the site discharging at an agricultural run-off rate.
- 4.2.6.2 It is assumed that the surface water run-off from the small area of surfacing to the site entrance will drain onto the adjacent ground.
- 4.2.6.3 The uncontrolled surface water run-off from the new development could be approximately 258 litres per second, based on BS EN 752 calculations, using a rainfall intensity of 50mm/hour. However, to meet the flood risk planning requirements, it is unacceptable to discharge flows freely from the proposed development site at an unrestricted rate. Therefore, flows from the proposed development are normally limited to the greenfield runoff rate, established as 1.4 litres per second per ha, based on the impermeable contributing area of the site. For this development this would equate to approximately 2.6 litres per second and consequently this discharge rate has been used for design purposes.
- 4.2.6.4 In order to ensure the discharge of surface water will not increase the risk of flooding to other properties, it will be necessary to attenuate the drainage by restricting the discharge and providing storage as required.
- 4.2.6.5 The design will need to be based upon the critical 100 year storm event with the required additional allowance of 40% to account for climate change.
- 4.2.6.6 The new agricultural workers dwellings are too remote from the main poultry unit to connect to the drainage network serving the poultry unit.
- 4.2.6.7 It is therefore proposed that a separate discharge from the dwellings be provided.
- 4.2.6.8 Based upon the design criteria set out above, a hydraulic model study has been undertaken in order to determine the pipe sizes and gradients and to assess the required volume of storage which will need to be provided.

4.2.6.9 The model output shows that the pipe sizes required will vary from 100mm to 750mm in diameter.

4.2.6.10 A summary of the storage volumes required is set out in Table 5 below.

Table 5: Volume of Surface Water Storage Required

Storm Event	30 Year Storm	100 Year Storm + 40%
Storage Volume Required	704m ³	1565m ³
Additional Storage Volume Required	Nil	861m ³

4.2.6.11 The required storage will be provided within an attenuation lagoon located to the south of the new poultry unit.

4.2.6.12 A copy of the hydraulic model study calculations is included in Appendix B.

4.2.7 Drawing

4.2.7.1 Indicative drainage layout drawings showing the proposed drainage strategy for the development are included in Appendix C.

4.2.8 Volume Control

4.2.8.1 SuDS guidance advises that the run-off volume from the developed site for the 1 in 100 year 6-hour rainfall event should not exceed the greenfield run-off volume for the same event.

4.2.8.2 A greenfield discharge rate has been used for design purposes and therefore this criteria has been satisfied.

4.2.8.3 We consider that the impact on the receiving watercourse has been minimised as far as is reasonably practicable.

4.2.9 Pollution Control

- 4.2.9.1 It is a requirement to ensure that the quality of any receiving body is not adversely affected by the development.
- 4.2.9.2 Investigations have revealed that the development site does not overlay an aquifer and lies within a groundwater vulnerability zone classified as 'unproductive'.
- 4.2.9.3 In order to minimise the risk of pollution to the final watercourse, clean roof water drainage should discharge directly into the sealed drainage network (i.e. not via gullies) and then directly towards the watercourse.
- 4.2.9.4 Discharge to a watercourse enables dilution to take place at the discharge point and thus reduces the likelihood of pollution occurring.
- 4.2.9.5 In order to minimise the risk of pollutants entering the watercourse, it is recommended that the final inspection chamber prior to the outfall to the watercourse should contain a silt trap.
- 4.2.9.6 The run-off from the areas of paving will need to pass through a filter trench prior to the outfall.
- 4.2.9.7 On this basis the risk of pollutants being discharged to the watercourse is extremely remote.

4.2.10 Wash – Down

- 4.2.10.1 The drainage run-off from the external paved area discharges directly to 2 No. SSAFO Regulated sealed storage tanks during clean-down operations, for which an Environmental Permit will be in place.

4.2.11 Designing for Exceedance

- 4.2.11.1 Overland flood risk from exceedance flows and from off-site sources will be mitigated to a large extent by the creation of the new surface water sewerage system as described above. Where possible proposed ground levels will be set to channel flows away from the proposed building.

- 4.2.11.2 Furthermore, the ground floor construction level for the new buildings will be raised above the finished ground level, which will provide additional clearance above any likely overland flooding.
- 4.2.11.3 The existing overland flow routes should generally be maintained within the final layout of the development site without increasing the flood risk to off-site parties.
- 4.2.11.4 Any existing flood risk may reduce by the creation of a formal surface water drainage system but cannot be entirely removed.
- 4.2.11.5 A drawing showing the anticipated overland surface water exceedance flood routing resulting from the development is included in Appendix D.

4.2.12 Highways Drainage

- 4.2.12.1 The development does not incorporate any formal highway drainage.

4.2.13 Water Quality

- 4.2.13.1 The water quality from the development via the surface water drainage system has been assessed in accordance with the simple index approach set out in Chapter 26 of the CIRIA SuDS Manual C753.
- 4.2.13.2 The output shows that the water quality from the roof areas and areas of external paving is of an acceptable standard without any further treatment.
- 4.2.13.3 A copy of the matrix outputs from the assessment is included in Appendix E.

4.3 Foul Water Drainage

- 4.3.1 The new amenity block incorporates WC and waste water facilities and consequently a separate foul water drainage network will be required.
- 4.3.2 The new agricultural dwellings incorporate WC and waste water facilities and will require a separate foul water drainage network.

- 4.3.3 As there are no public foul water sewers in the vicinity of the development, it will be necessary for appropriate domestic sized waste water treatment plants to be provided, which will ultimately discharge the treated waste to the local watercourse.

5.0 OPERATION AND MAINTENANCE

- 5.1 The drainage pipework is designed with self-cleansing gradients and consequently the network should require little or no maintenance.
- 5.2 All gullies or drainage channel systems serving areas of hardstanding will need to be regularly inspected to ensure the system remains operable. See Table 6 below.
- 5.3 The inspection chambers should be regularly inspected to ensure the system is free-flowing. See Table 6 below.

Table 6: Operation and Maintenance Requirements for Silt Traps/Trapped Gullies (Based on CIRIA C753 Table 14.2)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	6 monthly
	Inspect filter media and establish appropriate replacement frequencies	6 monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

- 5.4 On the basis that a Hydro-Brake® Vortex Flow Control Device needs to be provided, then this should be maintained as set out in Table 7 below.

Table 7: Operation and Maintenance Requirements for Hydro-Brake® Vortex Flow Control Device (Based on Manufacturer's recommendations)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Monthly during the first three months, then every 6 months
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months

5.5 Operation and maintenance requirements for the attenuation lagoon are set out in Table 8 below.

Table 8: Operation and Maintenance Requirements for Attenuation Lagoon

Maintenance schedule	Required action	Typical frequency*
Routine maintenance	Remove litter and debris	6 monthly
	Vegetation management	As required
Occasional maintenance	Clean inlet/outlet pipe	As required
Remedial actions	Repair/re-construct damaged component/structure	As required
	Remove silt and debris	As required
Monitoring	Inspect for evidence of damage or erosion	6 monthly
	Inspect sediment accumulation	Yearly
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

5.6 Operation and maintenance requirements for the filter trenches are set out in Table 9 below.

Table 9: Operation and Maintenance Requirements for Filter Trenches

Maintenance schedule	Required action	Typical frequency*
Regular maintenance	None	
Occasional maintenance	Remove silt and debris from inspection chamber	As required
Remedial actions	Re-construct filter trench if evidence of heavy siltation or failure	As required
Monitoring	Inspect downstream PPIC for evidence of siltation and to ensure system is free-flowing	Yearly
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

5.7 Operation and Maintenance requirements for the waste water treatment plant are set out in table 10 below:-

Table 10: Operation and Maintenance Requirements for Package Sewage Treatment Plant

Maintenance schedule	Required action	Typical frequency*
Monitoring	Check air blower is operational	Weekly
	Check beacon is not flashing, if flashing call service engineer	Weekly
Routine maintenance	Air blower - inspect intake filter, clean or replace	6 monthly
	Kiosk - visual inspection for damage repair or replace	6 monthly
	Aeration chamber - visual inspection for damage, repair or replace	6 monthly
	Outlet pipe - check for blockages, clean as necessary	6 monthly
	Alarm - test alarm is functioning, repair or replace	6 monthly
Occasional maintenance	Air blower - install service kit and filter kit (new diaphragms)	18 monthly
	De-sludging - inspect level of solid settlement. De-sludge when volume exceeds 70%	6 monthly
*During the first year of operation, inspections should be carried out at least monthly to ensure that the system is functioning as designed and that no damage is evident.		

- 5.8 The sludge storage tanks are to be fitted with an automatic alarm, located in a nearby suitable location, such that it can be easily seen and operated by those responsible for the operation and maintenance of the tanks in compliance with the requirements of the Environmental Permit.
- 5.9 The sludge storage tanks should be regularly inspected and tested to ensure the integrity of the system is maintained. See Table 11 below.

Table 11: Operation and Maintenance Requirements for Sludge Storage Tank (based on manufacturer's recommendations)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Check level of sludge	After each wash-down operation
	Check alarm and controls are functioning correctly	12 monthly
Occasional maintenance	De-sludge tank	As required by appointed waste operator
Monitoring	If alarm sounds arrange immediate sludge removal	As required

- 5.10 Operation and maintenance requirements of the drainage components, as listed above, should be undertaken in accordance with Chapter 32 of the CIRIA SuDS Manual, along with the relevant tables and any relevant manufacturer's recommendations. See also BS 8582:2013 Code of Practice for Surface Water Management for Development Sites Section 11 and Susdrain Fact Sheet on SuDS Maintenance and Adoption Options (England) dated September 2015.
- 5.11 The personnel undertaking the maintenance should have appropriate experience of SuDS and drainage maintenance and should be capable of keeping sufficiently detailed records of any inspections. If personnel do not have appropriate experience, then specific inspection visits may be necessary. During the first year of operations of SuDS, inspections should usually be carried out at monthly intervals (and after significant storm events).
- 5.12 The responsibility for the operation and maintenance of the drainage and SuDS will lie with Wray Farming, or any subsequent landowner of the site.

6.0 FLOOD RISK ASSESSMENT

6.1 Flood Zone

- 6.1.1 A copy of the Environment Agency Flood Map for Planning is included in Figure 4 below, which identifies the development site to be located within an area designated as Flood Zone 3, (high probability of flooding), comprising land assessed as having a 1 in 100 or greater annual probability of river flooding or a 1 in 200 year or greater annual probability of flooding from the sea.

Figure 4: Environment Agency Flood Map for Planning dated January 2022



6.2 Sequential Test

- 6.2.1 As set out in the National Planning Policy Framework, the aim of the Sequential Test is to steer new developments to areas with the lowest probability of flooding.

- 6.2.2 The Flood Map for Planning produced by the Environment Agency (included in Figure 4) shows that the land within the ownership of the development includes a small area of land designated as Flood Zone 1 (low probability of flooding) and Flood Zone 2 (medium probability of flooding), whilst most of the land is shown to lie in Flood Zone 3 (high probability of flooding).
- 6.2.3 Consideration has therefore been given to try to locate the new poultry building within the lower flood risk area.
- 6.2.4 However, due to the scale of the development, it becomes necessary for the new buildings to be located in Flood Zone 3a.
- 6.2.5 Where there are no reasonably available sites in the lower flood risk zone, then the NPPF advises that sites in Flood Zone 3a can be considered, taking into account the flood risk vulnerability of land uses.
- 6.2.6 Table 2 of the NPPF Technical Guidelines Flood Risk Vulnerability Classification categorises the various types of development. Land and buildings used for agriculture and forestry are categorised as 'Less Vulnerable' development.
- 6.2.7 Table 3 of the NPPF Technical Guidelines considers the suitability of developments in terms of their vulnerability, based upon their classification.
- 6.2.8 This advises that 'Less Vulnerable' developments are appropriate in Flood Zone 3a.
- 6.2.9 Table 3 also advises that an Exception Test is only required if the development is classified as 'Essential Infrastructure' or 'More Vulnerable'.
- 6.2.10 The proposed poultry building in this location is therefore categorised as 'appropriate development'.
- 6.2.11 As the agricultural workers dwellings need to be located in close proximity to the poultry buildings for safe management purposes, it is also necessary for these dwellings to be sited on land designated as Flood Zone 3a.
- 6.2.12 Flood mitigation measures are recommended within this site specific Flood Risk Assessment which are considered appropriate for the type of development and its' location in terms of flood risk.

6.3 Tidal Flooding

- 6.3.1 The development is located approximately 20km to the west of the coastline at The Wash.
- 6.3.2 However, due to the low-lying nature of the land to the west of the coastline there is a considerable area of land in the vicinity of the development which is shown to be at potential risk of future flooding accounting for sea level rise resulting from global warming.
- 6.3.3 At a distance of 20km from the source of such a flood event, the resultant depth of flood water at the location of the site should not be significant. Flood mitigation measures will, however, need to be considered to minimise the risk from flooding.
- 6.3.4 Details of such proposed mitigation measures are included in Section 6 of this report.

6.4 Fluvial Flooding

- 6.4.1 There is an open agricultural drainage ditch crossing the site (Old Swimmer Dam Drain).
- 6.4.2 There is a large open drainage ditch along the north western site boundary (Hammond Beck).
- 6.4.3 South Forty Foot Drain is situated approximately 1.5km to the west of the site.
- 6.4.4 The River Welland is situated approximately 12km to the south east of the site.
- 6.4.5 The River Witham is situated approximately 15km to the north east of the site.
- 6.4.6 The area of the development is shown to be susceptible to flooding from fluvial/tidal flooding as the local watercourse's outfall into The Wash, and consequently there is a risk of them overtopping during periods of high tides.

- 6.4.7 Flood mitigation measures will need to be considered within the design of the development. Details of such measures are set out in Section 7 of this report.

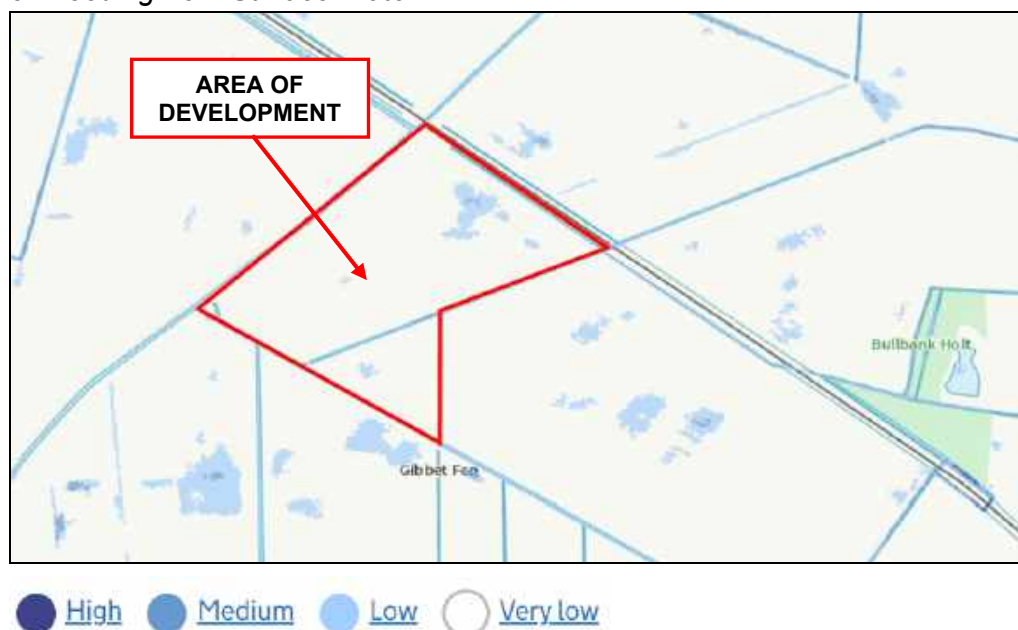
6.5 Flooding from Open Drainage Ditches

- 6.5.1 There are a number of large open drainage ditches in the vicinity of the site which drain the low-lying agricultural land.
- 6.5.2 There is a potential risk that the capacity of these ditches could be exceeded during an extreme rainfall event.
- 6.5.3 Flood mitigation measures proposed to account for fluvial/tidal flooring will adequately address the risk to the development from this potential flood source.
- 6.5.4 The risk to the development from this potential source is therefore considered to be low and acceptable.

6.6 Surface Water Flooding

- 6.6.1 A copy of the Environment Agency map showing the extent of flooding from surface water is included in Figure 5 below.

Figure 5: Environment Agency map dated January 2022 showing the Extent of Flooding from Surface Water



- 6.6.2 The map indicates that the majority of the site is in an area which is considered to be at very low risk of surface water flooding.
- 6.6.3 Copies of the maps produced by the Environment Agency showing the likely depth of surface water flooding are included in Figures 6, 7 and 8 below.

Figure 6: Environment Agency map dated January 2022 showing the likely depth of flooding from surface water – low risk

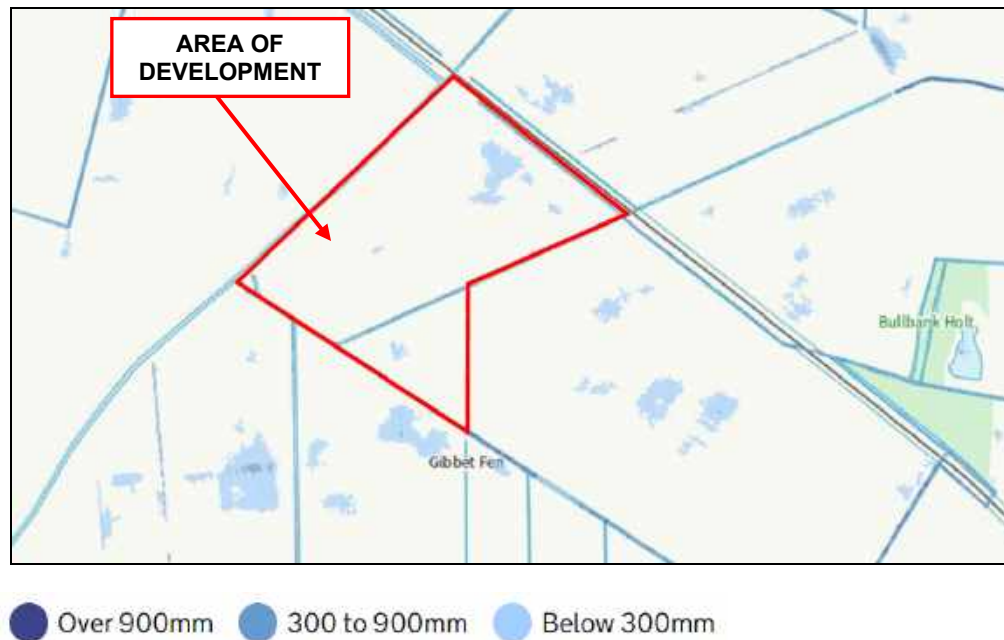


Figure 7: Environment Agency map dated January 2022 showing the Likely Depth of Flooding from Surface Water – Medium Risk

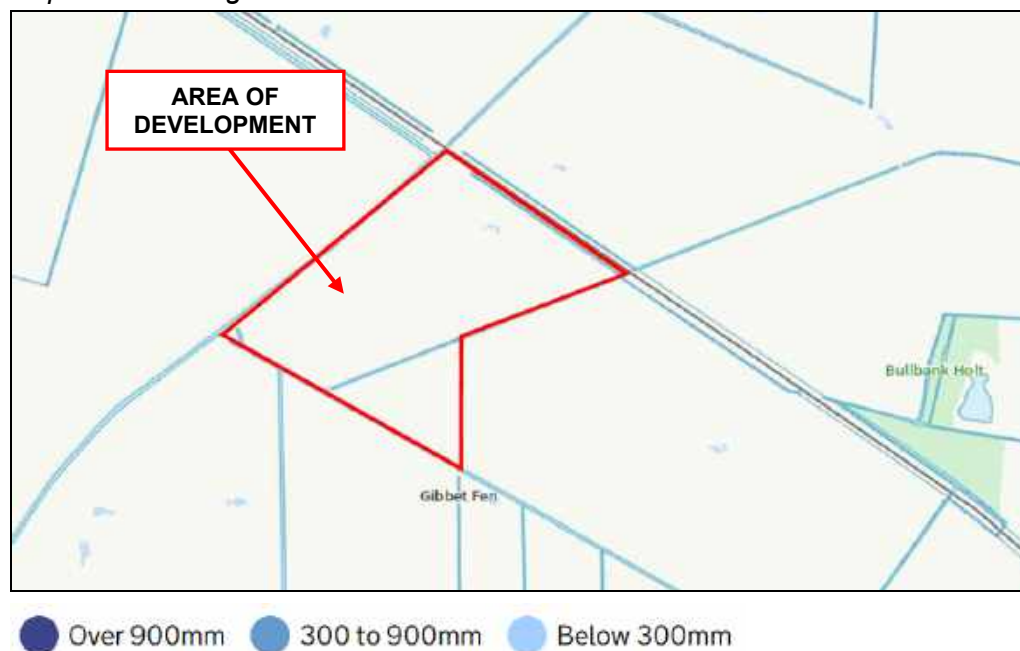
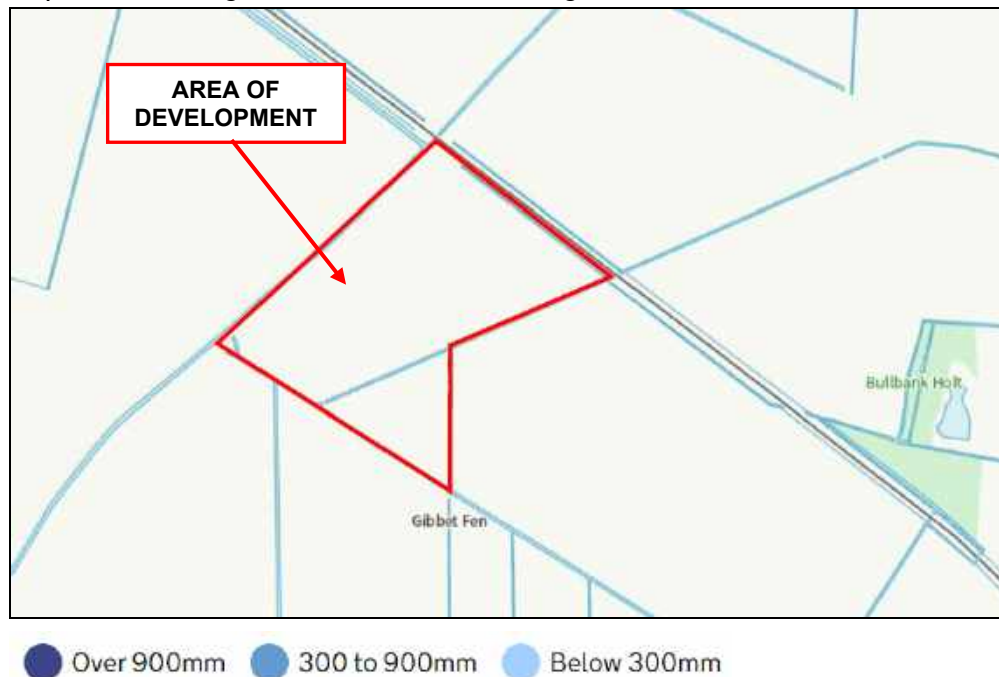


Figure 8: Environment Agency map dated January 2022 showing the Likely Depth of Flooding from Surface Water – High Risk



- 6.6.4 The maps show that for a “low risk” scenario the isolated area of the site is shown to be at risk of flooding up to a depth of less than 300mm.
- 6.6.5 For a “medium risk” scenario the development site is not shown to be at risk of flooding.
- 6.6.6 For a “high risk” scenario the development site is not shown to be at risk of flooding.
- 6.6.7 On this basis, it is considered that the risk to the development from surface water flooding is low and acceptable.

6.7 Groundwater Flooding

- 6.7.1 Groundwater flooding can occur when the sub-surface water levels are high and emerges above ground level.
- 6.7.2 The project will not involve deep excavation works and consequently the risk to the development from this potential flood source is considered to be low and acceptable.

6.8 Flood Risk from Existing Sewers

- 6.8.1 There are no existing sewers in the vicinity of the proposed development.
- 6.8.2 The risk to the development from this potential flood source is considered to be low and acceptable.

6.9 Flood Risk from Water Mains

- 6.9.1 There are no water mains present in the vicinity of the proposed development.
- 6.9.2 The risk to the development from this potential flood source is considered to be low and acceptable.

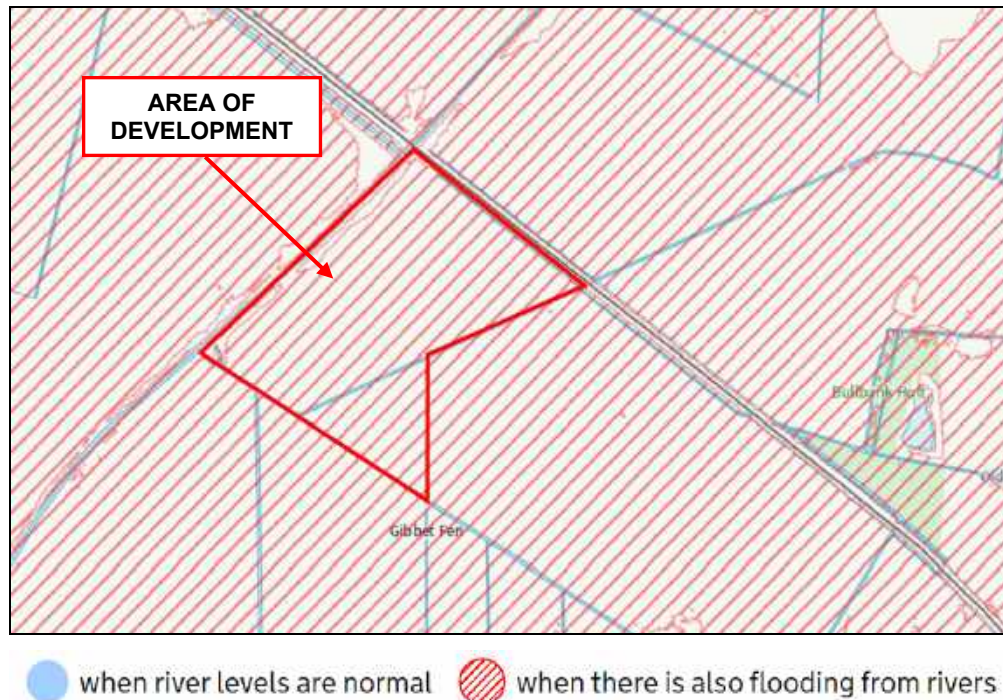
6.10 Flood Risk from Proposed Sewers

- 6.10.1 There are new surface water drainage works involved with the development.
- 6.10.2 The drainage will be installed in accordance with section 4 of this report and will be installed in compliance with current guidelines.
- 6.10.3 The risk of flooding to the development from this potential source is considered to be low and acceptable.

6.11 Flooding from Reservoirs, Canals and other Artificial Sources

- 6.11.1 Investigations indicate that there are no structures or water features in the vicinity of the development which are likely to pose a risk of flooding.
- 6.11.2 A copy of the map produced by the Environment Agency showing the extent of flooding from reservoirs is included in Figure 9 below.

Figure 9: Environment Agency map dated January 2022 showing the Extent of Flooding from Reservoirs



- 6.11.3 The map shows that the development site is not considered to be at risk from reservoir flooding during normal river conditions but is at risk if there is a combined failure of a reservoir.
- 6.11.4 The reservoirs are regularly inspected and maintained by the Environment Agency and the likelihood of a failure of any such reservoir dam is considered to be extremely remote.
- 6.11.5 The risk of flooding to the development from any such potential flood source is considered to be low and acceptable.

7.0 **FLOOD MITIGATION MEASURES**

7.1 **Management**

7.1.1 The development should subscribe to the Environment Agency's early 'Flood Direct' warning service which will alert the development of any likely flood situations. This will then enable a safe evacuation of the development should the need arise.

7.1.2 The development should have a Flood Risk Evacuation Plan in place. Suitable notices should be positioned in common areas to ensure all occupants understand the procedures in place in the event of a flood situation and where to escape to safety, should this prove necessary.

7.2 **Passive Flood Protection**

7.2.1 The development is shown to lie within an area considered to have a high probability of flooding on the Environment Agency's flood map for planning.

7.2.2 For new developments lying within Flood Zone 3 the normal requirement is to elevate the ground floor by a minimum of 600mm above the existing ground level or above the predicted flood level if this information is available.

7.2.3 The average ground level over the area of the proposed poultry and ancillary buildings has been determined at 1.80m OD(N).

7.2.4 On this basis the minimum ground floor construction level for the new poultry buildings should be at 2.40m OD(N).

7.2.5 The average ground level over the area of the new agricultural workers dwellings has been determined at 1.70m OD(N).

7.2.6 On this basis, the minimum ground floor construction level for the new dwellings should be at 2.30m OD(N).

7.2.7 At this level of construction, we consider the risk of flooding to the dwellings has been adequately reduced.

7.2.8 At these construction levels, it is considered that the risk from overland surface water has also been addressed.

7.3 Flood Resilience

7.3.1 For developments lying within Flood Zone 3(a), it is a requirement to provide flood resilient construction up to a height of 300mm above the elevated ground floor construction level in order to minimise the extent of flood damage, should flood waters enter the building and to enable ease of reconstruction and minimise the timescale of any repair works.

7.3.2 For this development this would result in a flood resilient construction level of 2.70m OD(N) for the poultry buildings and 2.60m OD(N) for the dwellings.

7.3.3 The main poultry buildings are agricultural and consequently will not incorporate any internal finishes.

7.3.4 Providing all electrical or other flood sensitive equipment is elevated to a minimum height of 300mm above the raised floor level, the buildings should not suffer any damage in the event of a major flood event.

7.3.5 The following measures should be incorporated within the construction of the new dwellings:-

- There should be no voids within the external walls, other than doorways, within 300mm of the adjacent ground level.
- All partition walls constructed at ground floor level should be of suitable robust construction or metal stud partitions fixed with plasterboard, with the lower boarding laid horizontally for ease of replacement.
- All electrical apparatus or other flood sensitive equipment should be elevated to a minimum height of 300mm above floor level in order to prevent damage occurring should flood waters enter the buildings.
- All cables should be routed at high level with vertical drops to the fittings.
- Floor finishes provided at ground floor level should be suitable for ease of cleaning after flooding, should this situation occur.

7.3.6 Alternatively, the floor construction level of the dwellings could be raised by an additional 300mm up to a level of 2.60m OD(N) which would negate the need for flood resilient construction to be provided.

- 7.3.7 For this particular development, it is recommended that the floor construction level of the dwellings is elevated to a minimum level of 2.70m OD(N), which would negate the need to provide flood resilience and is shown to be above the predicted flood level in the local vicinity.

7.4 Safe Refuge

- 7.4.1 For new developments which lie in Flood Zone 3, it is a requirement to provide safe refuge to ensure there is no reliance on evacuation measures by the Emergency Services should a more severe flood event occur and flood waters affect the buildings.
- 7.4.2 The ground floor level of the dwellings will be constructed above the predicted flood level and consequently provides the required safe refuge

7.5 Access/Egress

- 7.5.1 The public road network (A52) lying to the south of the development is shown to lie in Flood Zone 1 (low probability of flooding), which would maintain safe access to and egress from the development in the event of a major flood situation.
- 7.5.2 The existing road levels in this location are shown to be at approximately 2.70m OD(N), indicating that this level of constriction lies above the predicted flood level.
- 7.5.3 It is advisable for the new access track leading from the A52 to the development site to be elevated up to this level of 2.70m OD(N) in order to provide safe access to and egress from the development in the event of a major flood scenario

8.0 SUMMARY

- 8.1 The report has been prepared to assess the flood risk and drainage implications for a proposed poultry unit development on land to the west of Gibbet Fen to the west of Donington, Spalding, Lincolnshire.
- 8.2 The site falls in Flood Zone 3 (high probability of flooding) on the Environment Agency Planning map.
- 8.3 The new poultry buildings are classed as 'Less Vulnerable' development which is considered appropriate in Flood Zone 3. The agricultural workers dwellings are classed as 'More Vulnerable' development and a Sequential Test has demonstrated that it is necessary for their construction to be located in Flood Zone 3.
- 8.4 The primary risk to the site is considered to be from fluvial/tidal flooding from the local watercourses and the North Sea during an extreme flood event.
- 8.5 Mitigation measures are proposed which it is considered will reduce the risk of flooding to the development to an acceptable level.
- 8.6 This report has considered other potential sources of flooding to the site, including groundwater, fluvial, existing sewers, water mains and other artificial sources.
- 8.7 Overall, this report demonstrates that the flood risk to the site is reasonable and acceptable providing the mitigation measures detailed in Section 7 are incorporated into the design of the development.
- 8.8 The report also demonstrates that the site can be suitably drained, with the development being designed to the required standards.
- 8.9 It is proposed that the surface water run-off from the development will discharge at the restricted greenfield rate to an existing open drainage ditch located to the south east of the new poultry buildings and the appropriate volume of storage provided by extending the existing attenuation lagoon.
- 8.10 It is proposed that the foul waste water from the development will be suitably treated and discharged to the adjacent watercourse.

APPENDIX A

Site Layout Drawings



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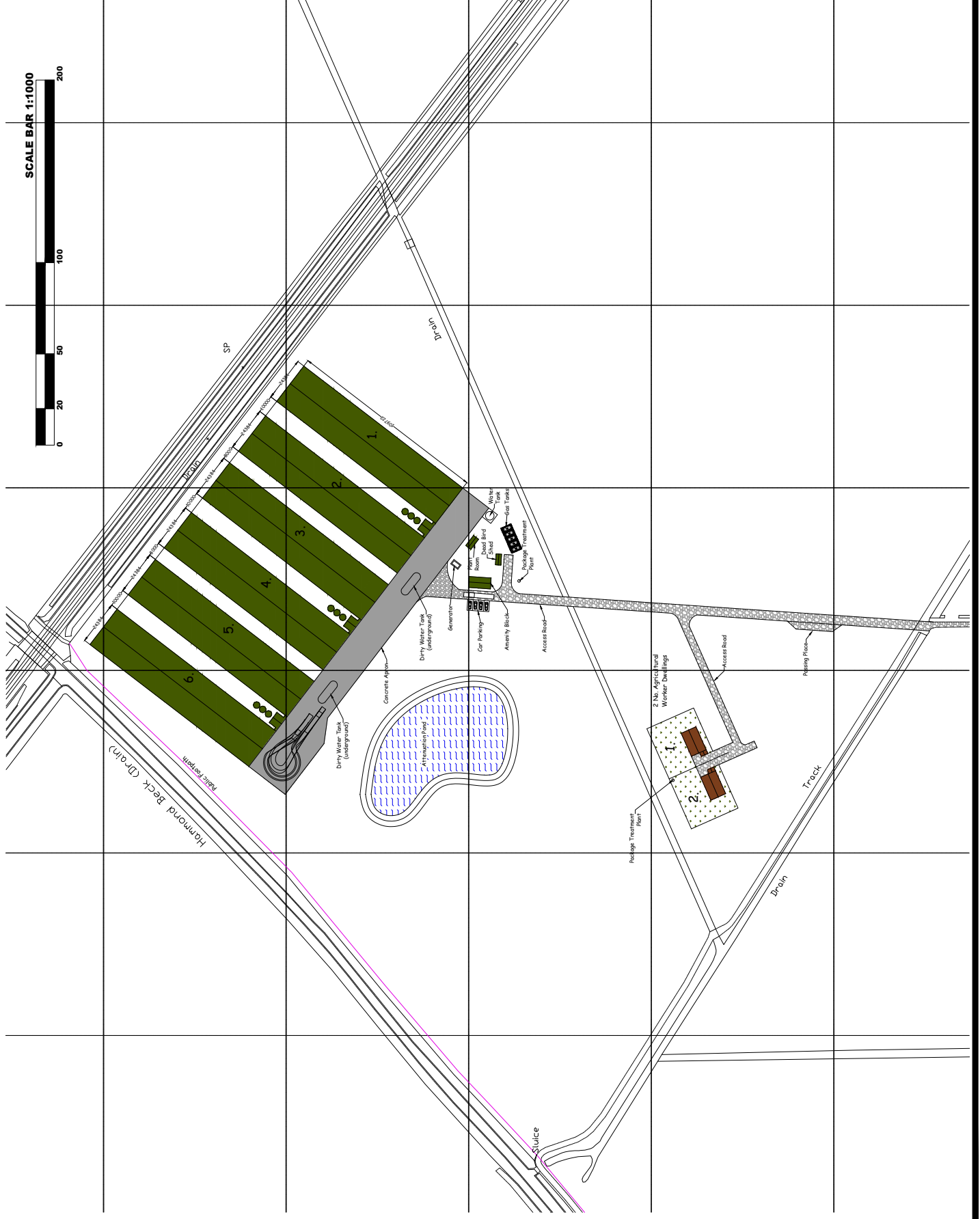
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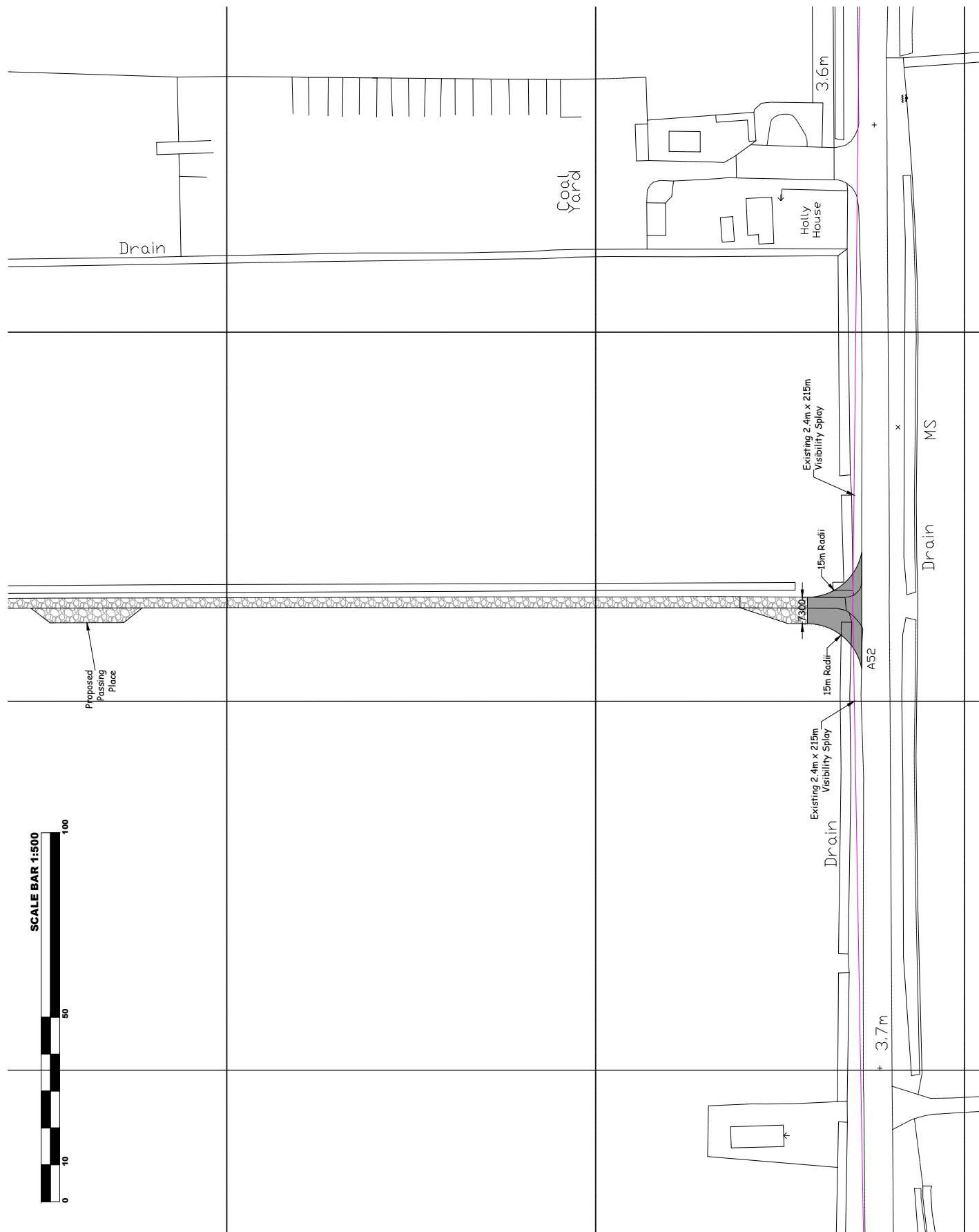
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Site Plan A1

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DWG. NUMBER
IP/CGC/02

DATE
Dec 21
REV
-





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Clarke Group Construction Ltd

JOB TITLE

Proposed Poultry Unit

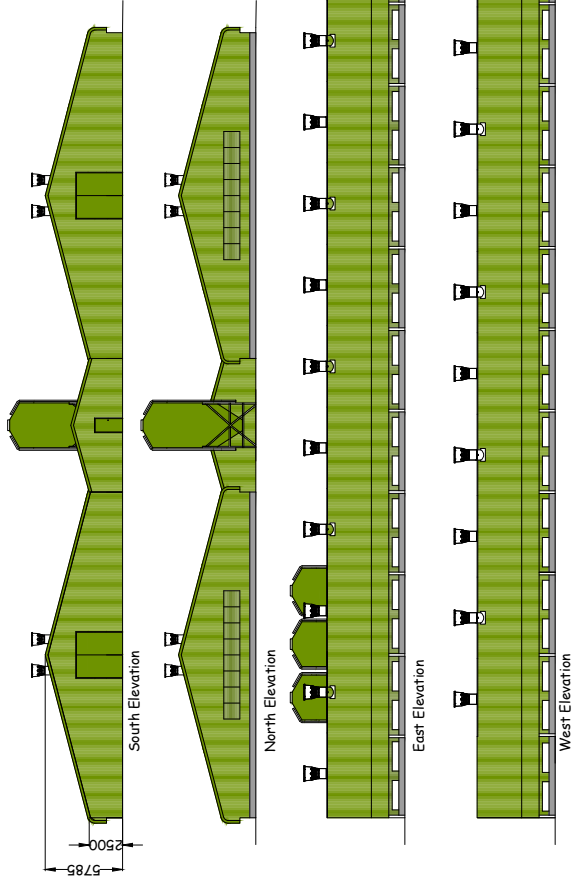
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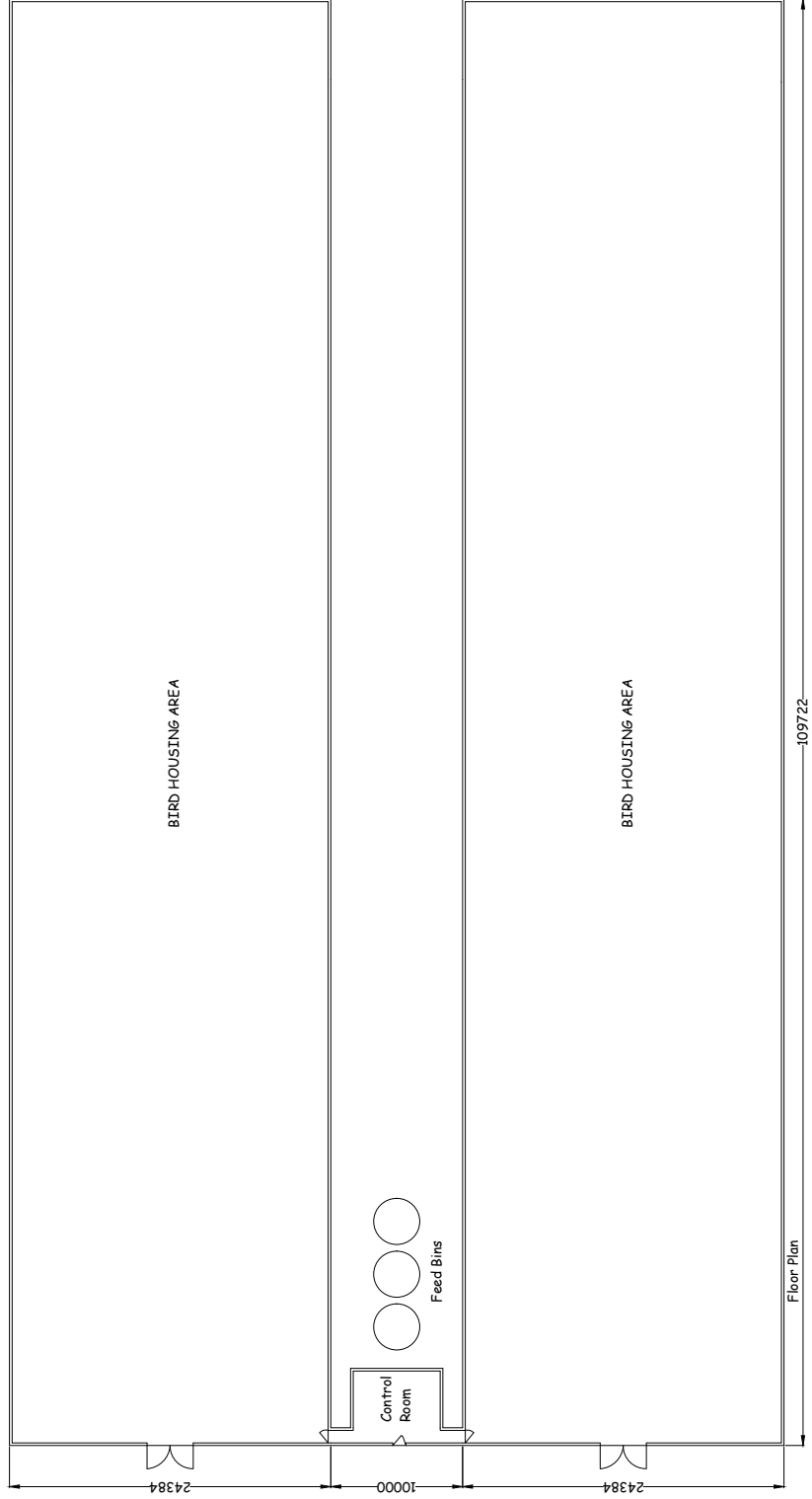
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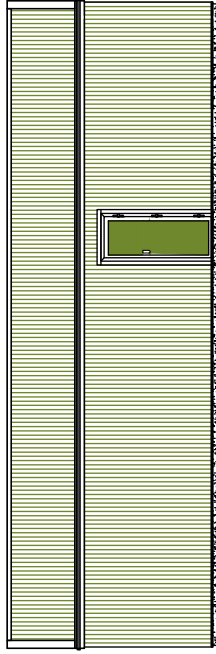
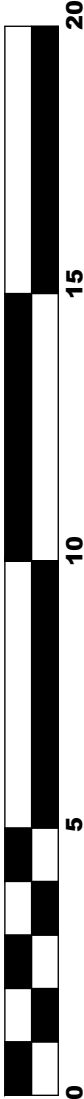
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DATE
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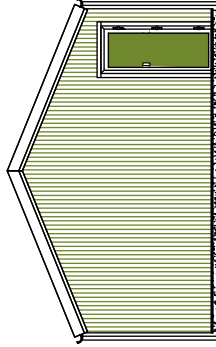
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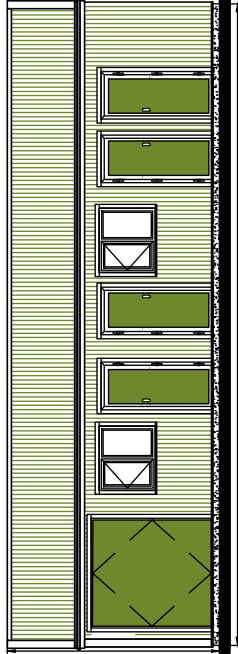
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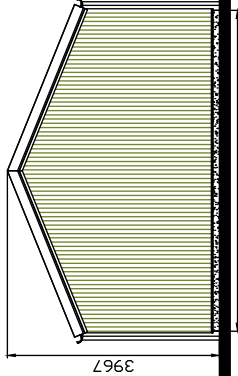
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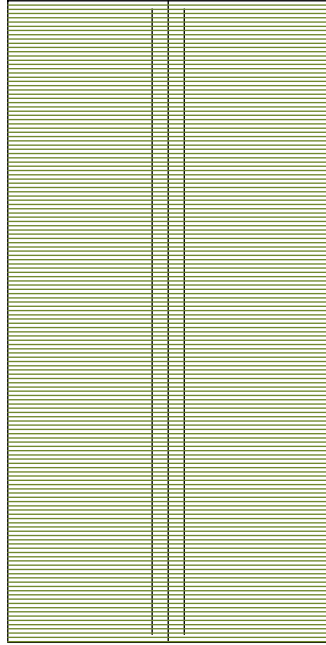
SOUTH ELEVATION



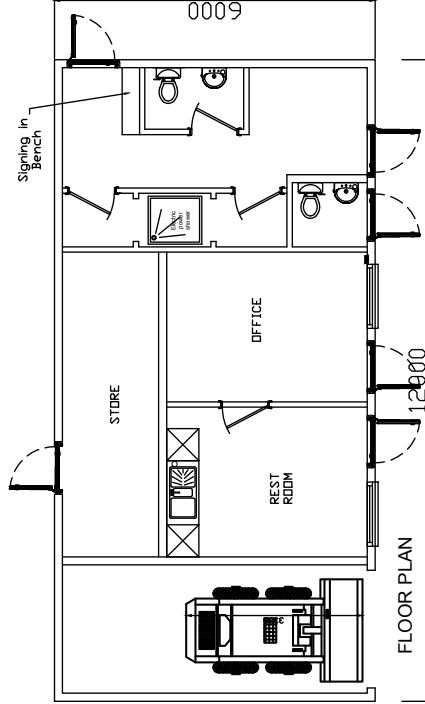
WEST ELEVATION



NORTH ELEVATION



ROOF PLAN



FLOOR PLAN



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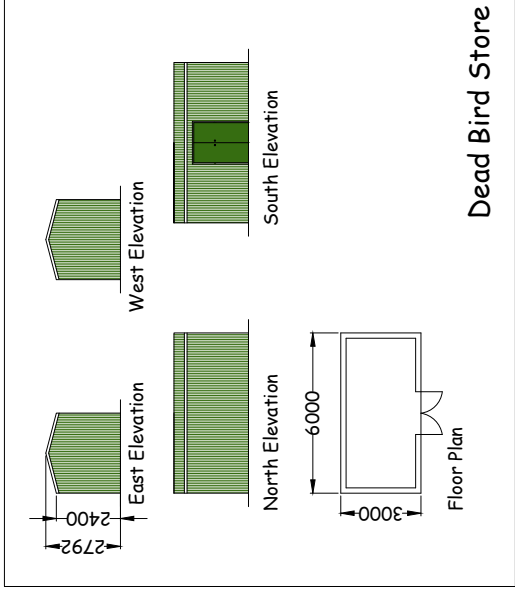
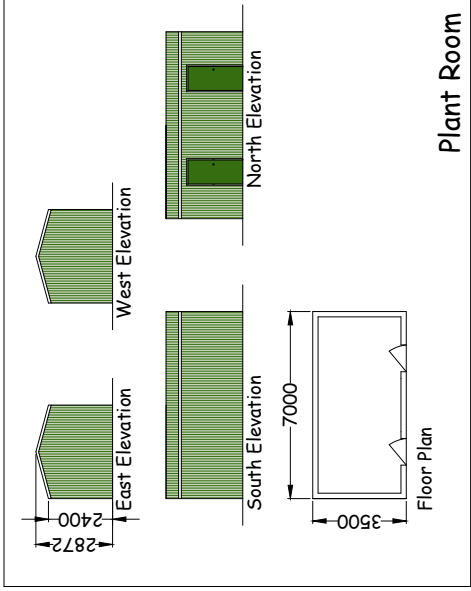
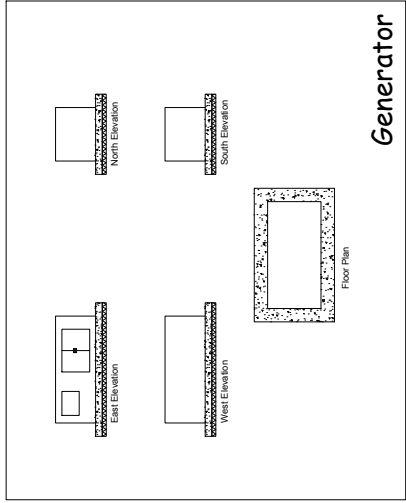
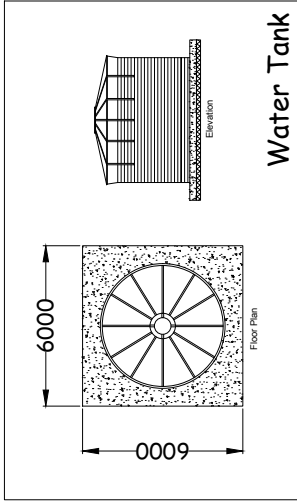
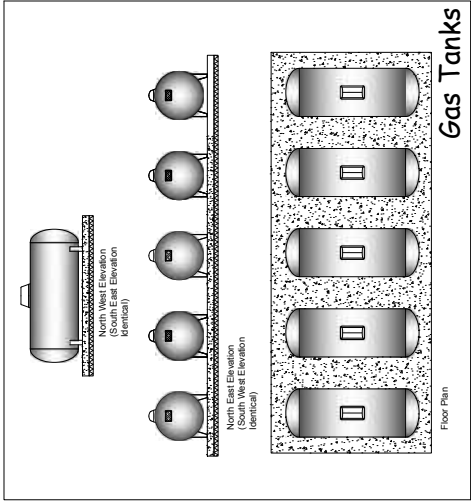
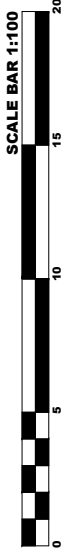
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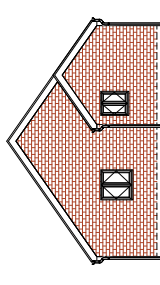
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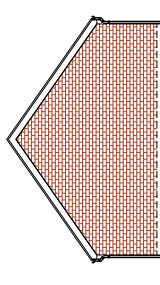
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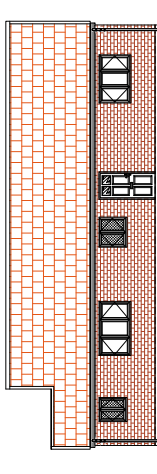




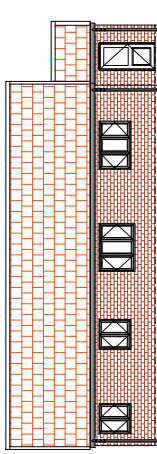
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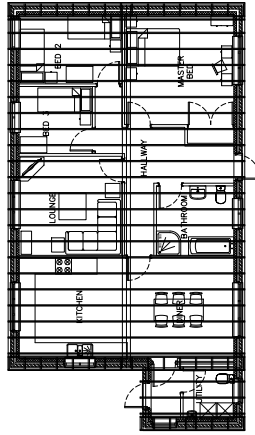
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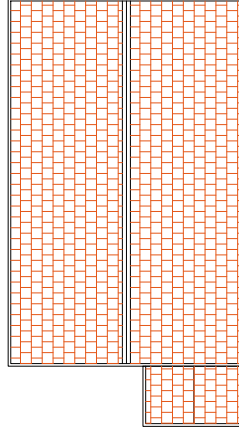
South Elevation



North Elevation



Floor Plan



Roof Plan



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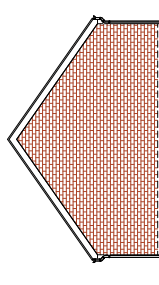
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DWG. TITLE
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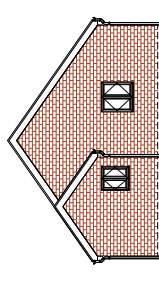
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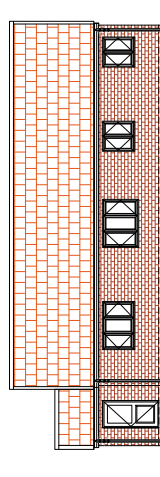
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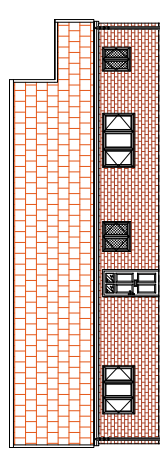
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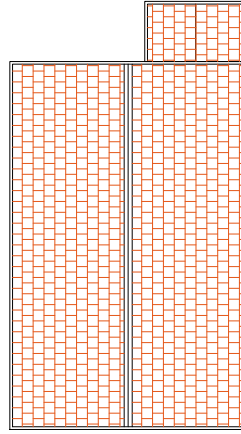
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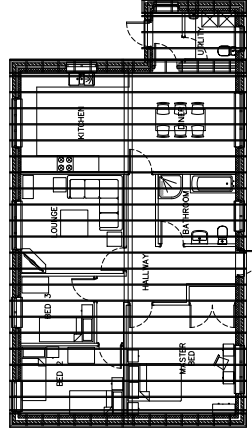
North Elevation



South Elevation



Roof Plan



Floor Plan

APPENDIX B

Hydraulic Model Study

Alan Wood & Partners		Page 1
Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
Date 06/01/2022 File Drawnet 1.1.MDX	Designed by MJC Checked by AD	
Micro Drainage	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes Pvt MH

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.046	4-8	0.899	8-12	1.051	12-16	0.004

Total Area Contributing (ha) = 2.000

Total Pipe Volume (m³) = 234.131

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	21.770	0.109	200.0	0.067	1.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	22.712	0.114	200.0	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	22.618	0.113	200.0	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	22.901	0.115	200.0	0.067	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	33.202	0.166	200.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL E (m)	I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	1.33	0.900	0.067	0.0	0.0	0.0	1.11	78.3	9.1
S1.001	50.00	1.67	0.791	0.134	0.0	0.0	0.0	1.11	78.3	18.1
S1.002	50.00	2.01	0.678	0.201	0.0	0.0	0.0	1.11	78.3	27.2
S1.003	50.00	2.31	0.490	0.267	0.0	0.0	0.0	1.28	141.1	36.2
S1.004	50.00	2.74	0.375	0.267	0.0	0.0	0.0	1.28	141.1	36.2

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Omega 2 Monks Cross Drive York YO32 9GZ					Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations						
Date 06/01/2022 File Drawnet 1.1.MDX					Designed by MJC Checked by AD						
Micro Drainage					Network 2020.1						
Network Design Table for Storm											
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	21.856	0.146	150.0	0.067	1.00	0.0	0.600	o	300	Pipe/Conduit	
S4.001	22.623	0.151	150.0	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.002	22.346	0.120	186.2	0.067	0.00	0.0	0.600	o	375	Pipe/Conduit	
S4.003	23.218	0.125	185.7	0.067	0.00	0.0	0.600	o	375	Pipe/Conduit	
S3.005	33.385	0.081	410.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S5.000	21.910	0.146	150.0	0.071	1.00	0.0	0.600	o	300	Pipe/Conduit	
S5.001	22.580	0.151	150.0	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.002	22.214	0.173	128.4	0.067	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.003	23.333	0.182	128.2	0.067	0.00	0.0	0.600	o	375	Pipe/Conduit	
S3.006	32.397	0.079	410.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S3.007	23.227	0.057	410.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S3.008	22.303	0.054	410.0	0.033	0.00	0.0	0.600	o	525	Pipe/Conduit	
S3.009	22.303	0.054	410.0	0.033	0.00	0.0	0.600	o	525	Pipe/Conduit	
S3.010	22.745	0.055	410.0	0.033	0.00	0.0	0.600	o	525	Pipe/Conduit	
S3.011	57.060	0.139	410.0	0.033	0.00	0.0	0.600	o	525	Pipe/Conduit	
S3.012	63.422	0.317	200.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S6.000	84.049	0.336	250.0	0.092	1.00	0.0	0.600	o	300	Pipe/Conduit	
S6.001	87.914	0.352	250.0	0.080	0.00	0.0	0.600	o	300	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)	
S4.000	50.00	1.28	0.900	0.067	0.0	0.0	0.0	1.28	90.6	9.1	
S4.001	50.00	1.58	0.754	0.134	0.0	0.0	0.0	1.28	90.6	18.1	
S4.002	50.00	1.86	0.528	0.201	0.0	0.0	0.0	1.32	146.3	27.2	
S4.003	50.00	2.15	0.408	0.267	0.0	0.0	0.0	1.33	146.5	36.2	
S3.005	50.00	3.12	0.133	0.539	0.0	0.0	0.0	1.10	238.1	73.0	
S5.000	50.00	1.28	0.900	0.071	0.0	0.0	0.0	1.28	90.6	9.7	
S5.001	50.00	1.58	0.754	0.138	0.0	0.0	0.0	1.28	90.6	18.7	
S5.002	50.00	1.81	0.528	0.205	0.0	0.0	0.0	1.60	176.4	27.8	
S5.003	50.00	2.05	0.355	0.272	0.0	0.0	0.0	1.60	176.6	36.8	
S3.006	50.00	3.61	0.023	0.811	0.0	0.0	0.0	1.10	238.1	109.9	
S3.007	50.00	3.96	-0.056	0.811	0.0	0.0	0.0	1.10	238.1	109.9	
S3.008	50.00	4.30	-0.113	0.845	0.0	0.0	0.0	1.10	238.1	114.4	
S3.009	50.00	4.63	-0.167	0.878	0.0	0.0	0.0	1.10	238.1	118.9	
S3.010	50.00	4.98	-0.221	0.912	0.0	0.0	0.0	1.10	238.1	123.4	
S3.011	50.00	5.84	-0.277	0.945	0.0	0.0	0.0	1.10	238.1	128.0	
S3.012	50.00	6.51	-0.416	0.945	0.0	0.0	0.0	1.58	342.1	128.0	
S6.000	50.00	2.42	0.900	0.092	0.0	0.0	0.0	0.99	70.0	12.5	
S6.001	50.00	3.90	0.564	0.172	0.0	0.0	0.0	0.99	70.0	23.3	
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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
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Micro Drainage	Network 2020.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.002	13.573	0.054	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.003	58.465	0.234	250.0	0.110	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.000	83.148	0.703	118.3	0.092	1.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	32.311	0.273	118.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.004	19.057	0.433	44.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.014	12.671	0.025	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.015	66.516	0.133	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.016	54.959	0.550	100.0	0.000	0.00	0.0	0.600	o	100	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)
S6.002	50.00	4.12	0.212	0.172	0.0	0.0	0.0	0.99	70.0	23.3
S6.003	50.00	5.11	0.158	0.282	0.0	0.0	0.0	0.99	70.0	38.3
S7.000	50.00	1.96	0.900	0.092	0.0	0.0	0.0	1.44	102.1	12.5
S7.001	50.00	2.33	0.197	0.092	0.0	0.0	0.0	1.44	102.1	12.5
S6.004	50.00	5.24	-0.076	0.375	0.0	0.0	0.0	2.38	168.0	50.7
S1.014	50.00	7.49	-0.959	2.000	0.0	0.0	0.0	1.24	549.9	270.8
S1.015	50.00	8.38	-0.985	2.000	0.0	0.0	0.0	1.24	549.9	270.8
S1.016	50.00	9.57	-1.118	2.000	0.0	0.0	0.0	0.77	6.0	270.8

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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
Date 06/01/2022 File Drawnet 1.1.MDX	Designed by MJC Checked by AD	
Micro Drainage Network 2020.1		

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)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	2.100	1.200	Open Manhole	1200	S1.000	0.900	300				
S2	2.100	1.309	Open Manhole	1200	S1.001	0.791	300	S1.000	0.791	300	
S3	2.100	1.422	Open Manhole	1200	S1.002	0.678	300	S1.001	0.678	300	
S4	2.100	1.610	Open Manhole	1350	S1.003	0.490	375	S1.002	0.565	300	
S5	2.100	1.725	Open Manhole	1350	S1.004	0.375	375	S1.003	0.375	375	
S6	2.100	1.200	Open Manhole	1200	S2.000	0.900	300				
S7	2.100	1.345	Open Manhole	1200	S2.001	0.755	300	S2.000	0.755	300	
S8	2.100	1.572	Open Manhole	1350	S2.002	0.528	375	S2.001	0.603	300	
S9	2.100	1.731	Open Manhole	1350	S2.003	0.369	375	S2.002	0.369	375	
S10	2.100	1.966	Open Manhole	1350	S1.005	0.134	450	S1.004	0.209	375	
								S2.003	0.210	375	1
S11	2.100	2.072	Open Manhole	1350	S1.006	0.028	450	S1.005	0.028	450	
S12	2.100	2.223	Open Manhole	1500	S1.007	-0.123	525	S1.006	-0.048	450	
S13	2.100	2.279	Open Manhole	1500	S1.008	-0.179	525	S1.007	-0.179	525	
S14	2.100	2.334	Open Manhole	1500	S1.009	-0.234	525	S1.008	-0.234	525	
S15	2.100	2.387	Open Manhole	1500	S1.010	-0.287	525	S1.009	-0.287	525	
S16	1.800	2.204	Open Manhole	1500	S1.011	-0.404	525	S1.010	-0.404	525	
S17	1.800	2.315	Open Manhole	1500	S1.012	-0.515	525	S1.011	-0.515	525	
S18	1.800	2.424	Open Manhole	1500	S1.013	-0.624	525	S1.012	-0.624	525	
S19	2.100	1.200	Open Manhole	1500	S3.000	0.900	375				
S20	2.100	1.309	Open Manhole	1500	S3.001	0.791	375	S3.000	0.791	375	
S21	2.100	1.422	Open Manhole	1500	S3.002	0.678	375	S3.001	0.678	375	
S22	2.100	1.535	Open Manhole	1500	S3.003	0.565	375	S3.002	0.565	375	
S23	2.100	1.650	Open Manhole	1500	S3.004	0.450	375	S3.003	0.450	375	
S24	2.100	1.200	Open Manhole	1200	S4.000	0.900	300				
S25	2.100	1.346	Open Manhole	1200	S4.001	0.754	300	S4.000	0.754	300	
S26	2.100	1.572	Open Manhole	1350	S4.002	0.528	375	S4.001	0.603	300	
S27	2.100	1.692	Open Manhole	1350	S4.003	0.408	375	S4.002	0.408	375	
S28	2.100	1.967	Open Manhole	1500	S3.005	0.133	525	S3.004	0.283	375	
								S4.003	0.283	375	
S29	2.100	1.200	Open Manhole	1200	S5.000	0.900	300				
S30	2.100	1.346	Open Manhole	1200	S5.001	0.754	300	S5.000	0.754	300	
S31	2.100	1.572	Open Manhole	1350	S5.002	0.528	375	S5.001	0.603	300	
S32	2.100	1.745	Open Manhole	1350	S5.003	0.355	375	S5.002	0.355	375	
S33	2.100	2.077	Open Manhole	1500	S3.006	0.023	525	S3.005	0.052	525	29
								S5.003	0.173	375	
S34	2.100	2.156	Open Manhole	1500	S3.007	-0.056	525	S3.006	-0.056	525	
S35	2.100	2.213	Open Manhole	1500	S3.008	-0.113	525	S3.007	-0.113	525	

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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
Date 06/01/2022 File Drawnet 1.1.MDX	Designed by MJC Checked by AD	
Micro Drainage	Network 2020.1	

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)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S36	2.100	2.267	Open Manhole	1500	S3.009	-0.167	525	S3.008	-0.167	525	
S37	2.100	2.321	Open Manhole	1500	S3.010	-0.221	525	S3.009	-0.221	525	
S38	2.100	2.377	Open Manhole	1500	S3.011	-0.277	525	S3.010	-0.277	525	
S39	1.800	2.216	Open Manhole	1500	S3.012	-0.416	525	S3.011	-0.416	525	
S40	2.100	1.200	Open Manhole	1200	S6.000	0.900	300				
S41	2.100	1.536	Open Manhole	1200	S6.001	0.564	300	S6.000	0.564	300	
S42	2.100	1.888	Open Manhole	1200	S6.002	0.212	300	S6.001	0.212	300	
S43	2.100	1.942	Open Manhole	1200	S6.003	0.158	300	S6.002	0.158	300	
S44	2.100	1.200	Open Manhole	1200	S7.000	0.900	300				
S45	2.100	1.903	Open Manhole	1200	S7.001	0.197	300	S7.000	0.197	300	
S46	2.100	2.176	Open Manhole	1200	S6.004	-0.076	300	S6.003	-0.076	300	
								S7.001	-0.076	300	
S47	1.800	2.759	Open Manhole	1800	S1.014	-0.959	750	S1.013	-0.734	525	
								S3.012	-0.733	525	
								S6.004	-0.509	300	
S48	1.700	2.685	Open Manhole	1800	S1.015	-0.985	750	S1.014	-0.985	750	
S49	1.700	2.818	Open Manhole	1800	S1.016	-1.118	100	S1.015	-1.118	750	
S	1.700	3.368	Open Manhole	0		OUTFALL		S1.016	-1.668	100	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	519063.571	335958.853	519063.571	335958.853	Required	
S2	519076.826	335976.123	519076.826	335976.123	Required	
S3	519090.654	335994.141	519090.654	335994.141	Required	
S4	519104.425	336012.083	519104.425	336012.083	Required	
S5	519118.369	336030.250	519118.369	336030.250	Required	
S6	519089.912	335938.641	519089.912	335938.641	Required	

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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
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Micro Drainage Network 2020.1		

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	S1	2.100	0.900	0.900	Open Manhole	1200
S1.001	o	300	S2	2.100	0.791	1.009	Open Manhole	1200
S1.002	o	300	S3	2.100	0.678	1.122	Open Manhole	1200
S1.003	o	375	S4	2.100	0.490	1.235	Open Manhole	1350
S1.004	o	375	S5	2.100	0.375	1.350	Open Manhole	1350
S2.000	o	300	S6	2.100	0.900	0.900	Open Manhole	1200
S2.001	o	300	S7	2.100	0.755	1.045	Open Manhole	1200
S2.002	o	375	S8	2.100	0.528	1.197	Open Manhole	1350
S2.003	o	375	S9	2.100	0.369	1.356	Open Manhole	1350
S1.005	o	450	S10	2.100	0.134	1.516	Open Manhole	1350
S1.006	o	450	S11	2.100	0.028	1.622	Open Manhole	1350
S1.007	o	525	S12	2.100	-0.123	1.698	Open Manhole	1500
S1.008	o	525	S13	2.100	-0.179	1.754	Open Manhole	1500
S1.009	o	525	S14	2.100	-0.234	1.809	Open Manhole	1500
S1.010	o	525	S15	2.100	-0.287	1.862	Open Manhole	1500
S1.011	o	525	S16	1.800	-0.404	1.679	Open Manhole	1500
S1.012	o	525	S17	1.800	-0.515	1.790	Open Manhole	1500
S1.013	o	525	S18	1.800	-0.624	1.899	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	21.770	200.0	S2	2.100	0.791	1.009	Open Manhole	1200
S1.001	22.712	200.0	S3	2.100	0.678	1.122	Open Manhole	1200
S1.002	22.618	200.0	S4	2.100	0.565	1.236	Open Manhole	1350
S1.003	22.901	200.0	S5	2.100	0.375	1.350	Open Manhole	1350
S1.004	33.202	200.0	S10	2.100	0.209	1.516	Open Manhole	1350
S2.000	21.726	150.0	S7	2.100	0.755	1.045	Open Manhole	1200
S2.001	22.758	150.0	S8	2.100	0.603	1.197	Open Manhole	1350
S2.002	22.758	143.1	S9	2.100	0.369	1.356	Open Manhole	1350
S2.003	22.760	143.1	S10	2.100	0.210	1.515	Open Manhole	1350
S1.005	32.062	300.0	S11	2.100	0.028	1.622	Open Manhole	1350
S1.006	22.819	300.0	S12	2.100	-0.048	1.698	Open Manhole	1500
S1.007	22.790	410.0	S13	2.100	-0.179	1.754	Open Manhole	1500
S1.008	22.728	410.0	S14	2.100	-0.234	1.809	Open Manhole	1500
S1.009	21.727	410.0	S15	2.100	-0.287	1.862	Open Manhole	1500
S1.010	47.902	410.0	S16	1.800	-0.404	1.679	Open Manhole	1500
S1.011	45.276	410.0	S17	1.800	-0.515	1.790	Open Manhole	1500
S1.012	45.000	410.0	S18	1.800	-0.624	1.899	Open Manhole	1500
S1.013	45.000	410.0	S47	1.800	-0.734	2.009	Open Manhole	1800

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Micro Drainage	Network 2020.1	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	o	375	S19	2.100	0.900	0.825	Open Manhole	1500
S3.001	o	375	S20	2.100	0.791	0.934	Open Manhole	1500
S3.002	o	375	S21	2.100	0.678	1.047	Open Manhole	1500
S3.003	o	375	S22	2.100	0.565	1.160	Open Manhole	1500
S3.004	o	375	S23	2.100	0.450	1.275	Open Manhole	1500
S4.000	o	300	S24	2.100	0.900	0.900	Open Manhole	1200
S4.001	o	300	S25	2.100	0.754	1.046	Open Manhole	1200
S4.002	o	375	S26	2.100	0.528	1.197	Open Manhole	1350
S4.003	o	375	S27	2.100	0.408	1.317	Open Manhole	1350
S3.005	o	525	S28	2.100	0.133	1.442	Open Manhole	1500
S5.000	o	300	S29	2.100	0.900	0.900	Open Manhole	1200
S5.001	o	300	S30	2.100	0.754	1.046	Open Manhole	1200
S5.002	o	375	S31	2.100	0.528	1.197	Open Manhole	1350
S5.003	o	375	S32	2.100	0.355	1.370	Open Manhole	1350
S3.006	o	525	S33	2.100	0.023	1.552	Open Manhole	1500
S3.007	o	525	S34	2.100	-0.056	1.631	Open Manhole	1500
S3.008	o	525	S35	2.100	-0.113	1.688	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	21.812	200.0	S20	2.100	0.791	0.934	Open Manhole	1500
S3.001	22.669	200.0	S21	2.100	0.678	1.047	Open Manhole	1500
S3.002	22.486	200.0	S22	2.100	0.565	1.160	Open Manhole	1500
S3.003	23.030	200.0	S23	2.100	0.450	1.275	Open Manhole	1500
S3.004	33.395	200.0	S28	2.100	0.283	1.442	Open Manhole	1500
S4.000	21.856	150.0	S25	2.100	0.754	1.046	Open Manhole	1200
S4.001	22.623	150.0	S26	2.100	0.603	1.197	Open Manhole	1350
S4.002	22.346	186.2	S27	2.100	0.408	1.317	Open Manhole	1350
S4.003	23.218	185.7	S28	2.100	0.283	1.442	Open Manhole	1500
S3.005	33.385	410.0	S33	2.100	0.052	1.523	Open Manhole	1500
S5.000	21.910	150.0	S30	2.100	0.754	1.046	Open Manhole	1200
S5.001	22.580	150.0	S31	2.100	0.603	1.197	Open Manhole	1350
S5.002	22.214	128.4	S32	2.100	0.355	1.370	Open Manhole	1350
S5.003	23.333	128.2	S33	2.100	0.173	1.552	Open Manhole	1500
S3.006	32.397	410.0	S34	2.100	-0.056	1.631	Open Manhole	1500
S3.007	23.227	410.0	S35	2.100	-0.113	1.688	Open Manhole	1500
S3.008	22.303	410.0	S36	2.100	-0.167	1.742	Open Manhole	1500

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Micro Drainage	Network 2020.1	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.009	o	525	S36	2.100	-0.167	1.742	Open Manhole	1500
S3.010	o	525	S37	2.100	-0.221	1.796	Open Manhole	1500
S3.011	o	525	S38	2.100	-0.277	1.852	Open Manhole	1500
S3.012	o	525	S39	1.800	-0.416	1.691	Open Manhole	1500
S6.000	o	300	S40	2.100	0.900	0.900	Open Manhole	1200
S6.001	o	300	S41	2.100	0.564	1.236	Open Manhole	1200
S6.002	o	300	S42	2.100	0.212	1.588	Open Manhole	1200
S6.003	o	300	S43	2.100	0.158	1.642	Open Manhole	1200
S7.000	o	300	S44	2.100	0.900	0.900	Open Manhole	1200
S7.001	o	300	S45	2.100	0.197	1.603	Open Manhole	1200
S6.004	o	300	S46	2.100	-0.076	1.876	Open Manhole	1200
S1.014	o	750	S47	1.800	-0.959	2.009	Open Manhole	1800
S1.015	o	750	S48	1.700	-0.985	1.935	Open Manhole	1800
S1.016	o	100	S49	1.700	-1.118	2.718	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.009	22.303	410.0	S37	2.100	-0.221	1.796	Open Manhole	1500
S3.010	22.745	410.0	S38	2.100	-0.277	1.852	Open Manhole	1500
S3.011	57.060	410.0	S39	1.800	-0.416	1.691	Open Manhole	1500
S3.012	63.422	200.0	S47	1.800	-0.733	2.008	Open Manhole	1800
S6.000	84.049	250.0	S41	2.100	0.564	1.236	Open Manhole	1200
S6.001	87.914	250.0	S42	2.100	0.212	1.588	Open Manhole	1200
S6.002	13.573	250.0	S43	2.100	0.158	1.642	Open Manhole	1200
S6.003	58.465	250.0	S46	2.100	-0.076	1.876	Open Manhole	1200
S7.000	83.148	118.3	S45	2.100	0.197	1.603	Open Manhole	1200
S7.001	32.311	118.4	S46	2.100	-0.076	1.876	Open Manhole	1200
S6.004	19.057	44.0	S47	1.800	-0.509	2.009	Open Manhole	1800
S1.014	12.671	500.0	S48	1.700	-0.985	1.935	Open Manhole	1800
S1.015	66.516	500.0	S49	1.700	-1.118	2.068	Open Manhole	1800
S1.016	54.959	100.0	S	1.700	-1.668	3.268	Open Manhole	0

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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
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Micro Drainage	Network 2020.1	
Synthetic Rainfall Details Storm Duration (mins) 30		
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Micro Drainage	Network 2020.1	

Online Controls for Storm

Pump Manhole: S49, DS/PN: S1.016, Volume (m³): 35.8

Invert Level (m) -1.118

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.6000	0.900	2.6000	1.700	2.6000	2.500	2.6000
0.200	2.6000	1.000	2.6000	1.800	2.6000	2.600	2.6000
0.300	2.6000	1.100	2.6000	1.900	2.6000	2.700	2.6000
0.400	2.6000	1.200	2.6000	2.000	2.6000	2.800	2.6000
0.500	2.6000	1.300	2.6000	2.100	2.6000	2.900	2.6000
0.600	2.6000	1.400	2.6000	2.200	2.6000	3.000	2.6000
0.700	2.6000	1.500	2.6000	2.300	2.6000		
0.800	2.6000	1.600	2.6000	2.400	2.6000		

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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations													
Date 06/01/2022 File Drawnet 1.1.MDX	Designed by MJC Checked by AD													
Micro Drainage Network 2020.1														
<u>Storage Structures for Storm</u> <u>Tank or Pond Manhole: S49, DS/PN: S1.016</u> Invert Level (m) -1.118 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>270.0</td><td>2.518</td><td>889.3</td><td>2.519</td><td>0.0</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	270.0	2.518	889.3	2.519	0.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)									
0.000	270.0	2.518	889.3	2.519	0.0									
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Micro Drainage	Network 2020.1	

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

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Cap.	(l/s)	Time (mins)	Flow (l/s)		
S1.000	S1	-0.207	0.000	0.18			12.2	OK	
S1.001	S2	-0.193	0.000	0.27			18.8	OK	
S1.002	S3	-0.174	0.000	0.36			24.9	OK	
S1.003	S4	-0.244	0.000	0.26			31.5	OK	
S1.004	S5	-0.248	0.000	0.25			30.9	OK	
S2.000	S6	-0.211	0.000	0.17			13.3	OK	
S2.001	S7	-0.197	0.000	0.25			20.1	OK	
S2.002	S8	-0.268	0.000	0.18			26.0	OK	
S2.003	S9	-0.252	0.000	0.23			33.2	OK	
S1.005	S10	-0.257	0.000	0.38			61.4	OK	
S1.006	S11	-0.253	0.000	0.40			60.7	OK	
S1.007	S12	-0.302	0.000	0.33			62.9	OK	
S1.008	S13	-0.302	0.000	0.34			64.1	OK	
S1.009	S14	-0.307	0.000	0.35			65.7	OK	
S1.010	S15	-0.320	0.000	0.31			66.4	OK	
S1.011	S16	-0.325	0.000	0.31			64.3	OK	
S1.012	S17	-0.327	0.000	0.30			63.0	OK	

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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
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Micro Drainage	Network 2020.1	

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

PN	US/MH Name	Surcharged Flooded		Half Drain		Pipe		Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)		
S3.005	S28	-0.305	0.000	0.30			60.9	OK	
S5.000	S29	-0.211	0.000	0.17			13.3	OK	
S5.001	S30	-0.197	0.000	0.25			20.2	OK	
S5.002	S31	-0.271	0.000	0.18			26.8	OK	
S5.003	S32	-0.255	0.000	0.22			33.3	OK	
S3.006	S33	-0.266	0.000	0.43			86.3	OK	
S3.007	S34	-0.263	0.000	0.44			83.4	OK	
S3.008	S35	-0.264	0.000	0.44			84.2	OK	
S3.009	S36	-0.266	0.000	0.45			84.8	OK	
S3.010	S37	-0.275	0.000	0.45			86.5	OK	
S3.011	S38	-0.291	0.000	0.40			85.9	OK	
S3.012	S39	-0.338	0.000	0.27			84.3	OK	
S6.000	S40	-0.189	0.000	0.21			14.1	OK	
S6.001	S41	-0.183	0.000	0.28			18.9	OK	
S6.002	S42	-0.174	0.000	0.34			19.4	OK	
S6.003	S43	-0.156	0.000	0.44			29.5	OK	
S7.000	S44	-0.209	0.000	0.16			15.4	OK	
S7.001	S45	-0.218	0.000	0.16			15.0	OK	
S6.004	S46	-0.197	0.000	0.26			37.7	OK	
S1.014	S47	-0.125	0.000	0.07			19.3	OK	
S1.015	S48	-0.100	0.000	0.04			18.9	OK	
S1.016	S49	0.682	0.000	0.44			2.6	SURCHARGED	

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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
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Micro Drainage	Network 2020.1	

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

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m ³)			Time (mins)	Flow (l/s)	
S1.000	S1	1.052	-0.148	0.000	0.44			30.1	OK
S1.001	S2	0.989	-0.102	0.000	0.72			50.1	OK
S1.002	S3	0.942	-0.036	0.000	0.99			68.9	OK
S1.003	S4	0.737	-0.128	0.000	0.74			89.4	OK
S1.004	S5	0.636	-0.114	0.000	0.69			86.7	OK
S2.000	S6	1.045	-0.155	0.000	0.41			32.9	OK
S2.001	S7	0.939	-0.116	0.000	0.67			54.0	OK
S2.002	S8	0.723	-0.181	0.000	0.51			73.3	OK
S2.003	S9	0.609	-0.135	0.000	0.67			95.0	OK
S1.005	S10	0.561	-0.024	0.000	1.00			160.9	OK
S1.006	S11	0.436	-0.042	0.000	1.00			153.6	OK
S1.007	S12	0.416	0.014	0.000	0.05			8.8	SURCHARGED
S1.008	S13	0.416	0.070	0.000	0.05			9.3	SURCHARGED
S1.009	S14	0.416	0.125	0.000	0.05			9.8	SURCHARGED
S1.010	S15	0.416	0.178	0.000	0.05			10.3	SURCHARGED
S1.011	S16	0.416	0.295	0.000	0.05			10.2	SURCHARGED
S1.012	S17	0.416	0.406	0.000	0.05			10.3	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S1.003	S4	
S1.004	S5	
S2.000	S6	
S2.001	S7	
S2.002	S8	
S2.003	S9	
S1.005	S10	
S1.006	S11	
S1.007	S12	
S1.008	S13	
S1.009	S14	
S1.010	S15	
S1.011	S16	
S1.012	S17	

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Micro Drainage	Network 2020.1	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.013	S18	1440 Winter	30	+0%	30/60 Winter			
S3.000	S19	15 Summer	30	+0%	100/15 Summer			
S3.001	S20	15 Summer	30	+0%	100/15 Summer			
S3.002	S21	15 Summer	30	+0%	100/15 Summer			
S3.003	S22	15 Summer	30	+0%	100/15 Summer			
S3.004	S23	15 Winter	30	+0%	100/15 Summer			
S4.000	S24	15 Summer	30	+0%	100/15 Summer			
S4.001	S25	15 Summer	30	+0%	100/15 Summer			
S4.002	S26	15 Summer	30	+0%	100/15 Summer			
S4.003	S27	15 Winter	30	+0%	100/15 Summer			
S3.005	S28	15 Winter	30	+0%	100/15 Summer			
S5.000	S29	15 Summer	30	+0%	100/15 Summer			
S5.001	S30	15 Summer	30	+0%	100/15 Summer			
S5.002	S31	15 Summer	30	+0%	100/15 Summer			
S5.003	S32	15 Winter	30	+0%	100/15 Summer			
S3.006	S33	15 Winter	30	+0%	30/15 Winter			
S3.007	S34	15 Winter	30	+0%	100/15 Summer			
S3.008	S35	1440 Winter	30	+0%	30/15 Winter			
S3.009	S36	1440 Winter	30	+0%	30/15 Winter			
S3.010	S37	1440 Winter	30	+0%	30/600 Winter			
S3.011	S38	1440 Winter	30	+0%	30/360 Winter			
S3.012	S39	1440 Winter	30	+0%	30/180 Winter			
S6.000	S40	15 Summer	30	+0%	100/15 Summer			
S6.001	S41	15 Summer	30	+0%	100/15 Summer			
S6.002	S42	15 Winter	30	+0%	30/15 Summer			
S6.003	S43	15 Winter	30	+0%	30/15 Summer			
S7.000	S44	15 Summer	30	+0%	100/720 Winter			
S7.001	S45	1440 Winter	30	+0%	100/120 Summer			
S6.004	S46	1440 Winter	30	+0%	30/360 Winter			
S1.014	S47	1440 Winter	30	+0%	30/60 Summer			
S1.015	S48	1440 Winter	30	+0%	30/30 Winter			
S1.016	S49	1440 Winter	30	+0%	1/15 Summer			

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)	
S1.013	S18	0.416	0.516	0.000	0.05			10.2	SURCHARGED
S3.000	S19	1.044	-0.231	0.000	0.27			32.6	OK
S3.001	S20	0.968	-0.198	0.000	0.44			53.2	OK
S3.002	S21	0.894	-0.159	0.000	0.61			73.1	OK
S3.003	S22	0.817	-0.124	0.000	0.77			93.4	OK
S3.004	S23	0.711	-0.114	0.000	0.71			89.4	OK
S4.000	S24	1.040	-0.160	0.000	0.39			30.7	OK
S4.001	S25	0.933	-0.121	0.000	0.65			51.8	OK
S4.002	S26	0.737	-0.166	0.000	0.58			71.9	OK
S4.003	S27	0.701	-0.082	0.000	0.74			92.3	OK

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Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations																																											
Date 06/01/2022 File Drawnet 1.1.MDX	Designed by MJC Checked by AD																																											
Micro Drainage	Network 2020.1																																											
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>																																												
	<table><tr><td></td><td>US/MH</td><td>Level</td></tr><tr><td>PN</td><td>Name</td><td>Exceeded</td></tr><tr><td>S3.011</td><td>S38</td><td></td></tr><tr><td>S3.012</td><td>S39</td><td></td></tr><tr><td>S6.000</td><td>S40</td><td></td></tr><tr><td>S6.001</td><td>S41</td><td></td></tr><tr><td>S6.002</td><td>S42</td><td></td></tr><tr><td>S6.003</td><td>S43</td><td></td></tr><tr><td>S7.000</td><td>S44</td><td></td></tr><tr><td>S7.001</td><td>S45</td><td></td></tr><tr><td>S6.004</td><td>S46</td><td></td></tr><tr><td>S1.014</td><td>S47</td><td></td></tr><tr><td>S1.015</td><td>S48</td><td></td></tr><tr><td>S1.016</td><td>S49</td><td></td></tr></table>		US/MH	Level	PN	Name	Exceeded	S3.011	S38		S3.012	S39		S6.000	S40		S6.001	S41		S6.002	S42		S6.003	S43		S7.000	S44		S7.001	S45		S6.004	S46		S1.014	S47		S1.015	S48		S1.016	S49		
	US/MH	Level																																										
PN	Name	Exceeded																																										
S3.011	S38																																											
S3.012	S39																																											
S6.000	S40																																											
S6.001	S41																																											
S6.002	S42																																											
S6.003	S43																																											
S7.000	S44																																											
S7.001	S45																																											
S6.004	S46																																											
S1.014	S47																																											
S1.015	S48																																											
S1.016	S49																																											
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Date 06/01/2022 File Drawnet 1.1.MDX	Designed by MJC Checked by AD	
Micro Drainage	Network 2020.1	

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

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)	
S1.000	S1	1.740	0.540	0.000	0.63			43.3	SURCHARGED
S1.001	S2	1.653	0.562	0.000	1.11			76.8	SURCHARGED
S1.002	S3	1.573	0.596	0.000	1.60			110.8	SURCHARGED
S1.003	S4	1.515	0.650	0.000	0.03			4.2	SURCHARGED
S1.004	S5	1.516	0.765	0.000	0.03			4.2	SURCHARGED
S2.000	S6	1.515	0.315	0.000	0.01			1.1	SURCHARGED
S2.001	S7	1.515	0.460	0.000	0.03			2.2	SURCHARGED
S2.002	S8	1.516	0.612	0.000	0.02			3.2	SURCHARGED
S2.003	S9	1.516	0.772	0.000	0.03			4.3	SURCHARGED
S1.005	S10	1.516	0.931	0.000	0.05			8.4	SURCHARGED
S1.006	S11	1.516	1.038	0.000	0.05			8.4	SURCHARGED
S1.007	S12	1.516	1.114	0.000	0.05			8.8	SURCHARGED
S1.008	S13	1.516	1.170	0.000	0.05			9.1	SURCHARGED
S1.009	S14	1.516	1.225	0.000	0.05			9.5	SURCHARGED
S1.010	S15	1.516	1.278	0.000	0.05			10.0	SURCHARGED
S1.011	S16	1.516	1.395	0.000	0.05			9.9	FLOOD RISK
S1.012	S17	1.516	1.506	0.000	0.05			9.9	FLOOD RISK

PN	US/MH Level	
	Name	Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S1.003	S4	
S1.004	S5	
S2.000	S6	
S2.001	S7	
S2.002	S8	
S2.003	S9	
S1.005	S10	
S1.006	S11	
S1.007	S12	
S1.008	S13	
S1.009	S14	
S1.010	S15	
S1.011	S16	
S1.012	S17	

Alan Wood & Partners		Page 29
Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations	
Date 06/01/2022 File Drawnet 1.1.MDX	Designed by MJC Checked by AD	
Micro Drainage	Network 2020.1	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) SurchARGE	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.013	S18	2880 Winter	100	+40%	30/60 Winter			
S3.000	S19	15 Winter	100	+40%	100/15 Summer			
S3.001	S20	15 Winter	100	+40%	100/15 Summer			
S3.002	S21	15 Winter	100	+40%	100/15 Summer			
S3.003	S22	15 Winter	100	+40%	100/15 Summer			
S3.004	S23	15 Winter	100	+40%	100/15 Summer			
S4.000	S24	15 Winter	100	+40%	100/15 Summer			
S4.001	S25	15 Winter	100	+40%	100/15 Summer			
S4.002	S26	15 Winter	100	+40%	100/15 Summer			
S4.003	S27	15 Winter	100	+40%	100/15 Summer			
S3.005	S28	2880 Winter	100	+40%	100/15 Summer			
S5.000	S29	15 Winter	100	+40%	100/15 Summer			
S5.001	S30	15 Winter	100	+40%	100/15 Summer			
S5.002	S31	15 Winter	100	+40%	100/15 Summer			
S5.003	S32	2880 Winter	100	+40%	100/15 Summer			
S3.006	S33	2880 Winter	100	+40%	30/15 Winter			
S3.007	S34	2880 Winter	100	+40%	100/15 Summer			
S3.008	S35	2880 Winter	100	+40%	30/15 Winter			
S3.009	S36	2880 Winter	100	+40%	30/15 Winter			
S3.010	S37	2880 Winter	100	+40%	30/600 Winter			
S3.011	S38	2880 Winter	100	+40%	30/360 Winter			
S3.012	S39	2880 Winter	100	+40%	30/180 Winter			
S6.000	S40	15 Winter	100	+40%	100/15 Summer			
S6.001	S41	15 Winter	100	+40%	100/15 Summer			
S6.002	S42	2880 Winter	100	+40%	30/15 Summer			
S6.003	S43	2880 Winter	100	+40%	30/15 Summer			
S7.000	S44	2880 Winter	100	+40%	100/720 Winter			
S7.001	S45	2880 Winter	100	+40%	100/120 Summer			
S6.004	S46	2880 Winter	100	+40%	30/360 Winter			
S1.014	S47	2880 Winter	100	+40%	30/60 Summer			
S1.015	S48	2880 Winter	100	+40%	30/30 Winter			
S1.016	S49	2880 Winter	100	+40%	1/15 Summer			

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)	
S1.013	S18	1.516	1.615	0.000	0.05			9.8	FLOOD RISK
S3.000	S19	1.852	0.577	0.000	0.42			50.7	FLOOD RISK
S3.001	S20	1.844	0.678	0.000	0.62			75.1	FLOOD RISK
S3.002	S21	1.741	0.688	0.000	0.84			101.1	SURCHARGED
S3.003	S22	1.640	0.700	0.000	1.05			126.6	SURCHARGED
S3.004	S23	1.536	0.711	0.000	0.89			112.8	SURCHARGED
S4.000	S24	1.773	0.573	0.000	0.60			47.8	SURCHARGED
S4.001	S25	1.760	0.706	0.000	0.98			78.7	SURCHARGED
S4.002	S26	1.644	0.740	0.000	0.82			102.5	SURCHARGED
S4.003	S27	1.536	0.752	0.000	1.07			134.8	SURCHARGED

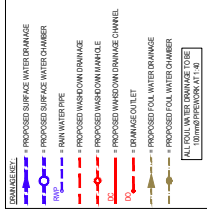
Alan Wood & Partners		Page 31																																							
Omega 2 Monks Cross Drive York YO32 9GZ	Proposed 6No. Poultry Units Land at Gibbet Fen, Donnington Hydraulic Calculations																																								
Date 06/01/2022 File Drawnet 1.1.MDX	Designed by MJC Checked by AD																																								
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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>																																									
	<table><tr><th>PN</th><th>US/MH Name</th><th>Level Exceeded</th></tr><tr><td>S3.011</td><td>S38</td><td></td></tr><tr><td>S3.012</td><td>S39</td><td></td></tr><tr><td>S6.000</td><td>S40</td><td></td></tr><tr><td>S6.001</td><td>S41</td><td></td></tr><tr><td>S6.002</td><td>S42</td><td></td></tr><tr><td>S6.003</td><td>S43</td><td></td></tr><tr><td>S7.000</td><td>S44</td><td></td></tr><tr><td>S7.001</td><td>S45</td><td></td></tr><tr><td>S6.004</td><td>S46</td><td></td></tr><tr><td>S1.014</td><td>S47</td><td></td></tr><tr><td>S1.015</td><td>S48</td><td></td></tr><tr><td>S1.016</td><td>S49</td><td></td></tr></table>	PN	US/MH Name	Level Exceeded	S3.011	S38		S3.012	S39		S6.000	S40		S6.001	S41		S6.002	S42		S6.003	S43		S7.000	S44		S7.001	S45		S6.004	S46		S1.014	S47		S1.015	S48		S1.016	S49		
PN	US/MH Name	Level Exceeded																																							
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APPENDIX C

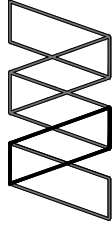
Drainage Strategy Drawings

1. THESE NOTES ARE INTENDED TO AUGMENT DRAWINGS AND SPECIFICATIONS. WHERE CONFLICT OF REQUIREMENTS EXISTS THE ORDER OF PRECEDENCE SHALL BE AS SHOWN IN THE SPECIFICATION. OTHERWISE THE STRICTEST PROVISION SHALL GOVERN.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS.

3. PLANNING FOR THE QUALITY ASSURANCE TO BE OBTAINED ON SITE BY THE CONTRACTOR AND THE DESIGNER TO THE ENGINEER AND FURTHER INSTRUCTIONS OBTAINED BEFORE WORK COMMENCED.
4. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE REMOVAL OF THE FORMWORK. THE DESIGNER MUST BE INVOLVED IN DETERMINING THE ERECTION PROCEDURE AND SEQUENCE AND ENSURE THAT THE BUILDING COMPONENTS ARE SAFE DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER TEMPORARY BRACING, GUSSET OR TIE-DOWNS WHICH MAY BE REQUIRED TO STABILISE THE STRUCTURE DURING THE PERIOD OF CONSTRUCTION. THE DESIGNER MUST CONSIDER THE EFFECTS OF THE ERECTION SEQUENCE, COMPLETION AND PROLONGING THAT THE PURPOSE AND ANY ADVERSE PROPERTIES ARE SAFE IN THE TEMPORARY CONDITION.



P1	FIRST ISSUE	14.01.22	MJC	AD	-
Rev	Description	Date	By	Chk	App



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Project: Agricultural Development for Land at Gibbet Fen, Fen Road, Donington, Spalding

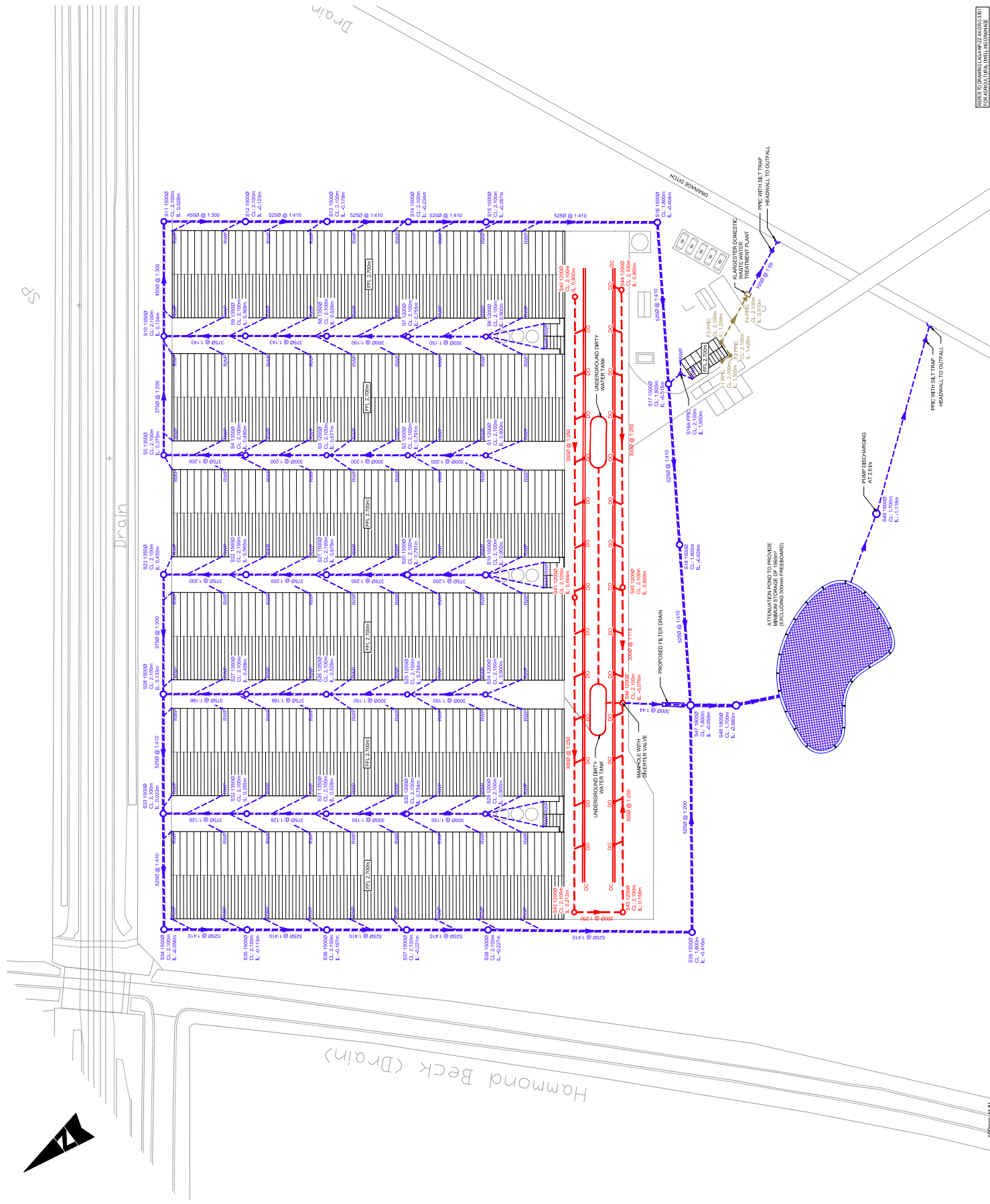
Client: **Clarke Group Construction Ltd**

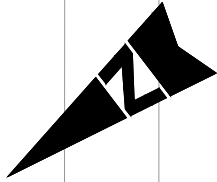
Drawing: Drainage Strategy Layout (Sheet 1 of 2)

Robles	Civils
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FOR APPROVAL

Job no.	46624	Scale@ At:	1:500	Rev.	P1
Project	Originator	Volume	Level	Type	Ride Number
IAC	AWP	77	W	DB	C 2200

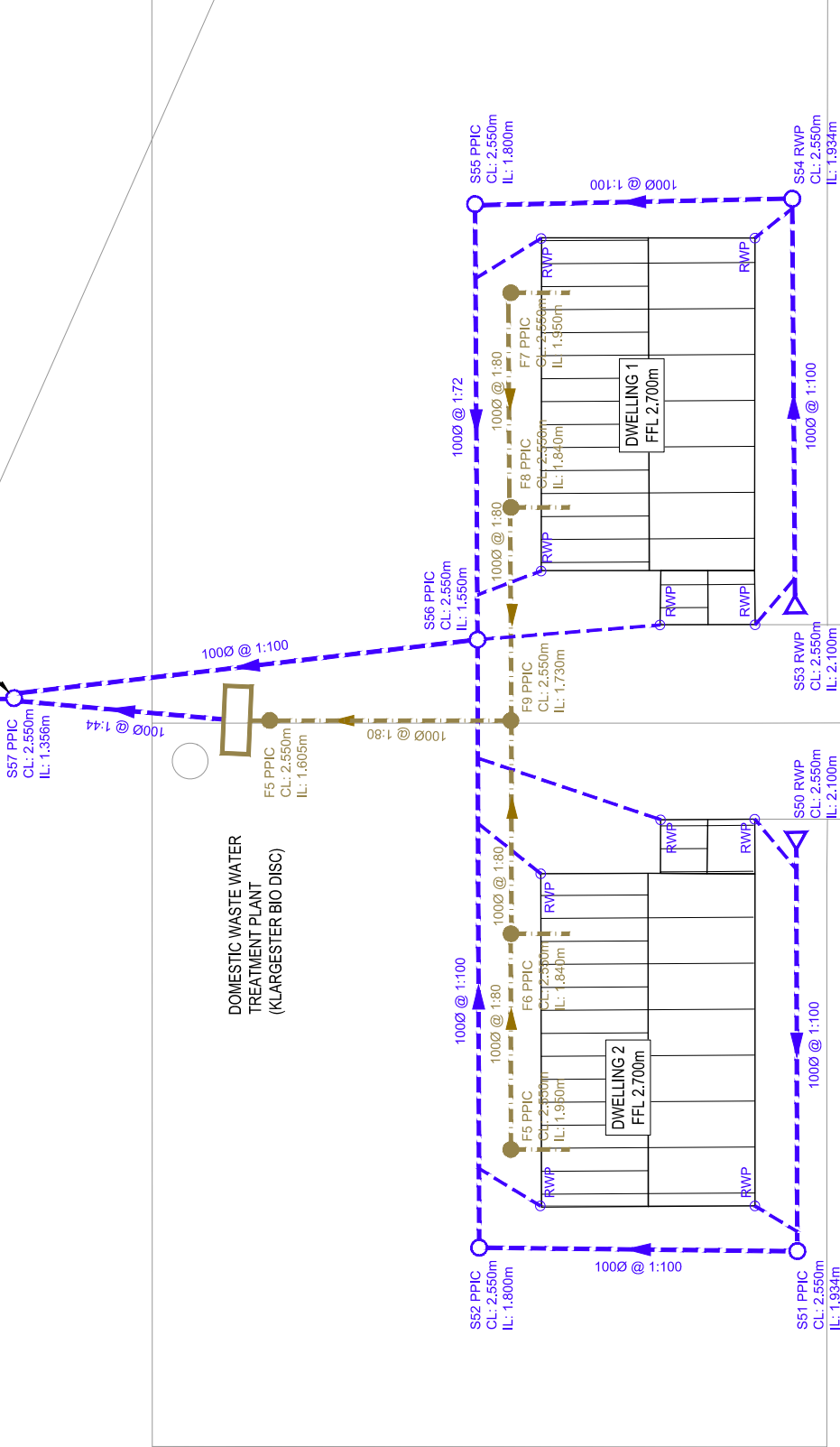




DRAINAGE DITCH

HEADWALL TO OUTFALL

PPIC WITH SILT TRAP



DOMESTIC WASTE WATER
TREATMENT PLANT
(KLARGESTER BIO DISC)

DWELLING 1
FFL 2.700m

DWELLING 2
FFL 2.700m

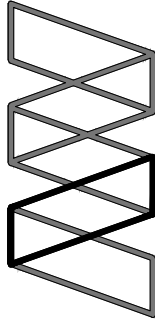
NOTES:

- THESE NOTES ARE INTENDED TO AUGMENT DRAWINGS AND SPECIFICATIONS. WHERE CONFLICT OF REQUIREMENTS EXIST THE ORDER OF PRECEDENCE SHALL BE AS SHOWN IN THE SPECIFICATION. OTHERWISE THE STRICTEST PROVISION SHALL GOVERN.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS.
- DRAWINGS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY AND FURTHER INSTRUCTIONS OBTAINED BEFORE WORK COMMENCED.
- THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE BUILDING IS FULLY COMPLETED. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE THE BUILDING'S FOUNDATION PROCEDURE AND TO ENSURE THAT THE FOUNDATION IS DESIGNED TO BE SAFE DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE-DOWNS WHICH MAY BE NECESSARY, SUCH MATERIAL REMAINING THE PROPERTY OF THE CONTRACTOR ON COMPLETION, AND FOR ENSURING THAT THE WORKS AND ANY ADJACENT PROPERTIES ARE SAFE IN THE TEMPORARY CONDITION.

DRAINAGE KEY:

- = PROPOSED SURFACE WATER DRAINAGE
- = PROPOSED SURFACE WATER CHAMBER
- = RAIN WATER PIPE
- = PROPOSED FOUL WATER DRAINAGE
- = PROPOSED FOUL WATER CHAMBER

P1	FIRST ISSUE	14.01.21	MJC	AD	--
Rev	Description	Date	By	Chk	App



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Project: Agricultural Development for Land at Gibbet Fen, Fen Road, Donington, Spalding	Client: Clarke Group Construction Ltd	Drawing: Drainage Strategy Layout (Sheet 2 of 2)	Role: Civils	Drawing Status: FOR APPROVAL	Job no. 46624	Scale@ A3: 1:200	Rev. P1
				Project Originator Volume Level Type Role Number	LAG - AWP - ZZ - XX - DR - C - 3301		

REFER TO DRAWING LAG-AWP-ZZ-XX-DR-C-3300
FOR AGRICULTURAL UNIT DRAINAGE

100mm at A3

APPENDIX D

Surface Water Exceedance Flood Routing Drawing

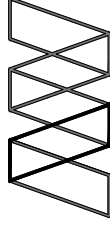
- NOTES:**
1. DRAWINGS ARE INTENDED TO ASSIST IN DRAWINGS AND SPECIFICATIONS. IN THE EVENT OF CONFLICT, THE SPECIFICATIONS SHALL PREVAIL. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
 2. THIS DRAWING IS TO BE USED IN CONNECTION WITH ALL OTHER RELEVANT DRAWINGS AND ARCHITECTS' DRAWINGS.
 3. DRAWINGS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER AND FURTHER INFORMATION TO BE OBTAINED BEFORE PROCEEDING WITH THE WORK.
 4. THE CONTRACTOR SHALL COMPLY WITH ALL RELEVANT REGULATIONS AND STANDARDS AFTER THE DESIGN HAS BEEN COMPLETED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXISTING CONDITIONS AND ENSURING THAT THE EXISTING CONDITIONS ARE SUITABLE FOR THE PROPOSED WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
 5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.

KEY

 = PROPOSED SURFACE WATER EXCEEDANCE FLOW PATH ROUTE

 = EXISTING SURFACE WATER EXCEEDANCE FLOW PATH ROUTE

P1	FIRST ISSUE	06.01.22	HUD	AD	-
Row	Description	Date	By	Chk	Am



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T. 01904 611594

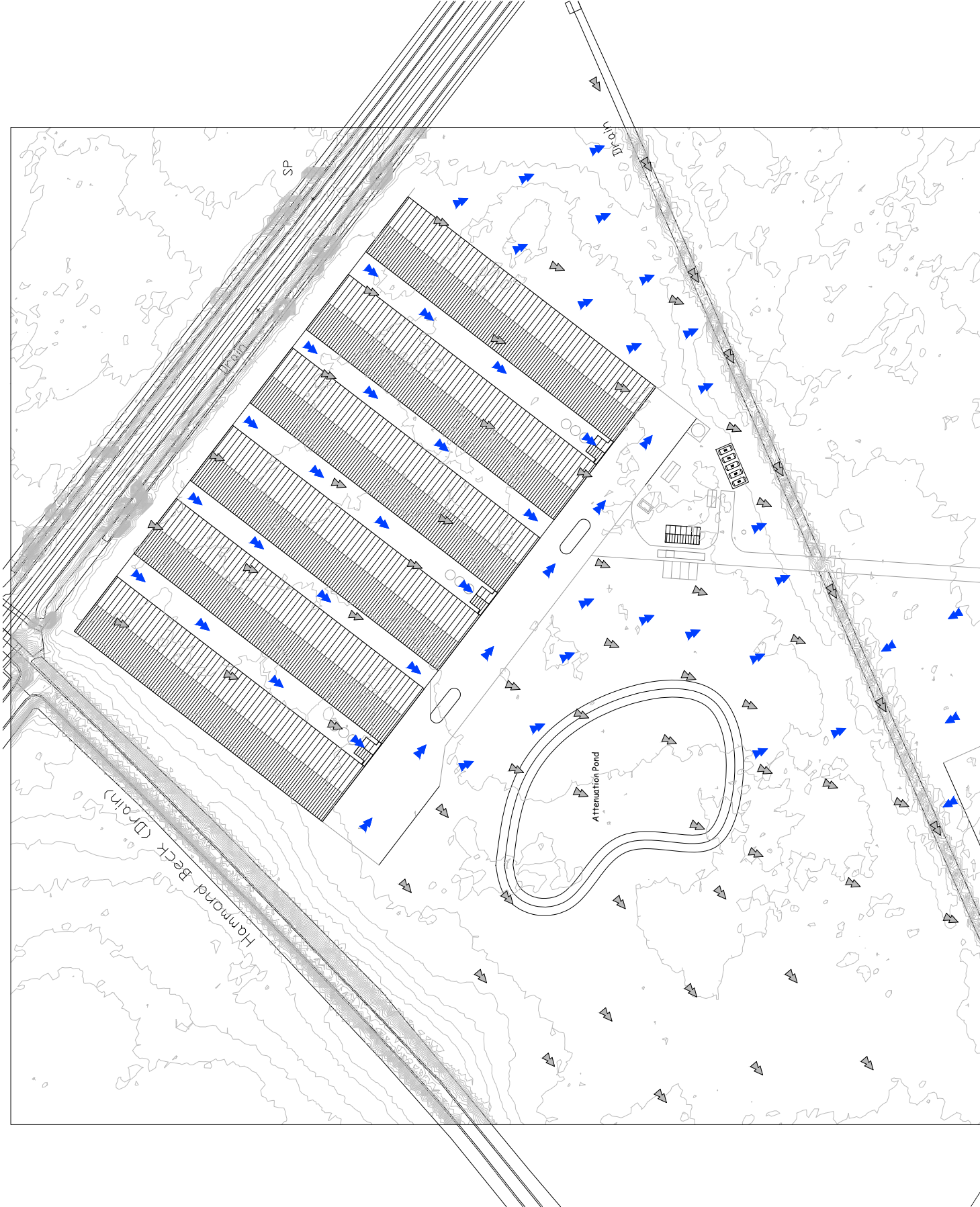
Project: Agricultural workers Dwellings For land at
Gibbel Fen, fen road, Donnington, Spalding
PE11 4XE

Client: **Clarke Group Construction Ltd**

Drawing: SW Exceedance Flood Routing

Role:	Civils
Drawing Status:	FOR APPROVAL

Job no.	46624	Scale@ A1:	N.T.S	Rev	P1
Project		Originator	Volume	Level	Type Role Number
LAG - AWP - ZZ		XX	DR	C	3400



APPENDIX E

CIRIA SuDS Manual Water Quality Matrix Outputs

SIMPLE INDEX APPROACH: TOOL



HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability whatsoever arising out of the use or impossibility to use the tool, even when HRW has been informed of the possibility of this claim. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).
2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)
3. Relevant design examples are included in the SuDS Manual Appendix C.
4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.
5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.
6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

	DROP DOWN LIST	RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
	USER ENTRY	USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

1. The land use varies across the runoff area either:
- use the land use type with the highest Pollution Hazard Index
 - apply the approach in which the land use types to determine whether the proposed SuDS design is suitable or not. It is not considered collecting more than one runoff area separately and providing additional treatment
1. The generic land use types suggested are not applicable. Select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row.

Runoff Area Land Use Description		Hazard Level	Pollution Hazard Indices			DESIGN CONDITIONS	
			Total Suspended Solids	Metals	Hydrocarbons		
Select land use type from the drop down list (or 'Other' if none applicable): →	Agricultural/Industrial (e.g. inert materials)	Very low	0.3	0.2	0.05	1	2
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:							
Landuse Pollution Hazard Index		Very low	0.3	0.2	0.05		

DESIGN CONDITIONS	
1	2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

- This step should be applied to evaluate the water quality protection provided by proposed SuDS components or discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration however small even where infiltration is not specifically accounted for in the design)
1. You have fewer than 3 components select 'None' or the components that are not used
1. The proposed component is: a) a proprietary treatment product and not generically described; b) the suggested components then: Proprietary treatment system or User defined indices should be selected and a description of the component and agreed user defined indices should be entered in the row below the drop down list

SuDS Component Description	Pollution Mitigation Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: Detention basin	0.5	0.5	0.6
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: None	0	0	0
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: None	0	0	0
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:			
Aggregated Surface Water Pollution Mitigation Index	0.5	0.5	0.6

DESIGN CONDITIONS	
1	2
SuDS components can only be assumed to deliver these indices. They allow design guidance with respect to hydraulics and treatment. Detention basins should be designed to ensure the active retention and management of sediment such that the sediment will not be re-suspended and washed out in subsequent events	

Note: 1. the total aggregated mitigation index is 1 (which is not a realistic outcome) then the outcome is 1 at 0.5. In this scenario the proposed components are likely to have a very high mitigation potential or reducing pollutant levels in the runoff and should be used or any proposed land use (note: where risk assessment is required this outcome would need more detailed verification)

Is the runoff now discharged to an infiltration component?

Yes? [Go to Step 2B](#)
No? [Go to Step 2C](#)

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration however small even where infiltration is not specifically accounted for in the design)

Groundwater protection description: as the proposed depth of soil or other material through which runoff will flow between the runoff area and the underlying groundwater

Where the discharge is to surface waters and risks to groundwater need not be considered select 'None'

1. The proposed groundwater protection is: a) a proprietary product and not generically described; b) the suggested measures then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

Pollution Mitigation Indices			
	Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: →	None		
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select "Proprietary product" or "User defined indices" and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index			
	0	0	0

DESIGN CONDITIONS	
1	2
3	4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

Combined Pollution Mitigation Indices	Pollution Mitigation Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	0.5	0.5	0.6

Note: 1. the total aggregated mitigation index is 1 (which is not a realistic outcome) then the outcome is 1 at 0.5. In this scenario the proposed components are likely to have a very high mitigation potential or reducing pollutant levels in the runoff and should be used or any proposed land use (note: where risk assessment is required this outcome would need more detailed verification)

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index then the proposed components are considered sufficient in providing pollution risk mitigation

In England and Wales where the discharge is to protected surface waters or groundwater an additional treatment component (ie over and above that required or standard discharges) or other equivalent protection is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales protected groundwater resources are defined as 'Source Protection Zones'. In Northern Ireland a more precautionary approach may be used and this should be checked with the environmental regulator or a local authority.

Sufficiency of Pollution Mitigation Indices	
Total Suspended Solids	Metals
Sufficient	Sufficient
Sufficient	Sufficient

Relevance to local planning documents should also be made to identify any additional protection required or sites due to be added conservation areas (Chapter 7: The SuDS design process). The implications of developments and other uses should only be to an area with an environmental designation such as a Site of Special Scientific Interest (SSSI) should be considered via consultation with relevant conservation bodies such as Natural England.

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but interception requires separate evaluation.

SIMPLE INDEX APPROACH: TOOL



HRW shall not be liable for any direct or indirect damage claims, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tool, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claims, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool, or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

- The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).
- The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
- Relevant design examples are included in the SuDS Manual Appendix C.
- Each of the steps below are part of the process set out in the Flowchart on Sheet 3.

Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST	RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
USER ENTRY	USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down list.

Runoff Area Land Use Description	Pollution Hazard	Pollution Hazard Indices			DESIGN CONDITIONS
		Total Suspended Solids	Metals	Hydrocarbons	
Select land use type from the drop down list (or 'Other' if none applicable)					12 The classification is not appropriate for 'hedge yards, ferry parks, water management areas, or chemical storage/handling zones'
Standard commercial yard or delivery area	Medium	0.7	0.6	0.7	
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	Medium	0.7	0.6	0.7

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the row below the drop down list.

SuDS Component Description	Total Suspended Solids	Pollution Mitigation Indices			DESIGN CONDITIONS
		Metals	Hydrocarbons		
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list:					123 SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B
Detention basin	0.5	0.5	0.6		
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list:					
Filter drain (where the trench is not designed as an infiltration component)	0.4	0.4	0.4		SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B Filter drains should be provided by upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list:					
None					
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:					Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at "<0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification)
Aggregated Surface Water Pollution Mitigation Index	0.7	0.7	0.6		

Is the runoff now discharged to an infiltration component?

Yes? [Go to Step 2B](#)
No? [Go to Step 2C](#)

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

	Total Suspended Solids	Pollution Mitigation Indices			DESIGN CONDITIONS
		Metals	Hydrocarbons		
Select type of groundwater protection from the drop down list:					1234
None					
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:					
Groundwater Protection Pollution Mitigation Index	0	0	0		

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices			Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at "<0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification)
	Total Suspended Solids	Metals	Hydrocarbons	
Combined Pollution Mitigation Indices for the Runoff Area	0.7	0.7	0.6	

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides enhanced protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indices				1
Total Suspended Solids	Metals	Hydrocarbons		
Sufficient	Sufficient	Sufficient		Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

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