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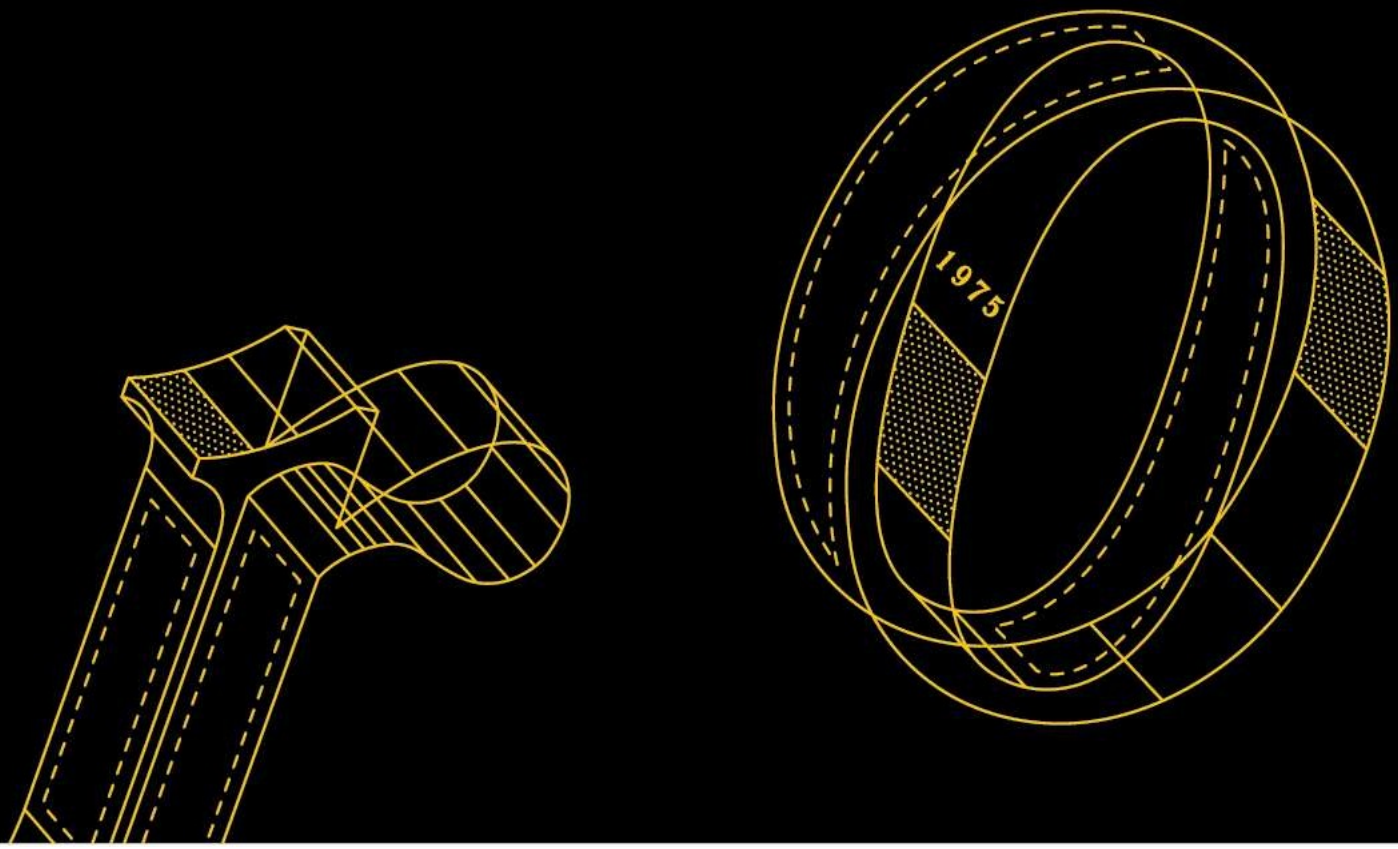


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Project Title: Markfield Conference Centre & Residence

Document Title: Surface Water Drainage Design Report – Discharge of Conditions 10, 11, 12 & 13

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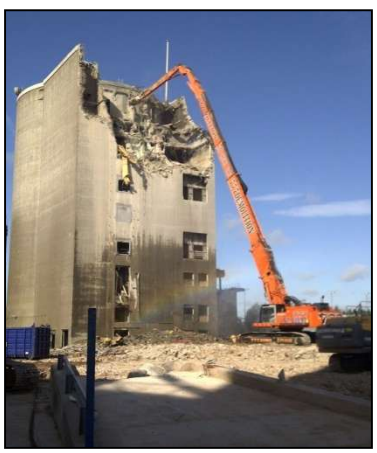
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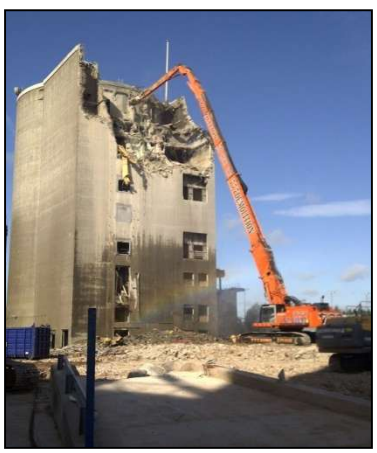


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1 Introduction

Norder Design Associates (NDA) have been appointed by The Islamic Foundation to develop the below-ground drainage design for the redevelopment of the Markfield Conference Centre, Ratby Lane, Markfield, Leicestershire.

Planning permission (reference 20/00887/FUL) was granted by Hinckley and Bosworth Borough Council (HBBC) on 12 February 2024 for the demolition of the existing conference centre and a residential building and the erection of a new conference centre, including an indoor sports facility, and a new residential building with associated landscaping.

This report sets out the surface water drainage design for the development and has been prepared to support the discharge of the drainage-related planning conditions 10, 11, 12 and 13, taking account of the advisory Notes to Applicant 4 to 7 attached to the decision notice. Table 1-1 identifies where each condition is addressed.

Condition	Requirement (summary)	Addressed in
10 (pre-commencement)	Surface water drainage scheme. Note 4: SuDS with treatment train; runoff limited to greenfield rates; runoff accommodated on site up to the 1 in 100 year event plus climate change; calculations, construction details, and modelled 1 in 1, 1 in 30 and 1 in 100 year plus climate change scenarios.	Sections 3, 4 and 5
11 (pre-commencement)	Management of surface water on site during construction. Note 5: temporary attenuation, treatment, controls, maintenance and protection.	Section 6
12 (pre-occupation)	Long-term maintenance of the surface water drainage system. Routine maintenance, remedial actions, monitoring and pollution incident procedures.	Section 7
13 (pre-commencement)	Infiltration testing (or suitable evidence to preclude testing). Note 7: testing to BRE Digest 365.	Section 3.2

Table 1-1: Drainage-related planning conditions (Planning Ref. 20/00887/FUL)

1. The Sustainable Drainage Systems (SuDS) discharge hierarchy outlined in the Flood Risk and Coastal Change section of the Planning Practice Guidance.
2. Limitation of the surface water discharge from the proposed extension to the equivalent greenfield runoff rate, calculated using the HR Wallingford IH124 method.
3. A surface water drainage network incorporating cellular attenuation storage and a vortex flow control, supported by hydraulic calculations.
4. Network performance for the 1 in 2 year, 1 in 30 year, 1 in 100 year and 1 in 100 year plus 40% climate change storm events.
5. Surface water quality management in accordance with the CIRIA C753 SuDS Manual Simple Index Approach.
6. Management of surface water during the construction phase.

7. A long-term management and maintenance plan for the surface water drainage system, including pollution incident procedures.

This report should be read in conjunction with NDA drawings 9482-NDA-ZZ-XX-DR-C-1501 and 9482-NDA-ZZ-XX-DR-C-1502 and the standard drainage construction details 9482-NDA-XX-XX-DR-C-1510 and 9482-NDA-XX-XX-DR-C-1511.

2 Site Description and Location

2.1 Site Description

The site forms part of The Islamic Foundation campus on Ratby Lane, Markfield, Leicestershire, LE67 9SY. The campus contains a mosque, library, conference and residential facilities. The development area comprises the footprint of the existing conference centre and residential building, which are to be demolished, together with the surrounding access, parking and landscaped areas. Retained campus buildings lie to the north-west of the development area, and mature trees and vegetation lie to the south and east.

Item	Detail
Site address	The Islamic Foundation, Markfield Conference Centre, Ratby Lane, Markfield, Leicestershire, LE67 9SY
OS Grid Reference	E 449339, N 309039 (approximately SK 493 090)
Planning reference	20/00887/FUL (decision dated 12 February 2024)
Local Planning Authority	Hinckley and Bosworth Borough Council
Sewerage undertaker	Severn Trent Water

Table 2-1: Summary of site location

2.2 Topography and Geology

Site levels are taken from the Mapmatic topographical survey (drawing 3527 Rev 1) and utility survey (drawing 3527B Rev 0). Proposed drainage cover levels range from approximately 166.27 mAOD at the north-west of the development to approximately 164.93 mAOD at the southern corner of the conference centre. The site therefore falls gently from the north-west towards the south and east. The receiving surface water sewer to the east of the conference centre has an invert level of 163.51 mAOD.

British Geological Survey (BGS) mapping reviewed in the investigation records glacial deposits of the Oadby Member (poorly sorted clays, sand and gravel) beneath the site, underlain by mudstone of the Triassic Edwalton Member (Mercia Mudstone Group). The Oadby Member is classified as a Secondary Undifferentiated Aquifer and the Edwalton Member as a Secondary B

Aquifer. The site is not within a Source Protection Zone. The nearest surface watercourse is a drain approximately 150 m east of the site.

Six window sampler boreholes (WS1 to WS6) were drilled to 5.45 m below ground level (bgl) on 8 July 2025. Ground conditions were consistent across the site:

- Topsoil to 0.3 m to 0.6 m bgl.
- Red-brown, mottled grey and black, sandy gravelly CLAY. This was predominantly firm, becoming stiff with depth, with soft and very sandy horizons between about 1.8 m and 5.0 m bgl in WS1 and WS3 to WS6. The clay extended beyond the base of all boreholes. SPT N values ranged from 4 to 36.
- Slight groundwater seepages were recorded in WS1, WS3 and WS4 at 2.7 m to 3.5 m bgl (approximately 162.45 to 162.60 mAOD). No groundwater was encountered in WS2, WS5 or WS6.

These findings are consistent with the HR Wallingford greenfield runoff assessment for the site (Appendix B), which uses the mapped WRAP soil type 4 and a Standard Percentage Runoff (SPR) of 0.47, indicating soils of low permeability. They are also consistent with the National Soil Map, which records soils around Markfield as slowly draining loams over glacial till (Hinckley and Bosworth Borough Council, Agricultural Land Desk Study, May 2020).

2.3 Existing Drainage

The site is previously developed. The existing conference centre and residential building are served by a private surface water drainage network within the campus.

Existing 100 mm and 150 mm diameter surface water drains serving the retained buildings to the north-west cross the footprint of the proposed residential block. These will be intercepted and diverted around the new building via a new 150 mm diameter diversion pipe (manholes S1 to S8) and reconnected to the existing network downstream, at Outfall 02. The depths and positions of several existing pipes and manholes on this route (S2, S6, S7 and S8) are to be confirmed on site before construction.

An existing 150 mm diameter surface water sewer runs to the east of the conference centre, with an invert level of 163.51 mAOD at the proposed point of connection. This sewer will receive the attenuated discharge from the new buildings (Outfall 01).

2.4 Proposed Development

The proposed development comprises a new conference centre including an indoor sports facility (building footprint approximately 1,337 m²) and a new residential block (building footprint approximately 731 m²), together with associated external works and landscaping.

The roof areas of the two new buildings (0.207 ha in total) drain to a single cellular attenuation tank and discharge at a restricted rate through a vortex flow control. A small area of external hardstanding (0.013 ha) drains via gully S9 into the diverted surface water network and discharges at Outfall 02.

3 Surface Water Drainage Strategy

The drainage strategy was developed in line with the hierarchical approach outlined in the Flood Risk and Coastal Change section of the Planning Practice Guidance and Part H3 of the Building Regulations. These recommend that surface water runoff is discharged as high up the following hierarchy as reasonably practicable:

1. Priority Level 1: Surface water runoff is collected for re-use on site (rainwater harvesting).
2. Priority Level 2: Surface water runoff is disposed of by infiltration into the ground.
3. Priority Level 3: Surface water runoff is discharged to a surface water body or watercourse.
4. Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain or other drainage system.
5. Priority Level 5: Surface water runoff is discharged to a combined sewer.

The following sections set out the options considered and the method of discharge adopted.

3.1 Level 1: Rainwater Harvesting

Rainwater harvesting for non-potable uses, such as WC flushing in the conference centre and residential block, could reduce the volume of runoff leaving the site. However, a harvesting tank may already be full at the start of a storm, so it cannot be relied upon to provide attenuation. Rainwater harvesting has therefore not been included in the attenuation calculations. It may be incorporated at the client's discretion without detriment to the drainage design presented here.

3.2 Level 2: Infiltration (Condition 13)

Condition 13 requires infiltration testing, or suitable evidence to preclude testing, to confirm whether the site is suitable for the use of infiltration as a drainage element. Note 7 asks for test results to conform to BRE Digest 365.

Infiltration testing. As part of the Emcus ground investigation, falling-head infiltration tests were carried out in boreholes WS1, WS2 and WS3. These are located across the development footprint. Infiltration rates were calculated between 75% and 25% of the effective head, following the BRE Digest 365 method. The results are summarised in Table 3-1.

Test	Ground level (mAOD)	Water level during test (m bgl)	Strata tested	Infiltration rate (m/s)
WS1	165.15	0.80 falling to 2.35 over 190 min	Stiff sandy gravelly clay; soft very sandy clay below 2.7 m; seepage at 2.7 m	2.28×10^{-6}
WS2	166.15	0.62, no measurable fall over 85 min	Firm to stiff gravelly clay; no groundwater	No measurable infiltration
WS3	166.10	0.47 falling to 1.53 over 170 min	Firm gravelly clay; soft very sandy clay below 2.7 m; seepage at 3.5 m	1.94×10^{-6}

Table 3-1: Infiltration test results (Emcus Limited, ref. MJH/J2231/D1/1, Appendix D)

The ground investigation concludes (Section 8.4) that, from consideration of the ground conditions revealed by the boreholes and the results of the infiltration rate testing, the strata beneath the site will not be suitable to receive water from soakaways.

- **Proximity to buildings.** The constrained site means storage can only be located close to the new buildings. Building Regulations Approved Document H recommends that infiltration devices are at least 5 m from buildings. The investigation also notes that the buildings will be within the zone of influence of trees in shrinkable clay soils. Concentrating water into these soils close to foundations is undesirable.

The infiltration testing, together with the ground investigation findings, demonstrates that the site is not suitable for the use of infiltration as a drainage disposal method. Further testing to the full BRE Digest 365 trial-pit procedure is not considered necessary. The test results and the supporting extracts from the ground investigation report are provided in Appendix D

Surface water will therefore be attenuated and discharged at a controlled rate (Level 4). The attenuation tank has been modelled with no infiltration and is to be wrapped in an impermeable geomembrane.

3.3 Level 3: Discharge to Watercourse

No watercourse is recorded within or immediately adjacent to the development area on the topographical and utility surveys used for the design, so discharge to a watercourse is not practicable.

3.4 Level 4: Discharge to Surface Water Sewer

There is an existing surface water drainage network serving the campus. It is proposed that the attenuated runoff from the new buildings is discharged to the existing 150 mm diameter surface water sewer east of the conference centre as noted in the drainage design drawing. The discharge rate will be restricted to below the equivalent greenfield runoff rate using a vortex flow control, with attenuation provided on site in a cellular storage tank.

3.5 Level 5: Discharge to Combined Sewer

Discharge to a combined or foul sewer is not required, since Level 4 (discharge to a surface water sewer) is achievable.

4 Surface Water Design Criteria

The surface water drainage design outlined in this report has been developed in accordance with the following standards and guidance:

- National Planning Policy Framework (NPPF) and the Flood Risk and Coastal Change section of the Planning Practice Guidance.
- Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems (DEFRA, March 2015).
- CIRIA C753 The SuDS Manual (2015).
- Building Regulations Approved Document H: Drainage and Waste Disposal (2015 edition).
- Design and Construction Guidance for foul and surface water sewers, Approved Version 2.0 (March 2020).
- BS EN 752:2017 Drain and sewer systems outside buildings.
- Leicestershire County Council Lead Local Flood Authority guidance for developers.
- Environment Agency, Flood risk assessments: climate change allowances.
- Policy DM7 of the Hinckley and Bosworth Site Allocations and Development Management Policies DPD (2016).

The surface water drainage network was modelled using Autodesk InfoDrainage 2026.4 with the following parameters:

Parameter	Value adopted
Rainfall methodology	FSR (as configured in the InfoDrainage model)
Network sizing method	(UK) Modified Rational Method
Minimum time of entry	5 minutes
Time of concentration	8 minutes (roof catchments); 5 minutes (Catchment Area (4))
Volumetric runoff coefficient (Cv)	0.75 summer; 0.84 winter
Percentage impermeable (PIMP)	100% for all positively drained areas
Urban creep	0% (non-residential building and apartment block with no curtilage for future extension)
Return periods analysed	1 in 2, 1 in 30, 1 in 100 and 1 in 100 year + 40% climate change
Storm durations	Summer and winter profiles; the critical duration for each element is reported in Appendices
Minimum cover to pipe crown	1.2 m
Pipe velocity	Minimum 1.0 m/s; maximum 3.0 m/s
Pipe gradients	Between 1 in 500 and 1 in 40

Table 4-1: Hydraulic model design parameters

The design performance criteria, consistent with standards S7 to S9 of the Non-statutory Technical Standards and Note 4 of the planning decision notice, are:

- No flooding on any part of the site for the 1 in 30 year return period event.
- No flooding of any building (including basements) or utility plant for the 1 in 100 year plus climate change event, with any exceedance flows managed within the site along designed flow routes.
- Peak discharge from the development not exceeding the equivalent greenfield runoff rate for the same event.

Climate change. The new buildings are permanent development with a design life extending beyond 2061, so the 2070s epoch (2061 to 2125) applies. Leicestershire County Council's Assessment of Local Flood Risk (2023) reports a central allowance of 25% and an upper end

allowance of 40% for the 1 in 100 year peak rainfall intensity in this epoch. The upper end allowance of 40% has been applied to the 1 in 100 year event.

4.1 Greenfield Runoff Rates

In accordance with the requirements of Leicestershire County Council as Lead Local Flood Authority (Note 4), surface water runoff from the development is to be limited to the equivalent greenfield runoff rate. Greenfield runoff rates have been calculated for the roof area of the two new buildings (0.2067 ha) using the HR Wallingford Greenfield Runoff Rate Estimation Tool (IH124 method, version 2.2.3). The full output is contained in the Appendices and the results are summarised in Table 4-2.

Input / return period	**Value**
Site area	0.2067 ha
SAAR	693 mm
WRAP soil type / SPR	4 / 0.47
Hydrological region	4
1 in 1 year	0.8 l/s
QBAR	1.0 l/s
1 in 2 year	0.9 l/s
1 in 10 year	1.5 l/s
1 in 30 year	2.0 l/s
1 in 100 year	2.5 l/s

Table 4-2: Greenfield runoff rates (HR Wallingford IH124)

The discharge from the attenuated network has been limited using a Hydro-Brake vortex flow control with a design flow of 1.0 l/s, equal to QBAR. A design flow of 1.0 l/s is generally accepted as a practical minimum, as smaller flow controls become prone to blockage.

4.2 Sustainable Drainage Systems and Attenuation

The proposed surface water drainage strategy aims to manage surface water runoff sustainably without increasing flood risk on or off site and without adversely affecting water quality. The new buildings sit within a constrained, previously developed campus with mature trees to the south and east. Below-ground cellular attenuation storage has therefore been adopted, located in the landscaped area to the north-east of the conference centre. The surface water network is shown schematically in Figure 4-1 and comprises:

- Rainwater pipes from the residential block roof connected to a 150 mm diameter carrier drain (S14 to S16), discharging into the attenuation tank.
- Rainwater pipes from the conference centre roof connected to a 150 mm diameter carrier drain (S10 to S13), discharging into the attenuation tank at Inlet B.
- A cellular attenuation tank (SDS Geo Light 600 or similar approved), with outlet to a 1500 mm diameter flow control chamber (S20) containing a Hydro-Brake vortex flow control.
- A 150 mm diameter outfall from S20 via S22 to the existing 150 mm diameter surface water sewer at an invert level of 163.51 mAOD (Outfall 01).
- Gully S9, serving 0.013 ha of external hardstanding, connected to the 150 mm diameter diversion pipe (S6 to S8) and discharging to the existing network at Outfall 02.

Table 4-3 summarises the attenuation provided and Table 4-4 the flow control.

Attenuation feature	Properties	Value
Cellular attenuation tank (Polystorm-R or similar)	Plan dimensions	13.0 m × 12.0 m
	Depth	1.0 m (5 no. 0.2 m crate layers)
	Void ratio	95%
	Base / top level	163.710 / 164.710 mAOD
	Finished cover level above tank	165.645 mAOD
	Total storage volume	149.1 m³

Table 4-3: Summary of the attenuation storage provided

Property	Hydro-Brake vortex flow control
Location	Manhole S20 (1500 mm diameter chamber)
Unit reference	CHE-0043-1000-1200-1000 (or equivalent)
Design flow	1.0 l/s
Design head	1.2 m
Invert level	163.700 mAOD (tank outlet invert 163.710 mAOD)
Objective / application	Minimise upstream storage; surface water only

Table 4-4: Summary of the flow control device

The restricted discharge is conveyed from S20 via S22 in a 150 mm diameter pipe to the existing 150 mm diameter surface water sewer east of the conference centre. Where the outfall pipe passes close to the foundations of the existing building, it is to be laid encased in concrete and backfilled in short sections, as noted on drawing 9482-NDA-ZZ-XX-DR-C-1502. Figure 4-2 shows the arrangement of the tank, flow control and outfall.

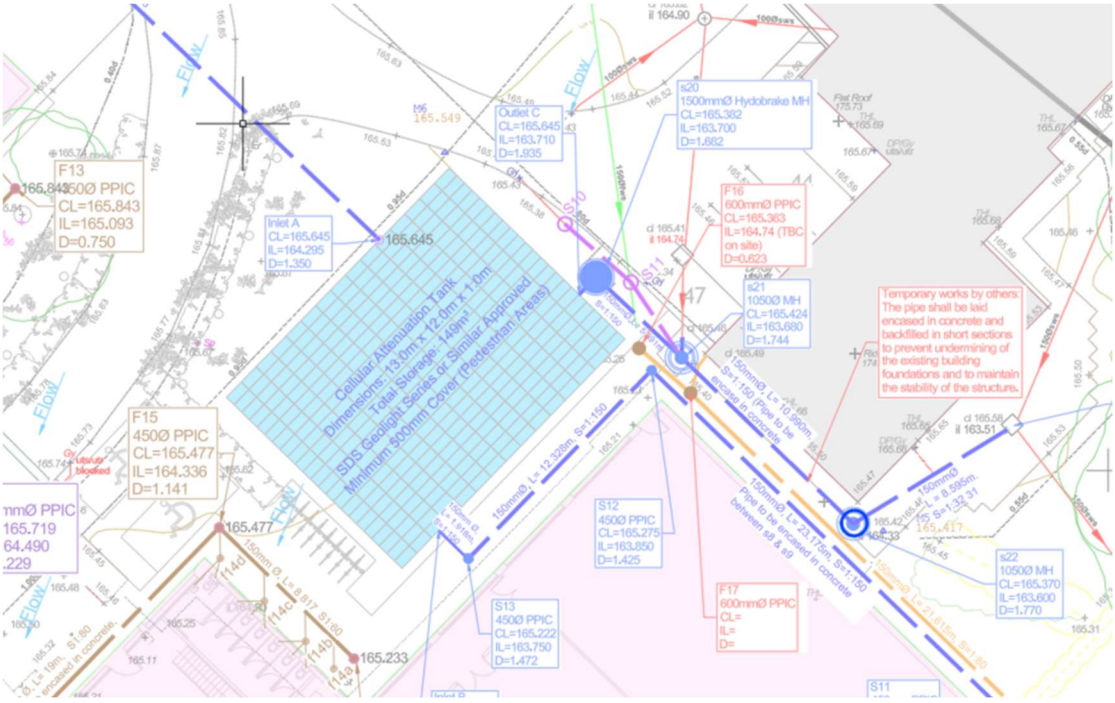


Figure 4-2: Attenuation tank, flow control chamber S20 and Outfall 01, extract from drawing 9482-NDA-ZZ-XX-DR-C-1502

4.3 Hydraulic Model Results

The network was analysed for the 1 in 2, 1 in 30, 1 in 100 and 1 in 100 year plus 40% climate change events. The full InfoDrainage output is contained in Appendix C and the key results are summarised in Tables 4-5 and 4-6.

Return period	Peak discharge Outfall 01 (l/s)	Tank max. level (mAOD) / depth (m)	Tank max. volume (m³) / % available
1 in 2 year	0.6	163.984 / 0.274	40.7 / 72.7%
1 in 30 year	0.6	164.229 / 0.519	76.9 / 48.4%
1 in 100 year	1.0	164.396 / 0.686	101.6 / 31.9%
1 in 100 year + 40% CC	1.5	164.706 / 0.996	147.5 / 1.1%

Table 4-5: Summary of hydraulic model results (critical storm per element)

The critical event for the attenuation tank is the 960 minute winter storm in all return periods. At the 1 in 100 year plus 40% climate change event, the maximum water level in the tank (164.706 mAOD) is 0.94 m below the finished cover level above the tank (165.645 mAOD). The tank therefore contains the design storm without surcharging to ground.

Table 4-6 compares the peak discharge from the attenuated network (Outfall 01) with the greenfield runoff rates for the contributing roof area.

Return period	Greenfield runoff rate (l/s)	Proposed peak discharge, Outfall 01 (l/s)
1 in 1 year	0.8	≤ 0.6 (see note)
1 in 2 year	0.9	0.6
1 in 30 year	2.0	0.6
1 in 100 year	2.5	1.0
1 in 100 year + 40% CC	2.5	1.5

Table 4-6: Comparison of proposed discharge with greenfield runoff rates

The modelled network performs as follows:

- For the 1 in 2 year event, no flooding occurs. Manholes S11, S12 and S13 on the conference centre branch surcharge but remain below cover level.
- For the 1 in 30, 1 in 100 and 1 in 100 year plus 40% climate change events, the model predicts surcharge at manhole S10.
- No flooding is predicted at any other location for any event. The residential block branch (S14 to S16) does not flood; S14 surcharges marginally in the 1 in 100 year plus 40% climate change event.

Outfall 02 receives runoff from 0.013 ha of external hardstanding via gully S9, together with existing flows from the retained campus buildings carried by the diversion pipe. This discharge is unrestricted, as at present. The peak flow from gully S9 ranges from 1.7 l/s (1 in 2 year) to 6.5 l/s (1 in 100 year plus 40% climate change).

4.4 Surface Water Quality

CIRIA C753 The SuDS Manual (2015) recommends the Simple Index Approach for assessing the water quality treatment required for discharges to surface waters. Under this approach, the pollution hazard index of each land use (Table 26.2) is compared with the total mitigation index of the SuDS components proposed (Tables 26.3 and 26.4). The pollution hazard indices for the development are given in Table 4-7.

Land use	Pollution hazard level	Total suspended solids	Metals	Hydrocarbons
Residential roof (residential block)	Very low	0.2	0.2	0.05
Other roof (conference centre)	Low	0.3	0.2	0.05
Low-traffic external hardstanding / car parking (gully S9)	Low	0.5	0.4	0.4

Table 4-7: Pollution hazard indices (CIRIA C753 Table 26.2)

For residential roofs, CIRIA C753 requires only the removal of gross solids and sediment. This will be provided by roof outlets with leaf guards and by catchpit chambers with sumps upstream of the attenuation tank.

Cellular storage provides attenuation but is not credited with a pollution mitigation index. To provide the treatment required for the conference centre roof and the hardstanding draining to gully S9, the following measures are included in the scheme:

Measure	Location	Purpose
Roof outlets with leaf guards; rainwater pipes connected via rodding access	All roofs	Removal of gross solids at source
Catchpit chambers with 300 mm sumps	S13 and S16 (upstream of tank inlets)	Removal of sediment before the tank; protects storage and flow control
Trapped gully with proprietary filter insert	S9	Treatment of hardstanding runoff before discharge to Outfall 02
Geotextile wrap to cellular tank	Attenuation tank	Prevents ingress of fines and protects storage volume

Table 4-8: Water quality treatment measures

4.5 Flow Paths and Flood Exceedance Routes

Exceedance flow routes are shown on drawings 9482-NDA-ZZ-XX-DR-C-1501 and 1502. External levels are to be designed so that overland flows are directed away from building entrances and towards landscaped areas and the existing campus external areas, following the existing fall of the site towards the south and east.

To protect the buildings from exceedance flows and from a blockage of the flow control, the following measures are to be adopted:

- Finished floor levels of both buildings to be set a minimum of 150 mm above adjacent external ground levels, with external levels falling away from thresholds.
- The Hydro-Brake chamber (S20) to be provided with the manufacturer's pull-cord bypass door, so the tank can be drained down if the control becomes blocked.
- The tank cover level (165.645 mAOD) sits 0.94 m above the maximum design water level, so there is additional freeboard within the tank and its surrounding chambers before any surface flooding occurs from the tank.

4.6 Drawings and Construction Details

Details of the drainage proposals are provided on the following drawings, which accompany this report:

- 9482-NDA-ZZ-XX-DR-C-1501 Drainage Layout (Sheet 1 of 2).
- 9482-NDA-ZZ-XX-DR-C-1502 Drainage Layout (Sheet 2 of 2).
- 9482-NDA-XX-XX-DR-C-1510 and 9482-NDA-XX-XX-DR-C-1511 Standard Construction Details: Drainage.

5 Compliance with Condition 10

Table 5-1 summarises how the surface water drainage scheme responds to each requirement of Note 4 attached to Condition 10.

Note 4 requirement	Response
SuDS techniques with sufficient treatment trains to maintain or improve existing water quality	Cellular attenuation with catchpits, a proprietary treatment device and a filter gully insert (Section 4.4).
Limitation of runoff to equivalent greenfield rates	Discharge from the new buildings limited by Hydro-Brake to a maximum of 0.9 l/s, below greenfield rates for all events (Table 4-6).
Accommodation of runoff on site up to the 1 in 100 year plus climate change event	148m³ stored in the tank at 1 in 100 year + 40% CC. Flooding at S10 to be resolved (Section 4.3).
Drainage calculations and modelled 1 in 1, 1 in 30 and 1 in 100 year + CC scenarios	InfoDrainage results for 1 in 2, 1 in 30, 1 in 100 and 1 in 100 year + 40%.
Construction details, cross sections, long sections, headwall details, pipe protection	Drainage layouts and standard details (Section 4.6). Long sections and specific details to follow.

Table 5-1: Response to Note 4

6 Surface Water During Construction

This section sets out how surface water will be managed during construction to prevent any increase in flood risk, maintain the existing runoff quality and protect the permanent drainage system, in accordance with Condition 11 and Note 5. The Principal Contractor will be responsible for implementing these measures and will nominate a responsible person for their inspection and maintenance. The measures will be incorporated into the Construction Environmental Management Plan.

6.1 Construction Sequence

The drainage works will be sequenced as follows:

1. Before demolition, locate and confirm the levels of existing surface water drains, particularly where marked “to be confirmed” on the drawings. Existing drains serving the retained buildings must remain operational throughout the works.
2. Construct the 150 mm diameter diversion pipe (S1 to S8) and connect it to the existing network before the existing drains within the residential block footprint are taken out of service.
3. Demolish the existing buildings. Cap redundant connections securely to prevent silt-laden water entering the retained network.
4. Construct the attenuation tank, flow control chamber S20 and outfall to S22 early in the programme. Keep the tank inlets plugged until the upstream catchment is complete and stabilised.
5. Construct the carrier drains and roof connections as the buildings progress, with temporary blanking of open pipe ends.
6. On completion, remove the temporary plugs, jet and CCTV survey the new network, clean catchpits and the tank, and commission the Hydro-Brake.

6.2 Temporary Drainage and Attenuation

- Excavations and formation levels will be graded to fall to temporary sumps, so that runoff is collected rather than allowed to flow uncontrolled across the site.
- Water collected in excavations and sumps will be pumped to a settlement tank or proprietary silt treatment unit before discharge to the existing surface water network. Pumped discharge will be controlled so that it does not exceed the existing runoff rate from the works area, and no silt-laden water will be discharged.

- Temporary bunds or cut-off drains will be used where necessary to prevent runoff from the works area reaching the retained campus buildings or neighbouring land.
- No infiltration features are proposed, so no protection of infiltration areas is required.

6.3 Pollution Prevention and Treatment

- Existing gullies and manholes within and adjacent to the works will be protected with gully filter bags or covers, and silt fencing will be installed around exposed earthworks where runoff could reach drains.
- Stockpiles will be located at least 10 m from gullies and manholes and covered or seeded if left for extended periods.
- Fuels and chemicals will be stored in bunded containers on an impermeable base away from drains. Refuelling will take place in a designated area using drip trays.
- Concrete washout will be confined to a lined, designated area. Wash water will not enter any drain.
- Spill kits will be kept on site and at refuelling points, and site operatives will be briefed on their use.

6.4 Protection of the Permanent Drainage System

- The cellular tank will be wrapped in geotextile and its inlets kept plugged until upstream construction is complete, preventing silt ingress.
- An exclusion zone will be maintained over the attenuation tank to prevent construction plant and stockpiles loading the tank beyond its design cover and loading class.
- Open pipe ends and chambers will be capped or covered at the end of each working day.
- The Hydro-Brake unit will be installed or uncovered only once the upstream network is clean, to avoid blockage by construction debris.

6.5 Inspection and Monitoring

The nominated person will inspect all temporary drainage and pollution control measures daily and after every significant rainfall event and will record the inspections in the site diary. Defective silt fences, gully protection or settlement facilities will be repaired immediately. Any pollution incident will be dealt with in accordance with Section 7.3 and reported to the Environment Agency

7 Maintenance Management

7.1 Responsibility

The surface water drainage system will remain private and will not be offered for adoption. The Islamic Foundation, as site owner, will be responsible for the long-term management and maintenance of the system for the lifetime of the development Maintenance will be undertaken by a competent drainage contractor appointed by the owner. A record of all inspections, maintenance activities and remedial works will be kept and made available to the Local Planning Authority or Lead Local Flood Authority on request.

The activities in the following tables are based on CIRIA C753 The SuDS Manual. Inspection frequencies should be reviewed after the first year of operation, based on observed silt accumulation.

7.2 Maintenance Schedules

Roof Outlets, Gutters and Rainwater Pipes

Maintenance type	Required action	Suggested frequency
Regular maintenance	Inspect roof outlets, gutters and leaf guards; remove leaves and debris.	Six-monthly, and after autumn leaf fall
	Check rodding access points and downpipe connections for damage or blockage.	Annually
Remedial actions	Repair or replace damaged outlets, guards or pipework.	As required

Table 7-1: Roof Outlets, Gutters and Rainwater Pipes maintenance

Carrier Drains and Manholes

Maintenance type	Required action	Suggested frequency
Regular maintenance	Check for signs of flooding or ponding around manholes that could indicate a blockage or poor pipework condition. Lift covers and inspect chambers.	Monthly for the first year, then six-monthly
	Jet and rod pipework as required. If blockages are found, undertake a CCTV survey to check condition and repair as necessary.	Annually
Monitoring	CCTV survey of the full network.	At handover, then every 5 years

Table 7-2: Carrier Drains and Manholes maintenance

Catchpits and Gullies

Maintenance type	Required action	Suggested frequency
Regular maintenance	Inspect for blockages and silt accumulation.	Quarterly
	Remove silt from catchpit and gully sumps; clean filter inserts.	Annually, or when sump is 50% full
Remedial actions	Replace gully filter inserts in accordance with manufacturer's recommendations.	As required

Table 7-3: Catchpits and Gullies maintenance

Proprietary Treatment Device

Maintenance type	Required action	Suggested frequency
Regular maintenance	Inspect and remove trapped sediment, floatables and oil in accordance with the manufacturer's operation and maintenance manual.	Six-monthly, or as specified by the manufacturer
Remedial actions	Replace filter media or components.	As specified by the manufacturer

Table 7-4: Proprietary Treatment Device maintenance

Cellular Attenuation Tank

Maintenance type	Required action	Suggested frequency
Regular maintenance	Inspect inlets, outlets and vents and identify any part of the system not operating correctly.	Monthly for 3 months after installation, then annually
	Remove debris from the catchment surface where it may cause risks to performance.	Monthly
	Remove sediment from pre-treatment structures (catchpits) upstream of the tank.	Annually, or as required
Remedial actions	Repair or rehabilitate inlets, outlets and vents.	As required
Monitoring	Survey inside the tank (via inspection / access chambers) for sediment build-up and remove if necessary.	Every 5 years, or as required

Table 7-5: Cellular Attenuation Tank maintenance

Hydro-Brake Flow Control (S20)

Maintenance type	Required action	Suggested frequency
Regular maintenance	Inspect the flow control and chamber; remove any debris or silt from the inlet and sump.	Monthly for the first 3 months, then six-monthly
	Operate the pull-cord bypass door to confirm it is free to move and reset.	Annually
Remedial actions	Clear blockages; if the tank is surcharged due to blockage, use the bypass to drain down under controlled conditions.	As required

Table 7-6: Hydro-Brake Flow Control (S20) maintenance

7.3 Pollution Incident Procedure

In accordance with, the following procedure is to be implemented if a pollution incident occurs within the development, for example a fuel or chemical spillage:

1. Make the area safe and, where it is safe to do so, stop the source of the spillage.
2. Contain the spillage using the site spill kit. Place drain blockers over affected gullies and manholes and block the outlet from S20 or S22 to prevent pollutants leaving the site.
3. Arrange for a licensed waste contractor to remove contaminated water, silt and absorbent materials from the affected chambers, catchpits, treatment device and tank by tanker, for disposal at a licensed facility.
4. Jet and clean the affected parts of the system, CCTV survey to confirm it is clean, and replace any contaminated filter media.
5. Record the incident, the actions taken and any lessons learned in the maintenance log and review the pollution prevention measures.

8 Summary of Design

This report presents the surface water drainage design for the redevelopment of the Markfield Conference Centre and supports the discharge of Conditions 10, 11, 12 and 13 of planning permission 20/00887/FUL.

Infiltration is not considered viable given the low-permeability mudstone and till geology and the proximity of the storage to buildings. There is no accessible watercourse, so the attenuated runoff will be discharged to the existing 150 mm diameter surface water sewer east of the conference centre.

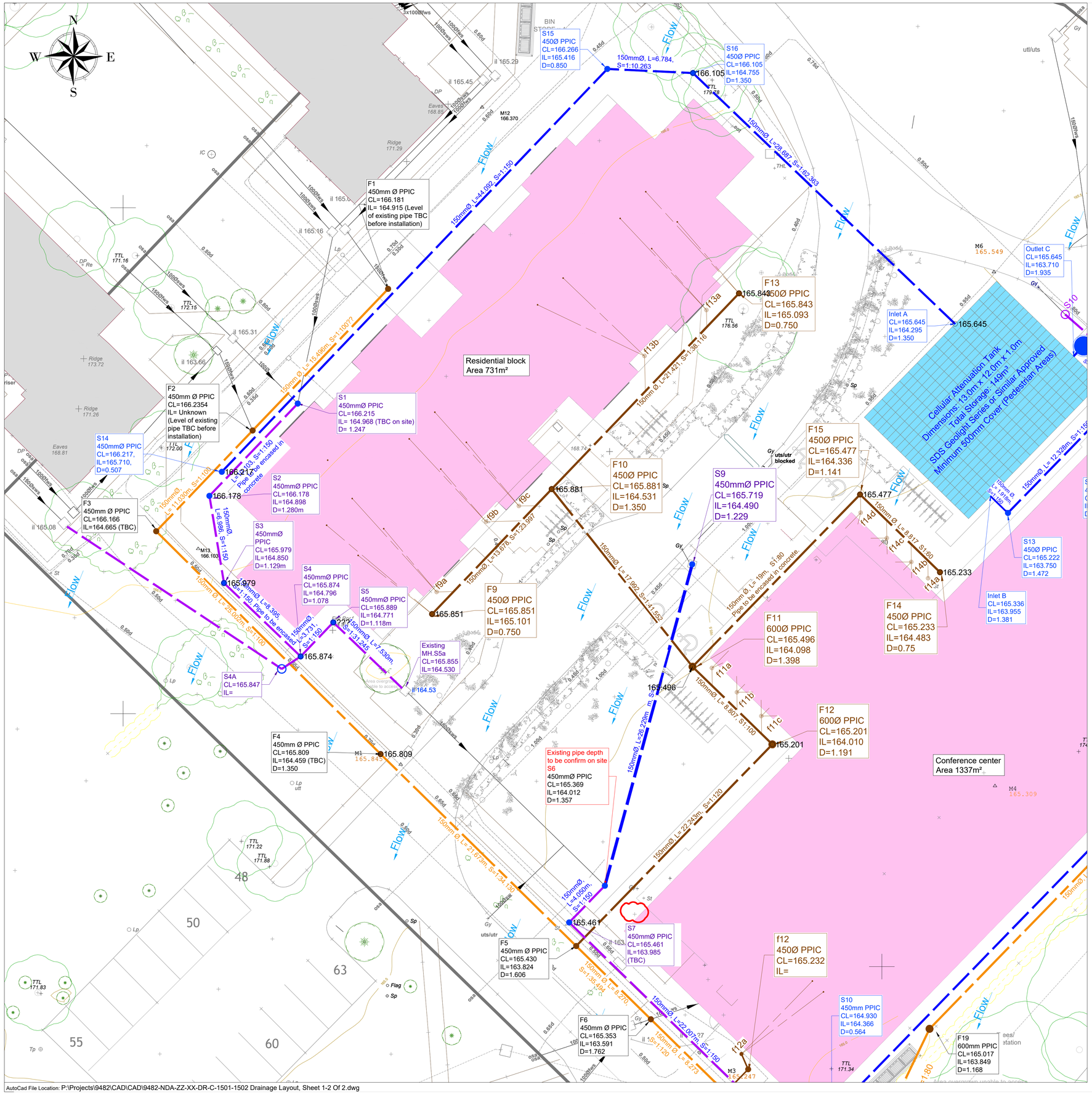
Runoff from the roofs of the new conference centre and residential block (0.207 ha) is attenuated in a 149 m³ cellular storage tank. Discharge is restricted by a Hydro-Brake vortex flow control with a design flow of 1.0 l/s, equal to the greenfield QBAR. The modelled peak discharge is 0.6 l/s for the 1 in 2 year event and 1.0 l/s for the 1 in 100 year plus 40% climate change event, below the greenfield runoff rate for every return period.

Water quality will be managed through roof outlet guards, catchpits, a proprietary treatment device and a filter gully insert. Surface water during construction will be managed through sequencing, temporary sumps, settlement and pollution prevention measures. A maintenance schedule and pollution incident procedure have been set out for the owner to implement for the lifetime of the development.

9 Appendices

9.1 Appendix A – Drainage Layout Drawings

Reduced copies of drawings 9482-NDA-ZZ-XX-DR-C-1501 and 9482-NDA-ZZ-XX-DR-C-1502 are reproduced below for reference. The full-size A1 drawings are submitted separately.



AutoCad File Location: P:\Projects\9482\CAD\CAD\9482-NDA-ZZ-XX-DR-C-1501-1502 Drainage Layout, Sheet 1-2 Of 2.dwg

Drainage Notes

1. The Contractor shall verify all dimensions and existing conditions on site prior to commencing the works. Any discrepancies noted on site are to be reported to the Engineer immediately.
2. For details of ground conditions refer to Ground Investigation Report. The Engineer shall be immediately notified of any variations to the reported ground conditions.
3. All drainage works are to be undertaken in accordance with Sewers for Adoption (latest edition) and the Specification for Highway Works (SHW).
4. Dimensions marked 'dimensions to be site checked' are subject to confirmation by the contractor prior to commencement of construction.
5. Cover levels shown are approximate, contractor to position covers level with adjacent proposed levels.
6. All gully connection pipes to be 150mm diameter, connected to the carrier drain by a 45° oblique angled junction for pipes 300mm diameter and less.
7. The Contractor is to undertake a CCTV survey of all new drainage works immediately prior to practical completion.
8. Temporary works associated with the construction of the works shall be the responsibility of the Contractor.
9. The convension of the sub-stack, svp and air admittance valves must be confirmed with M&E.
10. Drawing to be read in conjunction with drawing number 9482-NDA-XX-XX-DR-C-1510 & 1511 Standard Construction Details - Drainage.

Drainage Key:

Surface Water:

- 150mm diameter surface water diversion pipe
- 150mm diameter surface water pipe from proposed building
- 1500mm diameter Hydrobrake manhole
- 1200mm diameter surface water manhole
- 1050mm diameter surface water manhole
- 600mm diameter PPIC
- 450mm diameter PPIC
- Rodding eye
- 150mmØ Rainwater down pipe
- Cellular sttenuation tank
- Flow — Flood exceedance flow path

Foul Water:

- 150mm Ø foul diversion pipe
- 150mm Ø foul pipe connection from proposed building
- 110mm diameter foul connection
- 1200mm Ø manhole
- 300mm Ø PPIC
- 450mmØ PPIC
- 600mmØ PPIC Type D
- Pop-up in building

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General Notes:

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3. Conflicting information shown on the NDA drawings or discrepancies between the information given by NDA and that provided by others must be referred to NDA before work proceeds.
4. Dimensions must not be scaled from this drawing.
5. Dimensions marked 'dimension to be site checked' are subject to confirmation by site measurement before construction proceeds.
6. Subcontractor surveys, such as for the purposes of steelwork installation, take precedence over `site dimensions' indicated on this drawing. All surveys should ensure an accurate fit of components.
7. Temporary works associated with the construction of the project shall be the responsibility of the Principal Contractor.
8. Where any temporary works or scaffolding are required the Principal Contractor shall appoint a competent and suitably experienced Temporary Works Coordinator (TWC). Refer to BS 5975 for guidance on temporary works and the role of a TWC.
9. Calculations and drawings of all Contractor designed structural items associated with NDA's design responsibilities shall be submitted to the Engineer for comment at least 10 days prior to manufacture. Any comments made by NDA do not absolve the Contractor of his design responsibilities.
10. The use of any proprietary products shown on this drawing or in any associated specifications is based solely on the data made available to Norder by the manufacturer and/or supplier, and Norder has made no detailed check of the proprietary aspects of that product which remain the sole liability of the manufacturer and/or product supplier. All proprietary products must be installed in accordance with the manufacturer's requirements.
12. Design and drawing information is based on the Mapmatic topographical survey drawing number 3527 rev 1 and Utility survey drawing number 3527B rev 0. NDA does not accept any liability for any inaccuracies this information may contain.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

The Contractor shall comply with Health and Safety, Construction Design and Management (CDM) Regulations, 2015.

Please refer to the health and safety file for a full list of the hazards associated with the work - the following are the most significant items to be aware of.

Construction

1. The Contractor is to identify all existing services prior to the commencement of construction. Refer to the surveys, utilities plans and site investigation reports for position of existing services.
2. For detailed information on hazards, refer to risk assessment for the project.

Environmental

1. Consideration given to ground conditions. Contractor to review geotechnical report prior to undertaken excavation works.

Work can only be carried out by suitably trained and briefed personnel.

REV	DATE	AMENDMENT	DRW	CHK
P01	16/10/26	Preliminary	WM	AR

CLIENT

THE ISLAMIC FOUNDATION

PROJECT

Conference Centre & Residence

DRAWING TITLE

Drainage Layout (Sheet 1 of 2)

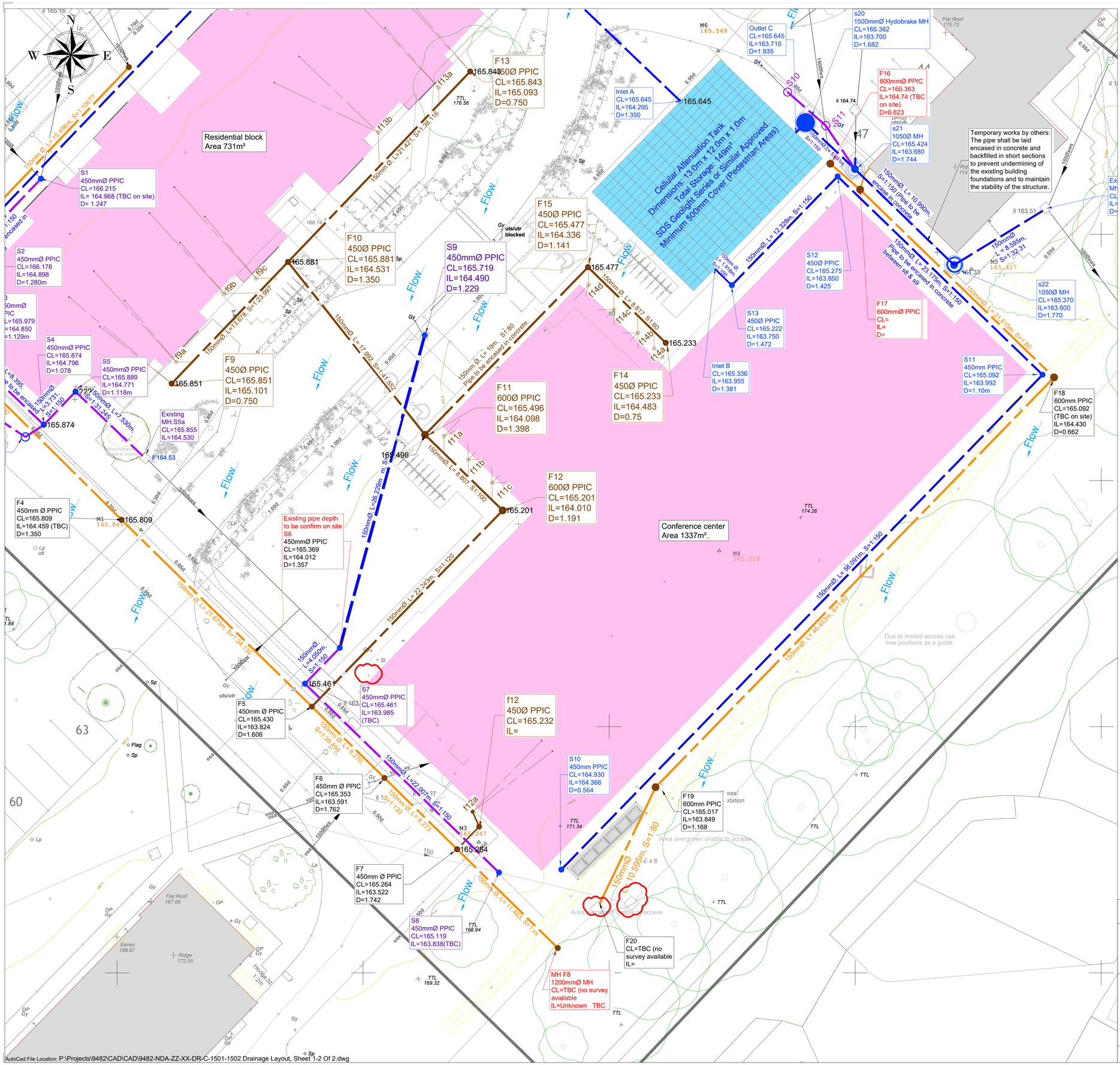
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SCALE	SHEET SIZE	NDA REF
Scale 1 : 150	A1	9482

SUITABILITY

S3 - Suitable for Review & Comment

DRAWING NO.	REV
9482-NDA-ZZ-XX-DR-C-1501	P01



AutoCad File Location: P:\Projects\9482\CAD\CAD\9482-NDA-ZZ-XX-DR-C-1501-1502 Drainage Layout, Sheet 1-2 Of 2.dwg

Drainage Notes

1. The Contractor shall verify all dimensions and existing conditions on site prior to commencing the works. Any discrepancies noted on site are to be reported to the Engineer immediately.
2. For details of ground conditions refer to Ground Investigation Report. The Engineer shall be immediately notified of any variations to the reported ground conditions.
3. All drainage works are to be undertaken in accordance with Sewers for Adoption (latest edition) and the Specification for Highway Works (SHW).
4. Dimensions marked 'dimensions to be site checked' are subject to confirmation by the contractor prior to commencement of construction.
5. Cover levels shown are approximate, contractor to position covers level with adjacent proposed levels.
6. All gully connection pipes to be 150mm diameter, connected to the carrier drain by a 45° oblique angled junction for pipes 300mm diameter and less.
7. The Contractor is to undertake a CCTV survey of all new drainage works immediately prior to practical completion.
8. Temporary works associated with the construction of the works shall be the responsibility of the Contractor.
9. Drawing to be read in conjunction with drawing number 9482-NDA-XX-XX-DR-C-1510 & 1511 Standard Construction Details - Drainage.

Drainage Key:

Surface Water:

- 150mm diameter surface water diversion pipe
- 150mm diameter surface water pipe from proposed building
- 1500mm diameter Hydrobrake manhole
- 1200mm diameter surface water manhole
- 1050mm diameter surface water manhole
- 600mm diameter PPIC
- 450mm diameter PPIC
- Rodding eye
- 150mmØ Rainwater down pipe
- Cellular sttenuation tank
- Flow Flood exceedance flow path

Foul Water:

- 150mm Ø foul diversion pipe
- 150mm Ø foul pipe connection from proposed building
- 110mm diameter foul connection
- 1200mm Ø manhole
- 300mm Ø PPIC
- 450mmØ PPIC
- 600mmØ PPIC Type D
- Pop-up in building

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Please refer to the health and safety file for a full list of the hazards associated with the work - the following are the most significant items to be aware of.

Construction

1. The Contractor is to identify all existing services prior to the commencement of construction. Refer to the surveys, utilities plans and site investigation reports for position of existing services.
2. For detailed information on hazards, refer to risk assessment for the project.

Environmental

1. Consideration given to ground conditions. Contractor to review geotechnical report prior to undertaken excavation works.

Work can only be carried out by suitably trained and briefed personnel.

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7. Temporary works associated with the construction of the project shall be the responsibility of the Principal Contractor.
8. Where any temporary works or scaffolding are required the Principal Contractor shall appoint a competent and suitably experienced Temporary Works Coordinator (TWC). Refer to BS 5975 for guidance on temporary works and the role of a TWC.
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REV	DATE	AMENDMENT	DRW	CHK
P01	16/10/26	Preliminary	WM	AR

CLIENT

THE ISLAMIC FOUNDATION

PROJECT

Conference Centre & Residence

DRAWING TITLE

Drainage Layout Sheet 2 of 2

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SCALE	SHEET SIZE	NDA REF
Scale 1 : 150	A1	9482

SUITABILITY

S2 - Suitable for Information

DRAWING NO.	REV
9482-NDA-ZZ-XX-DR-C-1502	P01

9.2 Appendix B – Greenfield Runoff Rate Estimation

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

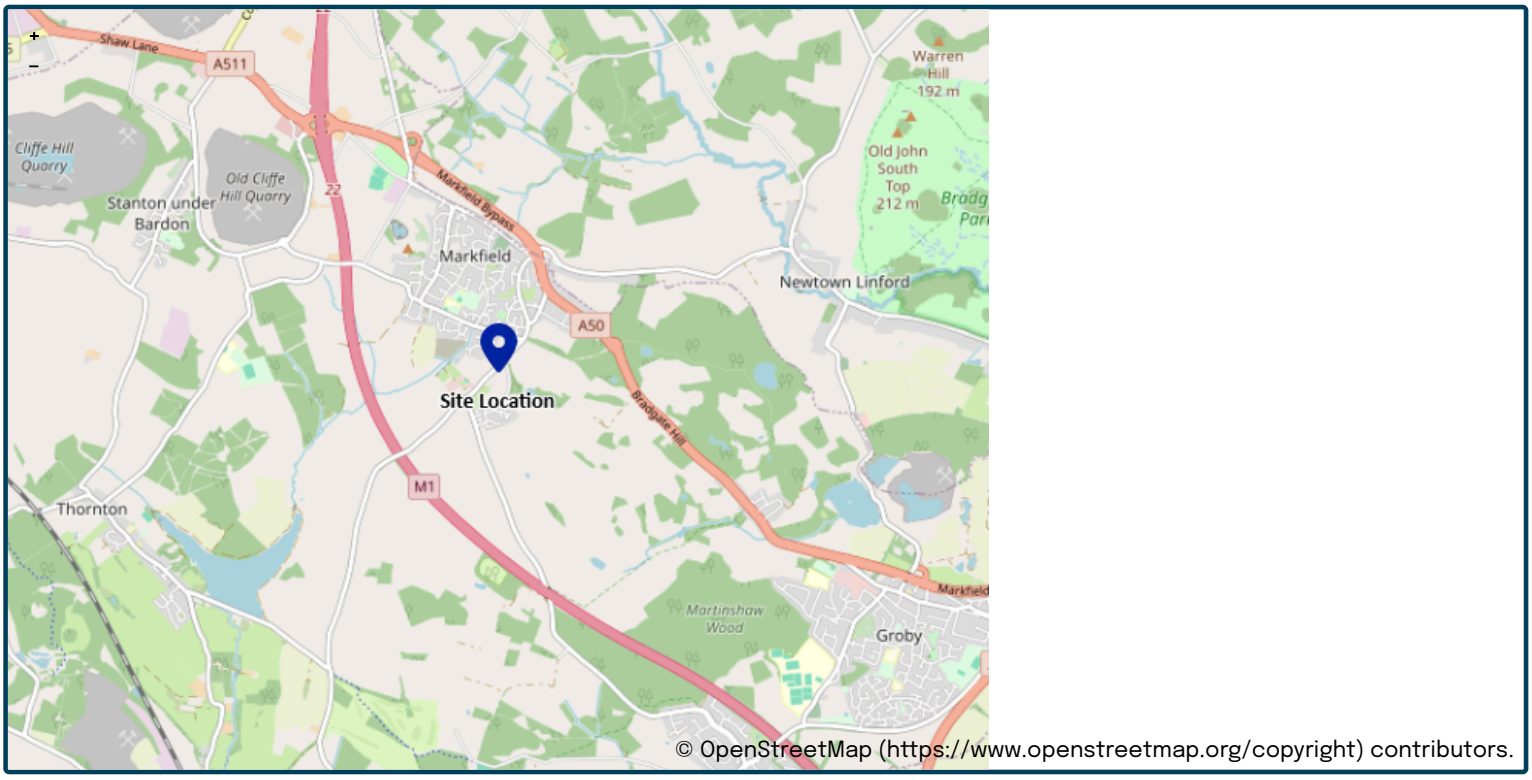
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	03/10/2026
Calculated by	
Reference	
Model version	2.2.3

Location

Site name	Markfield Islamic Centre
Site location	Markfield



Site easting (British National Grid)	449339
Site northing (British National Grid)	309039

Site details

Total site area (ha)	0.2067 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	693 mm		693
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	1 l/s		

Growth curve factors

	My value		Map value
Hydrological region	4		4
1 year growth factor	0.83		
2 year growth factor	0.89		
10 year growth factor	1.49		
30 year growth factor	2		
100 year growth factor	2.57		
200 year growth factor	3.04		

Results

Method	IH124
Flow rate 1 year (l/s)	0.8 l/s
Flow rate 2 year (l/s)	0.9 l/s
Flow rate 10 years (l/s)	1.5 l/s
Flow rate 30 years (l/s)	2.0 l/s
Flow rate 100 years (l/s)	2.5 l/s
Flow rate 200 years (l/s)	3.0 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

9.3 Appendix C – Hydraulic Calculations (InfoDrainage)

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Inflows Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		



Catchment Area

Type : Catchment Area

Area (ha)	0.039

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	8
Percentage Impervious (%)	100



Catchment Area (1)

Type : Catchment Area

Area (ha)	0.034

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	8
Percentage Impervious (%)	100

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Inflows Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		



Catchment Area (2)

Type : Catchment Area

Area (ha)	0.07

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	8
Percentage Impervious (%)	100



Catchment Area (3)

Type : Catchment Area

Area (ha)	0.064

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	8
Percentage Impervious (%)	100

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Inflows Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		



Catchment Area (4)

Type : Catchment Area

Area (ha)	0.013

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Junctions Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)	Lock
S14	Manhole	449287.802	309019.099	166.217	0.507	165.710	Circular	1.200	None
S15	Manhole	449318.305	309050.986	166.266	0.850	165.416	Circular	1.200	None
S16	Manhole	449325.035	309050.658	166.105	1.350	164.755	Circular	1.200	None
S20	Manhole	449356.038	309029.108	165.382	1.682	163.700	Circular	1.200	None
S22	Manhole	449368.053	309017.460	165.370	1.770	163.600	Circular	1.200	None
S10	Manhole	449336.070	308968.416	164.930	0.594	164.336	Circular	1.200	None
S11	Manhole	449375.155	309008.558	165.092	1.100	163.992	Circular	1.200	None
S12	Manhole	449358.604	309024.652	165.275	1.425	163.850	Circular	1.200	None
S13	Manhole	449349.964	309015.898	165.222	1.472	163.750	Circular	1.200	None
OUTFALL 01	Manhole	449375.375	309022.025	165.580	2.070	163.510	Circular	1.200	None
S9	Manhole	449324.829	309011.826	165.719	1.229	164.490	Circular	1.200	None
S6	Manhole	449318.121	308986.362	165.369	1.357	164.012	Circular	1.200	None
S7	Manhole	449315.304	308983.504	165.461	1.476	163.985	Circular	1.200	None
S8	Manhole	449331.033	308968.164	165.119	1.281	163.838	Circular	1.200	None
OUTFALL 02	Manhole	449342.125	308965.652	165.119	1.419	163.700	Circular	1.200	None

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by:	Checked by:	Approved By:
	IO	AR	PL
Report Details: Type: Junctions Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
S14	Inlet	Catchment Area	(None)	No Restriction
S15	Inlet	Pipe Catchment Area (1)	(None)	No Restriction
S16	Inlet	Pipe (1)	(None)	No Restriction
S20	Inlet	Pipe (8)	(None)	No Restriction
S22	Inlet	Pipe (2)	(None)	No Restriction
S10	Inlet	Catchment Area (2)	(None)	No Restriction
S11	Inlet	Pipe (4)	(None)	No Restriction
S12	Inlet	Pipe (5)	(None)	No Restriction
S13	Inlet	Pipe (6)	(None)	No Restriction
	Inlet (1)	Catchment Area (3)	(None)	No Restriction
OUTFALL 01	Inlet	Pipe (3)	(None)	No Restriction
S9	Inlet	Catchment Area (4)	(None)	No Restriction
S6	Inlet	Pipe (10)	(None)	No Restriction
S7	Inlet	Pipe (11)	(None)	No Restriction
S8	Inlet	Pipe (12)	(None)	No Restriction
OUTFALL 02	Inlet	Pipe (13)	(None)	No Restriction

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
S14	Outlet	Pipe	Free Discharge
S15	Outlet	Pipe (1)	Free Discharge
S16	Outlet	Pipe (7)	Free Discharge
S20	Outlet	Pipe (2)	Free Discharge
S22	Outlet	Pipe (3)	Free Discharge
S10	Outlet	Pipe (4)	Free Discharge
S11	Outlet	Pipe (5)	Free Discharge
S12	Outlet	Pipe (6)	Free Discharge
S13	Outlet	Pipe (9)	Free Discharge
S9	Outlet	Pipe (10)	Free Discharge
S6	Outlet	Pipe (11)	Free Discharge
S7	Outlet	Pipe (12)	Free Discharge
S8	Outlet	Pipe (13)	Free Discharge



Cellular Storage

Type : Cellular Storage

Dimensions

Exceedance Level (m)	165.645
Depth (m)	1.000
Base Level (m)	163.710
Number of Crates Long	13
Number of Crates Wide	12
Number of Crates High	5
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	1
Crate Height (m)	0.2
Total Volume (m³)	149.135

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Pipe (7)
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

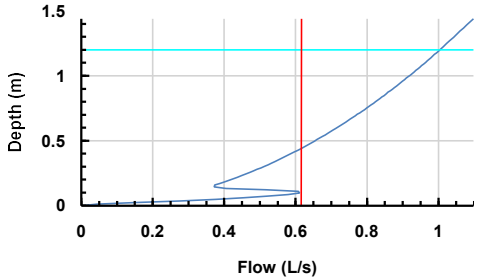
Inlet Type	Point Inflow
Incoming Item(s)	Pipe (9)
Bypass Destination	(None)
Capacity Type	No Restriction

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Outlets

Outlet

Outgoing Connection	Pipe (8)
Outlet Type	Hydro-Brake®
Invert Level (m)	163.710
Design Depth (m)	1.200
Design Flow (L/s)	1.0
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐
Unit Reference	CHE-0043-1000-1200-1000



Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	S14		Time of Concentration	0.039	100	0	100	0.039
Catchment Area (1)	S15		Time of Concentration	0.034	100	0	100	0.034
Catchment Area (2)	S10		Time of Concentration	0.070	100	0	100	0.070
Catchment Area (3)	S13		Time of Concentration	0.064	100	0	100	0.064
Catchment Area (4)	S9		Time of Concentration	0.013	100	0	100	0.013
TOTAL		**0.0**		**0.220**				**0.220**

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by:	Checked by:	Approved By:
	IO	AR	PL
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.200
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:X)	Max. Slope (1:X)
100	0.00	0.00
150	0.00	0.00

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
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	IO	AR	PL
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Manhole Options

Apply Offset	☐

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Rainfall Analysis Criteria	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FSR01: 2 years: +0 %: 30 mins: Winter	0.04	4.6	4.301
Catchment Area (1)	FSR01: 2 years: +0 %: 30 mins: Winter	0.03	4.0	3.680
Catchment Area (2)	FSR01: 2 years: +0 %: 30 mins: Winter	0.07	8.2	7.624
Catchment Area (3)	FSR01: 2 years: +0 %: 30 mins: Winter	0.06	7.6	7.003
Catchment Area (4)	FSR01: 2 years: +0 %: 15 mins: Winter	0.01	2.3	1.078

Project:	Date:		
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Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FSR01: 30 years: +0 %: 30 mins: Winter	0.04	8.9	8.203
Catchment Area (1)	FSR01: 30 years: +0 %: 30 mins: Winter	0.03	7.6	7.028
Catchment Area (2)	FSR01: 30 years: +0 %: 30 mins: Winter	0.07	15.7	14.538
Catchment Area (3)	FSR01: 30 years: +0 %: 30 mins: Winter	0.06	14.4	13.350
Catchment Area (4)	FSR01: 30 years: +0 %: 15 mins: Winter	0.01	4.4	2.041

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
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Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FSR01: 100 years: +0 %: 30 mins: Winter	0.04	11.6	10.735
Catchment Area (1)	FSR01: 100 years: +0 %: 30 mins: Winter	0.03	9.9	9.191
Catchment Area (2)	FSR01: 100 years: +0 %: 30 mins: Winter	0.07	20.6	19.020
Catchment Area (3)	FSR01: 100 years: +0 %: 30 mins: Winter	0.06	18.9	17.478
Catchment Area (4)	FSR01: 100 years: +0 %: 15 mins: Winter	0.01	5.7	2.652

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Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FSR01: 100 years: +40 %: 30 mins: Winter	0.04	16.3	15.022
Catchment Area (1)	FSR01: 100 years: +40 %: 30 mins: Winter	0.03	13.9	12.877
Catchment Area (2)	FSR01: 100 years: +40 %: 30 mins: Winter	0.07	28.8	26.636
Catchment Area (3)	FSR01: 100 years: +40 %: 30 mins: Winter	0.06	26.5	24.468
Catchment Area (4)	FSR01: 100 years: +40 %: 15 mins: Winter	0.01	8.0	3.714

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
S14	FSR01: 2 years: +0 %: 15 mins: Winter	166.217	165.710	165.772	0.062	4.6	0.070	0.000	4.6	3.305	OK
S15	FSR01: 2 years: +0 %: 15 mins: Winter	166.266	165.416	165.456	0.040	8.5	0.045	0.000	8.5	6.141	OK
S16	FSR01: 2 years: +0 %: 15 mins: Winter	166.105	164.755	164.813	0.058	8.5	0.066	0.000	8.5	6.156	OK
S20	FSR01: 2 years: +0 %: 240 mins: Winter	165.382	163.700	163.722	0.022	0.6	0.025	0.000	0.6	10.075	OK
S22	FSR01: 2 years: +0 %: 30 mins: Summer	165.370	163.600	163.619	0.019	0.6	0.022	0.000	0.6	1.302	OK
S10	FSR01: 2 years: +0 %: 15 mins: Winter	164.930	164.336	164.420	0.084	8.1	0.094	0.000	8.1	5.879	OK
S11	FSR01: 2 years: +0 %: 15 mins: Winter	165.092	163.992	164.077	0.085	8.1	0.097	0.000	8.1	5.835	OK
S12	FSR01: 2 years: +0 %: 960 mins: Winter	165.275	163.850	163.984	0.134	0.9	0.152	0.000	0.9	20.103	OK
S13	FSR01: 2 years: +0 %: 960 mins: Winter	165.222	163.750	163.984	0.234	1.7	0.265	0.000	1.7	38.396	Surcharged
OUTFALL 01	FSR01: 2 years: +0 %: 30 mins: Summer	165.580	163.510	163.529	0.019	0.6	0.000	0.000	0.6	1.302	OK
S9	FSR01: 2 years: +0 %: 15 mins: Winter	165.719	164.490	164.521	0.031	2.3	0.035	0.000	2.2	1.079	OK
S6	FSR01: 2 years: +0 %: 15 mins: Winter	165.369	164.012	164.052	0.040	2.2	0.046	0.000	2.0	1.072	OK
S7	FSR01: 2 years: +0 %: 15 mins: Winter	165.461	163.985	164.023	0.038	2.0	0.043	0.000	1.8	1.068	OK
S8	FSR01: 2 years: +0 %: 15 mins: Winter	165.119	163.838	163.868	0.030	1.8	0.034	0.000	1.6	1.058	OK
OUTFALL 02	FSR01: 2 years: +0 %: 15 mins: Winter	165.119	163.700	163.729	0.029	1.6	0.000	0.000	1.6	1.058	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
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Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
S14	FSR01: 30 years: +0 %: 15 mins: Winter	166.217	165.710	165.799	0.089	8.7	0.101	0.000	8.7	6.284	OK
S15	FSR01: 30 years: +0 %: 15 mins: Winter	166.266	165.416	165.473	0.057	16.1	0.064	0.000	16.1	11.669	OK
S16	FSR01: 30 years: +0 %: 15 mins: Winter	166.105	164.755	164.836	0.081	16.1	0.092	0.000	16.1	11.668	OK
S20	FSR01: 30 years: +0 %: 960 mins: Winter	165.382	163.700	163.723	0.023	0.6	0.026	0.000	0.6	57.776	OK
S22	FSR01: 30 years: +0 %: 960 mins: Winter	165.370	163.600	163.620	0.020	0.6	0.022	0.000	0.6	57.742	OK
S10	FSR01: 30 years: +0 %: 15 mins: Winter	164.930	164.336	164.770	0.434	15.4	0.491	0.000	14.6	11.039	Flood Risk
S11	FSR01: 30 years: +0 %: 15 mins: Winter	165.092	163.992	164.387	0.395	14.6	0.447	0.000	14.0	11.106	Surcharged
S12	FSR01: 30 years: +0 %: 15 mins: Winter	165.275	163.850	164.231	0.381	14.0	0.431	0.000	13.6	10.876	Surcharged
S13	FSR01: 30 years: +0 %: 960 mins: Winter	165.222	163.750	164.229	0.479	2.9	0.542	0.000	2.9	66.357	Surcharged
OUTFALL 01	FSR01: 30 years: +0 %: 960 mins: Winter	165.580	163.510	163.529	0.019	0.6	0.000	0.000	0.6	57.742	OK
S9	FSR01: 30 years: +0 %: 15 mins: Winter	165.719	164.490	164.533	0.043	4.4	0.048	0.000	4.2	2.042	OK
S6	FSR01: 30 years: +0 %: 15 mins: Winter	165.369	164.012	164.070	0.058	4.2	0.066	0.000	3.9	2.034	OK
S7	FSR01: 30 years: +0 %: 15 mins: Winter	165.461	163.985	164.039	0.054	3.9	0.061	0.000	3.7	2.030	OK
S8	FSR01: 30 years: +0 %: 15 mins: Winter	165.119	163.838	163.882	0.044	3.7	0.050	0.000	3.4	2.018	OK
OUTFALL 02	FSR01: 30 years: +0 %: 15 mins: Winter	165.119	163.700	163.742	0.042	3.4	0.000	0.000	3.4	2.018	OK

Project:	Date:		
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Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
S14	FSR01: 100 years: +0 %: 30 mins: Winter	166.217	165.710	165.817	0.107	11.6	0.121	0.000	11.2	10.730	OK
S15	FSR01: 100 years: +0 %: 30 mins: Winter	166.266	165.416	165.483	0.067	21.2	0.076	0.000	21.0	19.919	OK
S16	FSR01: 100 years: +0 %: 15 mins: Winter	166.105	164.755	164.850	0.095	20.9	0.107	0.000	20.9	15.087	OK
S20	FSR01: 100 years: +0 %: 960 mins: Winter	165.382	163.700	163.725	0.025	0.7	0.028	0.000	0.7	67.198	OK
S22	FSR01: 100 years: +0 %: 960 mins: Winter	165.370	163.600	163.621	0.021	0.7	0.024	0.000	0.7	67.159	OK
S10	FSR01: 100 years: +0 %: 15 mins: Winter	164.930	164.336	164.931	0.595	19.9	1.655	0.984	16.2	14.324	Flood
S11	FSR01: 100 years: +0 %: 15 mins: Winter	165.092	163.992	164.543	0.551	16.2	0.623	0.000	16.5	14.433	Surcharged
S12	FSR01: 100 years: +0 %: 960 mins: Winter	165.275	163.850	164.395	0.545	1.8	0.616	0.000	1.8	43.460	Surcharged
S13	FSR01: 100 years: +0 %: 960 mins: Winter	165.222	163.750	164.395	0.645	3.5	0.729	0.000	3.5	84.102	Surcharged
OUTFALL 01	FSR01: 100 years: +0 %: 960 mins: Winter	165.580	163.510	163.531	0.021	0.7	0.000	0.000	0.7	67.159	OK
S9	FSR01: 100 years: +0 %: 15 mins: Winter	165.719	164.490	164.539	0.049	5.7	0.056	0.000	5.5	2.654	OK
S6	FSR01: 100 years: +0 %: 15 mins: Winter	165.369	164.012	164.080	0.068	5.5	0.077	0.000	5.1	2.645	OK
S7	FSR01: 100 years: +0 %: 15 mins: Winter	165.461	163.985	164.048	0.063	5.1	0.071	0.000	4.8	2.641	OK
S8	FSR01: 100 years: +0 %: 15 mins: Winter	165.119	163.838	163.889	0.051	4.8	0.058	0.000	4.5	2.629	OK
OUTFALL 02	FSR01: 100 years: +0 %: 15 mins: Winter	165.119	163.700	163.749	0.049	4.5	0.000	0.000	4.5	2.629	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
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Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
S14	FSR01: 100 years: +40 %: 15 mins: Winter	166.217	165.710	165.886	0.176	15.7	0.199	0.000	15.7	11.431	Surcharged
S15	FSR01: 100 years: +40 %: 15 mins: Winter	166.266	165.416	165.499	0.083	29.2	0.094	0.000	29.2	21.222	OK
S16	FSR01: 100 years: +40 %: 15 mins: Winter	166.105	164.755	164.878	0.123	29.2	0.139	0.000	29.1	21.096	OK
S20	FSR01: 100 years: +40 %: 960 mins: Winter	165.382	163.700	163.727	0.027	0.9	0.030	0.000	0.9	81.836	OK
S22	FSR01: 100 years: +40 %: 960 mins: Winter	165.370	163.600	163.623	0.023	0.9	0.026	0.000	0.9	81.792	OK
S10	FSR01: 100 years: +40 %: 30 mins: Winter	164.930	164.336	164.936	0.600	28.8	6.475	5.803	14.7	26.407	Flood
S11	FSR01: 100 years: +40 %: 960 mins: Winter	165.092	163.992	164.705	0.713	2.8	0.807	0.000	2.7	61.403	Surcharged
S12	FSR01: 100 years: +40 %: 960 mins: Winter	165.275	163.850	164.705	0.855	2.7	0.967	0.000	2.6	60.405	Surcharged
S13	FSR01: 100 years: +40 %: 960 mins: Winter	165.222	163.750	164.705	0.955	5.2	1.080	0.000	5.1	117.298	Surcharged
OUTFALL 01	FSR01: 100 years: +40 %: 960 mins: Winter	165.580	163.510	163.533	0.023	0.9	0.000	0.000	0.9	81.792	OK
S9	FSR01: 100 years: +40 %: 15 mins: Winter	165.719	164.490	164.549	0.059	8.0	0.067	0.000	7.8	3.716	OK
S6	FSR01: 100 years: +40 %: 15 mins: Winter	165.369	164.012	164.096	0.084	7.8	0.095	0.000	7.3	3.706	OK
S7	FSR01: 100 years: +40 %: 15 mins: Winter	165.461	163.985	164.061	0.076	7.3	0.086	0.000	6.9	3.702	OK
S8	FSR01: 100 years: +40 %: 15 mins: Winter	165.119	163.838	163.901	0.063	6.9	0.071	0.000	6.4	3.689	OK
OUTFALL 02	FSR01: 100 years: +40 %: 15 mins: Winter	165.119	163.700	163.759	0.059	6.4	0.000	0.000	6.5	3.689	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Resident Volume

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)
Cellular Storage	FSR01: 2 years: +0 %: 960 mins: Winter	163.984	163.984	163.984	0.274	0.274	0.274	2.6	40.631	0.000	0.000	0.6	44.502

Project:	Date:		
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Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Percentage Available (%)	Status
72.755	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Resident Volume

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)
Cellular Storage	FSR01: 30 years: +0 %: 960 mins: Winter	164.229	164.229	164.229	0.519	0.519	0.519	4.5	76.881	0.000	0.000	0.6	57.848

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Percentage Available (%)	Status
48.448	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Resident Volume

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)
Cellular Storage	FSR01: 100 years: +0 %: 960 mins: Winter	164.395	164.395	164.395	0.685	0.685	0.685	5.6	101.467	0.000	0.000	0.7	67.277

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Percentage Available (%)	Status
31.963	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Resident Volume

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)
Cellular Storage	FSR01: 100 years: +40 %: 960 mins: Winter	164.705	164.705	164.705	0.995	0.995	0.995	8.0	147.462	0.000	0.000	0.9	81.926

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Percentage Available (%)	Status
1.122	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Velocity

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S14	S15	166.217	165.772	0.051	3.305	0.9	0.32	4.6	OK
Pipe (1)	FSR01: 2 years: +0 %: 30 mins: Winter	Pipe	S15	S16	166.266	165.455	0.046	7.976	1.8	0.15	8.4	OK
Pipe (2)	FSR01: 2 years: +0 %: 120 mins: Summer	Pipe	S20	S22	165.382	163.722	0.021	4.378	0.4	0.04	0.6	OK
Pipe (3)	FSR01: 2 years: +0 %: 30 mins: Summer	Pipe	S22	OUTFALL 01	165.370	163.619	0.019	1.302	0.5	0.03	0.6	OK
Pipe (4)	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S10	S11	164.930	164.420	0.085	5.879	0.8	0.58	8.1	OK
Pipe (5)	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S11	S12	165.092	164.077	0.080	5.835	0.8	0.58	8.1	OK
Pipe (6)	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S12	S13	165.275	163.925	0.104	5.805	0.6	0.51	8.1	OK
Pipe (7)	FSR01: 2 years: +0 %: 15 mins: Summer	Pipe	S16	Cellular Storage	166.105	164.811	0.061	5.496	2.0	0.25	7.8	OK
Pipe (8)	FSR01: 2 years: +0 %: 30 mins: Winter	Pipe	Cellular Storage	S20	165.645	163.855	0.027	1.394	0.3	0.09	0.6	OK
Pipe (9)	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S13	Cellular Storage	165.222	163.884	0.101	11.043	1.6	1.34	15.4	OK
Pipe (10)	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S9	S6	165.719	164.521	0.036	1.079	0.7	0.09	2.2	OK
Pipe (11)	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S6	S7	165.369	164.052	0.039	1.072	0.6	0.14	2.0	OK
Pipe (12)	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S7	S8	165.461	164.023	0.034	1.068	0.6	0.13	1.8	OK
Pipe (13)	FSR01: 2 years: +0 %: 15 mins: Winter	Pipe	S8	OUTFALL 02	165.119	163.868	0.030	1.058	0.7	0.08	1.6	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Velocity

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR01: 30 years: +0 %: 15 mins: Winter	Pipe	S14	S15	166.217	165.799	0.073	6.284	1.0	0.6	8.7	OK
Pipe (1)	FSR01: 30 years: +0 %: 30 mins: Winter	Pipe	S15	S16	166.266	165.473	0.067	15.225	2.1	0.29	16.0	OK
Pipe (2)	FSR01: 30 years: +0 %: 960 mins: Winter	Pipe	S20	S22	165.382	163.723	0.021	57.776	0.4	0.05	0.6	OK
Pipe (3)	FSR01: 30 years: +0 %: 960 mins: Winter	Pipe	S22	OUTFALL 01	165.370	163.620	0.019	57.742	0.5	0.04	0.6	OK
Pipe (4)	FSR01: 30 years: +0 %: 15 mins: Winter	Pipe	S10	S11	164.930	164.770	0.150	11.039	0.9	1.05	14.6	Flood Risk
Pipe (5)	FSR01: 30 years: +0 %: 30 mins: Winter	Pipe	S11	S12	165.092	164.299	0.150	14.516	0.9	0.9	12.5	Surcharged
Pipe (6)	FSR01: 30 years: +0 %: 15 mins: Winter	Pipe	S12	S13	165.275	164.231	0.150	10.876	0.8	0.85	13.6	Surcharged
Pipe (7)	FSR01: 30 years: +0 %: 15 mins: Summer	Pipe	S16	Cellular Storage	166.105	164.833	0.107	10.423	2.1	0.48	14.7	OK
Pipe (8)	FSR01: 30 years: +0 %: 960 mins: Winter	Pipe	Cellular Storage	S20	165.645	164.229	0.027	57.815	0.3	0.1	0.6	Surcharged
Pipe (9)	FSR01: 30 years: +0 %: 15 mins: Winter	Pipe	S13	Cellular Storage	165.222	164.145	0.150	20.697	1.6	2.38	27.5	Surcharged
Pipe (10)	FSR01: 30 years: +0 %: 15 mins: Winter	Pipe	S9	S6	165.719	164.533	0.050	2.042	0.8	0.18	4.2	OK
Pipe (11)	FSR01: 30 years: +0 %: 15 mins: Winter	Pipe	S6	S7	165.369	164.070	0.056	2.034	0.7	0.27	3.9	OK
Pipe (12)	FSR01: 30 years: +0 %: 15 mins: Winter	Pipe	S7	S8	165.461	164.039	0.049	2.030	0.7	0.25	3.7	OK
Pipe (13)	FSR01: 30 years: +0 %: 15 mins: Winter	Pipe	S8	OUTFALL 02	165.119	163.882	0.043	2.018	0.8	0.17	3.4	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
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Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Velocity

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m^3)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR01: 100 years: +0 %: 15 mins: Winter	Pipe	S14	S15	166.217	165.816	0.086	8.155	1.1	0.78	11.2	OK
Pipe (1)	FSR01: 100 years: +0 %: 30 mins: Winter	Pipe	S15	S16	166.266	165.483	0.079	19.919	2.2	0.37	21.0	OK
Pipe (2)	FSR01: 100 years: +0 %: 960 mins: Winter	Pipe	S20	S22	165.382	163.725	0.023	67.198	0.4	0.05	0.7	OK
Pipe (3)	FSR01: 100 years: +0 %: 960 mins: Winter	Pipe	S22	OUTFALL 01	165.370	163.621	0.021	67.159	0.5	0.04	0.7	OK
Pipe (4)	FSR01: 100 years: +0 %: 30 mins: Summer	Pipe	S10	S11	164.930	164.930	0.150	16.899	0.9	1.17	16.2	Flood
Pipe (5)	FSR01: 100 years: +0 %: 15 mins: Winter	Pipe	S11	S12	165.092	164.543	0.150	14.433	0.9	1.19	16.5	Surcharged
Pipe (6)	FSR01: 100 years: +0 %: 15 mins: Winter	Pipe	S12	S13	165.275	164.370	0.150	14.005	1.0	1.06	17.0	Surcharged
Pipe (7)	FSR01: 100 years: +0 %: 15 mins: Summer	Pipe	S16	Cellular Storage	166.105	164.845	0.134	13.504	2.1	0.63	19.1	OK
Pipe (8)	FSR01: 100 years: +0 %: 960 mins: Winter	Pipe	Cellular Storage	S20	165.645	164.395	0.029	67.241	0.3	0.11	0.7	Surcharged
Pipe (9)	FSR01: 100 years: +0 %: 15 mins: Winter	Pipe	S13	Cellular Storage	165.222	164.270	0.150	26.793	1.9	2.88	33.2	Surcharged
Pipe (10)	FSR01: 100 years: +0 %: 15 mins: Winter	Pipe	S9	S6	165.719	164.539	0.059	2.654	0.9	0.23	5.5	OK
Pipe (11)	FSR01: 100 years: +0 %: 15 mins: Winter	Pipe	S6	S7	165.369	164.080	0.065	2.645	0.7	0.35	5.1	OK
Pipe (12)	FSR01: 100 years: +0 %: 15 mins: Winter	Pipe	S7	S8	165.461	164.048	0.057	2.641	0.8	0.33	4.8	OK
Pipe (13)	FSR01: 100 years: +0 %: 15 mins: Winter	Pipe	S8	OUTFALL 02	165.119	163.889	0.050	2.629	0.9	0.23	4.5	OK

Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
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Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

FSR01: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Velocity

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR01: 100 years: +40 %: 15 mins: Summer	Pipe	S14	S15	166.217	165.842	0.105	10.200	1.1	1	14.4	OK
Pipe (1)	FSR01: 100 years: +40 %: 30 mins: Summer	Pipe	S15	S16	166.266	165.496	0.096	24.907	2.3	0.49	27.6	OK
Pipe (2)	FSR01: 100 years: +40 %: 960 mins: Winter	Pipe	S20	S22	165.382	163.727	0.025	81.836	0.5	0.07	0.9	OK
Pipe (3)	FSR01: 100 years: +40 %: 960 mins: Winter	Pipe	S22	OUTFALL 01	165.370	163.623	0.023	81.792	0.5	0.05	0.9	OK
Pipe (4)	FSR01: 100 years: +40 %: 15 mins: Summer	Pipe	S10	S11	164.930	164.934	0.150	17.878	1.0	1.25	17.3	Flood
Pipe (5)	FSR01: 100 years: +40 %: 15 mins: Summer	Pipe	S11	S12	165.092	164.604	0.150	17.761	0.9	1.16	16.1	Surcharged
Pipe (6)	FSR01: 100 years: +40 %: 15 mins: Summer	Pipe	S12	S13	165.275	164.462	0.150	17.202	1.0	1.05	16.8	Surcharged
Pipe (7)	FSR01: 100 years: +40 %: 15 mins: Summer	Pipe	S16	Cellular Storage	166.105	164.868	0.150	18.834	2.2	0.87	26.6	OK
Pipe (8)	FSR01: 100 years: +40 %: 960 mins: Winter	Pipe	Cellular Storage	S20	165.645	164.705	0.032	81.886	0.3	0.14	0.9	Surcharged
Pipe (9)	FSR01: 100 years: +40 %: 15 mins: Winter	Pipe	S13	Cellular Storage	165.222	164.435	0.150	36.877	2.2	3.29	38.1	Surcharged
Pipe (10)	FSR01: 100 years: +40 %: 15 mins: Winter	Pipe	S9	S6	165.719	164.549	0.071	3.716	0.9	0.32	7.8	OK

Pipe (11)	FSR01: 100 years: +40 %: 15 mins: Winter	Pipe	S6	S7	165.369	164.096	0.080	3.706	0.8	0.5	7.3	OK
Pipe (12)	FSR01: 100 years: +40 %: 15 mins: Winter	Pipe	S7	S8	165.461	164.061	0.070	3.702	0.9	0.47	6.9	OK
Pipe (13)	FSR01: 100 years: +40 %: 15 mins: Winter	Pipe	S8	OUTFALL 02	165.119	163.901	0.061	3.689	1.0	0.33	6.4	OK

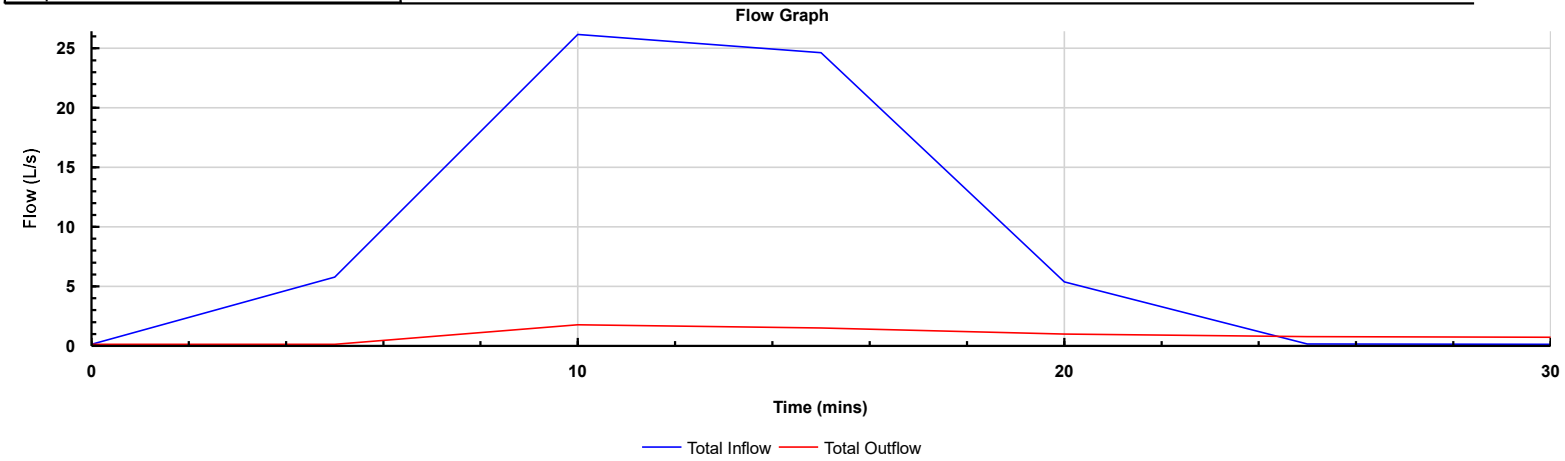
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	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Phase Management Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Phase
FSR01: 2 years: Increase Rainfall (%): +0: 15 mins: Winter

Tables

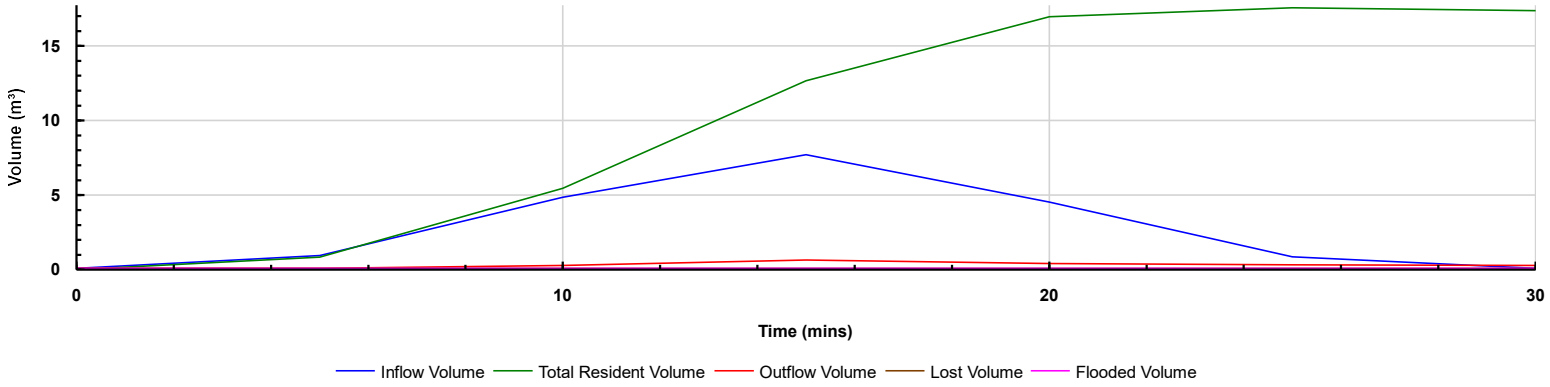
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
OUTFALL 01			0.6	0.426
OUTFALL 02			1.6	1.058
TOTAL	26.2	18.524	1.6	1.484

Graphs



Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Phase Management Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

Volume Graph



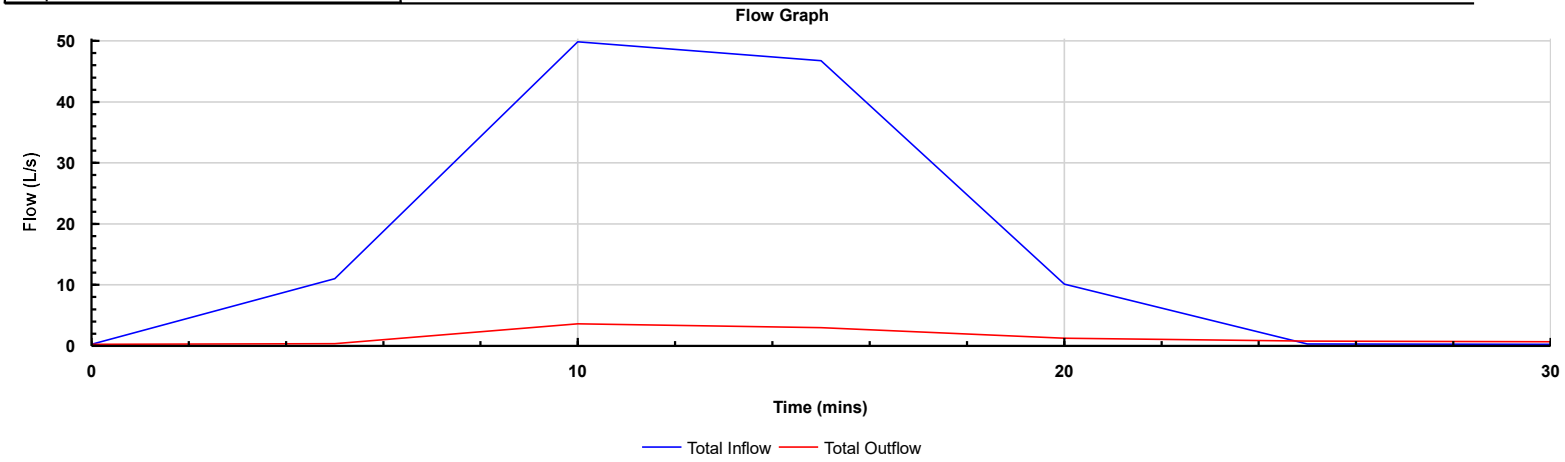
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Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
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Phase
FSR01: 30 years: Increase Rainfall (%): +0: 15 mins: Winter

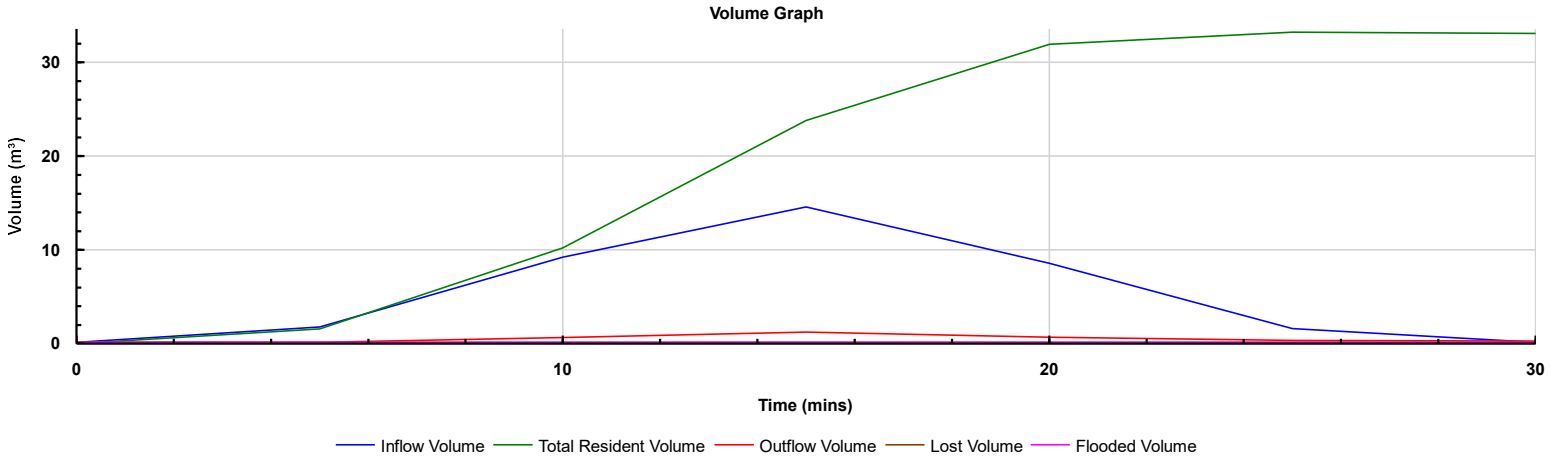
Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
OUTFALL 01			0.5	0.432
OUTFALL 02			3.4	2.018
TOTAL	49.9	35.143	3.4	2.450

Graphs



Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Phase Management Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		



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Report Details: Type: Phase Management Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		

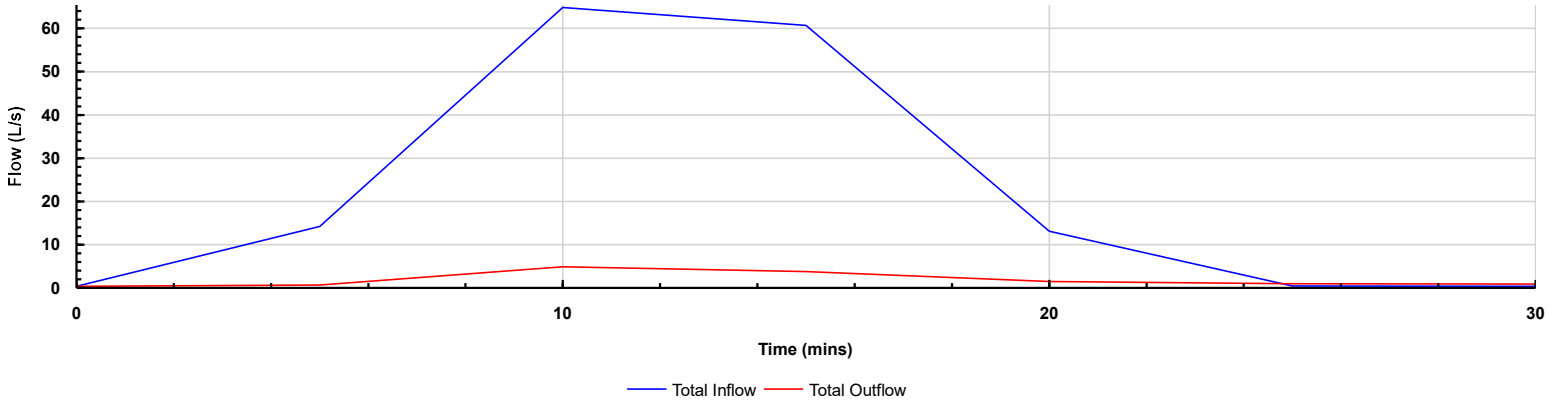
Phase
FSR01: 100 years: Increase Rainfall (%): +0: 15 mins: Winter

Tables

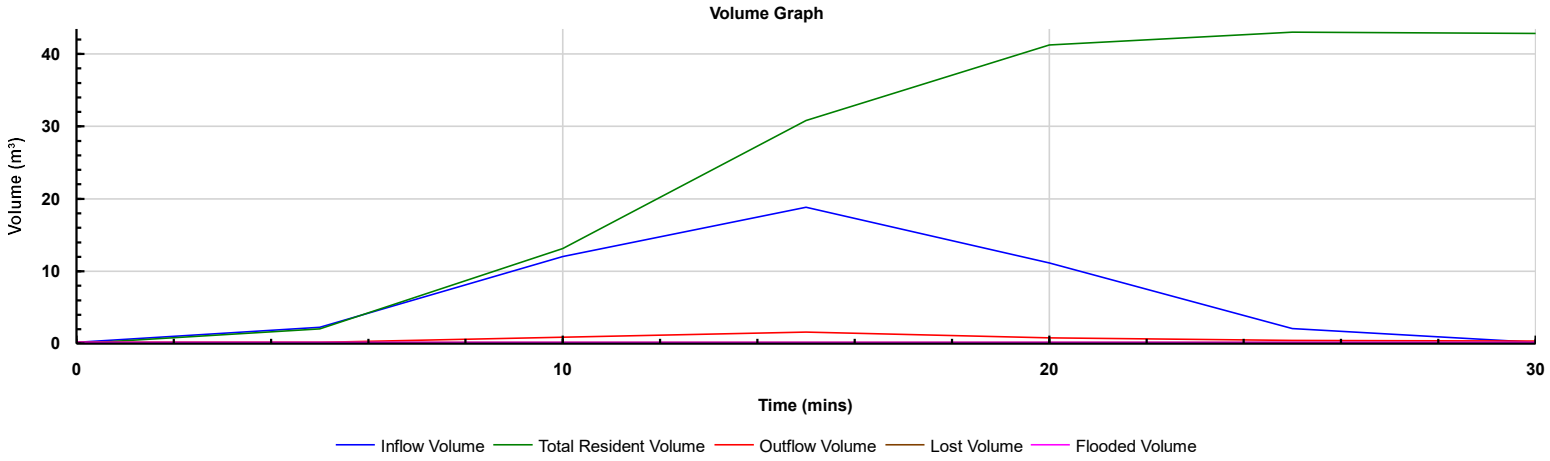
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
OUTFALL 01			0.6	0.475
OUTFALL 02			4.5	2.629
TOTAL	64.8	45.611	4.5	3.104

Graphs

Flow Graph



Project:	Date:		
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Report Details: Type: Phase Management Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		



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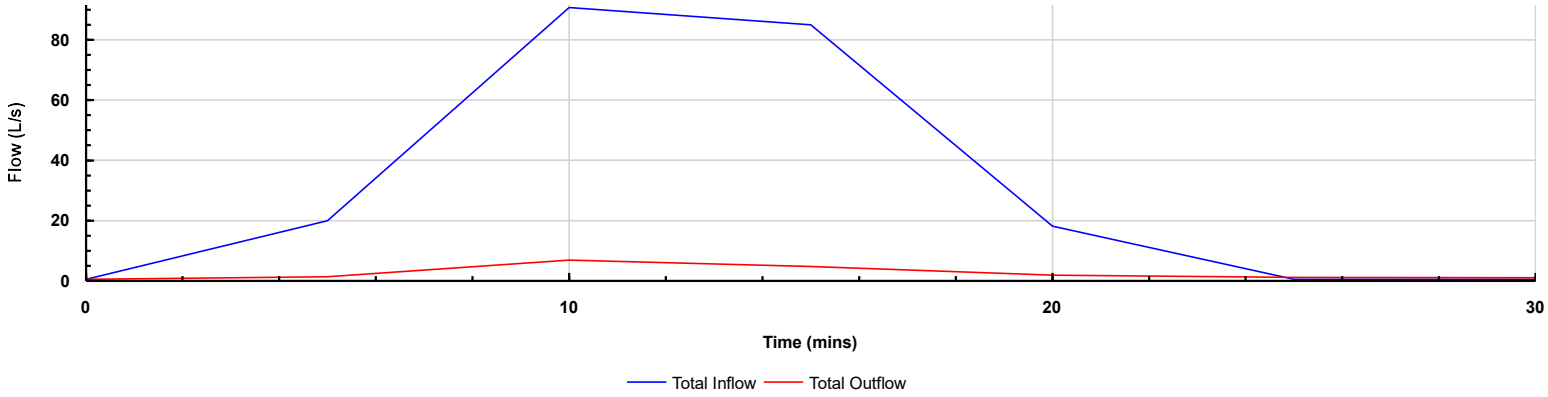
Phase
FSR01: 100 years: Increase Rainfall (%): +40: 15 mins: Winter

Tables

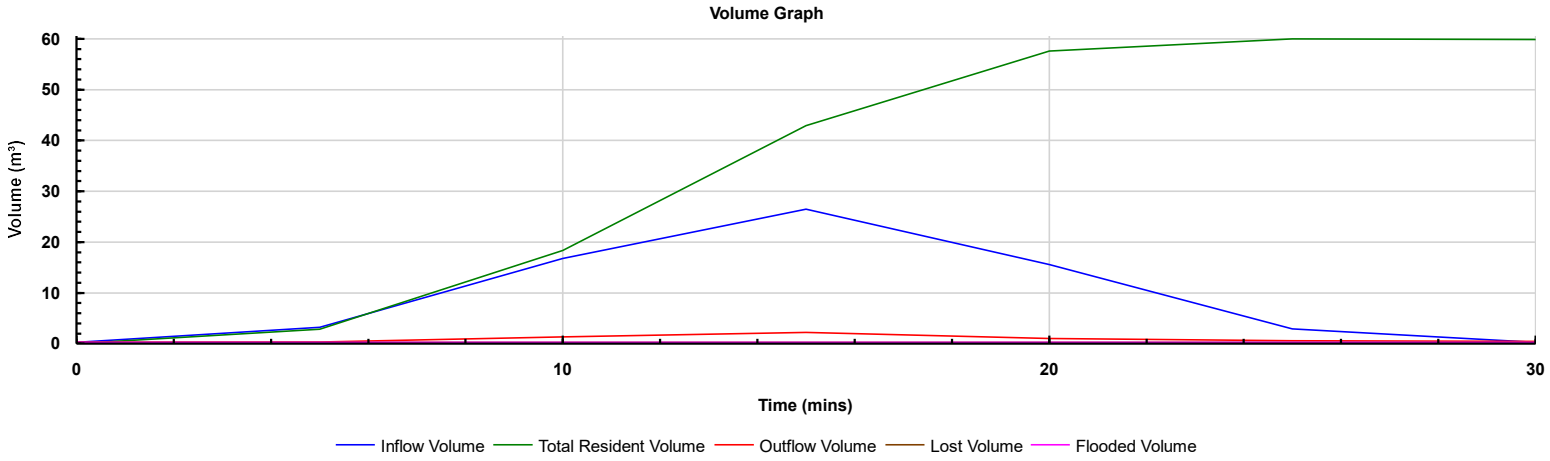
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
OUTFALL 01			0.5	0.538
OUTFALL 02			6.5	3.689
TOTAL	90.7	63.866	6.5	4.227

Graphs

Flow Graph



Project:	Date:		
Markfield Conference Centre & Residence Surface Water Calculations	03/11/2026		
	Designed by: IO	Checked by: AR	Approved By: PL
Report Details: Type: Phase Management Storm Phase: Phase	Company Address: Norder Design Associates Beech Lawn Green Lane Belper Derby DE56 1BY		



9.4 Appendix D – Infiltration Testing Evidence

Desk Study & Intrusive Ground Investigation
Markfield Conference Centre

DOCUMENT INFORMATION

Reference	Revision	Written	Project Director	Issue Date
MJH/J2231/D1/1	First	M Hanford	M Hanford	29/08/2025

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J2231/01 Site Location Plan
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APPENDICES

Appendix A Historical Plans
Appendix B Landmark Envirocheck Environmental Database Report
Appendix C Borehole Logs
Appendix D Results of Infiltration Rate testing
Appendix E Laboratory Analyses & Test Results
Appendix F Waste Classification Report

1.0 INTRODUCTION

1.1 This report describes a desk study and intrusive ground investigation of a site at Markfield Conference Centre, Ratby Lane, Markfield, Leicestershire.

1.2 The objectives of this investigation have been to obtain information relating to the geotechnical and geo-environmental conditions pertaining to the site and to produce an assessment of these factors in relation to the proposed development.

1.3 We have been advised that the proposed development at the site will comprise 2 buildings forming a conference centre / indoor sports facility; and a residential block. It is assumed in the production of this report that ground levels across the site will remain generally unchanged from those at the time of the investigation site works. If the assumptions made above and in the later sections of this report are not the case, then the recommendations presented within this report may require some amendment.

1.4 This report has been produced on behalf of our Client, The Islamic Foundation and no responsibility is accepted to any third party for all or any part. This report should not be relied upon or transferred to any other parties without the express written authorisation of Emcus Limited. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill.

1.5 The findings and opinions conveyed from the desk study within this report are based on information obtained from a variety of sources, as detailed within this report, which Emcus Limited believes are reliable. Nevertheless, Emcus Limited cannot and does not guarantee the authenticity or reliability of the information it has obtained from these sources, and used in the production of this report.

1.6 Whilst this report may express an opinion on the possible configuration of strata, groundwater, ground gases or contaminants between or beyond various locations, or on the possible presence of features based on visual, verbal or published evidence, this is for guidance only, and no liability can be accepted for its accuracy.

1.7 The site plans and drawings enclosed in this report should not be scaled off.

1.8 We recommend that the geo-environmental & geotechnical assessments within this report are discussed and agreed with the appropriate regulators (Local Authority, Environment Agency, etc.,), prior to any irrevocable actions being taken.

2.0 SITE DESCRIPTION

2.1 Site Location & Access

2.1.1 The site is located in the central south-eastern area of the Markfield Institute of Higher Education / Markfield Conference Centre, Ratby Lane, Markfield Leicestershire, (see drawings J2231/01 and J2231/02). The National Grid Reference for the approximate centre of the site is 449330 309010.

2.1.2 For the purpose of the investigation site works (undertaken 8th July 2025) access to the site was gained from the Ratby Lane, along the facility driveway.

2.2 Site Description & Surroundings

2.2.1 A walkover of the site was undertaken by an experienced Engineer from Emcus on 8th July 2025.

2.2.2 At the time of the walkover, the site generally comprised 2 elongate educational / conference buildings, surrounded by kempt lawns and planted borders. In addition, the southern area of the site comprised a hardstanding which was accessed via a driveway which extended through the central area of the site. (The driveway also provided access to the buildings / parking areas which were present beyond the south-western boundary of the site).

2.2.3 Mature trees were present in the landscaped areas around the margins of the site.

2.2.4 The boundaries of the site were undefined on the ground at the time of the walkover / investigation site works.

2.2.5 The areas beyond the north-eastern, north-western and south-western boundaries of the site generally comprised other buildings, landscaping and infrastructure within the educational / conference facility. The area to the south-east of the site generally comprised a woodland landscaping strip with housing and a retirement home beyond.

3.0 DESK STUDY

3.1 Historical Maps

3.1.1 Extracts of historical maps and aerial images have been reviewed to obtain an indication of the history of the site and its environs. The historical map / image extracts are presented as a series of plans generally comprising montages from approximately the same publication dates between 1884 and 2024. These historical plans are reproduced in Appendix A of this report.

3.1.2 The historical maps dated 1884 to 1929 indicate that the site was generally undeveloped having comprised part of a larger field, presumably used for agriculture.

3.1.3 The historical maps dated 1955 to 2024 indicate that the site generally comprised 2 elongate buildings surrounded by soft landscaping and hardstandings / driveways. The buildings / site are indicated to have comprised part of Markfield Hospital from 1958 to 1985 and then a training / educational centre.

3.1.4 The history of the area surrounding the site indicated by the historical maps can be summarised as follows.

Date (range)	Salient Features within potential influencing distance of the site
1884 to 1929	The area surrounding the site is indicated to have generally comprised undeveloped fields with a group of buildings (Upper Grange) centred 145m to the north-west of the site and a group of buildings (Groby Upper Park) centred 215m to the north-east of the site.
1955 - 1985	The area surrounding the site is indicated to have generally comprised buildings and grounds associated with Markfield Hospital. Residential housing is indicated to have been present 130m to the north of the site, fronting Ratby Lane.
1988 - 2024	The historical maps dated indicate the area to the south of the site was generally redeveloped with residential housing and associated infrastructure. The area to the west of the site is indicated to have comprised a training centre. In addition, the historical maps dated 1991 – 2024 indicate that the area to the north of the site was developed with training centre / educational buildings and associated grounds.

3.1.5 In addition, the historical maps indicate that issues and a drain / watercourse were present 150m to the east of the site. The maps dated 1991 to 2024 indicate that a pond was present 185m to the east of the site, beyond the issues / watercourse.

3.2 Geology, Hydrogeology & Hydrology

3.2.1 The GeoIndex data tool available through the website of the British Geological Survey (BGS) has been examined in respect of the strata underlying the site.

3.2.2 The GeoIndex indicates that the natural strata beneath the site comprises Quaternary (glacial) Oadby member, underlain by the Triassic Edwalton Member – Mudstone.

3.2.3 The Oadby member generally comprises poorly sorted brown – grey clays, sand and gravel. The Edwalton Member strata generally comprises red-brown and greenish-grey siltstone and mudstones with fine grained sandstones and disseminated gypsum.

3.2.4 In addition to the natural strata, Made Ground is anticipated beneath the site associated with the historic / existing development.

3.2.5 The extracts of the Aquifer Designation maps included within the Envirocheck report indicate that the superficial deposits underlying the site (Oadby Member) is a Secondary Undifferentiated Aquifer and the bedrock underlying the site (Edwalton Member) is a Secondary B Aquifer.

3.2.6 The site is not indicated to be located in a Source Protection Zone.

3.2.7 The Envirocheck information indicates that the closest surface watercourse is the drain 150m to the east of the site.

3.3 Coal Mining

3.3.1 The Mining Remediation Authority Map Viewer indicates that the site is not located in a Coal Mining Reporting Area and / or Development High Risk area.

3.4 Landmark Environmental Database Report

3.4.1 A search and review has been undertaken of information held on the Landmark 'Envirocheck' database, which provides information on the environmental setting of the site. A copy of the 'Envirocheck' Report is reproduced in Appendix B of this report, with the salient points summarised below.

- The Envirocheck report does not identify any landfills and / or waste management facilities within 250 metres of the site.
- The Envirocheck report does not identify any areas of potentially infilled land within 250m of the site.
- The Envirocheck report does not identify any pollution incidents; pollution controls; prosecutions; and / or discharge consents within 250m of the site.
- The Envirocheck report does not identify any contemporary trade directory entries within 250m of the site.

3.5 Radon

3.5.1 The Envirocheck report advises that no radon protection measures are necessary in the construction of new dwellings and extensions at the site. (This assessment is also considered suitable for commercial / industrial buildings which may incorporate smaller compartmental rooms / spaces).

4.0 PRELIMINARY CONCEPTUAL SITE MODEL

4.1 Potential Contaminant Sources

From the desk study searches, the following potential contaminant sources affecting the site have been identified.

Potential On-Site Sources

- Possible contamination associated with Made Ground beneath the site. – Potentially a range of metals, semi-metals, Poly Aromatic Hydrocarbons (PAHs) and asbestos.

Potential Off-site sources

- No potential sources of plausible off-site contamination have been identified.

4.2 Potential Receptors

The potential receptors associated with the proposed development of the site are:

- Human Health - Site end users.
- Ground water.
- Surface water.
- Development fabric / construction materials.

The health and safety risks to site contractors and maintenance workers have not been assessed specifically as part of this report. Whilst this report may make some general assessments / recommendations in this regard, these risks should be further assessed by the contractors involved.

4.3 Potential Pathways

The potential pathways associated with the proposed development of the site are:

- Ingestion of soil & dust.
- Inhalation of dust, gas & vapour.
- Dermal contact.
- Vertical and lateral migration of contamination (fluid / gas / vapour) through permeable strata, rock fractures and cavities, service entries & construction joints.
- Surface water run-off.

4.4 Summary of Potential Contaminant Linkages

The plausible contaminant linkages which have been identified for the proposed development at the site are identified in Table 4.5 below and classified as 'risks' by considering the product of the linkage probability and linkage consequence in accordance with following matrix.

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very high risk	High risk	Moderate risk	Moderate / Low risk
	Likely	High risk	Moderate risk	Moderate / Low risk	Low risk
	Low Likelihood	Moderate risk	Moderate / Low risk	Low risk	Very low risk
	Unlikely	Moderate / Low risk	Low risk	Very low risk	Very low risk

Table 4.4.1 – Risk Classification Matrix (Definitions based on guidance within Ciria C552, dated 2001)

Description of the classified risks identified by Table 4.4.1	
Very high risk	There is a high probability that severe harm will arise to a designated receptor from an identified receptor or there is evidence severe harm to a designated receptor is currently happening. Further investigation and remediation are likely to be required.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Further investigation is required and remedial works may be necessary.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Further investigation is normally required to clarify the risk.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Table 4.4.2 – Risk Classification Definition

Table 4.5: Preliminary Risk Assessment of Source-Pathway-Receptor Contaminant Linkages

Potential Contaminant	Potential Pathway(s)	Potential Receptor	Probability	Consequence	Risk Level	Comments
Metals, metalloids, asbestos and PAH within Made Ground beneath the site.	Ingestion, dermal contact, inhalation of dust.	Human health	Unlikely	Minor	Very low risk	The hardsurfacing of the proposed building floors will provide a break in the pollution pathway. No new soft landscaping is proposed.
	Vertical and lateral migration through permeable strata and rock fractures.	Groundwater	Unlikely	Minor	Very low risk	The strata underlying the site is not a Principal Aquifer. The site is not located in a source protection zone and there are no abstractions identified within 250m of the site. The hardsurfacing of the building will provide an impermeable cover reducing the potential for mobilisation.
	Surface water run-off.	Surface water	Unlikely	Minor	Very low risk	Surface water will be managed by a dedicated drainage system. Surface water run-off from the site is unlikely to impact the watercourse 150m to the east of the site.

5.0 SCOPE OF THE INVESTIGATION

5.1 Site Works

5.1.1 Intrusive investigation of the site was carried out on the 8th July 2025, under the full-time supervision of an experienced engineer from Emcus Limited. The investigation site works comprised the advancement of 6 dynamic sampler boreholes (WS1 – WS6) to depths of 5m bgl., in the locations indicated approximately on drawing J2231/03.

5.1.2 Standard Penetration Tests (SPTs) were undertaken in all the dynamic sampler boreholes at 1m vertical centres. Representative disturbed samples of all the strata encountered in the boreholes were placed into sealable plastic containers and glass jars provided by the analytical laboratory for that purpose. The boreholes were logged in general accordance with BS 5930: 2015 + A1: 2020 Code of practice for ground investigations. The Engineer's logs of the boreholes are presented in Appendix C of this report.

5.1.3 Once the sampling equipment had been removed, boreholes WS1, WS2 & WS3 were filled with water to depths of 0.5m – 0.8m bgl., and monitored at regular intervals to assess if the strata beneath the site would be suitable to receive water from soakaways. The results of the infiltration rate testing are presented in Appendix D.

5.2 Laboratory Analyses & Testing

5.2.1 Selected disturbed samples recovered from the investigatory holes were subsequently submitted to MCERTS and UKAS accredited laboratories for chemical analysis and geotechnical testing.

5.2.2 The chemical analyses were undertaken at the laboratories of Eurofins Chemtest and generally comprised the following:

- 5 samples were analysed for a range of metals, semi-metals, phenol, cyanides and USEPA 16 speciated Poly Aromatic Hydrocarbons, (PAHs).
- 3 samples were screened for the presence of asbestos.

5.2.3 The geotechnical testing was undertaken at the laboratories of Geolabs and generally comprised the following:

- 3 samples were tested for moisture content and plasticity index determinations, in accordance with BS EN ISO 17892-12: 2018.

5.2.4 In addition, 5 samples of the strata were also tested for pH and water-soluble sulphate to determine the potential aggressiveness of the ground to buried concrete.

5.2.5 Further details and the results of the chemical contamination analyses and geotechnical testing are presented in Appendix E.

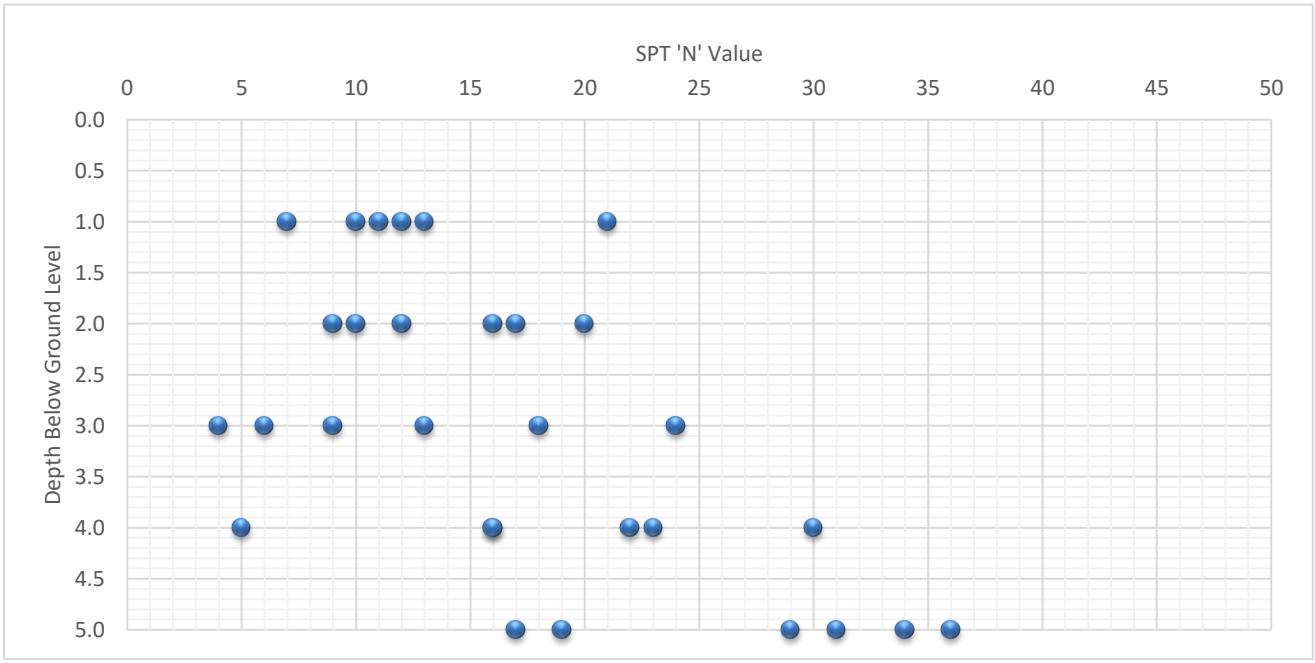
6.0 FINDINGS OF THE INVESTIGATION

6.1 Ground Conditions

6.1.1 Brown silty topsoil was initially encountered in all of the boreholes to depths of 0.3m – 0.6m bgl.

6.1.2 Natural strata was encountered underlying the topsoil in an all of the investigatory holes. The natural strata generally comprised red-brown, mottled black & grey, sandy clays with sub-rounded & sub-angular gravel. The clays were predominantly firm, but soft / with soft pockets in WS1 from 2.7m – 3.7m bgl.; WS3 from 2.7m – 5m bgl.; WS4 from 1.8m – 4.5m bgl.; WS5 from 2.5m – 4.5m bgl.; and WS6 from 2m – 4.8m bgl. The clays became predominantly stiff with increasing depth below ground level and extended beyond the bottom of the boreholes.

6.1.3 The Standard Penetration Tests (SPTs) undertaken in the natural clays revealed 'N' values in the range 4 to 36. The 'N' values revealed by the SPTs in the natural strata can be summarised as follows.



6.1.4 Slight groundwater seepages were encountered during the advancement of WS1, WS3 and WS4 at below 2.7m - 3.5m bgl. No groundwater was encountered during the advancement of WS2, WS5 and WS6.

6.1.5 The results of the preliminary soakaway testing in WS1 and WS3 revealed soil infiltration rates of 1.94×10^{-6} to 2.28×10^{-6} m/s. There was insufficient drop of the water level in WS2 during the monitoring period to allow a soil infiltration rate to be calculated for that test.

6.2 Chemical Contamination Analyses

6.2.1 The results of the chemical contamination analyses have generally been assessed with reference to the Suitable For Use Levels (S4UL) published by the Land Quality Management / Chartered Institute of Environmental Health (LQM/CIEH). In the absence of S4ULs for certain contaminants of concern, (i.e. Lead), reference has been to other available assessment guidelines, including Category 4 Screening Levels (C4SLs) published by DEFRA, etc., as detailed in the latter parts of this report.

6.2.2 The calculated S4ULs, C4SLs, etc. are generic assessment criteria (GACs) interpreted in current guidance as 'intervention values' relative to a particular intended end use for the respective site, to provide a means of assessing possible long term chronic risks to human health. The exceedance of a S4UL, C4SL, etc., can indicate that further detailed quantitative risk assessment and / or remedial action is required to enable/facilitate development for the particular end use of the site concerned.

6.2.3 We have been advised that the proposed development at the site will comprise a new conference centre / indoor sports facility and residential building. As such, the results of the contamination analyses have been assessed for both a commercial / industrial land-use category; and residential land-use category.

6.2.4 The results of the chemical analyses have revealed the strata beneath the site is free of significant contamination, with all the contaminant of concern concentrations falling below the levels of detection and / or below their respective GAC for the residential and commercial / industrial end use.

6.3 Geotechnical Laboratory Testing

6.3.1 The pH of the strata beneath the site was found to range between 6.3 and 7.4, with water-soluble sulphate concentrations in the range <10mg/l., to 16mg/l., as SO_4 revealed for the samples tested.

6.3.2 The results of the moisture content & plasticity index undertaken on the samples of natural strata can be summarised as follows.

Sample Reference	Moisture Content	Proportion of Sample <425µm	Plasticity Index
WS1 at 1.2m bgl.	20%	94%	29%
WS2 at 1.7m bgl.	18%	98%	28%
WS4 at 1.5m bgl.	18%	70%	25%

6.4 Waste Classification

6.4.1 The results of the chemical contamination analyses have been assessed using the 'HazWasteOnline' software. A copy of the Waste Assessment report is presented in Appendix F.

6.4.2 The waste characterisation report indicates that the natural strata and topsoil beneath the site would classify as Non-Hazardous Waste code 17 05 04, based on the analyses undertaken.

7.0 GEO-ENVIRONMENTAL ASSESSMENT

7.1 Contamination

7.1.1 The results of the chemical analyses have revealed the strata beneath the site is free of significant contamination when considered for a commercial and / or residential usage, with all the chemical of concern concentrations below the levels of detection and / or below their respective assessment criteria.

7.1.2 The intrusive investigation has not identified any significant contamination beneath the site. The strata beneath the site is not a Principal Aquifer. Surface water from the proposed development will be managed by a dedicated drainage system and run-off from the site is unlikely to adversely impact any drains / watercourses. From consideration of the investigation findings and the geo-environmental setting, the site is unlikely to pose a significant risk to controlled waters.

7.1.3 From consideration of the investigation results, geo-environmental remediation of the strata beneath the site is not required for the proposed conference centre / indoor sports facility and residential end-use.

7.1.4 Waste strata excavated from the site should be appropriately disposed of at a suitably licensed waste management facility.

7.1.5 If any visual and / or olfactory evidence of contamination is encountered, the advice of a suitable experienced geo-environmental engineer should be sought.

7.2 Radon & Other Ground Gases

7.2.1 The Envirocheck report advises no Radon protection measures are required at the site.

7.2.2 Furthermore, the desk study searches have not identified any landfills, infilled ground, etc., within potential influencing distance of the site.

7.2.3 In the absence of any plausible ground gas sources, it is considered the proposed conference centre and / or residential building do not require any specific measures to protect against carbon dioxide and / or methane.

8.0 GEOTECHNICAL ASSESSMENT

8.1 Foundations & Floor Slabs

8.1.1 It is anticipated that pad / strip foundations bearing on the natural clays should prove appropriate for the proposed 2 storey conference centre and residential buildings.

8.1.2 Where foundation depths do not exceed the minimum 0.9m below existing ground levels, it is recommended that strip foundations and pad foundations (up to 2m x 2m) which bear on the natural firm clays are designed with an assumed ground bearing resistance of 100kN/m^2.

8.1.3 Where foundations depths are deeper than the minimum 0.9m below existing ground levels and mindful of the softer clays encountered below 2m bgl., is recommended that a reduced ground bearing resistance of 75kN/m^2 is assumed.

8.1.4 As cohesive strata has been encountered beneath the site, it is recommended foundations and floor slabs are adjusted in accordance with the recommendations of NHBC Chapter 4.2 - Building Near Trees, (or similar guidance) to protect against the potential effects of heave and shrinkage associated with existing, proposed or recently removed trees and vegetation. The results of the plasticity index determinations, modified to account for the soil particles larger than 425μm, reveal the cohesive strata beneath the site should be regarded as having a medium volume change potential to accord with the NHBC guidance.

8.1.5 It is anticipated that the proposed buildings will be located within the zone of influence of trees / vegetation, requiring suspended ground floor slabs to be used.

8.1.6 All foundations should be deepened below roots of 5mm diameter.

8.2 Construction

8.2.1 It is anticipated that excavations at the site should generally be achievable using a JCB 3CX or similar excavation plant.

8.2.2 The short-term stability of excavations in the cohesive strata should be relatively good. However, the longer-term stability of excavations may be poor. As such, we would recommend appropriate excavation support, battering of excavation sides or other measures should be used during construction.

8.3 Concrete Design

8.3.1 We have considered the geology of the site and the ground conditions in accordance with the guidelines contained in Part C of BRE Special Digest 1: Concrete in aggressive ground (2005) and have categorised the site as a ‘greenfield’ site.

8.3.2 The results of the water-soluble sulphate analyses from the site fall within Design Sulphate (DS) Class DS-1. The groundwater conditions at the site should be considered to be mobile (potentially). On this basis and from consideration of the pH conditions, the site has been assigned an ACEC (Aggressive Chemical Environment for Concrete) Class AC-1.

8.3.3 The specific concrete mixes (The Design Chemical Class) to be used on site for all the 'in the ground' and 'on the ground' permanent applications should be determined, mindful of the ACEC Class, by the site-specific concrete requirements, in terms of the required durability and structural performance. These are assessed in terms of the Intended Working Life and any need for Additional Protective Measures (APM), as detailed in Part D, with further guidance in Parts E and F, of the BRE Special Digest 1, (2005).

8.4 Soakaways

8.4.1 From consideration of the ground conditions revealed by the boreholes and results of the infiltration rate testing, it is considered the strata beneath the site will not be suitable to receive water from soakaways.

DRAWINGS



Drawing Title **Site Location Plan**	**J2231/01**	
	Scale at A4: NTS	
Project **Markfield Conference Centre**	Drawn MJH	Approved MJH
Client **The Islamic Foundation**	Date 28/08/2025	Date 28/08/2025

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Drawing Title: **Site Plan**	**J2231/02**	
	Scale at A4: NTS	
Project: **Markfield Conference Centre**	Drawn: MJH	Approved: MJH
Client: **The Islamic Foundation**	Date: 28/08/2025	Date: 28/08/2025

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Conference Centre & Residential Block
Approximate Investigatory Hole Locations
Drawing J2231/03
10/07/2025
The Islamic Foundation

Not to Scale

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APPENDICES

Appendix D

Results of Infiltration Rate Testing

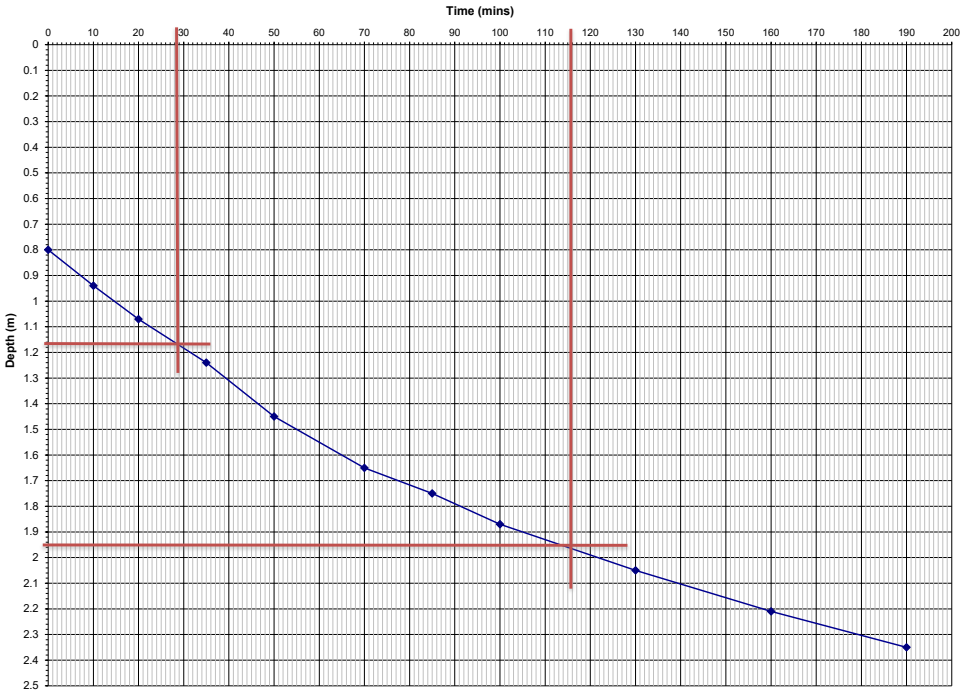
CALCULATION OF SOIL INFILTRATION RATE - BOREHOLE SOAKAWAY

Client:	**The Islamic Foundation**		
Site:	**Markfield Conference Centre, Ratby Lane, Leicestershire**	**Job No:**	**J2231**

Test No:	**WS1**

Size of Soakaway	
Overall Diameter (Av)	0.065
Standpipe Diameter	0.065
Depth (m) =	5.000

Time (min)	Depth (m)
0	0.8
10	0.94
20	1.07
35	1.24
50	1.45
70	1.65
85	1.75
100	1.87
130	2.05
160	2.21
190	2.35



Depth at start of test =	0.80
Depth at end of test =	2.35
75% effective depth =	1.19
25% effective depth =	1.96
Circumference of borehole (m)	0.2042
Base area of borehole (m^2) =	0.0033
Volume of water per 1m depth of standpipe	0.0033
Volume of water per 1m depth of borehole in gravel pack surrounding standpipe (30% void ratio)	0.0000
Volume of water per 1m depth of standpipe and gravel surround (m3)	0.0033
Eff area of loss to 50% max depth of test (m2)	0.432
Effective Storage volume (m^3) =	0.0051

time from graph to reach 75% level =	28
time from graph to reach 25% level =	115

Soil infiltration rate, f, (m/s) =	**2.28E-06**

Tested by:	**MH**	**Date:**	**08/07/2025**
Checked by:		**Date:**	**28/08/2025**

Notes

1) Infiltration rate calculated between 75% and 25% of head loss within borehole.

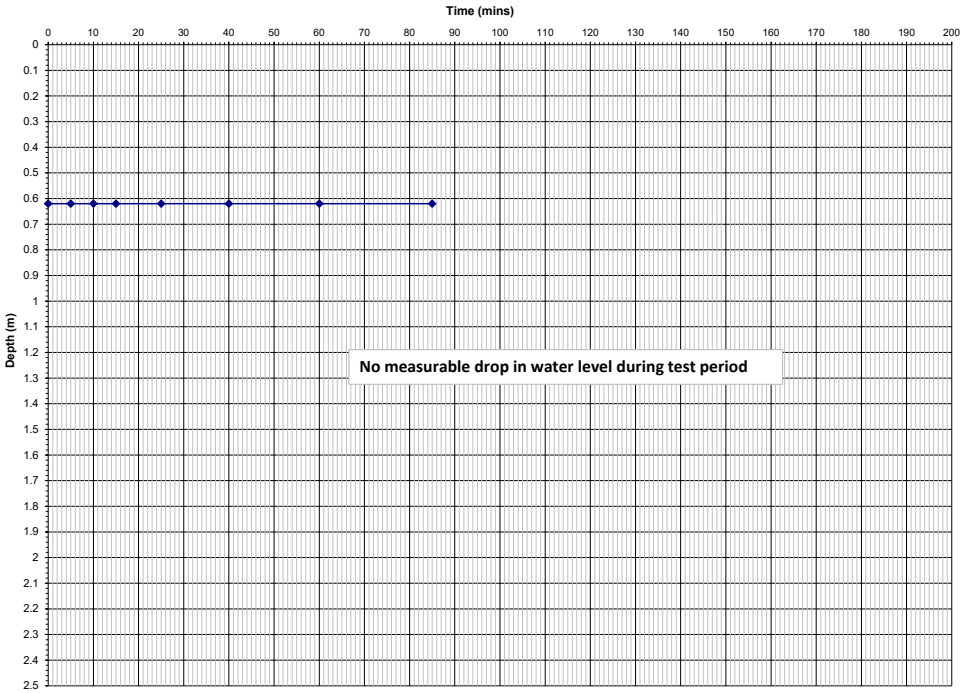
CALCULATION OF SOIL INFILTRATION RATE - BOREHOLE SOAKAWAY

Client:	**The Islamic Foundation**		
Site:	**Markfield Conference Centre, Ratby Lane, Leicestershire**	**Job No:**	**J2231**

Test No:	**WS2**

Size of Soakaway	
Overall Diameter (Av)	0.065
Standpipe Diameter	0.065
Depth (m) =	5.000

Time (min)	Depth (m)
0	0.62
5	0.62
10	0.62
15	0.62
25	0.62
40	0.62
60	0.62
85	0.62



Depth at start of test =	0.62
Depth at end of test =	0.62
75% effective depth =	0.62
25% effective depth =	0.62
Circumference of borehole (m)	0.2042
Base area of borehole (m^2) =	0.0033
Volume of water per 1m depth of standpipe	0.0033
Volume of water per 1m depth of borehole in gravel pack surrounding standpipe (30% void ratio)	0.0000
Volume of water per 1m depth of standpipe and gravel surround (m3)	0.0033
Eff area of loss to 50% max depth of test (m2)	0.451
Effective Storage volume (m^3) =	0.0000

time from graph to reach 75% level =	0
time from graph to reach 25% level =	0

Soil infiltration rate, f, (m/s) =	**#DIV/0!**

Tested by:	**MH**	**Date:**	**08/07/2025**
Checked by:		**Date:**	**28/08/2025**

Notes

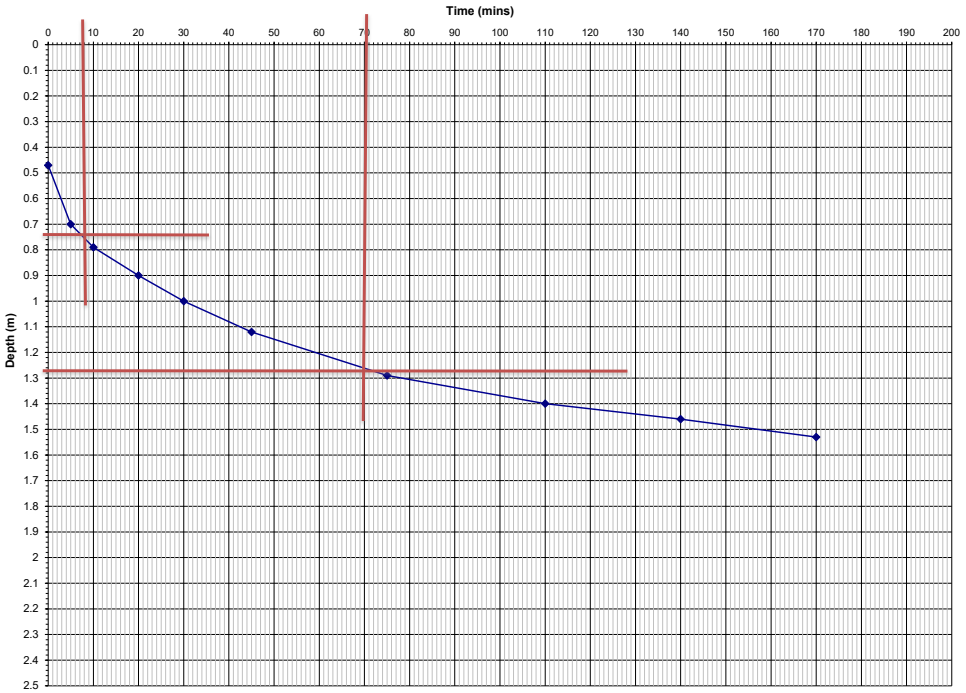
CALCULATION OF SOIL INFILTRATION RATE - BOREHOLE SOAKAWAY

Client:	**The Islamic Foundation**		
Site:	**Markfield Conference Centre, Ratby Lane, Leicestershire**	**Job No:**	**J2231**

Test No:	**WS3**

Size of Soakaway	
Overall Diameter (Av)	0.065
Standpipe Diameter	0.065
Depth (m) =	5.000

Time (min)	Depth (m)
0	0.47
5	0.7
10	0.79
20	0.9
30	1
45	1.12
75	1.29
110	1.4
140	1.46
170	1.53



Depth at start of test =	0.47
Depth at end of test =	1.53
75% effective depth =	0.74
25% effective depth =	1.27
Circumference of borehole (m)	0.2042
Base area of borehole (m^2) =	0.0033
Volume of water per 1m depth of standpipe	0.0033
Volume of water per 1m depth of borehole in gravel pack surrounding standpipe (30% void ratio)	0.0000
Volume of water per 1m depth of standpipe and gravel surround (m3)	0.0033
Eff area of loss to 50% max depth of test (m2)	0.466
Effective Storage volume (m^3) =	0.0035

time from graph to reach 75% level =	9
time from graph to reach 25% level =	74

Soil infiltration rate, f, (m/s) =	**1.94E-06**

Tested by:	**MH**	**Date:**	**08/07/2025**
Checked by:		**Date:**	**28/08/2025**

Notes

1) Infiltration rate calculated between 75% and 25% of head loss within borehole.