

|             |                                               |                |                 |
|-------------|-----------------------------------------------|----------------|-----------------|
| Title:      | <b>Sustainable Drainage Strategy Addendum</b> | Date Approved: | <b>18.04.23</b> |
| Discipline: | <b>Civils</b>                                 | Author:        | <b>LKi</b>      |
| Note Ref:   | <b>2220367-EWP-ZZ-XX-TN-C-0001</b>            |                |                 |

|           |          |              |                                     |             |                                               |              |                                               |
|-----------|----------|--------------|-------------------------------------|-------------|-----------------------------------------------|--------------|-----------------------------------------------|
|           |          |              | Issued for planning                 |             |                                               |              |                                               |
| revision: | P1       | prepared by: | Laura Kirk<br>MEng (Hons) CEng MICE | checked by: | Paul Davis<br>BEng (Hons)<br>MSc<br>CEng MICE | approved by: | Paul Davis<br>BEng (Hons)<br>MSc<br>CEng MICE |
| date:     | 18.04.23 | signature:   |                                     | signature:  |                                               | signature:   |                                               |

### Aim

This Addendum has been prepared to provide additional information to the report **2220367-EWP-ZZ-XX-RP-C-0002 Sustainable Drainage Strategy** which was produced in support of the proposed redevelopment at Braemar Avenue Baptist Church, Braemar Avenue, Wood Green, London, N22 7BY in the London Borough of Haringey. The purpose of this Addendum is to provide additional supporting information for the scheme as requested by the London Borough of Haringey as Lead Local Flood Authority (LLFA).

### Addendum to the report 2220367-EWP-ZZ-XX-RP-C-0002 Sustainable Drainage Strategy

#### **Existing Surface Water Runoff Rates (ref. Section 8.1 of report 2220367-EWP-ZZ-XX-RP-C-0002)**

Existing runoff rates for the site (315m<sup>2</sup> hardstanding) have been calculated using the Wallingford Procedure and are reproduced in Appendix A of this Addendum. These rates are all for a storm duration of 15 minutes, using a Cv value of 0.95 for roof areas and 0.9 for other hardstanding areas as stated in the Haringey LLFA Technical Assessment requirements.

#### **Proposed Surface Water Runoff Rates (ref. Section 8.3.3 of report 2220367-EWP-ZZ-XX-RP-C-0002)**

Surface water runoff rates for the development have been calculated using FEH data.

As outlined in the report **2220367-EWP-ZZ-XX-RP-C-0002 Sustainable Drainage Strategy**, attenuation is to be provided in the form of blue roofs, permeable paving and a below ground tank. The below ground tank is to serve all external amenity areas located at lower ground floor level, external hardstanding areas which lie over the basement footprint and all rainwater downpipes serving the building terraces. The outlets from the blue roofs and permeable paving will discharge to the sewer by gravity; the outlet from the below ground tank will be pumped.

It is proposed that runoff from the small external hardstanding area which is to be served by the permeable paving be restricted via an orifice plate to control the runoff rate to 0.4l/s. It is proposed that the pump rate from the below ground attenuation tank be set at 1.0l/s. Runoff rates from the blue roof areas have been calculated by a blue roof manufacturer; it should be noted that the runoff rate, storage depth and number of outlets for each blue roof area may be subject to alteration if another blue roof manufacturer is approached at a later design stage.

Whilst water butts and green roofs are to be incorporated within the scheme, they have been excluded from the attenuation calculations as these SuDS will not offer any storage volume should a storm event occur when they are already at capacity or saturated.

The total surface water runoff rates using FEH data are presented in **Table 1**. For flats and apartments, no urban creep allowance is required in line with the Haringey SuDS Design Requirements for LLFA Technical Assessment. MicroDrainage Source Control calculations are presented in Appendix A of this Addendum.

Table 1: Proposed surface water runoff rates using FEH data

| Storm event*                                                                                                                                                                                                                                   | Proposed total surface water runoff rate (l/s)** | Improvement over existing runoff rates |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------|
| 1 in 2-year                                                                                                                                                                                                                                    | 1.7                                              | 61%                                    |
| 1 in 30-year                                                                                                                                                                                                                                   | 2.2                                              | 74%                                    |
| 1 in 100-year                                                                                                                                                                                                                                  | 2.3                                              | 79%                                    |
| 1 in 100-year + 40% climate change                                                                                                                                                                                                             | 2.5                                              | 84%                                    |
| Notes:<br>* 1 in 1-year runoff rates are not available for the blue roofs using FEH datasets.<br>** Runoff rates for each blue roof area may be subject to alteration if another blue roof manufacturer is approached at a later design stage. |                                                  |                                        |

As stated in the Sustainable Drainage Strategy report **2220367-EWP-ZZ-XX-RP-C-0002**, in line with the Haringey Development Management DPD requirements where the 1 in 100-year greenfield runoff rate cannot be met for all storm events, runoff rates have been reduced as far as possible. The runoff rate for the 1 in 2-year event is reduced below the 1 in 100-year greenfield runoff rate (1.9l/s), with a greater than 50% betterment achieved for greater storm events.

Calculations are presented in Appendix A of this Addendum. Revised drawings are presented in Appendix B of this Addendum.

## Exceedance Events (ref. Section 8.3.3 of report 2220367-EWP-ZZ-XX-RP-C-0002)

The LLFA has requested that exceedance events be considered for the site, including the 1 in 200 year storm event plus climate change for overflows for the blue/green roofs.

The blue roof outlets will have an overflow weir to carry exceedance flows so that in the event of a blockage or exceedance event which exceeds the design storm (i.e. the 1 in 100 year storm event plus 40% climate change), water can continue to discharge from the blue roof areas. A blue roof manufacturer has been contacted and has advised that during an exceedance storm event, the blue roofs would continue to drain at the designed restricted rate for the 1 in 100 year storm event plus 40% climate change with surplus flows discharging unrestricted via the overflows. As the blue roofs discharge by gravity directly to the public sewer, any exceedance flows will also discharge by gravity to the public sewer.

## Proposed Surface Water Outfall (ref. Section 8.3.4 of report 2220367-EWP-ZZ-XX-RP-C-0002)

The proposed flows to the sewer have been accepted by Thames Water via a pre-planning enquiry, as appended in the report **2220367-EWP-ZZ-XX-RP-C-0002 Sustainable Drainage Strategy**.

The proposed reuse of the existing connection will be subject to a S106 agreement with Thames Water. The existing surface water drain serving the church which passes through the proposed development footprint is proposed to be replaced to run at high level at the lower ground floor of the new development. Existing flows, levels and outfall of this connection are to remain the same as existing.

## Sensitivity Analysis (ref. Section 10 of report 2220367-EWP-ZZ-XX-RP-C-0002)

The LLFA has requested that a sensitivity analysis be undertaken for the basement attenuation tank. A duty/standby pump arrangement is to be specified in the event that if one pump fails, the other will continue to run to allow the basement tank to empty. A duty/assist pump arrangement is not considered suitable due to the proposed low flow rates from the pump chambers.

A pump manufacturer (All Pump Solutions) has been approached for guidance. With the pumps connected either to a BMS or via a monitoring agreement with the pump supplier, a typical call-out time to implement repairs to a pump system in the event of a failure would be within a 24-hour period. It is recommended that the pumps are subject to regular servicing and maintenance as per the manufacturer's recommendations and in accordance with British Standards (BS EN 12056-4) to reduce the risk of pump failure due to lack of maintenance. The servicing and maintenance requirements for the pumps are to be listed in the site's O&M Manual at handover to the site owner.

The worst-case storm scenario for the attenuation tank is shown from calculations to be the 180 min winter storm event. For this storm scenario, the attenuation tank is shown to fully empty within 522 minutes (under 9 hours) at a flow rate of 1l/s under normal operating circumstances. Combined with the 24-hour call-out time for a pump manufacturer to attend site in the event of a failure of the pump system, the residual risk of the basement tank flooding in the event of a pump failure is considered to be low. Non-return valves are recommended to be built into the yard gullies serving external amenity spaces so that the risk of surcharge into the residential areas from the external amenity spaces is reduced.

The basement pumps will be connected to the building's BMS/control system, with a suitable back-up power mechanism provided for the surface water pump to allow for the pumps serving the attenuation tank to continue operating for a period of time in the event of a power cut.

## Addendum Appendix A - Calculations

Modified Ration Method for Brownfield Runoff  
Project Number: 2220367  
Project Name: Braemar Avenue Baptist Church  
Date: 14/11/2022

$Q = 2.78 \times C_v \times C_r \times I \times A$

Q = flow rate (l/s)  
Cv = Volumetric Runoff Coefficient  
Cr = Routing Coefficient  
I - Rainfall intensity  
A = Area (Ha)

Under summer rainfall conditions Cv ranges from 0.6 - 0.9, for fully impermeable areas value of 0.75 should be used.

The routing coeffieint varies between 1 and 2 and accounts for the effect of rainfall characterisitcs and catchment shape on the peak runoff magnitude.  
The SuDS manual recoomends a fixed value for Cr of 1.3 for design.

Rainfall intensity is calculated following Walling Procedure Volume 4 and is as follows:

1.0 Determination of M5-60 min and r

60 minute, 5 year storm (M5-60) has a rainfall depth  
M5-60 20.000  
Ratio r 0.4

2.0 Determination of M5-D

M5-D = Z1 (M5-60min)  
Z1 is taken from A3.a or A.3b for values between 0.12 and 0.45 and for durations between 5 minutes and 48 hours read to 0.01.

Assuming 1yr 15min, 2yr 15min, 30yr 15 min, 100yr 15min

Z1 0.64  
M5-15 12.8 mm

3.0 Determination of MT-D

MT-D is obtained from the relationship:  
MT-D = Z2(M5-D)

|                                                       |                                                       |                                                        |                                                         |
|-------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------|
| Taken from Table A1 for 1yr return period 15min storm | Taken from Table A1 for 2yr return period 15min storm | Taken from Table A1 for 30yr return period 15min storm | Taken from Table A1 for 100yr return period 15min storm |
| Z2 = 0.62                                             | Z2= 0.8                                               | Z2= 1.56                                               | Z2= 1.99                                                |
| M1-15= 7.9                                            | M2-15= 10.2                                           | M30-15= 20.0                                           | M100-15= 25.5                                           |

4 Determination of point rainfall intensities

|                 |                |                 |                  |
|-----------------|----------------|-----------------|------------------|
| i= 31.744 mm/hr | i= 40.96 mm/hr | i= 79.872 mm/hr | i= 101.888 mm/hr |
|-----------------|----------------|-----------------|------------------|

5 Application of areal reduction factor

From chart A4 where area is greater than 1km2  
ARF= 1

|                               |                               |                                |                                  |                                      |
|-------------------------------|-------------------------------|--------------------------------|----------------------------------|--------------------------------------|
| Average 1yr intensity<br>31.7 | Average 2yr intensity<br>41.0 | Average 30yr intensity<br>79.9 | Average 100yr intensity<br>101.9 | Average 100yr+40% intensity<br>142.6 |
|-------------------------------|-------------------------------|--------------------------------|----------------------------------|--------------------------------------|

EXISTING SITE

Area building (Ha) 0.0251  
Area hardstanding (Ha) 0.0064  
If using Cv = 0.95 for roofs and 0.9 from external areas.

| Storm Return Period | Existing Discharge (L/S) |
|---------------------|--------------------------|
| 1yr                 | 3.4                      |
| 2yr                 | 4.4                      |
| 30yr                | 8.5                      |
| 100yr               | 10.9                     |
| 100yr+40%           | 15.3                     |

# BLUE ROOF ATTENUATION AND OUTFLOW SUMMARY

## PRIVATE & CONFIDENTIAL - NOT FOR DISTRIBUTION

|                    |                                                                                                                                                                                                             |                     |      |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|
| Project Name:      | Braemar Avenue, Wood Green, London, N22 7BY - Roof 1                                                                                                                                                        |                     |      |
| Prepared for:      | Elliott Wood, London.                                                                                                                                                                                       |                     |      |
| Date:              | 06/03/2022                                                                                                                                                                                                  |                     |      |
| ABG Project ID:    | 24694                                                                                                                                                                                                       | Calculator version: | 1.30 |
| Prepared by:       | Andrew Keer, andrew@abgltd.com, 07525-808700                                                                                                                                                                |                     |      |
| Notes/description: | Green roof; with free-standing/ballasted PV panels to be installed, on top of the 'blue roof' system (recommended). Maintenance access only - TBC. Warm/inverted roof, construction, with zero falls - TBC. |                     |      |

### Input Parameters - Rainfall Information (Flood Estimation Handbook 2013)

|                                          |                |                       |
|------------------------------------------|----------------|-----------------------|
| Return period:                           | 100 years      | As supplied by Client |
| Allowance for Climate Change:            | 40 %           | As supplied by Client |
| OS grid reference selected for FEH data: | TQ 30481 90780 |                       |

### Input Parameters - Roof Information

|                           |                    |                       |
|---------------------------|--------------------|-----------------------|
| Total catchment area:     | 172 m <sup>2</sup> | As supplied by Client |
| Attenuation area:         | 145 m <sup>2</sup> | As supplied by Client |
| Maximum allowable runoff: | 0.6 l/s            | As supplied by Client |

### Output - Rainfall Calculation

| Duration | Time to Empty          | Restricted Outflow (l/s) |
|----------|------------------------|--------------------------|
| 15 mins  | 6 hours and 0 minutes  | 0.5                      |
| 30 mins  | 6 hours and 50 minutes | 0.5                      |
| 1 hour   | 7 hours and 40 minutes | 0.6                      |
| 2 hours  | 8 hours and 30 minutes | 0.6                      |
| 4 hours  | 8 hours and 40 minutes | 0.6                      |
| 6 hours  | 8 hours and 20 minutes | 0.6                      |
| 10 hours | 6 hours and 50 minutes | 0.5                      |
| 24 hours | 1 hour and 50 minutes  | 0.2                      |
| 48 hours | 0 hours and 0 minutes  | 0.0                      |

**Total attenuation required: 13.7 m<sup>3</sup>**

**Half empty time: 2 hours and 40 minutes.**

### Output - Recommended Blue Roof System

|              |                                                                                                                                                                                                                                                                                     |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Name: | ABG bluroof VF HD 129mm                                                                                                                                                                                                                                                             |
| Description: | The blue roof depth of 129mm, already includes for a 25mm reservoir board. No. of control positions TBC by design team, and also with the structural engineer's deflection analysis. Additional 'tell-tale'/emergency parapet overflow outlets, may also be added by the architect. |

|                              |                     |
|------------------------------|---------------------|
| Total attenuation capacity:  | 16.5 m <sup>3</sup> |
| Number of Blue Roof outlets: | 2                   |

#### Notes:

1. This document contains an estimate which has been prepared by ABG Ltd and is illustrative only and not a detailed design.
2. Further details on the theories used in this estimate are available upon request from ABG. The values given for the performance of the system relate to testing, modelling and analysis of our systems obtained from laboratories and testing institutes. In line with our policy of continuous improvement the right is reserved to make changes to our systems without notice at any time.
3. The estimate given in this report is based on the stated parameters as per the brief. If these parameters are not correct or have changed, ABG should be contacted to provide a revised estimate.
4. This estimate is specific to the characteristics of ABG products/systems and is not applicable to other competitor products. The substitution of the whole or any component of this design for a material supplied from another source renders this estimate invalid.
5. Final determination of the suitability of any information is the sole responsibility of the user. ABG will be pleased to discuss the use of this or any other product but responsibility for selection of a material and its application in any specific project remains with the user.

Blue Roof Estimate

## 1. DEFINITIONS

‘Consultant’ means ABG Geosynthetics Ltd and its legal successors. ‘Client’ means the person, firm, company or organisation for whom the Consultant is performing the Services. ‘Agreement’ means the contract referred to in Clause 2. ‘Services’ means the services to be performed by the Consultant in accordance with the proposal from the Consultant. ‘Project’ means the project or works for which the Client has commissioned the Services.

## 2. GENERAL

Unless and until a formal agreement is entered into, the Client’s acceptance of the proposal for Services from the Consultant or a request for some or all the Services to be performed by the Consultant, shall constitute a binding

contract between the Client and the Consultant which contract will be subject to any terms and conditions contained or referred to in the aforementioned proposal and these terms and conditions. In the event of any conflict, the terms and conditions in the proposal shall prevail over these terms and conditions. The Agreement so formed shall supersede all previous understandings, commitments or agreements whether written or oral between the Client and the Consultant relating to the subject matter hereof. No person or entity shall have any rights in relation to this Agreement, whether as third parties or otherwise, save the parties to this Agreement. Should any term or condition of this Agreement be held to be unenforceable or invalid by the courts of any jurisdiction to which it is subject then such term or condition shall be disregarded and the remaining terms and conditions shall remain in full force and effect.

## 3. PERFORMANCE OF SERVICES AND SCOPE

The Consultant shall perform the Services using the degree of skill care and diligence to be expected from a consultant experienced in the provision of services of similar scope size and complexity. The Consultant shall use reasonable endeavours to complete the Services within the time or programme agreed but shall not be responsible for any delay beyond the reasonable control of the Consultant.

The fee contained in the proposal is for the scope of services as defined therein. If not already contained in the proposal the Consultant and the Client shall agree as an initial activity an integrated project services programme to

include the activities of all the parties to the Project relevant to the Services to be supplied by the Consultant. The

aforesaid programme shall show the key dates for final information and the delivery of such to the Consultant so as to enable the Consultant to carry out the services in an efficient once through manner to achieve the programme delivery dates for the Services.

The Consultant provides various services including Design and Product use advice which is distinct from a Design Service. The Design Service may or may not attract a fee.

Where the Consultant’s services are of an advisory nature and dependent upon the degree of information and release thereof by the Client then the Client agrees that any reliance placed on the services by the Client shall take due account of such constraints.

## 4. CONFIDENTIALITY AND INTELLECTUAL PROPERTY RIGHTS

i. The Consultant and the Client shall keep confidential all information pertaining to the Services.

ii. Copyright for all reports, documents and the like produced by the Consultant in the performance of the Services

shall remain vested with the Consultant but the Consultant shall grant an irrevocable royalty free license to the Client to use such reports, documents and the like for any purpose in connection with the Project.

## 5. LIABILITY

i. The Consultant shall be liable to pay compensation to the Client arising out of or in connection with this Agreement only if a breach of the duty of care in Clause 3 is established against the Consultant.

ii. Notwithstanding any other term to the contrary in this Agreement or any related document and whether the cause of action for any claim arises under or in connection with the Agreement in contract or in tort, in negligence or for breach of statutory duty or otherwise the Consultant shall have no liability to the Client in respect of any claim for loss or damage arising from acts of war or terrorism or arising from flooding, burst water mains or failed drainage or arising from any incidence of toxic mould or asbestos but otherwise in relation to any cause of action as aforesaid the total liability of the Consultant in the aggregate for all claims shall be limited to a sum equivalent to ten (10) times the fee payable under this Agreement or £50,000, whichever is the lesser, or such other sum as may be expressly stated in the Consultant’s proposal, and further but without prejudice to the aforesaid limit of liability any such liability of the Consultant shall be limited to such sum or sums as it would be just and equitable for the Consultant to pay having regard to the Consultant’s responsibility for the same and on the basis that all other parties appointed or to be appointed by the Client to perform related services in connection with the Project shall be deemed to have provided undertakings on terms no less onerous than this Agreement and shall be deemed to have paid to the Client such contribution as it would be just and equitable for them to pay having regard to their responsibility for any loss or damage and providing that it shall be deemed that such other parties have not limited or excluded their liability to the Client for such loss or damage in any way which may be prejudicial to the Consultant’s liability under this clause. Nothing in this clause shall operate to exclude or limit the Consultant’s liability for death or personal injury.

iii. The Client shall indemnify and keep indemnified the Consultant from and against all claims, demands, proceedings, damages, costs and expenses arising out of or in connection with this Agreement or the Project arising from acts of terrorism or arising otherwise in excess of the liability of the Consultant under this Agreement or which may be made in respect of events occurring after the expiry of the period of liability stated in this Agreement.

iv. No action or proceedings under or in connection with this Agreement shall be commenced against the Consultant after the expiry of one year from completion of the Services.

v. ABG Geosynthetics Ltd is not responsible for consequential, indirect or incidental losses.

## 6. INSURANCE

The Consultant shall arrange Professional Indemnity Insurance cover for the amount stated in Clause 5(ii). The Consultant will use all reasonable endeavours to maintain Professional Indemnity Insurance cover for the period stated in 5(iv) above, providing such insurance remains available to the Consultant at commercially reasonable rates.

## 7. CLIENT’S OBLIGATIONS

The Client shall supply, without charge and in such time so as not to delay or disrupt the performance of the Consultant in carrying out the Services, all necessary and relevant information, in his possession or available to him from his other agents or consultants and all necessary approvals or consents. Any deviation on any information from the proposal shall be confirmed in writing and any attendant consequential fees will be forwarded for approval by the Client before any changes are made. The Consultant shall not be liable for any consequential delays on site. Every reasonable effort will be made to mitigate against delays, however no liability for losses and costs will be accepted. The approval or consent by the Client to the Services shall not relieve the Consultant from any liability under this Agreement. All work undertaken by the Consultant must be ratified and signed off by the Client.

## 8. PAYMENT

i. The Client shall pay the Consultant for the Services in accordance with the proposal and this Agreement. If the Consultant performs any additional services or if the Services are delayed or disrupted for reasons beyond the

reasonable control of the Consultant then the Consultant shall be entitled to such additional fees as are fair and reasonable in the circumstances. The Consultant may render an invoice at monthly intervals for services properly performed. The agreed invoice, or in the event of a dispute the undisputed element, shall be paid within 28 days of receipt of the invoice by the Client. Any invoice paid after this period will attract interest at 3% above the base

rate of the central bank of the country of the currency of payment along with any collection costs which may occur.

ii. The Client shall not withhold any payment of any sum or part of a sum due to the Consultant under this Agreement by reason of claims or alleged claims against the Consultant unless the amount to be withheld has been agreed between the Client and the Consultant as due to the Client or such sum arises from an award in adjudication, arbitration or litigation in favour of the Client and arises under or in connection with the Agreement. Save as aforesaid all rights of set off at common law, in equity or otherwise which the Client may otherwise be entitled to exercise are hereby expressly excluded.

## 9. TERMINATION

If a party is in breach of a material term of this Agreement and despite written notice from the other party fails to remedy such breach within 30 days or such other period as may be agreed between the parties, then the other party shall be entitled to terminate this Agreement forthwith. The Consultant may seek to recoup costs incurred for works completed prior to termination.

## 10. DISPUTE RESOLUTION

Any dispute between the parties that cannot be settled by mutual agreement shall be referred for final settlement to the arbitration of a person agreed between the parties or failing such agreement appointed upon the application of either party by the President of the Chartered Institute of Arbitrators and the said arbitration shall be carried out in accordance with the Construction Industry Model Arbitration Rules 1998 or such other version current at the time of the referral under this clause. Where the Agreement is subject to a governing law other than that of England and Wales then any dispute between the parties that cannot be settled by mutual agreement shall be finally settled by arbitration in accordance with the UNCITRAL Arbitration Rules by one arbitrator appointed in compliance with the said Rules. In either case such rules as appropriate are deemed to be incorporated into this Agreement by reference.

## 11. COMPLIANCE WITH LAWS

This Agreement shall be governed by and construed in accordance with the law of England and Wales unless stated otherwise in the proposal for services from the Consultant.

Changes to the above terms and conditions will only be considered if agreed in writing as part of the appointment process prior to ABG Geosynthetics commencing work.

# BLUE ROOF ATTENUATION AND OUTFLOW SUMMARY

## PRIVATE & CONFIDENTIAL - NOT FOR DISTRIBUTION

|                    |                                                                                                                                                                                                                                                                                                                              |                     |      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|
| Project Name:      | Braemar Avenue, Wood Green, London, N22 7BY - Roof 2                                                                                                                                                                                                                                                                         |                     |      |
| Prepared for:      | Elliott Wood, London.                                                                                                                                                                                                                                                                                                        |                     |      |
| Date:              | 06/03/2023                                                                                                                                                                                                                                                                                                                   |                     |      |
| ABG Project ID:    | 24694                                                                                                                                                                                                                                                                                                                        | Calculator version: | 1.30 |
| Prepared by:       | Andrew Keer, andrew@abgltd.com, 07525-808700                                                                                                                                                                                                                                                                                 |                     |      |
| Notes/description: | Green roof and/or hard landscaping (pavers on pedestals/ballast) - TBC; with potential free-standing/ballasted PV panels, and planters, to be installed, on top of the 'blue roof' system (recommended). Pedestrian/amenity access and/or maintenance access - TBC. Warm/inverted roof, construction, with zero falls - TBC. |                     |      |

### Input Parameters - Rainfall Information (Flood Estimation Handbook 2013)

|                                          |                |                       |
|------------------------------------------|----------------|-----------------------|
| Return period:                           | 100 years      | As supplied by Client |
| Allowance for Climate Change:            | 40 %           | As supplied by Client |
| OS grid reference selected for FEH data: | TQ 30481 90780 |                       |

### Input Parameters - Roof Information

|                           |                   |                       |
|---------------------------|-------------------|-----------------------|
| Total catchment area:     | 63 m <sup>2</sup> | As supplied by Client |
| Attenuation area:         | 50 m <sup>2</sup> | As supplied by Client |
| Maximum allowable runoff: | 0.6 l/s           | As supplied by Client |

### Output - Rainfall Calculation

| Duration | Time to Empty          | Restricted Outflow (l/s) |
|----------|------------------------|--------------------------|
| 15 mins  | 2 hours and 10 minutes | 0.5                      |
| 30 mins  | 2 hours and 20 minutes | 0.5                      |
| 1 hour   | 2 hours and 20 minutes | 0.5                      |
| 2 hours  | 2 hours and 20 minutes | 0.5                      |
| 4 hours  | 1 hour and 50 minutes  | 0.4                      |
| 6 hours  | 1 hour and 10 minutes  | 0.3                      |
| 10 hours | 0 hours and 10 minutes | 0.1                      |
| 24 hours | 0 hours and 0 minutes  | 0.0                      |
| 48 hours | 0 hours and 0 minutes  | 0.0                      |

**Total attenuation required: 3.4 m<sup>3</sup>**

**Half empty time: 0 hours and 30 minutes.**

### Output - Recommended Blue Roof System

|              |                                                                                                                                                                                                                                                                                     |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Name: | ABG bluroof VF HD 108mm/129mm                                                                                                                                                                                                                                                       |
| Description: | The blue roof depth of 129mm, already includes for a 25mm reservoir board. No. of control positions TBC by design team, and also with the structural engineer's deflection analysis. Additional 'tell-tale'/emergency parapet overflow outlets, may also be added by the architect. |

|                              |                    |
|------------------------------|--------------------|
| Total attenuation capacity:  | 4.8 m <sup>3</sup> |
| Number of Blue Roof outlets: | 2                  |

#### Notes:

1. This document contains an estimate which has been prepared by ABG Ltd and is illustrative only and not a detailed design.
2. Further details on the theories used in this estimate are available upon request from ABG. The values given for the performance of the system relate to testing, modelling and analysis of our systems obtained from laboratories and testing institutes. In line with our policy of continuous improvement the right is reserved to make changes to our systems without notice at any time.
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Blue Roof Estimate

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## 3. PERFORMANCE OF SERVICES AND SCOPE

The Consultant shall perform the Services using the degree of skill care and diligence to be expected from a consultant experienced in the provision of services of similar scope size and complexity. The Consultant shall use reasonable endeavours to complete the Services within the time or programme agreed but shall not be responsible for any delay beyond the reasonable control of the Consultant.

The fee contained in the proposal is for the scope of services as defined therein. If not already contained in the proposal the Consultant and the Client shall agree as an initial activity an integrated project services programme to

include the activities of all the parties to the Project relevant to the Services to be supplied by the Consultant. The

aforesaid programme shall show the key dates for final information and the delivery of such to the Consultant so as to enable the Consultant to carry out the services in an efficient once through manner to achieve the programme delivery dates for the Services.

The Consultant provides various services including Design and Product use advice which is distinct from a Design Service. The Design Service may or may not attract a fee.

Where the Consultant’s services are of an advisory nature and dependent upon the degree of information and release thereof by the Client then the Client agrees that any reliance placed on the services by the Client shall take due account of such constraints.

## 4. CONFIDENTIALITY AND INTELLECTUAL PROPERTY RIGHTS

i. The Consultant and the Client shall keep confidential all information pertaining to the Services.

ii. Copyright for all reports, documents and the like produced by the Consultant in the performance of the Services

shall remain vested with the Consultant but the Consultant shall grant an irrevocable royalty free license to the Client to use such reports, documents and the like for any purpose in connection with the Project.

## 5. LIABILITY

i. The Consultant shall be liable to pay compensation to the Client arising out of or in connection with this Agreement only if a breach of the duty of care in Clause 3 is established against the Consultant.

ii. Notwithstanding any other term to the contrary in this Agreement or any related document and whether the cause of action for any claim arises under or in connection with the Agreement in contract or in tort, in negligence or for breach of statutory duty or otherwise the Consultant shall have no liability to the Client in respect of any claim for loss or damage arising from acts of war or terrorism or arising from flooding, burst water mains or failed drainage or arising from any incidence of toxic mould or asbestos but otherwise in relation to any cause of action as aforesaid the total liability of the Consultant in the aggregate for all claims shall be limited to a sum equivalent to ten (10) times the fee payable under this Agreement or £50,000, whichever is the lesser, or such other sum as may be expressly stated in the Consultant’s proposal, and further but without prejudice to the aforesaid limit of liability any such liability of the Consultant shall be limited to such sum or sums as it would be just and equitable for the Consultant to pay having regard to the Consultant’s responsibility for the same and on the basis that all other parties appointed or to be appointed by the Client to perform related services in connection with the Project shall be deemed to have provided undertakings on terms no less onerous than this Agreement and shall be deemed to have paid to the Client such contribution as it would be just and equitable for them to pay having regard to their responsibility for any loss or damage and providing that it shall be deemed that such other parties have not limited or excluded their liability to the Client for such loss or damage in any way which may be prejudicial to the Consultant’s liability under this clause. Nothing in this clause shall operate to exclude or limit the Consultant’s liability for death or personal injury.

iii. The Client shall indemnify and keep indemnified the Consultant from and against all claims, demands, proceedings, damages, costs and expenses arising out of or in connection with this Agreement or the Project arising from acts of terrorism or arising otherwise in excess of the liability of the Consultant under this Agreement or which may be made in respect of events occurring after the expiry of the period of liability stated in this Agreement.

iv. No action or proceedings under or in connection with this Agreement shall be commenced against the Consultant after the expiry of one year from completion of the Services.

v. ABG Geosynthetics Ltd is not responsible for consequential, indirect or incidental losses.

## 6. INSURANCE

The Consultant shall arrange Professional Indemnity Insurance cover for the amount stated in Clause 5(ii). The Consultant will use all reasonable endeavours to maintain Professional Indemnity Insurance cover for the period stated in 5(iv) above, providing such insurance remains available to the Consultant at commercially reasonable rates.

## 7. CLIENT’S OBLIGATIONS

The Client shall supply, without charge and in such time so as not to delay or disrupt the performance of the Consultant in carrying out the Services, all necessary and relevant information, in his possession or available to him from his other agents or consultants and all necessary approvals or consents. Any deviation on any information from the proposal shall be confirmed in writing and any attendant consequential fees will be forwarded for approval by the Client before any changes are made. The Consultant shall not be liable for any consequential delays on site. Every reasonable effort will be made to mitigate against delays, however no liability for losses and costs will be accepted. The approval or consent by the Client to the Services shall not relieve the Consultant from any liability under this Agreement. All work undertaken by the Consultant must be ratified and signed off by the Client.

## 8. PAYMENT

i. The Client shall pay the Consultant for the Services in accordance with the proposal and this Agreement. If the Consultant performs any additional services or if the Services are delayed or disrupted for reasons beyond the reasonable control of the Consultant then the Consultant shall be entitled to such additional fees as are fair and reasonable in the circumstances. The Consultant may render an invoice at monthly intervals for services properly performed. The agreed invoice, or in the event of a dispute the undisputed element, shall be paid within 28 days of receipt of the invoice by the Client. Any invoice paid after this period will attract interest at 3% above the base

rate of the central bank of the country of the currency of payment along with any collection costs which may occur.

ii. The Client shall not withhold any payment of any sum or part of a sum due to the Consultant under this Agreement by reason of claims or alleged claims against the Consultant unless the amount to be withheld has been agreed between the Client and the Consultant as due to the Client or such sum arises from an award in adjudication, arbitration or litigation in favour of the Client and arises under or in connection with the Agreement. Save as aforesaid all rights of set off at common law, in equity or otherwise which the Client may otherwise be entitled to exercise are hereby expressly excluded.

## 9. TERMINATION

If a party is in breach of a material term of this Agreement and despite written notice from the other party fails to remedy such breach within 30 days or such other period as may be agreed between the parties, then the other party shall be entitled to terminate this Agreement forthwith. The Consultant may seek to recoup costs incurred for works completed prior to termination.

## 10. DISPUTE RESOLUTION

Any dispute between the parties that cannot be settled by mutual agreement shall be referred for final settlement to the arbitration of a person agreed between the parties or failing such agreement appointed upon the application of either party by the President of the Chartered Institute of Arbitrators and the said arbitration shall be carried out in accordance with the Construction Industry Model Arbitration Rules 1998 or such other version current at the time of the referral under this clause. Where the Agreement is subject to a governing law other than that of England and Wales then any dispute between the parties that cannot be settled by mutual agreement shall be finally settled by arbitration in accordance with the UNCITRAL Arbitration Rules by one arbitrator appointed in compliance with the said Rules. In either case such rules as appropriate are deemed to be incorporated into this Agreement by reference.

## 11. COMPLIANCE WITH LAWS

This Agreement shall be governed by and construed in accordance with the law of England and Wales unless stated otherwise in the proposal for services from the Consultant.

Changes to the above terms and conditions will only be considered if agreed in writing as part of the appointment process prior to ABG Geosynthetics commencing work.

|                                                      |                     |                                                              |                             |                       |                                                                                     |  |
|------------------------------------------------------|---------------------|--------------------------------------------------------------|-----------------------------|-----------------------|-------------------------------------------------------------------------------------|--|
| Elliott Wood Partnership LTD                         |                     |                                                              |                             |                       | Page 1                                                                              |  |
| 241 The Broadway<br>London<br>SW19 1SD               |                     | Braemar Avenue Baptist Church<br>2220367<br>Attenuation tank |                             |                       |  |  |
| Date 04/04/2023<br>File Attenuation tank.SRCX        |                     | Designed by LKi<br>Checked by                                |                             |                       |                                                                                     |  |
| Innovyze                                             |                     | Source Control 2020.1.3                                      |                             |                       |                                                                                     |  |
| Summary of Results for 100 year Return Period (+40%) |                     |                                                              |                             |                       |                                                                                     |  |
| Storm<br>Event                                       | Max<br>Level<br>(m) | Max<br>Depth<br>(m)                                          | Max<br>Control<br>(l/s)     | Max<br>Volume<br>(m³) | Status                                                                              |  |
| 15 min Summer                                        | 28.194              | 0.594                                                        | 1.0                         | 10.1                  | O K                                                                                 |  |
| 30 min Summer                                        | 28.330              | 0.730                                                        | 1.0                         | 12.4                  | O K                                                                                 |  |
| 60 min Summer                                        | 28.416              | 0.816                                                        | 1.0                         | 13.9                  | O K                                                                                 |  |
| 120 min Summer                                       | 28.521              | 0.921                                                        | 1.0                         | 15.7                  | O K                                                                                 |  |
| 180 min Summer                                       | 28.538              | 0.938                                                        | 1.0                         | 15.9                  | O K                                                                                 |  |
| 240 min Summer                                       | 28.529              | 0.929                                                        | 1.0                         | 15.8                  | O K                                                                                 |  |
| 360 min Summer                                       | 28.480              | 0.880                                                        | 1.0                         | 15.0                  | O K                                                                                 |  |
| 480 min Summer                                       | 28.414              | 0.814                                                        | 1.0                         | 13.8                  | O K                                                                                 |  |
| 600 min Summer                                       | 28.342              | 0.742                                                        | 1.0                         | 12.6                  | O K                                                                                 |  |
| 720 min Summer                                       | 28.269              | 0.669                                                        | 1.0                         | 11.4                  | O K                                                                                 |  |
| 960 min Summer                                       | 28.130              | 0.530                                                        | 1.0                         | 9.0                   | O K                                                                                 |  |
| 1440 min Summer                                      | 27.900              | 0.300                                                        | 1.0                         | 5.1                   | O K                                                                                 |  |
| 2160 min Summer                                      | 27.703              | 0.103                                                        | 1.0                         | 1.7                   | O K                                                                                 |  |
| 2880 min Summer                                      | 27.651              | 0.051                                                        | 0.9                         | 0.9                   | O K                                                                                 |  |
| 4320 min Summer                                      | 27.624              | 0.024                                                        | 0.6                         | 0.4                   | O K                                                                                 |  |
| 5760 min Summer                                      | 27.610              | 0.010                                                        | 0.5                         | 0.2                   | O K                                                                                 |  |
| 7200 min Summer                                      | 27.602              | 0.002                                                        | 0.4                         | 0.0                   | O K                                                                                 |  |
| 8640 min Summer                                      | 27.600              | 0.000                                                        | 0.4                         | 0.0                   | O K                                                                                 |  |
| 10080 min Summer                                     | 27.600              | 0.000                                                        | 0.3                         | 0.0                   | O K                                                                                 |  |
| 15 min Winter                                        | 28.194              | 0.594                                                        | 1.0                         | 10.1                  | O K                                                                                 |  |
| 30 min Winter                                        | 28.333              | 0.733                                                        | 1.0                         | 12.5                  | O K                                                                                 |  |
| Storm<br>Event                                       | Rain<br>(mm/hr)     | Flooded<br>Volume<br>(m³)                                    | Discharge<br>Volume<br>(m³) | Time-Peak<br>(mins)   |                                                                                     |  |
| 15 min Summer                                        | 172.317             | 0.0                                                          | 11.0                        | 18                    |                                                                                     |  |
| 30 min Summer                                        | 110.609             | 0.0                                                          | 14.2                        | 32                    |                                                                                     |  |
| 60 min Summer                                        | 67.371              | 0.0                                                          | 17.3                        | 62                    |                                                                                     |  |
| 120 min Summer                                       | 43.495              | 0.0                                                          | 22.3                        | 120                   |                                                                                     |  |
| 180 min Summer                                       | 33.130              | 0.0                                                          | 25.5                        | 152                   |                                                                                     |  |
| 240 min Summer                                       | 27.051              | 0.0                                                          | 27.8                        | 184                   |                                                                                     |  |
| 360 min Summer                                       | 19.995              | 0.0                                                          | 30.8                        | 250                   |                                                                                     |  |
| 480 min Summer                                       | 15.949              | 0.0                                                          | 32.7                        | 318                   |                                                                                     |  |
| 600 min Summer                                       | 13.297              | 0.0                                                          | 34.1                        | 386                   |                                                                                     |  |
| 720 min Summer                                       | 11.418              | 0.0                                                          | 35.1                        | 452                   |                                                                                     |  |
| 960 min Summer                                       | 8.918               | 0.0                                                          | 36.6                        | 578                   |                                                                                     |  |
| 1440 min Summer                                      | 6.223               | 0.0                                                          | 38.3                        | 820                   |                                                                                     |  |
| 2160 min Summer                                      | 4.318               | 0.0                                                          | 39.9                        | 1144                  |                                                                                     |  |
| 2880 min Summer                                      | 3.332               | 0.0                                                          | 41.0                        | 1468                  |                                                                                     |  |
| 4320 min Summer                                      | 2.317               | 0.0                                                          | 42.8                        | 2200                  |                                                                                     |  |
| 5760 min Summer                                      | 1.800               | 0.0                                                          | 44.3                        | 2936                  |                                                                                     |  |
| 7200 min Summer                                      | 1.490               | 0.0                                                          | 45.9                        | 3624                  |                                                                                     |  |
| 8640 min Summer                                      | 1.284               | 0.0                                                          | 47.4                        | 0                     |                                                                                     |  |
| 10080 min Summer                                     | 1.137               | 0.0                                                          | 49.0                        | 0                     |                                                                                     |  |
| 15 min Winter                                        | 172.317             | 0.0                                                          | 11.0                        | 18                    |                                                                                     |  |
| 30 min Winter                                        | 110.609             | 0.0                                                          | 14.2                        | 32                    |                                                                                     |  |
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|                                                      |                     |                                                              |                             |                       |                                                                                     |
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| 241 The Broadway<br>London<br>SW19 1SD               |                     | Braemar Avenue Baptist Church<br>2220367<br>Attenuation tank |                             |                       |  |
| Date 04/04/2023<br>File Attenuation tank.SRCX        |                     | Designed by LKi<br>Checked by                                |                             |                       |                                                                                     |
| Innovyze                                             |                     | Source Control 2020.1.3                                      |                             |                       |                                                                                     |
| Summary of Results for 100 year Return Period (+40%) |                     |                                                              |                             |                       |                                                                                     |
| Storm<br>Event                                       | Max<br>Level<br>(m) | Max<br>Depth<br>(m)                                          | Max<br>Control<br>(l/s)     | Max<br>Volume<br>(m³) | Status                                                                              |
| 60 min Winter                                        | 28.421              | 0.821                                                        | 1.0                         | 14.0                  | O K                                                                                 |
| 120 min Winter                                       | 28.532              | 0.932                                                        | 1.0                         | 15.8                  | O K                                                                                 |
| 180 min Winter                                       | 28.543              | 0.943                                                        | 1.0                         | 16.0                  | O K                                                                                 |
| 240 min Winter                                       | 28.525              | 0.925                                                        | 1.0                         | 15.7                  | O K                                                                                 |
| 360 min Winter                                       | 28.451              | 0.851                                                        | 1.0                         | 14.5                  | O K                                                                                 |
| 480 min Winter                                       | 28.353              | 0.753                                                        | 1.0                         | 12.8                  | O K                                                                                 |
| 600 min Winter                                       | 28.248              | 0.648                                                        | 1.0                         | 11.0                  | O K                                                                                 |
| 720 min Winter                                       | 28.145              | 0.545                                                        | 1.0                         | 9.3                   | O K                                                                                 |
| 960 min Winter                                       | 27.956              | 0.356                                                        | 1.0                         | 6.1                   | O K                                                                                 |
| 1440 min Winter                                      | 27.697              | 0.097                                                        | 1.0                         | 1.6                   | O K                                                                                 |
| 2160 min Winter                                      | 27.637              | 0.037                                                        | 0.8                         | 0.6                   | O K                                                                                 |
| 2880 min Winter                                      | 27.620              | 0.020                                                        | 0.6                         | 0.3                   | O K                                                                                 |
| 4320 min Winter                                      | 27.602              | 0.002                                                        | 0.4                         | 0.0                   | O K                                                                                 |
| 5760 min Winter                                      | 27.600              | 0.000                                                        | 0.3                         | 0.0                   | O K                                                                                 |
| 7200 min Winter                                      | 27.600              | 0.000                                                        | 0.3                         | 0.0                   | O K                                                                                 |
| 8640 min Winter                                      | 27.600              | 0.000                                                        | 0.2                         | 0.0                   | O K                                                                                 |
| 10080 min Winter                                     | 27.600              | 0.000                                                        | 0.2                         | 0.0                   | O K                                                                                 |
| Storm<br>Event                                       | Rain<br>(mm/hr)     | Flooded<br>Volume<br>(m³)                                    | Discharge<br>Volume<br>(m³) | Time-Peak<br>(mins)   |                                                                                     |
| 60 min Winter                                        | 67.371              | 0.0                                                          | 17.3                        | 60                    |                                                                                     |
| 120 min Winter                                       | 43.495              | 0.0                                                          | 22.3                        | 116                   |                                                                                     |
| 180 min Winter                                       | 33.130              | 0.0                                                          | 25.5                        | 168                   |                                                                                     |
| 240 min Winter                                       | 27.051              | 0.0                                                          | 27.7                        | 190                   |                                                                                     |
| 360 min Winter                                       | 19.995              | 0.0                                                          | 30.7                        | 266                   |                                                                                     |
| 480 min Winter                                       | 15.949              | 0.0                                                          | 32.7                        | 340                   |                                                                                     |
| 600 min Winter                                       | 13.297              | 0.0                                                          | 34.1                        | 410                   |                                                                                     |
| 720 min Winter                                       | 11.418              | 0.0                                                          | 35.1                        | 478                   |                                                                                     |
| 960 min Winter                                       | 8.918               | 0.0                                                          | 36.6                        | 604                   |                                                                                     |
| 1440 min Winter                                      | 6.223               | 0.0                                                          | 38.3                        | 796                   |                                                                                     |
| 2160 min Winter                                      | 4.318               | 0.0                                                          | 39.9                        | 1104                  |                                                                                     |
| 2880 min Winter                                      | 3.332               | 0.0                                                          | 41.0                        | 1468                  |                                                                                     |
| 4320 min Winter                                      | 2.317               | 0.0                                                          | 42.8                        | 2200                  |                                                                                     |
| 5760 min Winter                                      | 1.800               | 0.0                                                          | 44.3                        | 0                     |                                                                                     |
| 7200 min Winter                                      | 1.490               | 0.0                                                          | 45.9                        | 0                     |                                                                                     |
| 8640 min Winter                                      | 1.284               | 0.0                                                          | 47.4                        | 0                     |                                                                                     |
| 10080 min Winter                                     | 1.137               | 0.0                                                          | 49.0                        | 0                     |                                                                                     |
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|                                               |                                                              |                                                                                     |
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| Innovyze Source Control 2020.1.3              |                                                              |                                                                                     |

Rainfall Details

|                       |                                 |
|-----------------------|---------------------------------|
| Rainfall Model        | FEH                             |
| Return Period (years) | 100                             |
| FEH Rainfall Version  | 2013                            |
| Site Location         | GB 530476 190756 TQ 30476 90756 |
| Data Type             | Point                           |
| Summer Storms         | Yes                             |
| Winter Storms         | Yes                             |
| Cv (Summer)           | 0.950                           |
| Cv (Winter)           | 0.950                           |
| Shortest Storm (mins) | 15                              |
| Longest Storm (mins)  | 10080                           |
| Climate Change %      | +40                             |

Time Area Diagram

Total Area (ha) 0.027

|       | Time (mins) | Area    |
|-------|-------------|---------|
| From: | To:         | (ha)    |
|       | 0           | 4 0.027 |

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|                                               |                                                              |                                                                                     |
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| Innovyze Source Control 2020.1.3              |                                                              |                                                                                     |

Model Details

Storage is Online Cover Level (m) 29.400

Tank or Pond Structure

Invert Level (m) 27.600

| Depth (m) | Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) |
|-----------|------------------------|-----------|------------------------|-----------|------------------------|
| 0.000     | 17.0                   | 1.000     | 17.0                   | 1.001     | 0.0                    |

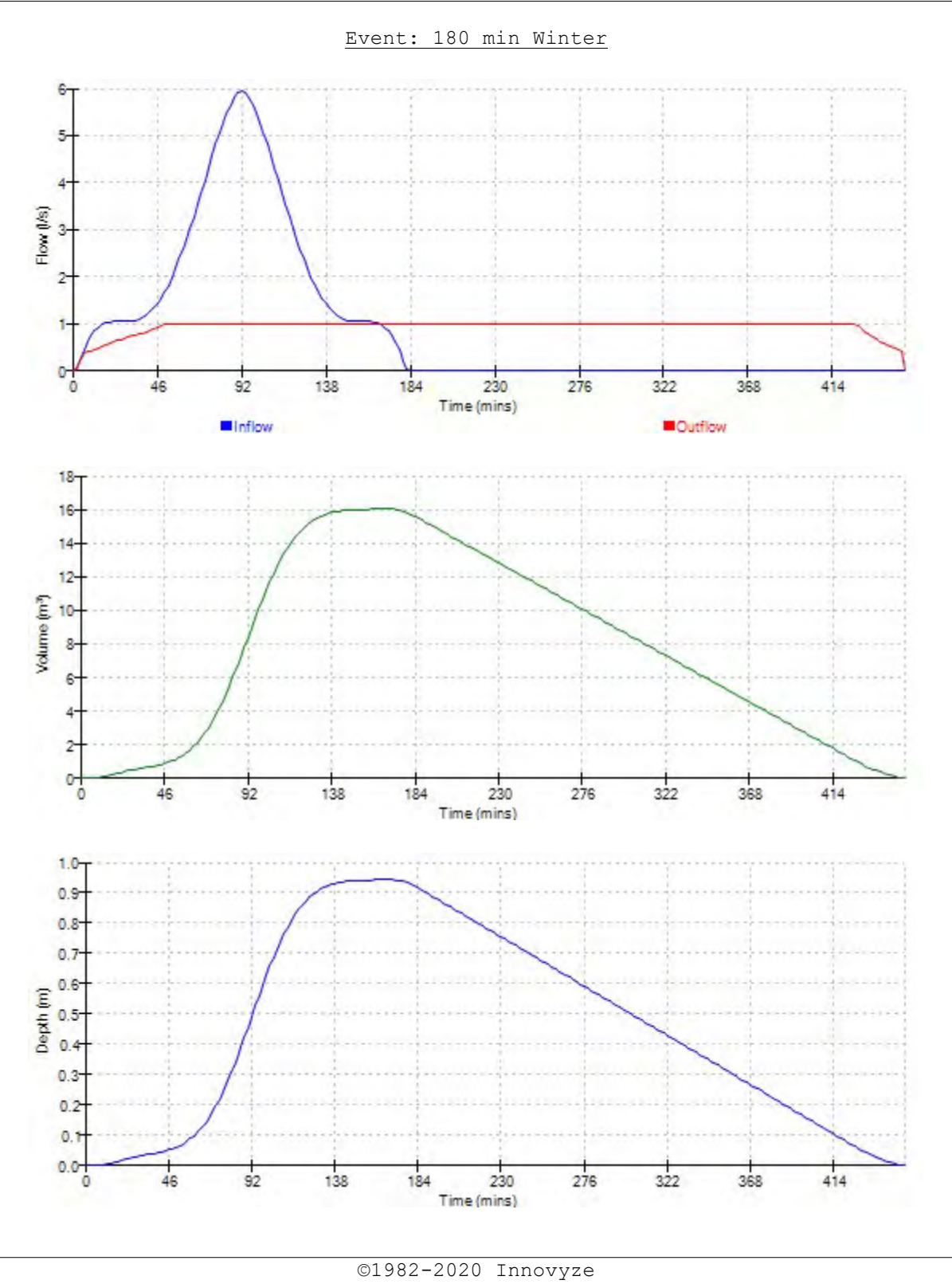
Pump Outflow Control

Invert Level (m) 27.260

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100     | 0.0000     | 0.900     | 1.0000     | 1.700     | 1.0000     | 2.500     | 1.0000     |
| 0.200     | 0.0000     | 1.000     | 1.0000     | 1.800     | 1.0000     | 2.600     | 1.0000     |
| 0.300     | 0.0000     | 1.100     | 1.0000     | 1.900     | 1.0000     | 2.700     | 1.0000     |
| 0.400     | 1.0000     | 1.200     | 1.0000     | 2.000     | 1.0000     | 2.800     | 1.0000     |
| 0.500     | 1.0000     | 1.300     | 1.0000     | 2.100     | 1.0000     | 2.900     | 1.0000     |
| 0.600     | 1.0000     | 1.400     | 1.0000     | 2.200     | 1.0000     | 3.000     | 1.0000     |
| 0.700     | 1.0000     | 1.500     | 1.0000     | 2.300     | 1.0000     |           |            |
| 0.800     | 1.0000     | 1.600     | 1.0000     | 2.400     | 1.0000     |           |            |

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|                                        |                                                              |                                                                                     |
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| Date 04/04/2023                        | Designed by LKi                                              |                                                                                     |
| File Attenuation tank.SRCX             | Checked by                                                   |                                                                                     |
| Innovyze                               | Source Control 2020.1.3                                      |                                                                                     |



Elliott Wood Partnership LTD

241 The Broadway  
London  
SW19 1SD

Date 04/04/2023  
File Permeable paving.SRCX

Innovyze

Braemar Avenue Baptist Church  
2220367  
Permeable paving

Designed by LKi  
Checked by

Source Control 2020.1.3

Page 1

Micro Drainage

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 72 minutes.

| Storm Event      | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max E Outflow (l/s) | Max Volume (m³) | Status     |
|------------------|---------------|---------------|------------------------|-------------------|---------------------|-----------------|------------|
| 15 min Summer    | 36.127        | 0.137         | 0.0                    | 0.3               | 0.3                 | 1.8             | O K        |
| 30 min Summer    | 36.156        | 0.166         | 0.0                    | 0.4               | 0.4                 | 2.2             | Flood Risk |
| 60 min Summer    | 36.166        | 0.176         | 0.0                    | 0.4               | 0.4                 | 2.4             | Flood Risk |
| 120 min Summer   | 36.177        | 0.187         | 0.0                    | 0.4               | 0.4                 | 2.5             | Flood Risk |
| 180 min Summer   | 36.175        | 0.185         | 0.0                    | 0.4               | 0.4                 | 2.5             | Flood Risk |
| 240 min Summer   | 36.169        | 0.179         | 0.0                    | 0.4               | 0.4                 | 2.4             | Flood Risk |
| 360 min Summer   | 36.149        | 0.159         | 0.0                    | 0.4               | 0.4                 | 2.1             | Flood Risk |
| 480 min Summer   | 36.127        | 0.137         | 0.0                    | 0.3               | 0.3                 | 1.8             | O K        |
| 600 min Summer   | 36.104        | 0.114         | 0.0                    | 0.3               | 0.3                 | 1.5             | O K        |
| 720 min Summer   | 36.084        | 0.094         | 0.0                    | 0.3               | 0.3                 | 1.2             | O K        |
| 960 min Summer   | 36.049        | 0.059         | 0.0                    | 0.3               | 0.3                 | 0.7             | O K        |
| 1440 min Summer  | 36.008        | 0.018         | 0.0                    | 0.3               | 0.3                 | 0.1             | O K        |
| 2160 min Summer  | 35.990        | 0.000         | 0.0                    | 0.3               | 0.3                 | 0.0             | O K        |
| 2880 min Summer  | 35.990        | 0.000         | 0.0                    | 0.2               | 0.2                 | 0.0             | O K        |
| 4320 min Summer  | 35.990        | 0.000         | 0.0                    | 0.1               | 0.1                 | 0.0             | O K        |
| 5760 min Summer  | 35.990        | 0.000         | 0.0                    | 0.1               | 0.1                 | 0.0             | O K        |
| 7200 min Summer  | 35.990        | 0.000         | 0.0                    | 0.1               | 0.1                 | 0.0             | O K        |
| 8640 min Summer  | 35.990        | 0.000         | 0.0                    | 0.1               | 0.1                 | 0.0             | O K        |
| 10080 min Summer | 35.990        | 0.000         | 0.0                    | 0.1               | 0.1                 | 0.0             | O K        |
| 15 min Winter    | 36.127        | 0.137         | 0.0                    | 0.3               | 0.3                 | 1.8             | O K        |

| Storm Event      | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 15 min Summer    | 172.317      | 0.0                 | 2.1                   | 17               |
| 30 min Summer    | 110.609      | 0.0                 | 2.7                   | 31               |
| 60 min Summer    | 67.371       | 0.0                 | 3.4                   | 58               |
| 120 min Summer   | 43.495       | 0.0                 | 4.5                   | 90               |
| 180 min Summer   | 33.130       | 0.0                 | 5.1                   | 126              |
| 240 min Summer   | 27.051       | 0.0                 | 5.6                   | 160              |
| 360 min Summer   | 19.995       | 0.0                 | 6.2                   | 228              |
| 480 min Summer   | 15.949       | 0.0                 | 6.6                   | 294              |
| 600 min Summer   | 13.297       | 0.0                 | 6.9                   | 358              |
| 720 min Summer   | 11.418       | 0.0                 | 7.1                   | 420              |
| 960 min Summer   | 8.918        | 0.0                 | 7.4                   | 538              |
| 1440 min Summer  | 6.223        | 0.0                 | 7.7                   | 752              |
| 2160 min Summer  | 4.318        | 0.0                 | 7.9                   | 0                |
| 2880 min Summer  | 3.332        | 0.0                 | 8.1                   | 0                |
| 4320 min Summer  | 2.317        | 0.0                 | 8.3                   | 0                |
| 5760 min Summer  | 1.800        | 0.0                 | 8.5                   | 0                |
| 7200 min Summer  | 1.490        | 0.0                 | 8.7                   | 0                |
| 8640 min Summer  | 1.284        | 0.0                 | 8.9                   | 0                |
| 10080 min Summer | 1.137        | 0.0                 | 9.1                   | 0                |
| 15 min Winter    | 172.317      | 0.0                 | 2.1                   | 17               |

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|                                                      |               |                     |                                                              |                   |                     |                 |                                                                                     |
|------------------------------------------------------|---------------|---------------------|--------------------------------------------------------------|-------------------|---------------------|-----------------|-------------------------------------------------------------------------------------|
| Elliott Wood Partnership LTD                         |               |                     |                                                              |                   |                     |                 | Page 2                                                                              |
| 241 The Broadway<br>London<br>SW19 1SD               |               |                     | Braemar Avenue Baptist Church<br>2220367<br>Permeable paving |                   |                     |                 |  |
| Date 04/04/2023<br>File Permeable paving.SRCX        |               |                     | Designed by LKi<br>Checked by                                |                   |                     |                 |                                                                                     |
| Innovyze                                             |               |                     | Source Control 2020.1.3                                      |                   |                     |                 |                                                                                     |
| Summary of Results for 100 year Return Period (+40%) |               |                     |                                                              |                   |                     |                 |                                                                                     |
| Storm Event                                          | Max Level (m) | Max Depth (m)       | Max Infiltration (l/s)                                       | Max Control (l/s) | Max E Outflow (l/s) | Max Volume (m³) | Status                                                                              |
| 30 min Winter                                        | 36.156        | 0.166               | 0.0                                                          | 0.4               | 0.4                 | 2.2             | Flood Risk                                                                          |
| 60 min Winter                                        | 36.167        | 0.177               | 0.0                                                          | 0.4               | 0.4                 | 2.4             | Flood Risk                                                                          |
| 120 min Winter                                       | 36.176        | 0.186               | 0.0                                                          | 0.4               | 0.4                 | 2.5             | Flood Risk                                                                          |
| 180 min Winter                                       | 36.170        | 0.180               | 0.0                                                          | 0.4               | 0.4                 | 2.5             | Flood Risk                                                                          |
| 240 min Winter                                       | 36.158        | 0.168               | 0.0                                                          | 0.4               | 0.4                 | 2.3             | Flood Risk                                                                          |
| 360 min Winter                                       | 36.127        | 0.137               | 0.0                                                          | 0.3               | 0.3                 | 1.8             | O K                                                                                 |
| 480 min Winter                                       | 36.094        | 0.104               | 0.0                                                          | 0.3               | 0.3                 | 1.4             | O K                                                                                 |
| 600 min Winter                                       | 36.065        | 0.075               | 0.0                                                          | 0.3               | 0.3                 | 0.9             | O K                                                                                 |
| 720 min Winter                                       | 36.039        | 0.049               | 0.0                                                          | 0.3               | 0.3                 | 0.6             | O K                                                                                 |
| 960 min Winter                                       | 36.004        | 0.014               | 0.0                                                          | 0.3               | 0.3                 | 0.1             | O K                                                                                 |
| 1440 min Winter                                      | 35.990        | 0.000               | 0.0                                                          | 0.2               | 0.2                 | 0.0             | O K                                                                                 |
| 2160 min Winter                                      | 35.990        | 0.000               | 0.0                                                          | 0.2               | 0.2                 | 0.0             | O K                                                                                 |
| 2880 min Winter                                      | 35.990        | 0.000               | 0.0                                                          | 0.1               | 0.1                 | 0.0             | O K                                                                                 |
| 4320 min Winter                                      | 35.990        | 0.000               | 0.0                                                          | 0.1               | 0.1                 | 0.0             | O K                                                                                 |
| 5760 min Winter                                      | 35.990        | 0.000               | 0.0                                                          | 0.1               | 0.1                 | 0.0             | O K                                                                                 |
| 7200 min Winter                                      | 35.990        | 0.000               | 0.0                                                          | 0.1               | 0.1                 | 0.0             | O K                                                                                 |
| 8640 min Winter                                      | 35.990        | 0.000               | 0.0                                                          | 0.0               | 0.0                 | 0.0             | O K                                                                                 |
| 10080 min Winter                                     | 35.990        | 0.000               | 0.0                                                          | 0.0               | 0.0                 | 0.0             | O K                                                                                 |
| Storm Event                                          | Rain (mm/hr)  | Flooded Volume (m³) | Discharge Volume (m³)                                        | Time-Peak (mins)  |                     |                 |                                                                                     |
| 30 min Winter                                        | 110.609       | 0.0                 | 2.7                                                          | 31                |                     |                 |                                                                                     |
| 60 min Winter                                        | 67.371        | 0.0                 | 3.4                                                          | 58                |                     |                 |                                                                                     |
| 120 min Winter                                       | 43.495        | 0.0                 | 4.5                                                          | 94                |                     |                 |                                                                                     |
| 180 min Winter                                       | 33.130        | 0.0                 | 5.1                                                          | 134               |                     |                 |                                                                                     |
| 240 min Winter                                       | 27.051        | 0.0                 | 5.6                                                          | 172               |                     |                 |                                                                                     |
| 360 min Winter                                       | 19.995        | 0.0                 | 6.2                                                          | 244               |                     |                 |                                                                                     |
| 480 min Winter                                       | 15.949        | 0.0                 | 6.6                                                          | 310               |                     |                 |                                                                                     |
| 600 min Winter                                       | 13.297        | 0.0                 | 6.9                                                          | 372               |                     |                 |                                                                                     |
| 720 min Winter                                       | 11.418        | 0.0                 | 7.1                                                          | 428               |                     |                 |                                                                                     |
| 960 min Winter                                       | 8.918         | 0.0                 | 7.4                                                          | 520               |                     |                 |                                                                                     |
| 1440 min Winter                                      | 6.223         | 0.0                 | 7.7                                                          | 0                 |                     |                 |                                                                                     |
| 2160 min Winter                                      | 4.318         | 0.0                 | 7.9                                                          | 0                 |                     |                 |                                                                                     |
| 2880 min Winter                                      | 3.332         | 0.0                 | 8.1                                                          | 0                 |                     |                 |                                                                                     |
| 4320 min Winter                                      | 2.317         | 0.0                 | 8.3                                                          | 0                 |                     |                 |                                                                                     |
| 5760 min Winter                                      | 1.800         | 0.0                 | 8.5                                                          | 0                 |                     |                 |                                                                                     |
| 7200 min Winter                                      | 1.490         | 0.0                 | 8.7                                                          | 0                 |                     |                 |                                                                                     |
| 8640 min Winter                                      | 1.284         | 0.0                 | 8.9                                                          | 0                 |                     |                 |                                                                                     |
| 10080 min Winter                                     | 1.137         | 0.0                 | 9.1                                                          | 0                 |                     |                 |                                                                                     |
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|                                               |                                                              |                                                                                     |
|-----------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Elliott Wood Partnership LTD                  |                                                              | Page 3                                                                              |
| 241 The Broadway<br>London<br>SW19 1SD        | Braemar Avenue Baptist Church<br>2220367<br>Permeable paving |  |
| Date 04/04/2023<br>File Permeable paving.SRCX | Designed by LKi<br>Checked by                                |                                                                                     |
| Innovyze Source Control 2020.1.3              |                                                              |                                                                                     |

Rainfall Details

|                       |                                 |
|-----------------------|---------------------------------|
| Rainfall Model        | FEH                             |
| Return Period (years) | 100                             |
| FEH Rainfall Version  | 2013                            |
| Site Location         | GB 530476 190756 TQ 30476 90756 |
| Data Type             | Point                           |
| Summer Storms         | Yes                             |
| Winter Storms         | Yes                             |
| Cv (Summer)           | 0.900                           |
| Cv (Winter)           | 0.900                           |
| Shortest Storm (mins) | 15                              |
| Longest Storm (mins)  | 10080                           |
| Climate Change %      | +40                             |

Time Area Diagram

Total Area (ha) 0.006

| Time (mins) | Area     |
|-------------|----------|
| From:       | To: (ha) |
| 0           | 4 0.006  |

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|                                               |                                                              |                                                                                     |
|-----------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Elliott Wood Partnership LTD                  |                                                              | Page 4                                                                              |
| 241 The Broadway<br>London<br>SW19 1SD        | Braemar Avenue Baptist Church<br>2220367<br>Permeable paving |  |
| Date 04/04/2023<br>File Permeable paving.SRCX | Designed by LKi<br>Checked by                                |                                                                                     |
| Innovyze Source Control 2020.1.3              |                                                              |                                                                                     |

Model Details

Storage is Online Cover Level (m) 36.440

Porous Car Park Structure

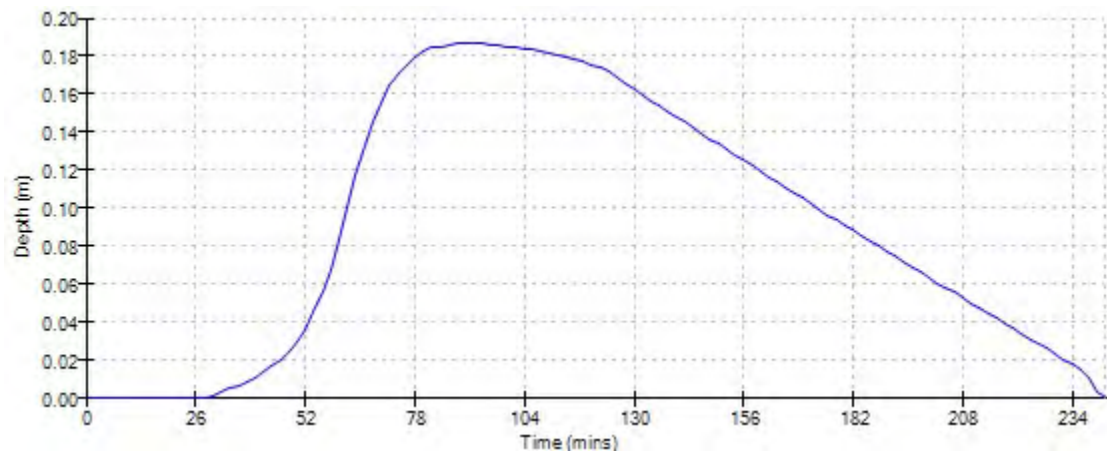
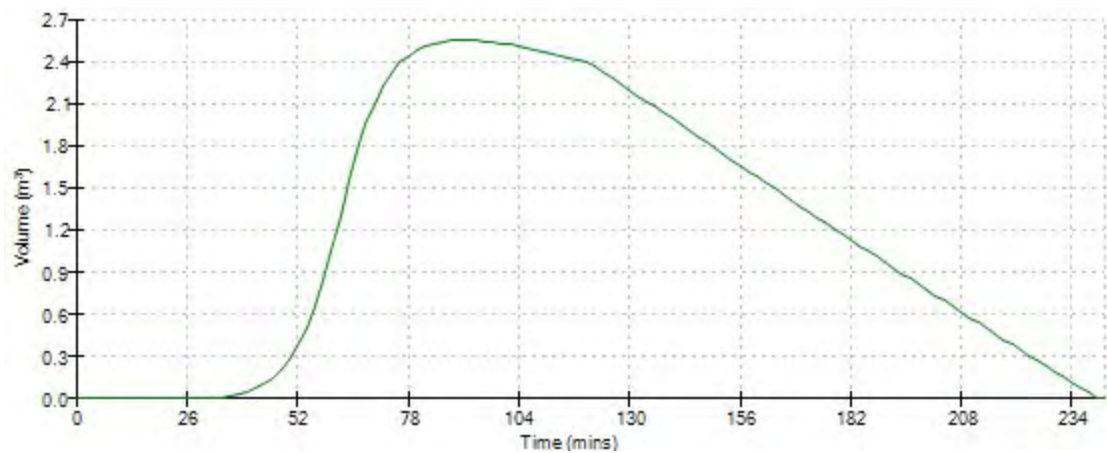
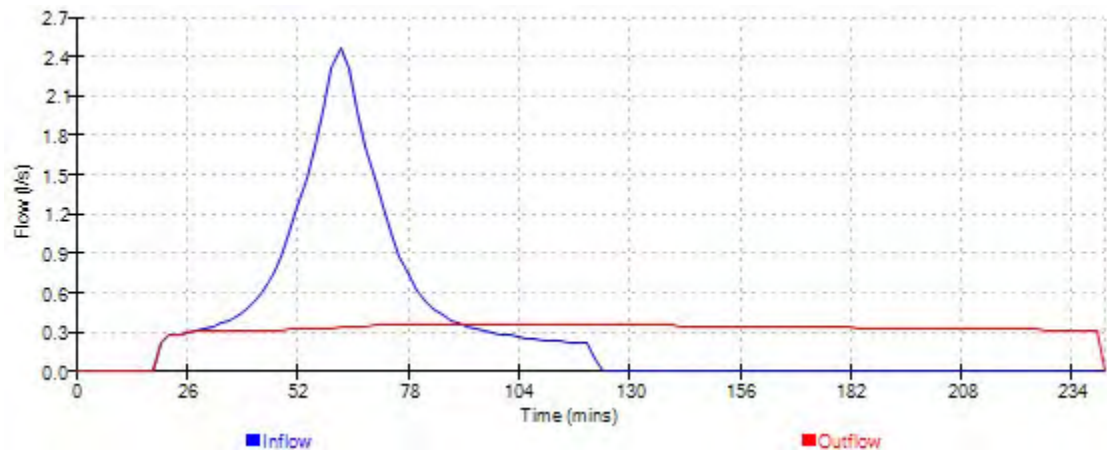
|                                      |         |                         |       |
|--------------------------------------|---------|-------------------------|-------|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m)               | 12.0  |
| Membrane Percolation (mm/hr)         | 1000    | Length (m)              | 4.0   |
| Max Percolation (l/s)                | 13.3    | Slope (1:X)             | 200.0 |
| Safety Factor                        | 2.0     | Depression Storage (mm) | 5     |
| Porosity                             | 0.30    | Evaporation (mm/day)    | 3     |
| Invert Level (m)                     | 35.990  | Membrane Depth (m)      | 150   |

Orifice Outflow Control

Diameter (m) 0.014 Discharge Coefficient 0.600 Invert Level (m) 35.405

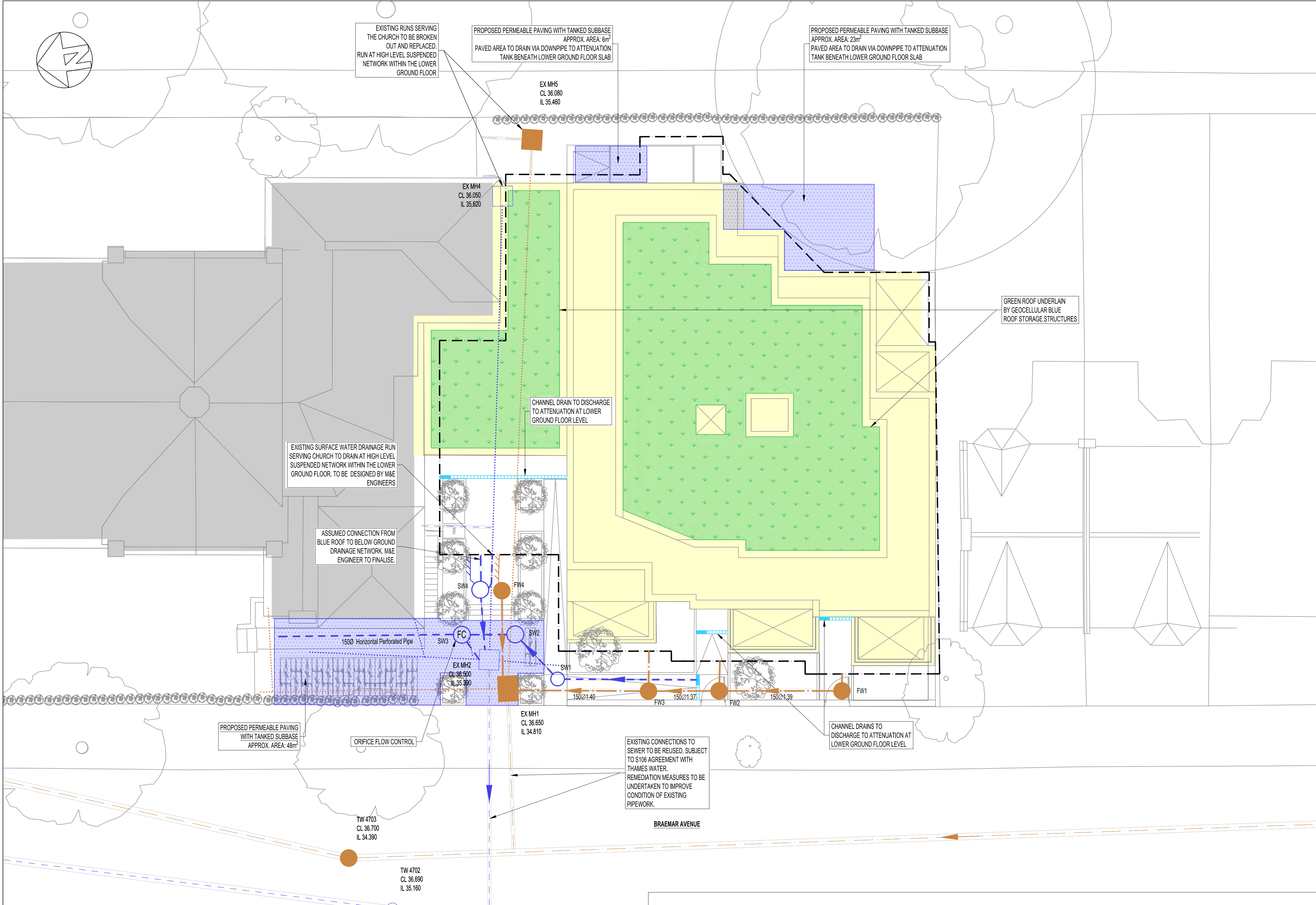
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Event: 120 min Summer



# technical note

Addendum Appendix B - Drawings



- BELOW GROUND DRAINAGE NOTES**
- THE LOCATION AND LEVEL OF EXISTING DRAINAGE CONNECTIONS AND EXISTING SERVICES IS TO BE CHECKED PRIOR TO COMMENCEMENT OF DRAINAGE WORKS. ANY VARIANCE TO THE DETAILS ON THIS DRAWING AND THE SCHEDULE IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
  - THE DESIGN IS BASED ON THE INFORMATION AVAILABLE ON THE DATE OF ISSUE FROM OTHER PARTIES (EG. ARCHITECT AND M & E ENGINEER). IT IS SUBJECT TO CHANGE RESULTING FROM UPDATES TO THE AVAILABLE INFORMATION FROM OTHERS.
  - THE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE NBS SPECIFICATIONS, ASSOCIATED MANHOLE SCHEDULE AND STANDARD DRAINAGE DETAIL DRAWINGS WHERE APPLICABLE.
  - THE POSITIONS OF FOUL AND SURFACE WATER DRAINAGE POINTS ARE INDICATIVE ONLY, REFER TO THE ARCHITECTS DRAWINGS FOR SETTING OUT DETAILS.
  - PRIVATE FOUL AND SURFACE WATER DRAINAGE IS TO BE CONSTRUCTED IN ACCORDANCE WITH BUILDING REGULATIONS PART H, BS EN752 AND BS EN12056.
  - DRAINS AT BASEMENT LEVEL ARE TO BE CONSTRUCTED USING CAST IRON (ENIGN OR EQUIVALENT) AND FLEXIBLY JOINTED TO BS 437.
  - DRAINS AT GROUND LEVEL ARE TO BE CONSTRUCTED USING VITRIFIED CLAY PIPES TO BS EN 285-1 SUPER STRENGTH SPECIFICATION (HEPWORTH SUPERSLEVE) OR SIMILAR APPROVED.
  - ALL SOIL CONNECTIONS UNDER BUILDINGS TO BE 100mm DIA LAID AT A MINIMUM GRADIENT OF 1/40 UNLESS NOTED OTHERWISE.
  - ALL SURFACE WATER CONNECTIONS TO BE 150mm DIAMETER AND TO BE LAID AT A MINIMUM GRADIENT OF 1/80 UNLESS NOTED OTHERWISE .
  - ALL SOIL CONNECTIONS AND RAINWATER PIPES SHOULD BE RODDABLE FROM GROUND LEVEL.
  - RAINWATER DOWN PIPES ARE TO CONNECT TO A DRAIN VIA A REST BEND. WHERE DRAINAGE IS COMBINED A P TRAP MUST ALSO BE PROVIDED.
  - IN CASES OF IN SITU CONCRETE FLOOR SLABS, DRAINS ARE TO BE CAST INTEGRAL WITH THE SLAB WHERE PIPE COVER TO THE CROWN IS LESS THAN 300mm. - NOTE SPECIAL PROVISIONS APPLY TO BASEMENT FLOOR SLABS - SEE DETAILED DRAINAGE AND STRUCTURAL DRAWINGS. CONCRETE ENCASEMENT TO BE REINFORCED AS PER DRAINAGE DETAIL.
  - IN CASES OF SUSPENDED FLOORS WHERE A VOID OF 300mm OR MORE EXISTS BELOW FLOOR DRAINS ARE TO BE SUSPENDED USING A PROPRIETARY HANGER SYSTEM OR CAST INTEGRAL WITH THE FLOOR.
  - WHERE DRAINS PASS THROUGH FOUNDATIONS OR OTHER RIGID STRUCTURES A LINTEL OR SLEEVE IS TO BE USED AND PROVISION FOR FLEXIBILITY IS TO BE MADE USING ROCKER PIPES.
  - BACKFILLING OF DRAIN TRENCHES ADJACENT TO BUILDING OR OTHER STRUCTURES IS TO BE IN ACCORDANCE WITH DIAGRAM 8 OF THE BUILDING REGULATIONS.
  - ANY PIPE OR GULLY OR OTHER FITTING OR DUCT PENETRATING THE BASEMENT SLAB OR WALL IS TO BE WATERPROOFED USING HYDROPHILIC STRIPS OR PUDDLE FLANGES TO ENSURE A WATER TIGHT JOINT. CONCRETE SURROUND TO DRAINAGE PIPES AND FITTINGS MAY BE REQUIRED IN CERTAIN CASES - REFER TO DETAILED DRAINAGE DRAWINGS AND RELEVANT STRUCTURAL DETAILS.
  - EXISTING FOUNDATIONS AND RETAINING WALLS MUST NOT BE UNDERMINED BY NEW DRAINAGE RUNS UNLESS AGREED IN WRITING WITH THE STRUCTURAL ENGINEER. CONTRACTOR TO SUBMIT METHOD STATEMENTS AND TEMPORARY WORKS PROPOSALS TO THE STRUCTURAL ENGINEER FOR COMMENT PRIOR TO COMMENCEMENT OF WORKS.
  - ALL DRAINAGE EXCAVATIONS SHOULD BE RISK ASSESSED BY THE CONTRACTOR TO ENSURE TRENCH SAFETY / STABILISATION. MEASURES ARE CONSIDERED DURING THE CONSTRUCTION PERIOD. ANY EXCAVATIONS LEFT EXPOSED SHOULD BE INSPECTED BY A COMPETENT PERSON ON A DAILY BASIS. GROUND CONDITIONS SHOULD BE MONITORED AND TOOL BOX TALKS SHOULD INCLUDE SITE INVESTIGATION INFORMATION TO AID THE CONTRACTORS ONGOING RISK ASSESSMENT AND METHOD OF EXCAVATION. ALL EXCAVATIONS SHOULD BE ASSESSED BY A COMPETENT PERSON FOR CONFINED SPACES REQUIREMENTS.
  - THE CONTRACTOR IS TO CONSIDER PHASING OF THE DRAINAGE INSTALLATION AND ARE TO PROVIDE TEMPORARY DRAINAGE MEASURES THEY DETERMINE ARE REQUIRED.
  - SUDS ARE TO BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS MADE WITHIN THE CIRIA SUDS MANUAL C753 (WITH PARTICULAR ATTENTION DRAWN TO CHAPTER 31) AND CIRIA GUIDANCE ON THE CONSTRUCTION OF SUDS C768. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONSIDER CONSTRUCTION PROGRAMME OF SUDS.
  - DETAILED DESIGN OF GEOCELLULAR ATTENUATION CRATES IS A CDP ITEM AND SHOULD BE BASED ON LEVEL, LAYOUT AND VOLUME DETAILS SHOWN. DETAILED DESIGN INFORMATION SHOULD BE PROVIDED TO THE CIVIL ENGINEER TO PASS COMMENT.
  - ALL MANHOLE COVER LEVELS SHOWN ARE APPROXIMATE AND ARE TO SUIT THE FINAL GROUND OR BUILDING LEVELS .
  - MANHOLE COVERS IN BLOCK PAVED AREAS ARE TO BE RECESSED UNLESS NOTED OTHERWISE.
  - ALL INTERNAL MANHOLE COVERS ARE TO BE NON-VENTILATING AND DOUBLE SEALED.
  - ALL EXTERNAL FOUL AND COMBINED WATER MANHOLE COVERS IN FOOTPATHS AND PAVED AREAS (OTHER THAN ROADS) ARE TO BE NON-VENTILATING AND SINGLE SEALED UNLESS NOTED OTHERWISE.
  - ALL EXTERNAL SURFACE WATER MANHOLE COVERS ARE TO BE NON-VENTILATING UNLESS NOTED OTHERWISE.
  - ALL MANHOLE COVERS ARE TO BE INSTALLED SQUARE TO PAVING, KERB LINES OR BUILDINGS.
  - FOR ADOPTED DRAINAGE, MANHOLE COVERS ARE TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE DCS OR SPECIFIC WATER AUTHORITY REQUIREMENT.
  - INSPECTION CHAMBERS ARE TO HAVE A REDUCED ACCESS PIECE WHEN THE DEPTH IS GREATER THAN 1.2m TO THE BASE OF THE CHAMBER.

This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

Do not scale from this drawing.

**LEGEND**

- FOUL WATER MANHOLE
- SURFACE WATER MANHOLE
- EXISTING FOUL WATER MANHOLE
- EXISTING SURFACE WATER MANHOLE
- EXISTING FOUL WATER
- EXISTING SURFACE WATER
- PROPOSED FOUL WATER
- PROPOSED SURFACE WATER
- PROPOSED FOUL WATER RISING MAIN
- PROPOSED SURFACE WATER RISING MAIN
- PROPOSED LINEAR CHANNEL WITH HEELGUARD GRATING
- FLOW CONTROL CHAMBER
- EXISTING BUILDING
- PROPOSED BUILDING
- LOWER GROUND FLOOR OUTLINE
- EXISTING FOUL WATER TO BE ABANDONED
- EXISTING SURFACE WATER TO BE ABANDONED
- PROPOSED PERMEABLE PAVING

NOT FOR CONSTRUCTION

|     |    |          |     |     |                        |
|-----|----|----------|-----|-----|------------------------|
| P2  | S2 | 16.12.22 | MAs | LKi | Issued for information |
| P1  | S2 | 12.12.22 | MAs | LKi | Issued for information |
| rev | sc | date     | by  | chk | description            |

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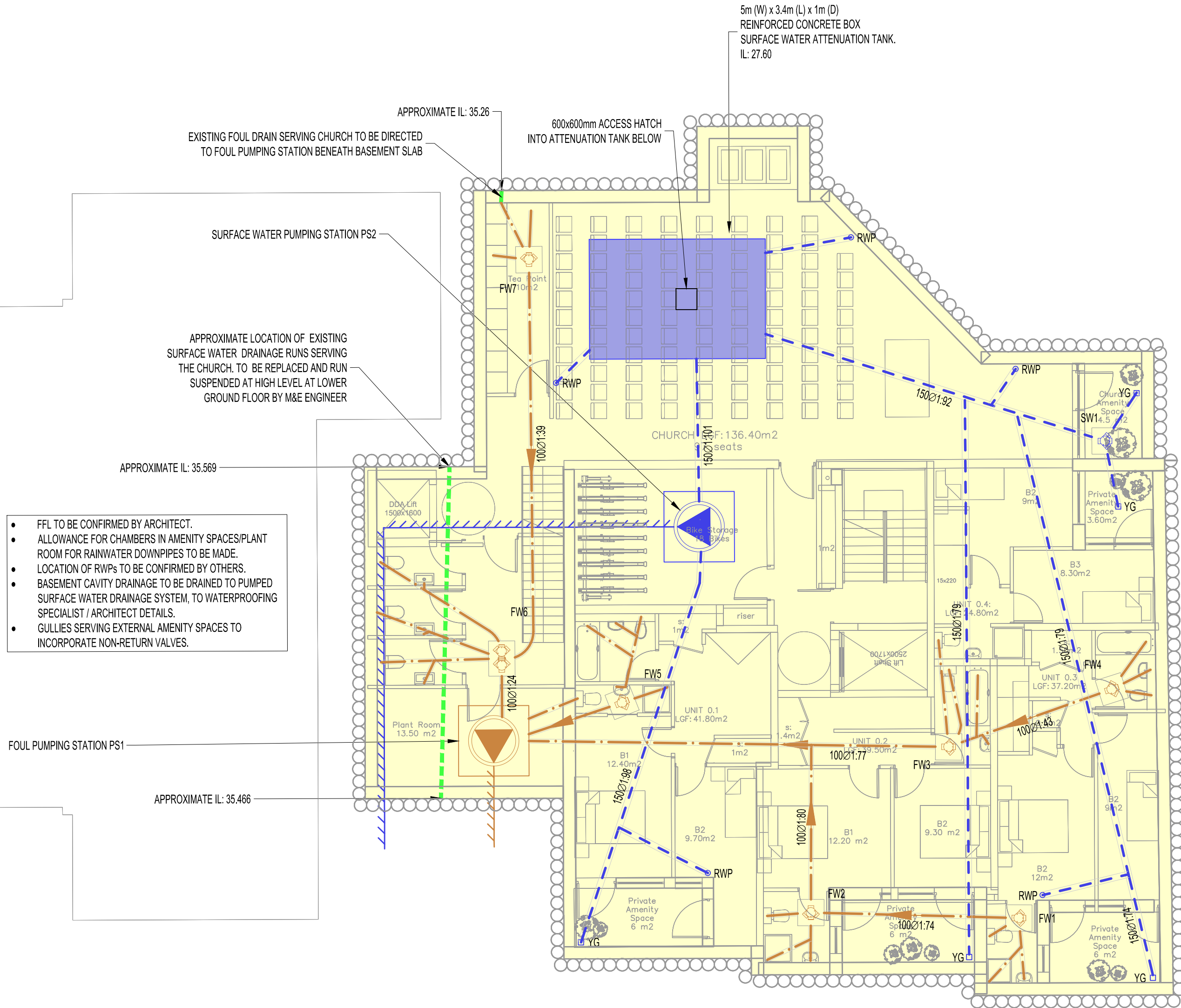
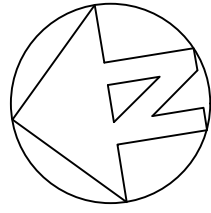
Project  
**Braemar Avenue Baptist Church**  
N22 7NY

Drawing title  
**Proposed Below Ground Drainage General Arrangement - Ground Floor**

|                      |               |                     |
|----------------------|---------------|---------------------|
| Scale (s)            | Date          | Drawn               |
| 1:100@ A1; 1:200@ A3 | December 2022 | MAs                 |
| Drawing status       | Status        | Revision            |
| Preliminary          | S2            | P1                  |
| Project no.          | Originator    | Zone                |
| 2220367              | -EWP-         | ZZ- XX- DR- C-10000 |

| SW MANHOLE SCHEDULE |              |                                |       |              |               |             |
|---------------------|--------------|--------------------------------|-------|--------------|---------------|-------------|
| Manhole             | Chamber Type | Cover Level (m)                | Depth | Chamber Size | Clear Opening | Cover Grade |
| SW1                 | PPIC         | CL = 36.660                    | 1.200 | 4500         | 450x450       | B125        |
|                     |              | SUMP LEVEL OF MANHOLE = 35.460 |       |              |               |             |
| SW2                 | PPIC         | CL = 36.440                    | 1.005 | 4500         | 450x450       | B125        |
|                     |              | SUMP LEVEL OF MANHOLE = 35.435 |       |              |               |             |
| SW3                 | PPIC         | CL = 36.500                    | 1.095 | 4500         | 450x450       | B125        |
|                     |              | SUMP LEVEL OF MANHOLE = 35.405 |       |              |               |             |
| SW4                 | PPIC         | CL = 36.190                    | 0.770 | 4500         | 450x450       | B125        |
|                     |              | SUMP LEVEL OF MANHOLE = 35.420 |       |              |               |             |

| FW MANHOLE SCHEDULE |              |                  |       |              |               |             |
|---------------------|--------------|------------------|-------|--------------|---------------|-------------|
| Manhole             | Chamber Type | Cover Level (m)  | Depth | Chamber Size | Clear Opening | Cover Grade |
| FW1                 | PPIC         | CL = 36.760      | 1.500 | 4500         | 450x450       | B125        |
|                     |              | INV IN = 35.260  |       |              |               |             |
| FW2                 | PPIC         | CL = 36.760      | 1.650 | 4500         | 450x450       | B125        |
|                     |              | INV IN = 35.110  |       |              |               |             |
| FW3                 | PPIC         | CL = 36.690      | 1.670 | 4500         | 450x450       | B125        |
|                     |              | INV IN = 35.020  |       |              |               |             |
| FW4                 | PPIC         | CL = 36.190      | 1.220 | 4500         | 450x450       | B125        |
|                     |              | INV OUT = 34.970 |       |              |               |             |



#### PACKAGED PUMP STATION 1

- PUMPING AT 1 L/S
- 24-HOUR EMERGENCY STORAGE REQUIRED TO SERVE PROPOSED BUILDING, ADDITIONAL VOLUME REQUIRED TO ALSO SERVE EXISTING FOUL FLOWS FROM CHURCH (FLOWS TO BE CONFIRMED) - VOLUME TO BE FURTHER EVALUATED AT NEXT DESIGN STAGE
- FOUL WATER PUMPING STATION WITH DUTY AND STANDBY VORTEX IMPELLER PUMPS WITH ALARMS, TELEMETRY AND NON-RETURN VALVES
- PUMPING STATION TO BE HOUSED WITHIN A 2.25M SQUARE RC BOX TO STRUCTURAL ENGINEERS DETAILS
- PUMPING STATION TO BE INSTALLED AND COMMISSIONED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS
- PUDDLE FLANGES TO BE INSTALLED WHERE PIPES PASS THROUGH RC WALLS
- PUMPING STATION TO BE CONNECTED TO BMS - ARCHITECT AND M&E TO PROVIDE DETAILS
- PUMPING STATION TO BE VENTED TO ATMOSPHERE AT HIGH LEVEL
- VENT PIPE ROUTE, ELECTRIC AND TERMINATION POINT TO BE CONFIRMED BY OTHERS
- ARCHITECT / M&E TO CONFIRM POSITION OF CONTROL KIOSK
- CONCRETE BACKFILL TO BE PROVIDED BETWEEN PUMP AND R/C BOX WALL STRICTLY IN ACCORDANCE WITH MANUFACTURERS INSTALLATION GUIDE
- 1000mm X 750mm CLEAR OPENING RECESSED DOUBLE SEALED LOCKABLE ACCESS COVER
- ACCESS COVER TO BE CENTRALLY LOCATED OVER PUMPING STATION AS PER MANUFACTURER'S REQUIREMENTS
- CL = 29.40 (I.E FFL)
- TOP OF GRP TANK IS TO ALIGN WITH THE UNDERSIDE OF THE STRUCTURAL SLAB
- LOWEST INCOMING PIPE INVERT = 28.34
- PUMP TANK TO BE BEDDED ON 100MM OF WET CONCRETE

#### PACKAGED PUMP STATION 2

- PUMPING AT 1 L/S
- SURFACE WATER WATER PUMPING STATION WITH DUTY AND STANDBY VORTEX IMPELLER PUMPS WITH ALARMS, TELEMETRY AND NON-RETURN VALVES
- PUMPING STATION TO BE HOUSED WITHIN A 2.25M SQUARE RC BOX TO STRUCTURAL ENGINEERS DETAILS
- PUMPING STATION TO BE INSTALLED AND COMMISSIONED IN STRICT ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS
- PUDDLE FLANGES TO BE INSTALLED WHERE PIPES PASS THROUGH RC WALLS
- PUMPING STATION TO BE CONNECTED TO BMS - ARCHITECT AND M&E TO PROVIDE DETAILS
- PUMPING STATION TO BE VENTED TO ATMOSPHERE AT HIGH LEVEL
- VENT PIPE ROUTE, ELECTRIC AND TERMINATION POINT TO BE CONFIRMED BY OTHERS
- ARCHITECT / M&E TO CONFIRM POSITION OF CONTROL KIOSK
- CONCRETE BACKFILL TO BE PROVIDED BETWEEN PUMP AND R/C BOX WALL STRICTLY IN ACCORDANCE WITH MANUFACTURERS INSTALLATION GUIDE
- 1000mm X 750mm CLEAR OPENING RECESSED DOUBLE SEALED LOCKABLE ACCESS COVER
- ACCESS COVER TO BE CENTRALLY LOCATED OVER PUMPING STATION AS PER MANUFACTURERS REQUIREMENTS
- CL = 29.40 (I.E FFL)
- TOP OF GRP TANK IS TO ALIGN WITH THE UNDERSIDE OF THE STRUCTURAL SLAB
- LOWEST INCOMING PIPE INVERT = 27.96
- PUMP TANK TO BE BEDDED ON 100MM OF WET CONCRETE

| SW MANHOLE SCHEDULE |                     |                                                                                                         |       |              |               |             |
|---------------------|---------------------|---------------------------------------------------------------------------------------------------------|-------|--------------|---------------|-------------|
| Manhole             | Chamber Type        | Cover Level (m)                                                                                         | Depth | Chamber Size | Clear Opening | Cover Grade |
| SW1                 | Reinforced Concrete | CL = 29.400<br>SUMP LEVEL OF MANHOLE = 28.120<br>INV IN = 28.495<br>INV IN = 28.495<br>INV OUT = 28.420 | 1.280 | 750x750      | 750x750       | B125        |

| FW MANHOLE SCHEDULE |                     |                                                                                                             |       |              |               |             |
|---------------------|---------------------|-------------------------------------------------------------------------------------------------------------|-------|--------------|---------------|-------------|
| Manhole             | Chamber Type        | Cover Level (m)                                                                                             | Depth | Chamber Size | Clear Opening | Cover Grade |
| FW1                 | Reinforced Concrete | CL = 29.400<br>INV IN = 28.090<br>INV IN = 28.090<br>INV OUT = 28.690                                       | 0.710 | 750x750      | 750x750       | B125        |
| FW2                 | Reinforced Concrete | CL = 29.400<br>INV IN = 28.610<br>INV IN = 28.610<br>INV IN = 28.610<br>INV OUT = 28.610                    | 0.790 | 750x750      | 750x750       | B125        |
| FW3                 | Reinforced Concrete | CL = 29.400<br>INV IN = 28.500<br>INV IN = 28.600<br>INV IN = 28.600<br>INV OUT = 28.500                    | 0.900 | 750x750      | 750x750       | B125        |
| FW4                 | Reinforced Concrete | CL = 29.400<br>INV IN = 28.665<br>INV IN = 28.665<br>INV IN = 28.665<br>INV OUT = 28.615                    | 0.785 | 750x750      | 750x750       | B125        |
| FW5                 | Reinforced Concrete | CL = 29.400<br>INV IN = 28.480<br>INV IN = 28.480<br>INV IN = 28.480<br>INV OUT = 28.430                    | 0.970 | 750x750      | 750x750       | B125        |
| FW6                 | Reinforced Concrete | CL = 29.400<br>INV IN = 28.440<br>INV IN = 28.440<br>INV IN = 28.430<br>INV IN = 28.440<br>INV OUT = 28.440 | 0.985 | 1000x750     | 1220x675      | B125        |
| FW7                 | Reinforced Concrete | CL = 29.400<br>INV IN = 28.750<br>INV IN = 28.750<br>INV IN = 28.750<br>INV OUT = 28.750                    | 0.650 | 750x750      | 750x750       | B125        |

#### BELOW GROUND DRAINAGE NOTES

- THE LOCATION AND LEVEL OF EXISTING DRAINAGE CONNECTIONS AND EXISTING SERVICES IS TO BE CHECKED PRIOR TO COMMENCEMENT OF DRAINAGE WORKS. ANY VARIANCE TO THE DETAILS ON THIS DRAWING AND THE SCHEDULE IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
- THE DESIGN IS BASED ON THE INFORMATION AVAILABLE ON THE DATE OF ISSUE FROM OTHER PARTIES (EG. ARCHITECT AND M & E ENGINEER). IT IS SUBJECT TO CHANGE RESULTING FROM UPDATES TO THE AVAILABLE INFORMATION FROM OTHERS.
- THE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE NBS SPECIFICATIONS, ASSOCIATED MANHOLE SCHEDULE AND STANDARD DRAINAGE DETAIL DRAWINGS WHERE APPLICABLE.
- THE POSITIONS OF FOUL AND SURFACE WATER DRAINAGE POINTS ARE INDICATIVE ONLY, REFER TO THE ARCHITECTS DRAWINGS FOR SETTING OUT DETAILS.
- PRIVATE FOUL AND SURFACE WATER DRAINAGE IS TO BE CONSTRUCTED IN ACCORDANCE WITH BUILDING REGULATIONS PART H, BS EN752 AND BS EN12056.
- DRAINS AT BASEMENT LEVEL ARE TO BE CONSTRUCTED USING CAST IRON (ENIGN OR EQUIVALENT) AND FLEXIBLY JOINTED TO BS 437.
- DRAINS AT GROUND LEVEL ARE TO BE CONSTRUCTED USING VITRIFIED CLAY PIPES TO BS EN 286-1 SUPER STRENGTH SPECIFICATION (HEPWORTH SUPERSLEVE) OR SIMILAR APPROVED.
- ALL SOIL CONNECTIONS UNDER BUILDINGS TO BE 100mm DIA LAID AT A MINIMUM GRADIENT OF 1/40 UNLESS NOTED OTHERWISE.
- ALL SURFACE WATER CONNECTIONS TO BE 150mm DIAMETER AND TO BE LAID AT A MINIMUM GRADIENT OF 1/80 UNLESS NOTED OTHERWISE .
- ALL SOIL CONNECTIONS AND RAINWATER PIPES SHOULD BE RODDABLE FROM GROUND LEVEL.
- RAINWATER DOWN PIPES ARE TO CONNECT TO A DRAIN VIA A REST BEND. WHERE DRAINAGE IS COMBINED A 'P' TRAP MUST ALSO BE PROVIDED.
- IN CASES OF IN SITU CONCRETE FLOOR SLABS, DRAINS ARE TO BE CAST INTEGRAL WITH THE SLAB WHERE PIPE COVER TO THE CROWN IS LESS THAN 300mm. - NOTE SPECIAL PROVISIONS APPLY TO BASEMENT FLOOR SLABS - SEE DETAILED DRAINAGE AND STRUCTURAL DRAWINGS. CONCRETE ENCASEMENT TO BE REINFORCED AS PER DRAINAGE DETAIL.
- IN CASES OF SUSPENDED FLOORS WHERE A VOID OF 300mm OR MORE EXISTS BELOW FLOOR DRAINS ARE TO BE SUSPENDED USING A PROPRIETARY HANGER SYSTEM OR CAST INTEGRAL WITH THE FLOOR.
- WHERE DRAINS PASS THROUGH FOUNDATIONS OR OTHER RIGID STRUCTURES A LINTEL OR SLEEVE IS TO BE USED AND PROVISION FOR FLEXIBILITY IS TO BE MADE USING ROCKER PIPES.
- BACKFILLING OF DRAIN TRENCHES ADJACENT TO BUILDING OR OTHER STRUCTURES IS TO BE IN ACCORDANCE WITH DIAGRAM 8 OF THE BUILDING REGULATIONS.
- ANY PIPE OR GULLY OR OTHER FITTING OR DUCT PENETRATING THE BASEMENT SLAB OR WALL IS TO BE WATERPROOFED USING HYDROPHILIC STRIPS OR PUDDLE FLANGES TO ENSURE A WATER TIGHT JOINT. CONCRETE SURROUND TO DRAINAGE PIPES AND FITTINGS MAY BE REQUIRED IN CERTAIN CASES - REFER TO DETAILED DRAINAGE DRAWINGS AND RELEVANT STRUCTURAL DETAILS.
- EXISTING FOUNDATIONS AND RETAINING WALLS MUST NOT BE UNDERMINED BY NEW DRAINAGE RUNS UNLESS AGREED IN WRITING WITH THE STRUCTURAL ENGINEER. CONTRACTOR TO SUBMIT METHOD STATEMENTS AND TEMPORARY WORKS PROPOSALS TO THE STRUCTURAL ENGINEER FOR COMMENT PRIOR TO COMMENCEMENT OF WORKS.
- ALL DRAINAGE EXCAVATIONS SHOULD BE RISK ASSESSED BY THE CONTRACTOR TO ENSURE TRENCH SAFETY / STABILISATION. MEASURES ARE CONSIDERED DURING THE CONSTRUCTION PERIOD. ANY EXCAVATIONS LEFT EXPOSED SHOULD BE INSPECTED BY A COMPETENT PERSON ON A DAILY BASIS. GROUND CONDITIONS SHOULD BE MONITORED AND TOOL BOX TALKS SHOULD INCLUDE SITE INVESTIGATION INFORMATION TO AID THE CONTRACTORS ONGOING RISK ASSESSMENT AND METHOD OF EXCAVATION. ALL EXCAVATIONS SHOULD BE ASSESSED BY A COMPETENT PERSON FOR CONFINED SPACES REQUIREMENTS.
- THE CONTRACTOR IS TO CONSIDER PHASING OF THE DRAINAGE INSTALLATION AND ARE TO PROVIDE TEMPORARY DRAINAGE MEASURES THEY DETERMINE ARE REQUIRED.
- SUDS ARE TO BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS MADE WITHIN THE CIRIA SUDS MANUAL C753 (WITH PARTICULAR ATTENTION DRAWN TO CHAPTER 31) AND CIRIA GUIDANCE ON THE CONSTRUCTION OF SUDS C768. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONSIDER CONSTRUCTION PROGRAMME OF SUDS.
- DETAILED DESIGN OF GEOCELLULAR ATTENUATION CRATES IS A CDP ITEM AND SHOULD BE BASED ON LEVEL, LAYOUT AND VOLUME DETAILS SHOWN. DETAILED DESIGN INFORMATION SHOULD BE PROVIDED TO THE CIVIL ENGINEER TO PASS COMMENT.
- ALL MANHOLE COVER LEVELS SHOWN ARE APPROXIMATE AND ARE TO SUIT THE FINAL GROUND OR BUILDING LEVELS .
- MANHOLE COVERS IN BLOCK PAVED AREAS ARE TO BE RECESSED UNLESS NOTED OTHERWISE.
- ALL INTERNAL MANHOLE COVERS ARE TO BE NON-VENTILATING AND DOUBLE SEALED.
- ALL EXTERNAL FOUL AND COMBINED WATER MANHOLE COVERS IN FOOTPATHS AND PAVED AREAS (OTHER THAN ROADS) ARE TO BE NON-VENTILATING AND SINGLE SEALED UNLESS NOTED OTHERWISE.
- ALL EXTERNAL SURFACE WATER MANHOLE COVERS ARE TO BE NON-VENTILATING UNLESS NOTED OTHERWISE.
- ALL MANHOLE COVERS ARE TO BE INSTALLED SQUARE TO PAVING, KERB LINES OR BUILDINGS.
- FOR ADOPTED DRAINAGE, MANHOLE COVERS ARE TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE DCS OR SPECIFIC WATER AUTHORITY REQUIREMENT.
- INSPECTION CHAMBERS ARE TO HAVE A REDUCED ACCESS PIECE WHEN THE DEPTH IS GREATER THAN 1.2m TO THE BASE OF THE CHAMBER.

This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

Do not scale from this drawing.

| LEGEND |                                                                                                     |
|--------|-----------------------------------------------------------------------------------------------------|
|        | PROPOSED FOUL WATER                                                                                 |
|        | PROPOSED SURFACE WATER                                                                              |
|        | PROPOSED SURFACE WATER PACKAGED PUMPING STATION                                                     |
|        | PROPOSED FOUL WATER PACKAGED PUMPING STATION                                                        |
|        | PROPOSED FOUL WATER RISING MAIN                                                                     |
|        | PROPOSED SURFACE WATER RISING MAIN                                                                  |
|        | YG                                                                                                  |
|        | TRAPPED YARD GULLY                                                                                  |
|        | RWP                                                                                                 |
|        | RAINWATER PIPE (POSITION BY OTHERS)                                                                 |
|        | SURFACE WATER ATTENUATION TANK                                                                      |
|        | PROPOSED SINGLE ENSIGN ED012 CHAMBER IN 750x750mm (INTERNAL DIMS) RC BOX                            |
|        | PROPOSED SINGLE ENSIGN ED012 CHAMBER IN 1200x1000mm (INTERNAL DIMS) RC BOX (DEPTH TO SOFFIT > 1.5m) |
|        | PROPOSED DOUBLE ENSIGN ED012 CHAMBER IN 1000x750mm (INTERNAL DIMS) RC BOX                           |
|        | PROPOSED DOUBLE ENSIGN ED012 CHAMBER IN 1200x1000mm (INTERNAL DIMS) RC BOX (DEPTH TO SOFFIT > 1.5m) |
|        | EXISTING DRAINAGE RUNS TO BE SUSPENDED AT HIGH LEVEL                                                |
|        | PROPOSED BUILDING                                                                                   |

NOT FOR CONSTRUCTION

|     |    |          |     |     |                        |
|-----|----|----------|-----|-----|------------------------|
| P3  | S2 | 17.04.23 | LKI | PDa | Issued for information |
| P2  | S2 | 16.12.22 | MAs | LKI | Issued for information |
| P1  | S2 | 12.12.22 | MAs | LKI | Issued for information |
| rev | sc | date     | by  | chk | description            |

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Project  
Braemar Avenue Baptist  
Church  
N22 7BY

Drawing title  
Proposed Below Ground Drainage  
General Arrangement - Lower  
Ground Floor

|                      |            |          |
|----------------------|------------|----------|
| Scale (s)            | Date       | Drawn    |
| 1:100@ A1; 1:200@ A3 | April 2023 | MAs      |
| Drawing status       | Status     | Revision |
| Preliminary          | S2         | P1       |
| Project no.          | Originator | Zone     |
| 2220367              | -EWP- ZZ-  | B1-      |
|                      | DR-        | C-09000  |