



Consulting Civil & Structural Engineers

**Proposed Surface Water
Drainage Strategy
Proposed Care facility
Broadwater Road
Welwyn Garden City**

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Consulting Civil & Structural Engineers

Proposed Surface Water Drainage Strategy

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Proposed Drainage Strategy

1.0 Introduction

- 1.1 NJP Consulting Civil & Structural Engineers Ltd has been appointed by the client, Marbrook Ltd to provide a drainage strategy to accompany a planning application, in respect of a proposed residential care development off Broadwater Road, Welwyn Garden City
- 1.2 This report provides a desk study review of the proposed drainage strategy based on CLA Architects drawing 110C Proposed site plan (Appendix 1) and the topographical survey (Appendix 2)

2.0 The Site

1. The proposed care home will be placed centrally on the site at an elevation of 86.500m AOD. The site is generally flat at an average level of 85.500 rising up on its southern boundary to 86.40m AOD

3.0 Existing Surface and Foul Water Sewers

1. There is an existing foul water sewer is located in Broadwater Road. The original office buildings were connected to this sewer.
2. The existing site is brownfield and is designated Previously Developed Land (PDL). A Betterment Rate of 2.0l/sec has been agreed with Thames Water (Appendix 3). The total site area is 0.375Ha and in its original form around 95% of the site was made up of car park and roof run off discharging uncontrolled into the public sewer in Broadwater Road generating a run off rate of:
 - 15 min 1 in 1 year storm 51 l/sec
 - 15 min 1 in 30 year storm 55 l/sec
 - 15 min 1 in 100 year storm 89 l/sec

4.0 Proposed Surface Water Drainage Strategy

1. Soil Infiltration tests were undertaken By Integral Geotechnique Ltd on 12th June 2019 and the results from their report to assess the suitability of SUDS methods to dispose of surface water from the new building plus associated car parking are contained within Appendix 3. Trial Pit 3 shows no infiltration and Trial Pit 4 provided an infiltration rate of 4.20×10^{-6} m/sec. This rate is relatively poor but does offer some infiltration at lower depths. Integral Geotechnique advise that some benefit may be taken for frequent smaller storm events but is not suitable for larger events including the 1:100 year event and 1 in 100 plus 30%ccf. Based on this information the design allows for zero infiltration (Appendix 4)
2. The SUDS system proposed will control the water at source in accordance with current best practice and National Planning Policy Guidelines, the CIRIA SUDS Manual 2015 and SuDS Design Guidance for Hertfordshire March 2015V2. The proposed

development is in an urban area and is of high intensity with limited open space. The proposals do however include for some limited soft landscaping and an opportunity to provide a permeable car park. (Appendix 5)

3. An infiltration system concrete block permeable paving solution, designed to cater for roof and yard drainage for the 1:100 year storm event plus a 40% climate change factor (ccf) will be incorporated into the design.
4. Due to the limited infiltration values strata below the system will include a flow control to the Thames Water combined sewer at an agreed rate of 2.0 l/sec. The existing surface water outlet will be utilised. The SUDS Manual 2015 recommends permeable paving as an efficient means of managing surface water run off at source, intercepting runoff, reducing the volume and frequency of run off and providing a treatment medium.
5. In line with best practice, improvements in water quality will be sought by capturing the first 5mm of rainfall falling on the site during a storm event within void spaces and filter media associated with the permeable surfaces, and topsoiled soft landscaping areas.
6. Surface water will filter through the permeable sub base of the car park and water quality will be improved by the process. The SuDS Manual 2015 Chapter 26 advises that roof run off requires 1 treatment, as it is deemed uncontaminated. The Interpave Guidance for Designers Developers, Planners and Local Authorities advises that permeable paving is preferable to oil interceptors and that it is considered as having 2 treatment stages. The Permafilter geotextile fabric layer also added within the system we are proposing, provides a third treatment. Permafilter fabric encourages the growth of amicrobic biofilm habitat. These microbes biodegrade any organic matter found in the run off, with a capacity to consume 400g of hydrocarbon per annum. Also, any non-degradable matter such as heavy metals and silts are trapped in the laying course optimising the cleansing of water.
7. When testing the 1:100 +40% ccf storm there is a flood warning risk for the 180 to 480 minute event but no actual flooding and exceedance contained wholly within the storage structure. Also note that there will be some infiltration but not allowed for in the calculations. This system has been tested for a 1:1 year, 1in 30 year and 1:100+40% ccf events. (Appendix 6)
8. In the unlikely event of exceedances run off will be contained within the 125mm upstand kerbs of the car park and also within the soft landscape areas. Any flows running offsite will be contained within the kerb channels and drained by road gullies into what is ultimately the same sewer system. Noting that the sewer will have increased capacity due to the attenuation provided by the development compared to

the original system. A line drain will be installed across the site entrance with an outlet to provide additional protection to the footway

9. The existing site generates flows varying between 51 l/sec and 88 l/sec 3.2 above refers). This will be removed under the current proposals increasing capacity in the existing sewers and reducing the risk of flooding to third parties downstream.

5.0 Conclusions

1. The system has been designed in accordance with current best practice for a range of storms in excess of the 1 in 100 year storm event +40%.
2. The existing site originally flowed unrestricted into the Thames Water public sewer
3. As a result of the scheme the risk of flooding downstream to third parties is greatly reduced.
4. A maintenance regime will be provided and the responsibility for maintenance will be with the care provider at no cost to the public.
5. Foul water will drain using the same connection into the Thames Water sewer. Thames water confirmed in their letter dated 3rd June 2019 that there is sufficient foul capacity for the care home within the system

Document Production Record

| Issue Number 1. | Name | Signature |
|-----------------|----------|-----------|
| Prepared | R Nelson | |
| Checked | R Dean | |
| Approved | R Dean | |

Document Issue Record

| Issue Number | Date | Revision Details |
|--------------|-----------------------------|--|
| V1.0 | 20 June 2019 | |
| V1.1 | 1 st August 2019 | Amendments to suit HCC comments dated 12/07/19 |
| | | |

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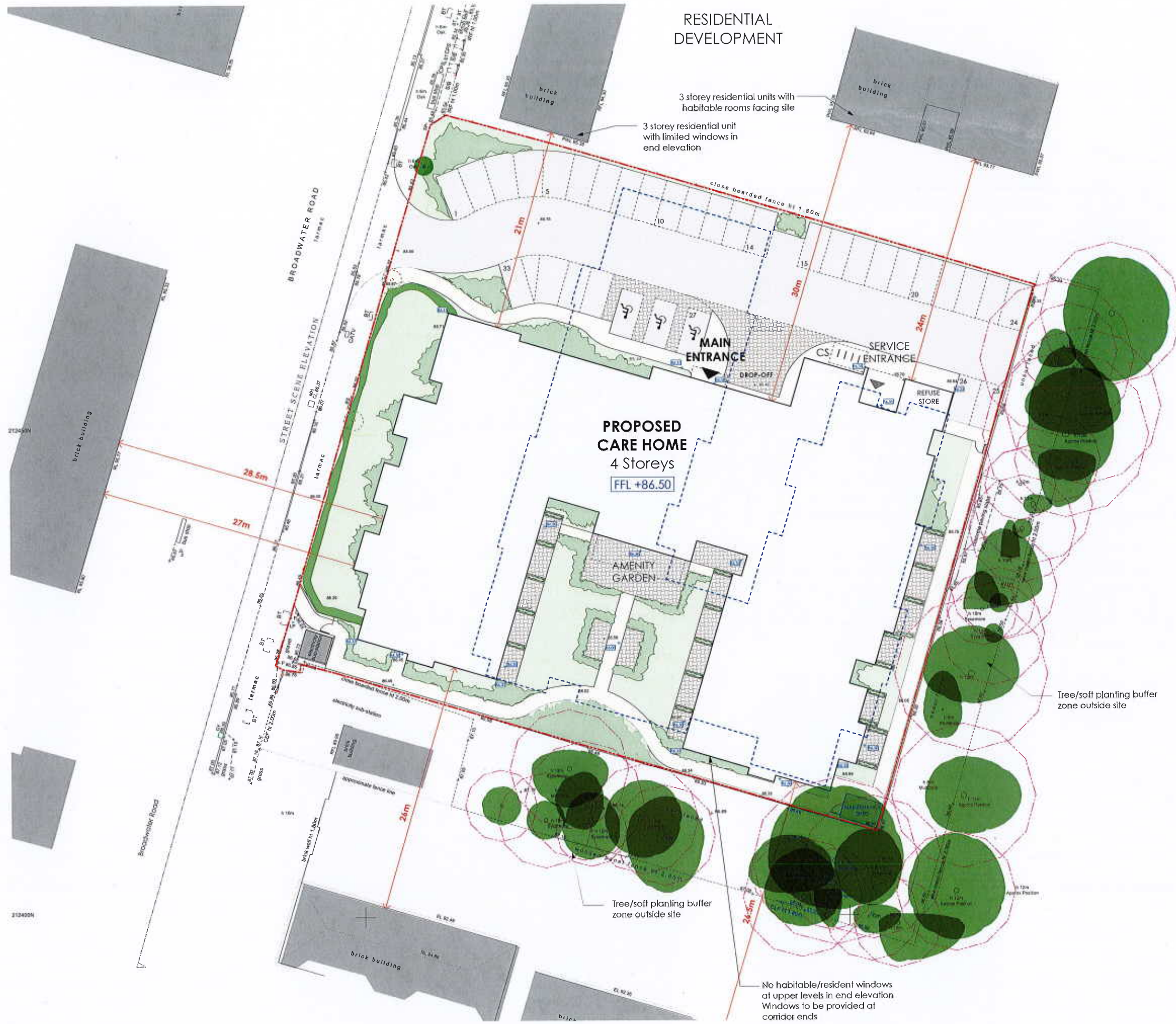
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APPENDIX 1

0 5 10 15 20 Metres

Scale Bar

SITE PLAN - AS PROPOSED



- NOTES**
- 1. Scheme design is subject to relevant Statutory Approvals.
 - 2. Drafting based on topographical survey ref: 1118-4891.
 - 3. Tree information based on Arboricultural Survey ref: 85587.
- MATERIALS PROHIBITED**
- 1. No asbestos
 - 2. No lead
 - 3. No bituminous products
 - 4. No concrete with aggregate containing crushed glass
 - 5. No concrete with aggregate containing crushed shell
 - 6. No concrete with aggregate containing crushed brick
 - 7. No concrete with aggregate containing crushed stone
 - 8. No concrete with aggregate containing crushed slag
 - 9. No concrete with aggregate containing crushed shale
 - 10. No concrete with aggregate containing crushed sandstone
 - 11. No concrete with aggregate containing crushed limestone
 - 12. No concrete with aggregate containing crushed granite
 - 13. No concrete with aggregate containing crushed gneiss
 - 14. No concrete with aggregate containing crushed mica
 - 15. No concrete with aggregate containing crushed quartz
 - 16. No concrete with aggregate containing crushed talc
 - 17. No concrete with aggregate containing crushed asbestos
 - 18. No concrete with aggregate containing crushed vermiculite
 - 19. No concrete with aggregate containing crushed asbestos vermiculite
 - 20. No concrete with aggregate containing crushed asbestos vermiculite

- NOTES**
- Scheme design is subject to relevant Statutory Approvals.
 - Drafting based on topographical survey ref: 1118-4891.
 - Tree information based on Arboricultural Survey ref: 85587.
- KEY**
- Site Boundary
 - Previous Consent Footprint
 - Existing Buildings
 - Proposed Building
 - Vehicle Access & Parking
 - Paths
 - Patio Area
 - Existing Tree - Retained
 - Existing Tree - Removed
 - Tree Root Protection Area
 - Soft Landscaping
 - Shubs
 - Hedge
 - 85.58 Existing Levels
 - 86.33 Proposed Levels
 - Cycle Shelter - 8 spaces

SCHEDULE OF ACCOMMODATION:

CARE HOME

| Storey | Room | Area | Use |
|----------------------------|-----------------|---------------|-------------|
| Ground Floor | 1 | 27 | Living |
| 1st Floor | 2 | 18 | Living |
| 2nd Floor | 3 | 22 | Living |
| 3rd Floor | 4 | 13 | Living |
| TOTAL ACCOMMODATION | 10 ROOMS | 80 SQM | 4000 |

PARKING

35 car parking spaces
incl. 2 no. disabled

PLANNING APPLICATION

© Car parking spaces out of use during refuse collection' notation omitted based on Mayer Brown drawing no. BPWELWYNGC.1/TK10. 30.04.2019

① 'Do Not Scale' notation omitted. 17.01.2019

② Sub-station indicated. 17.12.2018

PLANNING STATUS

- Preliminary
- For Approval
- Tender
- Construction
- Construction
- Matbrock

LOCATION

Broadwater Road
Weylyn Garden City
AL7 3AX

PROPOSED SITE PLAN

17-132-110

CLA

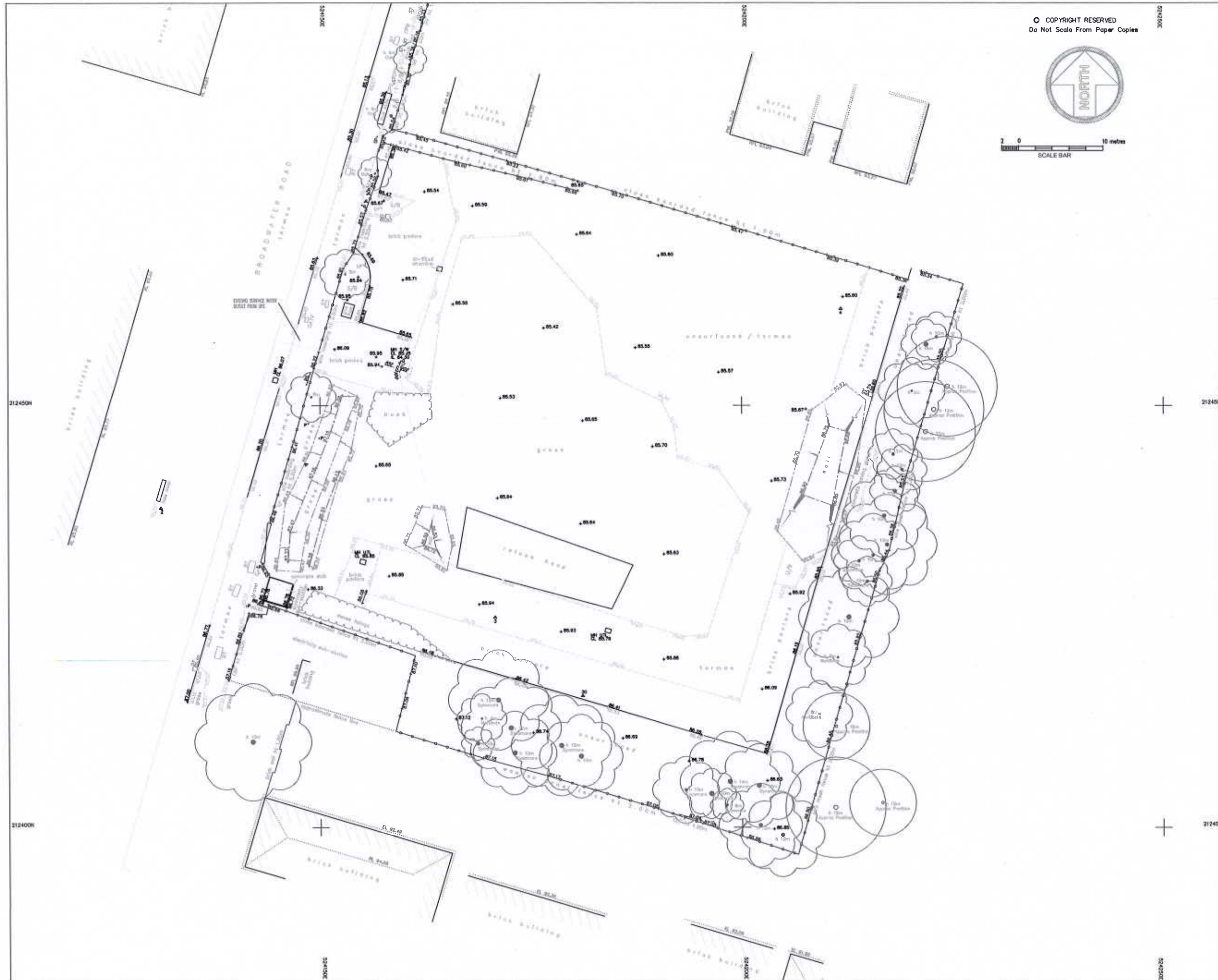
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APPENDIX 2



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| Co-ordinate Table | | | |
|-------------------|------------|------------|--------|
| Station | Easting | Northing | Level |
| 1 | 824181.090 | 212937.787 | 85.034 |
| 2 | 824131.104 | 212437.874 | 85.660 |
| 3 | 824179.718 | 212424.882 | 85.022 |
| 4 | 824201.734 | 212445.488 | 85.615 |
| 30 | 824181.081 | 212418.581 | 85.399 |

Every effort has been made to confirm tree species on site, yet it is advised to confirm these details with an arborist before proceeding with any design.

Every effort has been made to confirm drainage run, type and size on site, yet it is advised to check these details against statutory authority records before proceeding with any design.

GPS Note:
This survey is related to OSGB36(15) coordinate system by GPS 'rapid static' methods. No scale factor has been applied to the survey information. All horizontal distances taken from this drawing are ground distances.

| Revision | Description | Date |
|----------|-------------|------|
| | | |

LEGEND

Survey control station

Banking

Gate (single)

Gate (double)

Tree Spread and Girth shown to scale

Building

Fence

Contour 22.50

Wall

Ordnance Survey Value 15.37m

Abbreviations

| | | | |
|------------------------|-----|-----------------------|-----|
| Beltline Beacon | BB | Pipe | PE |
| Bollard | BD | Road Sign | RS |
| Borehole | BH | Rodding Eye | RE |
| British Telecom Box | BTB | Service Marker | MK |
| BT Inspection Cover | BT | Sign Post | SP |
| Concrete Paving Slabs | CPS | Stuice Valve | SV |
| Cable Television Cover | CTV | Stop Top | ST |
| Electricity Cable Fix | EC | Stop Cock | SC |
| Electricity Pole | EP | Telegraph Pole | TP |
| Earth Road | ER | Telephone Call Box | TGB |
| Fire Hydrant | FH | Traffic Light | TL |
| Flag Staff | FS | Unsurfaced | U/S |
| Gas Valve | GV | Vent Pipe | VP |
| Gate Post | GP | Water Meter | WM |
| Gully | GY | Eaves Level | EL |
| Inspection Cover | IC | Ridge Level | RL |
| Kerb Outlet | KO | Roof Level | RFL |
| Lamp Post | LP | Soffit Level | SFL |
| Manhole | MH | Threshold Level | THL |
| Marker Post | MK | Parapet Wall Level | PWL |
| Parking Meter | PM | Finished Floor Level | FFL |
| Post | P | | |
| Retaining Wall | RTW | Cover Level | CL |
| Barbed Wire Fence | BWF | Invert Level | IL |
| Close Boarded Fence | CBF | No Visible Connection | NVC |
| Chainlink Fence | CLF | Unable to Lift | UTL |
| Chestnut Paling Fence | CPF | Surface Water | SW |
| Post and Chain Fence | PCF | Foul Water | FW |
| Post and Rail Fence | PRF | | |
| Post and Wire Fence | PWF | Flower Bed | F/B |
| Wooden Panel Fence | WPF | Shrub Bed | S/B |

Land and Architectural Surveyors

04428 841200
04428 841201
04428 841202
04428 841203
04428 841204
04428 841205
04428 841206
04428 841207
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04428 841217
04428 841218
04428 841219
04428 841220

Client
BARKER PARRY TOWN PLANNING

Project
41 BROADWATER ROAD, WELWYN GARDEN CITY, HERTS, AL7 3AX

Title
TOPOGRAPHICAL SURVEY

| | | | |
|----------------|-------------|------------|----------|
| Drawn by | JRL | Checked by | GK |
| Scale | 1:200 @ A1 | Date | NOV 2018 |
| Drawing Number | TS18-448X/1 | Revision | - |
| Sheet | 1 of 1 | | |

All levels related to Ordnance Survey active GPS network, at survey station 4.
Value 85.615m



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APPENDIX 3



Mr Robert Nelson

NJP Consulting Engineers Ltd
20 St Andrews Crescent,
Cardiff,
South Wales,
CF10 3DD



03 June 2019

Pre-planning enquiry: Capacity Confirmation

Dear Robert,

Thank you for providing information on your development.

**Site: Highways House, Broadwater Road, Welwyn Garden City, Hertfordshire -
AL7 3AX**

Existing site: Offices (Demolished).

Proposed site: Care Home (88 beds).

Proposed foul water discharge by gravity into manhole TL24121403.

Proposed surface water discharge at 2.0 l/s for all storm events up to and including
1:100yr+40%CC into manhole TL24121404.

We're pleased to confirm that there will be sufficient foul and surface water capacity in our sewerage network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 020 3577 7608.

Yours sincerely

Zaid Kazi

Development Engineer
Developer Services – Sewer Adoptions Team



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APPENDIX 4

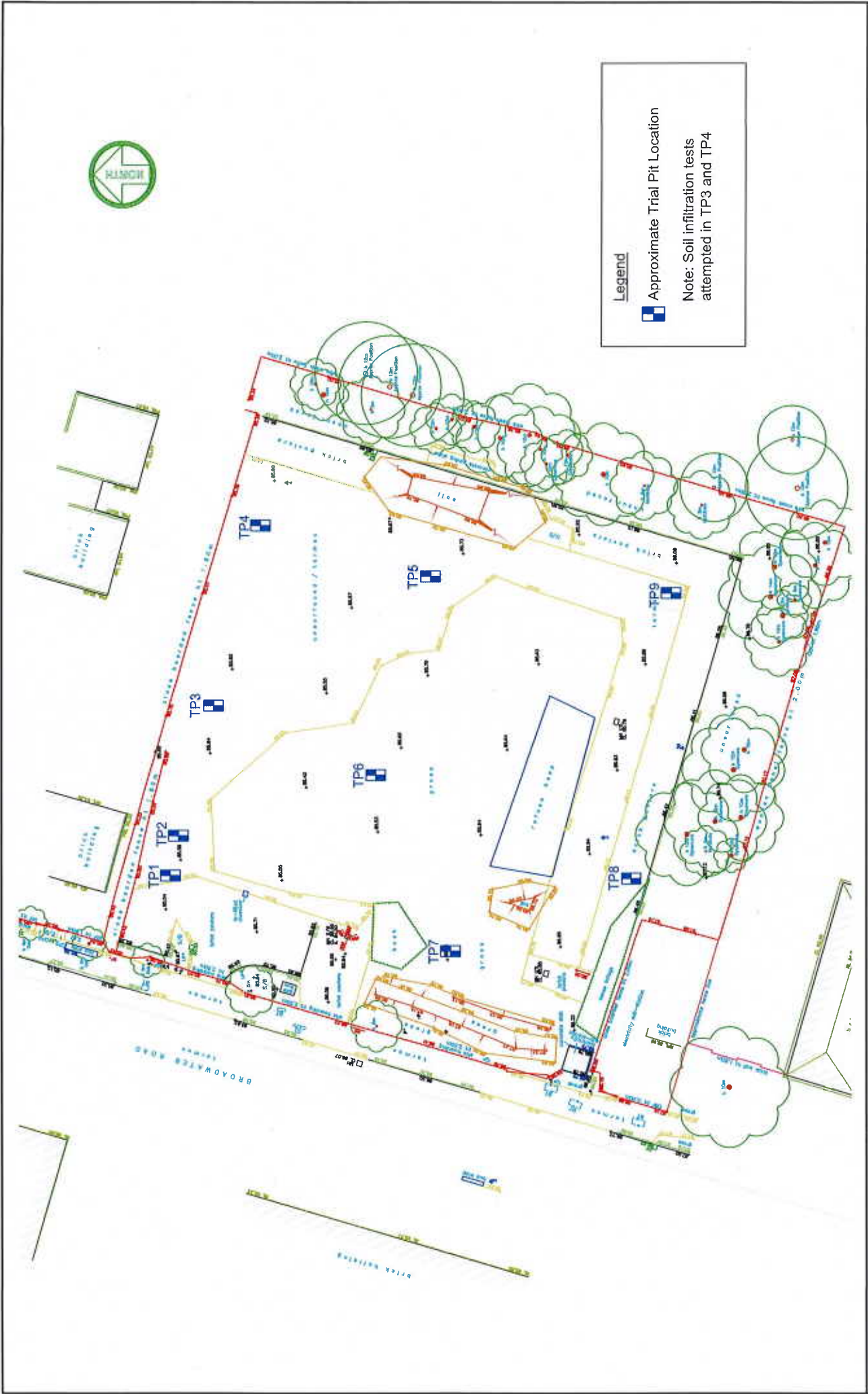


Figure 2: Site Plan

Project: Broadwater Road, Welwyn Garden City

Client: Signia Developments

Job No.: 12454

Scale: 1:400 at A3

Integral House,
7 Beccau Way,
Castlegate Business Park,
Chesham,
CF83 2AX,
Wales
Tel: 029 2080 7981

Integral
Géotechnique

BRE365 SOIL INFILTRATION RATE TEST - TP3

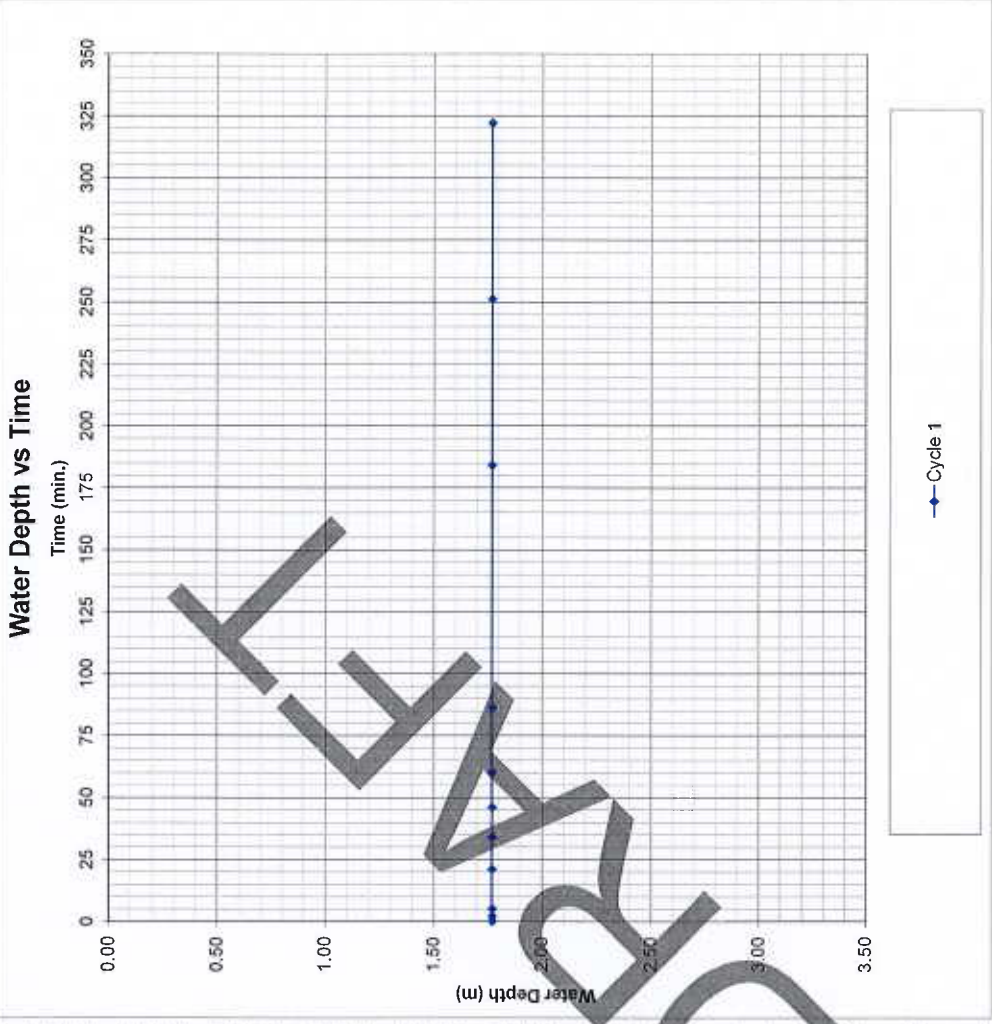
12454 Broadwater Road, Welwyn Garden City

| | |
|-----------------------|----------|
| Trail Pit Information | |
| Length (m) | 2.40 |
| Width (m) | 0.60 |
| Depth (m) | 3.50 |
| Groundwater | Dry |
| Weather Conditions | Rain |
| Date | 12.06.19 |

Remarks

Insufficient infiltration to calculate infiltration rate.

| Cycle 1 | | Cycle 2 | | Cycle 3 | |
|------------|-----------|------------|-----------|------------|-----------|
| Time (min) | Depth (m) | Time (min) | Depth (m) | Time (min) | Depth (m) |
| 0 | 1.77 | | | | |
| 2 | 1.77 | | | | |
| 5 | 1.77 | | | | |
| 21 | 1.77 | | | | |
| 34 | 1.77 | | | | |
| 46 | 1.77 | | | | |
| 60 | 1.77 | | | | |
| 88 | 1.77 | | | | |
| 184 | 1.77 | | | | |
| 251 | 1.77 | | | | |
| 322 | 1.77 | | | | |



Legend: ●—Cycle 1

| | | | | | |
|----------------------------|-------------------------------------|---------|---------|---------|---------|
| Final Excavation Depth (m) | At end of testing cycle | 3.50 | Cycle 1 | Cycle 2 | Cycle 3 |
| Water Depths (m) | Water depth at start of test | 1.77 | | | |
| | Water depth at end of test | 1.77 | | | |
| | Effective depth (measured) | 0.00 | | | |
| | % Effective storage depth | 0.00 | | | |
| | Effective Storage Depths (m) | | | | |
| | Effective storage depth (100%) | 1.73 | | | |
| | Effective storage depth (75%) | 1.30 | | | |
| | Effective storage depth (50%) | 0.87 | | | |
| | Effective storage depth (25%) | 0.43 | | | |
| | Outflow Time (min) | | | | |
| | Time for measured outflow | 322 | | | |
| | Time for 100% outflow | | | | |
| | Time for 75-25% outflow | | | | |
| | Volume of Outflow (m ³) | | | | |
| | Over measured effective depth | 0.00 | | | |
| | Over 100% effective depth | 2.49 | | | |
| | From 75% - 25% effective depth | 1.25 | | | |
| | Surface Area (m ²) | | | | |
| | For 100% effective storage | 11.82 | | | |
| | For 50% effective storage | 6.63 | | | |
| | Over measured depth | 1.44 | | | |
| | Soil Infiltration Rate (m/s) | | | | |
| | Over 100% effective depth | #DIV/0! | Cycle 1 | Cycle 2 | Cycle 3 |
| | Over measured depth | 0.0E+00 | | | |
| | Over 75% - 25% effective depth | #DIV/0! | | | |

BRE365 SOIL INFILTRATION RATE TEST - TP4

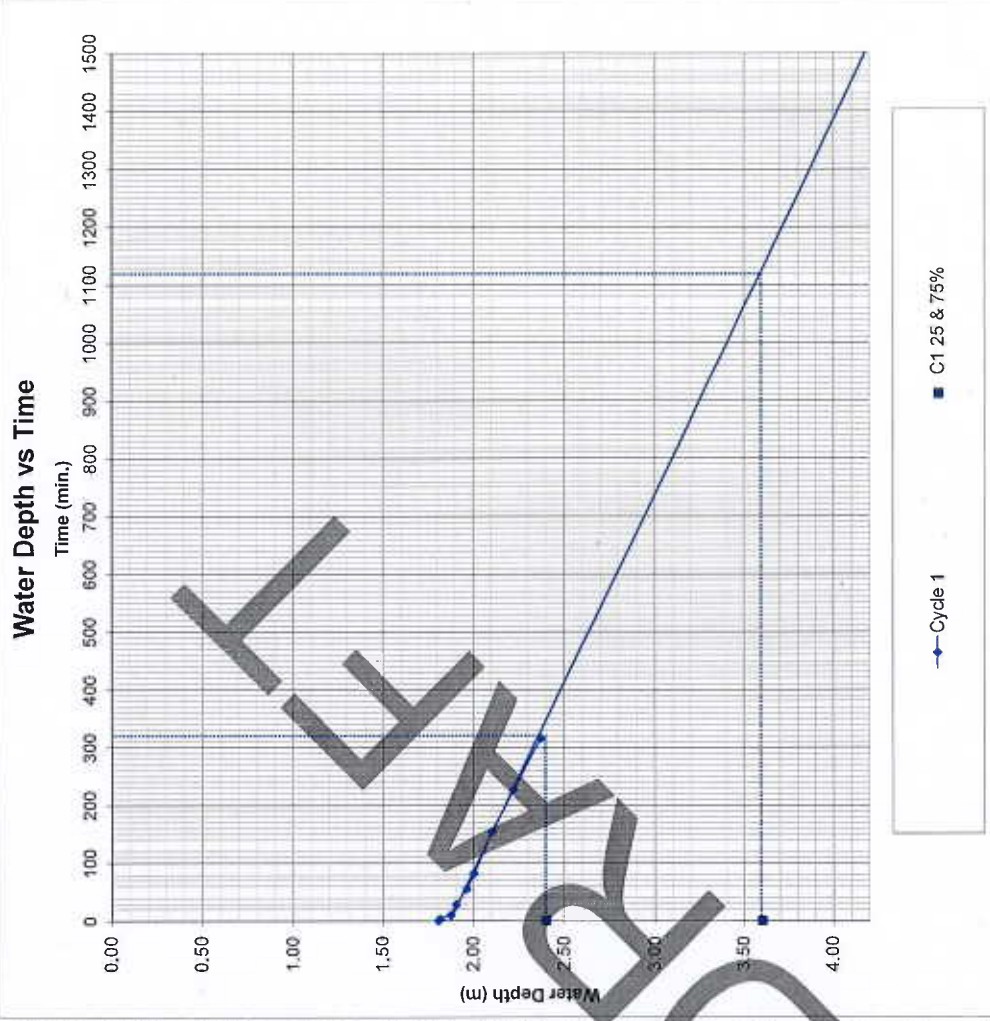
12454 Broadwater Road, Welwyn Garden City

| Trial Pit Information | |
|-----------------------|----------|
| Length (m) | 2.40 |
| Width (m) | 0.60 |
| Depth (m) | 4.20 |
| Groundwater | 1.5 |
| Weather Conditions | Rain |
| Date | 12.06.19 |

Remarks

Soil infiltration rate calculated from extrapolation of flow rate and time of test fill.

| Cycle 1 | | Cycle 2 | | Cycle 3 | |
|--|-----------|-------------|-----------|------------|-----------|
| Time (min) | Depth (m) | Time (min) | Depth (m) | Time (min) | Depth (m) |
| 0 | 1.80 | | | | |
| 3 | 1.81 | | | | |
| 10 | 1.87 | | | | |
| 28 | 1.90 | | | | |
| 55 | 1.98 | | | | |
| 82 | 2.00 | | | | |
| 154 | 2.10 | | | | |
| 227 | 2.22 | | | | |
| 315 | 2.37 | | | | |
| Final Excavation Depth (m) | | 4.20 | | | |
| Water Depths (m) | | 1.80 | | 1.80 | |
| Water depth at start of test | | 2.37 | | 2.37 | |
| Effective depth (measured) | | 0.57 | | 0.57 | |
| % Effective storage depth | | 0.24 | | 0.24 | |
| Effective Storage Depths (m) | | 2.40 | | 2.40 | |
| Effective storage depth (100%) | | 1.80 | | 1.80 | |
| Effective storage depth (75%) | | 1.20 | | 1.20 | |
| Effective storage depth (50%) | | 0.60 | | 0.60 | |
| Outflow Time (min) | | 315 | | 315 | |
| Time for measured outflow | | 1550 | | 1550 | |
| Time for 100% outflow | | 800 | | 800 | |
| Volume of Outflow (m³) | | 0.82 | | 0.82 | |
| Over measured effective depth | | 3.46 | | 3.46 | |
| Over 100% effective depth | | 1.73 | | 1.73 | |
| From 75% - 25% effective depth | | 15.84 | | 15.84 | |
| Surface Area (m²) | | 8.64 | | 8.64 | |
| For 100% effective storage | | 4.86 | | 4.86 | |
| Over measured depth | | | | | |
| Soil Infiltration Rate (m/s) | | 2.3E-06 | | 2.3E-06 | |
| Over 100% effective depth | | 8.9E-06 | | 8.9E-06 | |
| Over measured depth | | 4.7E-06 | | 4.7E-06 | |
| Over 75% - 25% effective depth | | | | | |



| | | | | |
|---|--|---|------------------------------|--|
|  | Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel: 029 20807991 Fax: 029 20862176 mail@integralgeotec.com | Project Name: Broadwater Road | Project No.: 12454 | Trial Pit No.: TP3 Sheet 1 of 1 |
|---|--|---|------------------------------|--|








| | | | |
|--|------------------------------------|--------------------------|-----------------------|
| Location: Welwyn Garden City | Client: Signia Developments | Logged By: GNS | Scale: 1:25 |
|--|------------------------------------|--------------------------|-----------------------|

| | | |
|-----------------------------------|-------------------------|----------------------------|
| Equipment: JCB 3CX | Coordinates: | Dimensions 2.40m |
| Date Excavated: 12/06/2019 | Level: 85.60mAOD | Depth : 3.50m |

| Samples & In-situ Testing | | | Depth (m) | Level (m AOD) | Legend | Stratum Description |
|---------------------------|------|---------|-----------|---------------|--------|---|
| Depth (m) | Type | Results | | | | |
| | | | | | | Soft to firm orange brown and grey slightly silty slightly sandy gravelly clay with frequent cobbles and occasional boulder (0.3m x 0.4m) of concrete, brick and metal. Gravel is fine to coarse angular and subangular concrete, brick, tarmac/bitumen, flint and plastic (MADE GROUND). |
| | | | 2.30 | 83.30 | | Soft to firm orange brown locally grey silty slightly sandy to sandy slightly gravelly clay. Gravel is fine to coarse angular and subangular flint and occasional tarmac/bitumen and brick (MADE GROUND). |
| | | | 2.70 | 82.80 | | Firm to stiff orange brown silty slightly gravelly clay. Gravel is fine to coarse angular and subangular flint. |
| | | | 3.10 | 82.50 | | Medium dense orange brown very clayey silty slightly gravelly SAND. Gravel is fine to coarse rounded, subrounded, subangular and angular flint. |
| | | | 3.50 | 82.10 | | End of Trialpit at 3.50 m |

| | | |
|--|--|---|
| Remarks: Soil infiltration test attempted in trial pit. | Groundwater: No groundwater encountered | Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample W - Water sample |
| | Stability: Stable in the short term | |



|  Integral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807891 Fax. 029 20862176 mail@integralgeotec.com | | Project Name: Broadwater Road | | Project No.: 12454 | | Trial Pit No.: TP4 Sheet 1 of 1 | |
|--|------|---|--|---|---|--|---|
| Location: Welwyn Garden City | | Client: Signia Developments | | Logged By: GNS | | Scale: 1:25 | |
| Equipment: JCB 3CX | | Coordinates: | | Dimensions: 2.50m | | Depth : 4.20m | |
| Date Excavated: 12/06/2019 | | Level: 85.60m AOD | |  | | | |
| Samples & In-situ Testing | | | Depth (m) | Level (m AOD) | Legend | Stratum Description | |
| Depth (m) | Type | Results | | | | | |
| 0.80 | ES | | 0.70 | 84.90 |  | Loose mid brown and orange brown silty sandy gravel with frequent cobbles of brick. Gravel is fine to coarse subangular brick and plastic and rounded flint (MADE GROUND). | |
| 1.60 | D | | 1.50 | 84.10 |  | Firm grey and dark grey locally black slightly silty slightly sandy slightly gravelly clay. Gravel is fine to coarse angular and subangular brick, ash, glass, metal and concrete (MADE GROUND). - Soils discoloured with a slight hydrocarbon odour between 0.7m and 1.5m depth. | |
| | | | 2.60 | 83.00 |  | Firm and firm to stiff orange brown slightly silty sandy slightly gravelly CLAY. Gravel is fine to coarse angular and subangular flint. | |
| | | | 4.20 | 81.40 |  | Medium dense orange brown and yellow brown clayey silty slightly gravelly SAND. Gravel is fine to coarse rounded and subrounded flint. | |
| | | | | | End of Trialpit at 4.20 m | | |
| Remarks: Soil infiltration test attempted in trial pit. | | | Groundwater: Minor water seepage at 1.5m depth | | Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample W - Water sample | |  |
| | | | Stability: Stable in the short term | | | | |



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APPENDIX 5

RESIDENTIAL DEVELOPMENT

- NOTES**
- DO NOT SCALE FROM THIS DRAWING - USE DIMENSIONS ONLY, IF IN DOUBT ASK.
 - ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS AND SPECIFICATIONS.

LEGEND

- RODDING EYE PRIVATE
- SURFACE WATER TYPE 3 INSPECTION CHAMBER PRIVATE ROAD RANGE 450 MAX DEPTH 2.0m
- HYDROPHONE CHAMBER
- SURFACE WATER DRAIN PRIVATE
- LINE DRAIN WITH RODDING ACCESS
- SURFACE WATER TYPE 3 STYLE 450mm # INSPECTION CHAMBER PRIVATE ROAD WITH 450mm SILT TRAP
- ROAD GULLY
- YARD GULLY
- 100mm THRESHOLD DRAIN TO DISCHARGE INTO NEAREST LANDSCAPE AREA END 300mm # PIPE TO BE WRAPPED IN A GEOTEXTILE AND SET IN A 300mm WIDE TRENCH OF PIPE BEDDING MATERIAL. WHERE NOT PRACTICAL THEN CONNECT INTO NEAREST RAMP OUTLET OR SURFACE WATER DRAIN
- 300mm 3.0m DEEP WELLS TO ALLOW SOME BENEFIT TO BE GAINED FROM STRATA BELOW FOR LOW LEVEL STORM EVENTS
- PERMEABLE PAVING TO CAR PARK COLOUR TO ARCHITECT/CLIENT REQUIREMENTS
- EXISTING SURFACE WATER SEWER

A CONTRACTOR WHO IS ACCREDITED TO THE BRITISH PLASTICS FEDERATION PLASTIC PIPES GROUP MUST UNDERTAKE THE INSTALLATION OF STRUCTURAL WALL PLASTIC PIPES THAT ARE OFFERED FOR ADOPTION

PIPE MATERIALS
 ALL PIPES TO BE 150mm # UNLESS NOTED OTHERWISE
 150mm - MUST HAVE CLASS 4 OR 5 LOADING
 150mm - HDPE/SDR35 ULTRADRAW SYSTEM
 225mm - 300mm HDPE/SDR35 ULTRADRAW SYSTEM
 300mm - 600mm HDPE/SDR35 ULTRADRAW SYSTEM
 600mm - CONCRETE OR METALIC SUBJECT TO DESIGN

A SECTION 106 APPLICATION TO CONNECT MUST BE MADE TO THE WATER AUTHORITY. THE DEVELOPER SHALL GIVE 21 DAYS NOTICE PRIOR TO CONNECTION. THE WORKS MAY ONLY BE UNDERTAKEN BY AN SPP HEALTH AND SAFETY APPROVED CONTRACTOR

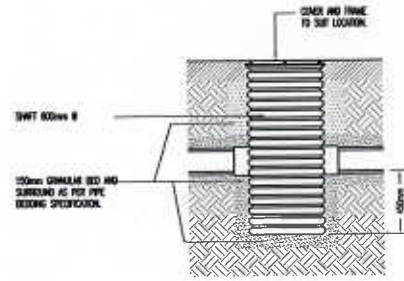


Tree/soft planting buffer zone outside site

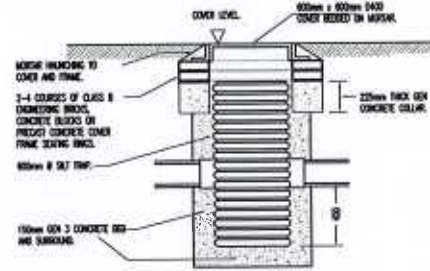
Tree/soft planting buffer zone outside site

| | | | |
|-----------------|--|--|---------|
| A | | KEEP SOME SCRAMBLES REMOVED FOLLOWING DISCUSSION WITH HERTS CC | BN |
| 31.07.19 | | | |
| REVISION | | | |
| DATE | | | |
| Client: | MARBROOK | | |
| Project Title: | BROADWATER ROAD WELWYN GARDEN CITY AL7 3AX | | |
| Drawing Title: | PROPOSED DRAINAGE STRATEGY | | |
| Drawn By: | BN | Scale: | 1:2500M |
| Date: | JUNE 2019 | Drawing Number: | |
| Checked By: | | 10528-500P | A |
| Drawn: | | | |
| Drawing Status: | PLANNING | | |
| | | NJP Consulting Engineers Limited 20 St Andrews Crescent Cardiff CF10 3DD | |
| | | Tel: 029 2072 9500 Email: info@njpek.com Web: www.njpek.com | |

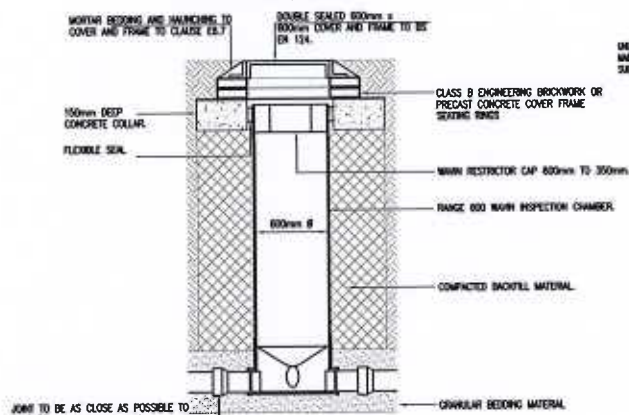
SILT TRAP



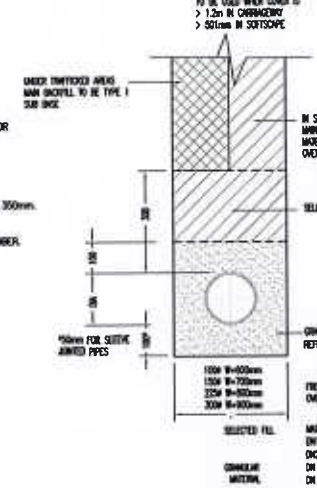
SILT TRAP WITH HEAVY DUTY D400 COVER AND FRAME



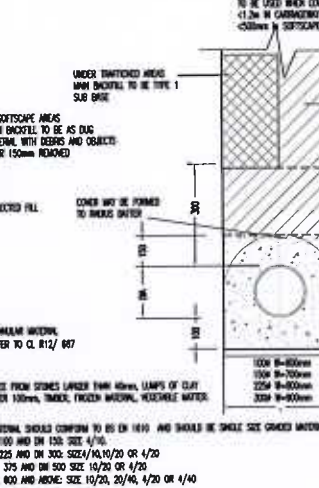
TYPICAL WAWN RANGE 600 INSPECTION CHAMBER DETAIL (R600)



CLASS S



CLASS Z



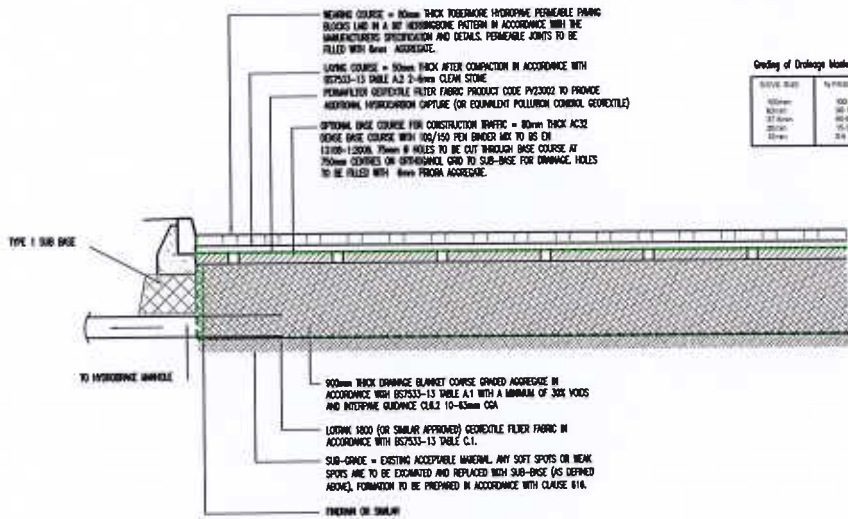
NOTES: (CLASS S & CLASS Z)

1. BEDDING BENEATH AND AT SIDES OF THE PIPE TO BE WELL COMPACTED.
 2. MAKE A CONCRETE CHAMBER IS PROVIDED, THE FIRST 300mm OF FILL ABOVE THE CROWN OF THE PIPE IS TO BE LIGHTLY COMPACTED BY HAND. MECHANICAL COMPACTOR MAY BE USED ONLY ABOVE THIS LEVEL.
 3. CONCRETE CHAMBERS AND ARCHES MAY BE EXTENDED TO THE SIDES OF THE TRENCH.
 4. GEOTEXTILES MAY BE USED WHERE DIRECTED OR APPROVED BY THE ENGINEER TO PREVENT BEDDING MATERIAL IN CONTACT WITH THE CONCRETE SLAB.
 5. IN VERY HOT CLIMATES, WHERE DIRECTED OR APPROVED BY THE ENGINEER A TEMPORARY LAMP SHALL NOT BE LAMP WITHIN THE CONCRETE SLAB.
- NOTES: (CLASS Z ONLY)
6. WHERE PIPES WITH FLEXIBLE JOINTS ARE USED, THE CONCRETE PROTECTION IS TO BE INTERRUPTED OVER ITS FULL CROSS SECTION AT INTERVALS NOT EXCEEDING 6 METRES (OR AS DIRECTED BY THE ENGINEER) BY A SHAPED FORMER OF BRICKS IMPREGATED COMPRESSIBLE FILLER. THESE INTERRUPTING SHALL CONCRETE WITH PIPE JOINTS.
 7. CONCRETE TO BE DEN 1.
 8. WHERE FLEXIBLE PIPES ARE USED, CARE MUST BE TAKEN TO PREVENT THE PIPES FROM FLOORING.

NOTES

1. ALL DIMENSIONS UNLESS OTHERWISE NOTED ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERING AND ARCHITECTS DRAWINGS AND SPECIFICATIONS.

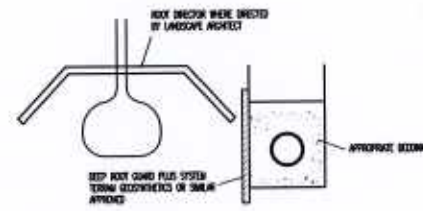
TYPICAL SECTION THROUGH BLOCK PAVED PARKING BAY AND PERMEABLE DRAINAGE



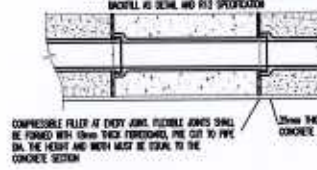
Grading of Drainage Blanket

| Grading | Grading | Grading |
|---------|---------|---------|
| 100mm | 100 | 100 |
| 150mm | 150 | 150 |
| 200mm | 200 | 200 |
| 250mm | 250 | 250 |
| 300mm | 300 | 300 |

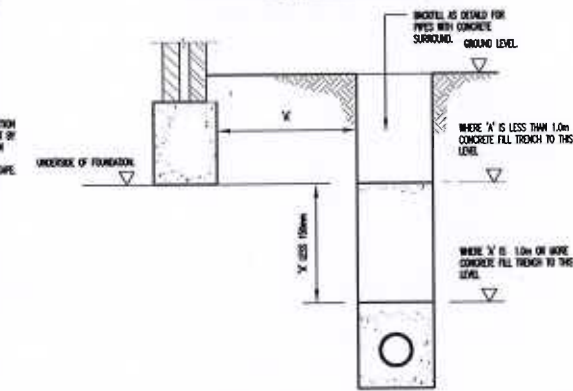
ROOT PROTECTION



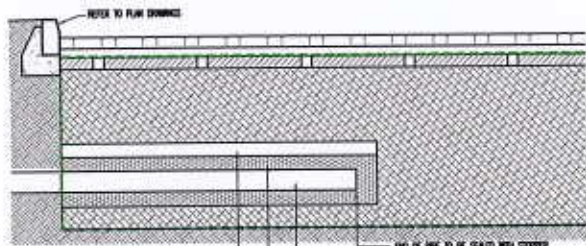
ELEVATION ON CLASS Z BEDDING



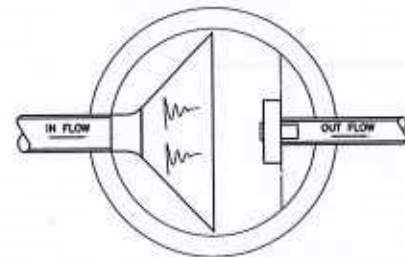
DETAILS ADJACENT STRIP FOUNDATIONS



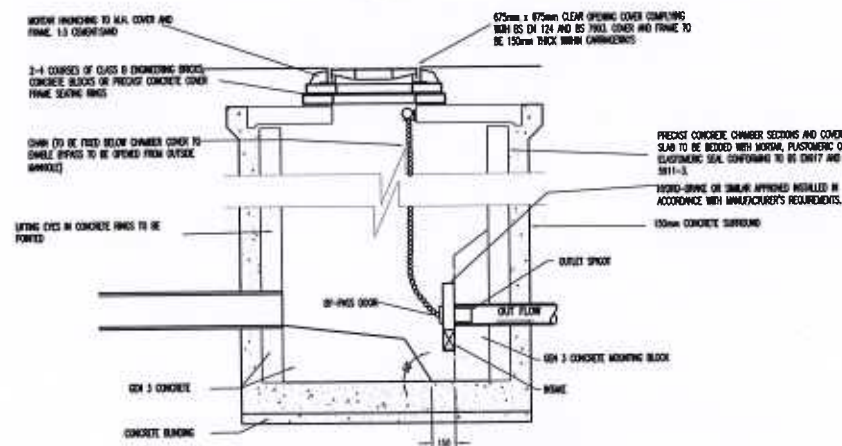
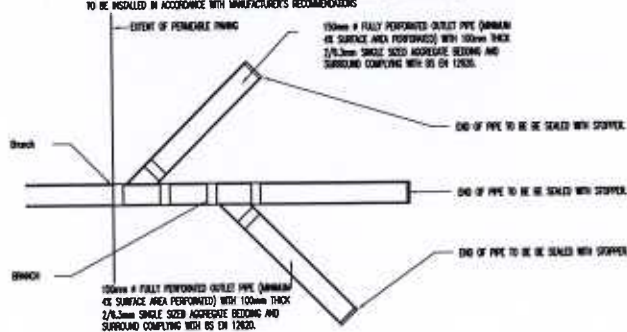
SECTION THROUGH DISTRIBUTION PIPE WITHIN DRAINAGE BLANKET



HYDRO BRAKE CHAMBER PLAN



PLAN OF DISTRIBUTION PIPE WITHIN DRAINAGE BLANKET



NOTES

1. CHAMBER COVER TO BE POSITIONED DIRECTLY ABOVE SP-INS DOOR.
2. DIMENSIONS ARE INDICATED ONLY AND ARE DEPENDANT ON TYPE OF CONTROL DEVICE USED. REFER TO MANUFACTURER'S SPECIFICATIONS FOR DETAILS.
3. FLOW CONTROL CHAMBER TO LIMIT FLOWS TO 2.0 L/S FOR ALL STAIN COATS UP TO 4 INCLUDING THE 1 IN 100 YEAR STORM PLUS AISE ALLOWANCE FOR CLIMATE CHANGE. HYDROBRAKE TYPE: 80-04E-0200-000-1000-2000 DESIGN HEAD - 1.00m ORIFICE DIAMETER - 60mm

| | | |
|----------|--|------|
| A | KEEP BORE SOWINGS REMOVED FOLLOWING DISCUSSION WITH HERTS OF | RN |
| 31.07.19 | | |
| REVISION | | DATE |
| DATE | | DATE |

Client:
WARBROOK

Project Title:
BROADWATER ROAD WELWYN GARDEN CITY AL7 3AX

Drawing Title:
PROPOSED DRAINAGE STRATEGY SURFACE WATER CONSTRUCTION DETAILS

| | |
|-----------------|----------------------------|
| Drawn by: RN | Scale: NTS (M) |
| Date: JUNE 2019 | Drawing Number: 10528-501P |
| Checked by: | Rev: A |
| Date: | |


Drawing Status: **PLANNING**

njp Consulting Engineers Limited
20 St Andrews Crescent
Cardiff CF10 3DD
Tel: 029 2072 9500
Email: info@njpk.com
Web: www.njpk.com



Consulting Civil & Structural Engineers

APPENDIX 6

| | | |
|---|---------------------------------------|---|
| NJP Consulting Engineers Limited | | Page 1 |
| 20 St Andrews Crescent Cardiff CF10 3DD | BROADWATER ROAD WELWYN GARDEN CITY |  |
| Date A- Aug 2019 File | Designed by NJP Checked by NJP | |
| Micro Drainage | | Source Control 2016.1 |

Summary of Results for 1 year Return Period

Half Drain Time : 143 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m ³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|----------------------------|------------------------------|--------|
| 15 min Summer | 84.856 | 0.066 | 0.0 | 1.4 | 1.4 | 11.1 | O K |
| 30 min Summer | 84.874 | 0.084 | 0.0 | 1.4 | 1.4 | 14.0 | O K |
| 60 min Summer | 84.890 | 0.100 | 0.0 | 1.4 | 1.4 | 16.7 | O K |
| 120 min Summer | 84.901 | 0.111 | 0.0 | 1.4 | 1.4 | 18.5 | O K |
| 180 min Summer | 84.902 | 0.112 | 0.0 | 1.4 | 1.4 | 18.8 | O K |
| 240 min Summer | 84.901 | 0.111 | 0.0 | 1.4 | 1.4 | 18.6 | O K |
| 360 min Summer | 84.898 | 0.108 | 0.0 | 1.4 | 1.4 | 18.0 | O K |
| 480 min Summer | 84.893 | 0.103 | 0.0 | 1.4 | 1.4 | 17.2 | O K |
| 600 min Summer | 84.887 | 0.097 | 0.0 | 1.4 | 1.4 | 16.2 | O K |
| 720 min Summer | 84.881 | 0.091 | 0.0 | 1.4 | 1.4 | 15.2 | O K |
| 960 min Summer | 84.868 | 0.078 | 0.0 | 1.4 | 1.4 | 13.1 | O K |
| 1440 min Summer | 84.844 | 0.054 | 0.0 | 1.4 | 1.4 | 9.0 | O K |
| 2160 min Summer | 84.816 | 0.026 | 0.0 | 1.4 | 1.4 | 4.3 | O K |
| 2880 min Summer | 84.798 | 0.008 | 0.0 | 1.4 | 1.4 | 1.4 | O K |
| 4320 min Summer | 84.790 | 0.000 | 0.0 | 1.2 | 1.2 | 0.0 | O K |
| 5760 min Summer | 84.790 | 0.000 | 0.0 | 1.0 | 1.0 | 0.0 | O K |
| 7200 min Summer | 84.790 | 0.000 | 0.0 | 0.9 | 0.9 | 0.0 | O K |
| 8640 min Summer | 84.790 | 0.000 | 0.0 | 0.7 | 0.7 | 0.0 | O K |
| 10080 min Summer | 84.790 | 0.000 | 0.0 | 0.7 | 0.7 | 0.0 | O K |
| 15 min Winter | 84.867 | 0.077 | 0.0 | 1.4 | 1.4 | 12.9 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m ³) | Discharge Volume (m ³) | Time-Peak (mins) |
|------------------|--------------|----------------------------------|------------------------------------|------------------|
| 15 min Summer | 31.320 | 0.0 | 12.3 | 24 |
| 30 min Summer | 19.320 | 0.0 | 15.9 | 38 |
| 60 min Summer | 11.917 | 0.0 | 20.2 | 66 |
| 120 min Summer | 7.351 | 0.0 | 25.6 | 120 |
| 180 min Summer | 5.542 | 0.0 | 29.4 | 156 |
| 240 min Summer | 4.535 | 0.0 | 32.1 | 188 |
| 360 min Summer | 3.418 | 0.0 | 36.6 | 256 |
| 480 min Summer | 2.797 | 0.0 | 40.2 | 324 |
| 600 min Summer | 2.394 | 0.0 | 43.0 | 392 |
| 720 min Summer | 2.109 | 0.0 | 45.6 | 460 |
| 960 min Summer | 1.723 | 0.0 | 49.7 | 592 |
| 1440 min Summer | 1.295 | 0.0 | 56.1 | 842 |
| 2160 min Summer | 0.974 | 0.0 | 63.1 | 1192 |
| 2880 min Summer | 0.796 | 0.0 | 68.3 | 1512 |
| 4320 min Summer | 0.595 | 0.0 | 75.7 | 0 |
| 5760 min Summer | 0.484 | 0.0 | 81.1 | 0 |
| 7200 min Summer | 0.412 | 0.0 | 85.3 | 0 |
| 8640 min Summer | 0.362 | 0.0 | 88.7 | 0 |
| 10080 min Summer | 0.324 | 0.0 | 91.6 | 0 |
| 15 min Winter | 31.320 | 0.0 | 14.2 | 25 |

20 St Andrews Crescent
Cardiff
CF10 3DD

BROADWATER ROAD
WELWYN GARDEN CITY



Date A- Aug 2019
File

Designed by NJP
Checked by NJP

Micro Drainage

Source Control 2016.1

Summary of Results for 1 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ (l/s) | Max Outflow Volume (m³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|-------------|-------------------------|--------|
| 30 min Winter | 84.887 | 0.097 | 0.0 | 1.4 | 1.4 | 16.2 | O K |
| 60 min Winter | 84.906 | 0.116 | 0.0 | 1.4 | 1.4 | 19.4 | O K |
| 120 min Winter | 84.922 | 0.132 | 0.0 | 1.4 | 1.4 | 22.0 | O K |
| 180 min Winter | 84.925 | 0.135 | 0.0 | 1.4 | 1.4 | 22.6 | O K |
| 240 min Winter | 84.923 | 0.133 | 0.0 | 1.4 | 1.4 | 22.2 | O K |
| 360 min Winter | 84.917 | 0.127 | 0.0 | 1.4 | 1.4 | 21.2 | O K |
| 480 min Winter | 84.908 | 0.118 | 0.0 | 1.4 | 1.4 | 19.7 | O K |
| 600 min Winter | 84.898 | 0.108 | 0.0 | 1.4 | 1.4 | 18.1 | O K |
| 720 min Winter | 84.888 | 0.098 | 0.0 | 1.4 | 1.4 | 16.3 | O K |
| 960 min Winter | 84.866 | 0.076 | 0.0 | 1.4 | 1.4 | 12.7 | O K |
| 1440 min Winter | 84.827 | 0.037 | 0.0 | 1.4 | 1.4 | 6.2 | O K |
| 2160 min Winter | 84.792 | 0.002 | 0.0 | 1.4 | 1.4 | 0.4 | O K |
| 2880 min Winter | 84.790 | 0.000 | 0.0 | 1.2 | 1.2 | 0.0 | O K |
| 4320 min Winter | 84.790 | 0.000 | 0.0 | 0.9 | 0.9 | 0.0 | O K |
| 5760 min Winter | 84.790 | 0.000 | 0.0 | 0.7 | 0.7 | 0.0 | O K |
| 7200 min Winter | 84.790 | 0.000 | 0.0 | 0.6 | 0.6 | 0.0 | O K |
| 8640 min Winter | 84.790 | 0.000 | 0.0 | 0.5 | 0.5 | 0.0 | O K |
| 10080 min Winter | 84.790 | 0.000 | 0.0 | 0.5 | 0.5 | 0.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 30 min Winter | 19.320 | 0.0 | 18.2 | 38 |
| 60 min Winter | 11.917 | 0.0 | 23.0 | 66 |
| 120 min Winter | 7.351 | 0.0 | 29.2 | 120 |
| 180 min Winter | 5.542 | 0.0 | 33.3 | 176 |
| 240 min Winter | 4.535 | 0.0 | 36.4 | 220 |
| 360 min Winter | 3.418 | 0.0 | 41.6 | 280 |
| 480 min Winter | 2.797 | 0.0 | 45.4 | 356 |
| 600 min Winter | 2.394 | 0.0 | 48.7 | 430 |
| 720 min Winter | 2.109 | 0.0 | 51.6 | 500 |
| 960 min Winter | 1.723 | 0.0 | 56.2 | 636 |
| 1440 min Winter | 1.295 | 0.0 | 63.4 | 880 |
| 2160 min Winter | 0.974 | 0.0 | 71.3 | 1152 |
| 2880 min Winter | 0.796 | 0.0 | 77.3 | 0 |
| 4320 min Winter | 0.595 | 0.0 | 85.8 | 0 |
| 5760 min Winter | 0.484 | 0.0 | 92.0 | 0 |
| 7200 min Winter | 0.412 | 0.0 | 97.0 | 0 |
| 8640 min Winter | 0.362 | 0.0 | 101.0 | 0 |
| 10080 min Winter | 0.324 | 0.0 | 104.5 | 0 |

20 St Andrews Crescent
Cardiff
CF10 3DD

BROADWATER ROAD
WELWYN GARDEN CITY



Date A- Aug 2019
File

Designed by NJP
Checked by NJP

Micro Drainage

Source Control 2016.1


Rainfall Details

| | |
|-----------------------|---------------------------------|
| Rainfall Model | FEH |
| Return Period (years) | 1 |
| Site Location | GB 524150 212350 TL 24150 12350 |
| C (1km) | -0.028 |
| D1 (1km) | 0.303 |
| D2 (1km) | 0.297 |
| D3 (1km) | 0.282 |
| E (1km) | 0.321 |
| F (1km) | 2.478 |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 0.750 |
| Cv (Winter) | 0.840 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +0 |

Time Area Diagram

Total Area (ha) 0.260

| Time (mins) | Area | Time (mins) | Area | Time (mins) | Area |
|-------------|---------|-------------|---------|-------------|----------|
| From: | To: | From: | To: | From: | To: |
| | (ha) | | (ha) | | (ha) |
| 0 | 4 0.087 | 4 | 8 0.087 | 8 | 12 0.087 |

| | | |
|---|---------------------------------------|---|
| NJP Consulting Engineers Limited | | Page 4 |
| 20 St Andrews Crescent Cardiff CF10 3DD | BROADWATER ROAD WELWYN GARDEN CITY |  |
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| Micro Drainage | Source Control 2016.1 | |

Model Details

Storage is Online Cover Level (m) 85.900

Porous Car Park Structure

| | | | |
|--------------------------------------|---------|-------------------------|------|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 10.4 |
| Membrane Percolation (mm/hr) | 3000 | Length (m) | 53.5 |
| Max Percolation (l/s) | 463.7 | Slope (1:X) | 0.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 84.790 | Membrane Depth (m) | 0 |

Hydro-Brake Optimum® Outflow Control

| | |
|-----------------------------------|----------------------------|
| Unit Reference | MD-SHE-0059-2000-1690-2000 |
| Design Head (m) | 1.690 |
| Design Flow (l/s) | 2.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 59 |
| Invert Level (m) | 84.400 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|
| Design Point (Calculated) | 1.690 | 2.0 |
| Flush-Flo™ | 0.259 | 1.4 |
| Kick-Flo® | 0.527 | 1.2 |
| Mean Flow over Head Range | - | 1.5 |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100 | 1.3 | 1.200 | 1.7 | 3.000 | 2.6 | 7.000 | 3.8 |
| 0.200 | 1.4 | 1.400 | 1.8 | 3.500 | 2.8 | 7.500 | 4.0 |
| 0.300 | 1.4 | 1.600 | 1.9 | 4.000 | 3.0 | 8.000 | 4.1 |
| 0.400 | 1.4 | 1.800 | 2.1 | 4.500 | 3.1 | 8.500 | 4.2 |
| 0.500 | 1.3 | 2.000 | 2.2 | 5.000 | 3.3 | 9.000 | 4.3 |
| 0.600 | 1.3 | 2.200 | 2.2 | 5.500 | 3.4 | 9.500 | 4.4 |
| 0.800 | 1.4 | 2.400 | 2.3 | 6.000 | 3.6 | | |
| 1.000 | 1.6 | 2.600 | 2.4 | 6.500 | 3.7 | | |

Summary of Results for 30 year Return Period

Half Drain Time : 413 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Outflow (l/s) | Max Volume (m ³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|-------------------|------------------------------|--------|
| 15 min Summer | 85.071 | 0.281 | 0.0 | 1.6 | 1.6 | 46.9 | O K |
| 30 min Summer | 85.112 | 0.322 | 0.0 | 1.6 | 1.6 | 53.7 | O K |
| 60 min Summer | 85.152 | 0.362 | 0.0 | 1.7 | 1.7 | 60.5 | O K |
| 120 min Summer | 85.186 | 0.396 | 0.0 | 1.7 | 1.7 | 66.0 | O K |
| 180 min Summer | 85.197 | 0.407 | 0.0 | 1.7 | 1.7 | 67.9 | O K |
| 240 min Summer | 85.197 | 0.407 | 0.0 | 1.7 | 1.7 | 68.0 | O K |
| 360 min Summer | 85.185 | 0.395 | 0.0 | 1.7 | 1.7 | 65.9 | O K |
| 480 min Summer | 85.169 | 0.379 | 0.0 | 1.7 | 1.7 | 63.2 | O K |
| 600 min Summer | 85.155 | 0.365 | 0.0 | 1.7 | 1.7 | 60.9 | O K |
| 720 min Summer | 85.143 | 0.353 | 0.0 | 1.7 | 1.7 | 58.9 | O K |
| 960 min Summer | 85.121 | 0.331 | 0.0 | 1.7 | 1.7 | 55.2 | O K |
| 1440 min Summer | 85.079 | 0.289 | 0.0 | 1.6 | 1.6 | 48.2 | O K |
| 2160 min Summer | 85.023 | 0.233 | 0.0 | 1.6 | 1.6 | 38.8 | O K |
| 2880 min Summer | 84.973 | 0.183 | 0.0 | 1.6 | 1.6 | 30.5 | O K |
| 4320 min Summer | 84.892 | 0.102 | 0.0 | 1.5 | 1.5 | 17.0 | O K |
| 5760 min Summer | 84.837 | 0.047 | 0.0 | 1.5 | 1.5 | 7.8 | O K |
| 7200 min Summer | 84.804 | 0.014 | 0.0 | 1.4 | 1.4 | 2.3 | O K |
| 8640 min Summer | 84.790 | 0.000 | 0.0 | 1.4 | 1.4 | 0.0 | O K |
| 10080 min Summer | 84.790 | 0.000 | 0.0 | 1.2 | 1.2 | 0.0 | O K |
| 15 min Winter | 85.108 | 0.318 | 0.0 | 1.6 | 1.6 | 53.0 | O K |


| Storm Event | Rain (mm/hr) | Flooded Volume (m ³) | Discharge Volume (m ³) | Time-Peak (mins) |
|------------------|--------------|----------------------------------|------------------------------------|------------------|
| 15 min Summer | 105.845 | 0.0 | 48.7 | 26 |
| 30 min Summer | 61.140 | 0.0 | 56.7 | 40 |
| 60 min Summer | 35.317 | 0.0 | 66.0 | 68 |
| 120 min Summer | 20.400 | 0.0 | 76.5 | 126 |
| 180 min Summer | 14.798 | 0.0 | 83.5 | 184 |
| 240 min Summer | 11.784 | 0.0 | 88.8 | 242 |
| 360 min Summer | 8.548 | 0.0 | 96.8 | 330 |
| 480 min Summer | 6.807 | 0.0 | 102.8 | 388 |
| 600 min Summer | 5.705 | 0.0 | 107.7 | 450 |
| 720 min Summer | 4.938 | 0.0 | 111.8 | 516 |
| 960 min Summer | 3.925 | 0.0 | 118.6 | 654 |
| 1440 min Summer | 2.840 | 0.0 | 128.3 | 924 |
| 2160 min Summer | 2.055 | 0.0 | 138.8 | 1324 |
| 2880 min Summer | 1.634 | 0.0 | 146.8 | 1708 |
| 4320 min Summer | 1.175 | 0.0 | 157.1 | 2428 |
| 5760 min Summer | 0.930 | 0.0 | 164.6 | 3112 |
| 7200 min Summer | 0.776 | 0.0 | 170.5 | 3752 |
| 8640 min Summer | 0.669 | 0.0 | 175.1 | 0 |
| 10080 min Summer | 0.590 | 0.0 | 178.9 | 0 |
| 15 min Winter | 105.845 | 0.0 | 54.9 | 26 |

| | | |
|---|---------------------------------------|---|
| NJP Consulting Engineers Limited | | Page 2 |
| 20 St Andrews Crescent Cardiff CF10 3DD | BROADWATER ROAD WELWYN GARDEN CITY |  |
| Date A Aug 2019 File source lin30.srcx | Designed by NJP Checked by NJP | |
| Micro Drainage | | Source Control 2016.1 |

Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ (l/s) | Max Outflow Volume (m³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|-------------|-------------------------|--------|
| 30 min Winter | 85.155 | 0.365 | 0.0 | 1.7 | 1.7 | 60.9 | O K |
| 60 min Winter | 85.202 | 0.412 | 0.0 | 1.7 | 1.7 | 68.7 | O K |
| 120 min Winter | 85.243 | 0.453 | 0.0 | 1.7 | 1.7 | 75.6 | O K |
| 180 min Winter | 85.260 | 0.470 | 0.0 | 1.7 | 1.7 | 78.4 | O K |
| 240 min Winter | 85.265 | 0.475 | 0.0 | 1.7 | 1.7 | 79.2 | O K |
| 360 min Winter | 85.258 | 0.468 | 0.0 | 1.7 | 1.7 | 78.1 | O K |
| 480 min Winter | 85.240 | 0.450 | 0.0 | 1.7 | 1.7 | 75.1 | O K |
| 600 min Winter | 85.221 | 0.431 | 0.0 | 1.7 | 1.7 | 72.0 | O K |
| 720 min Winter | 85.204 | 0.414 | 0.0 | 1.7 | 1.7 | 69.1 | O K |
| 960 min Winter | 85.173 | 0.383 | 0.0 | 1.7 | 1.7 | 63.9 | O K |
| 1440 min Winter | 85.111 | 0.321 | 0.0 | 1.6 | 1.6 | 53.5 | O K |
| 2160 min Winter | 85.025 | 0.235 | 0.0 | 1.6 | 1.6 | 39.3 | O K |
| 2880 min Winter | 84.952 | 0.162 | 0.0 | 1.5 | 1.5 | 27.1 | O K |
| 4320 min Winter | 84.842 | 0.052 | 0.0 | 1.5 | 1.5 | 8.6 | O K |
| 5760 min Winter | 84.790 | 0.000 | 0.0 | 1.4 | 1.4 | 0.0 | O K |
| 7200 min Winter | 84.790 | 0.000 | 0.0 | 1.2 | 1.2 | 0.0 | O K |
| 8640 min Winter | 84.790 | 0.000 | 0.0 | 1.0 | 1.0 | 0.0 | O K |
| 10080 min Winter | 84.790 | 0.000 | 0.0 | 0.9 | 0.9 | 0.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 30 min Winter | 61.140 | 0.0 | 63.9 | 40 |
| 60 min Winter | 35.317 | 0.0 | 74.3 | 68 |
| 120 min Winter | 20.400 | 0.0 | 86.1 | 124 |
| 180 min Winter | 14.798 | 0.0 | 93.8 | 182 |
| 240 min Winter | 11.784 | 0.0 | 99.8 | 238 |
| 360 min Winter | 8.548 | 0.0 | 108.7 | 348 |
| 480 min Winter | 6.807 | 0.0 | 115.6 | 446 |
| 600 min Winter | 5.705 | 0.0 | 121.0 | 480 |
| 720 min Winter | 4.938 | 0.0 | 125.7 | 556 |
| 960 min Winter | 3.925 | 0.0 | 133.2 | 708 |
| 1440 min Winter | 2.840 | 0.0 | 144.4 | 1004 |
| 2160 min Winter | 2.055 | 0.0 | 156.3 | 1424 |
| 2880 min Winter | 1.634 | 0.0 | 165.1 | 1816 |
| 4320 min Winter | 1.175 | 0.0 | 177.0 | 2504 |
| 5760 min Winter | 0.930 | 0.0 | 185.6 | 0 |
| 7200 min Winter | 0.776 | 0.0 | 192.3 | 0 |
| 8640 min Winter | 0.669 | 0.0 | 197.7 | 0 |
| 10080 min Winter | 0.590 | 0.0 | 202.2 | 0 |

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|---|---------------------------------------|---|
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| 20 St Andrews Crescent Cardiff CF10 3DD | BROADWATER ROAD WELWYN GARDEN CITY |  |
| Date A Aug 2019 File source lin30.srcx | Designed by NJP Checked by NJP | |
| Micro Drainage | Source Control 2016.1 | |


Rainfall Details

| | |
|-----------------------|---------------------------------|
| Rainfall Model | FEH |
| Return Period (years) | 30 |
| Site Location | GB 524150 212350 TL 24150 12350 |
| C (1km) | -0.028 |
| D1 (1km) | 0.303 |
| D2 (1km) | 0.297 |
| D3 (1km) | 0.282 |
| E (1km) | 0.321 |
| F (1km) | 2.478 |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 0.750 |
| Cv (Winter) | 0.840 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +0 |

Time Area Diagram

Total Area (ha) 0.260

| Time (mins) | Area | Time (mins) | Area | Time (mins) | Area |
|-------------|-------|-------------|-------|-------------|-------|
| From: | To: | From: | To: | From: | To: |
| 0 | 4 | 4 | 8 | 8 | 12 |
| | 0.087 | | 0.087 | | 0.087 |

| | | |
|---|---------------------------------------|---|
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| Micro Drainage | Source Control 2016.1 | |

Model Details

Storage is Online Cover Level (m) 85.900

Porous Car Park Structure

| | | | |
|--------------------------------------|---------|-------------------------|------|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 10.4 |
| Membrane Percolation (mm/hr) | 3000 | Length (m) | 53.5 |
| Max Percolation (l/s) | 463.7 | Slope (1:X) | 0.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 84.790 | Membrane Depth (m) | 0 |


Hydro-Brake Optimum® Outflow Control

| | |
|-----------------------------------|----------------------------|
| Unit Reference | MD-SHE-0059-2000-1690-2000 |
| Design Head (m) | 1.690 |
| Design Flow (l/s) | 2.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 59 |
| Invert Level (m) | 84.000 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|
| Design Point (Calculated) | 1.690 | 2.0 |
| Flush-Flo™ | 0.259 | 1.4 |
| Kick-Flo® | 0.527 | 1.2 |
| Mean Flow over Head Range | - | 1.5 |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100 | 1.3 | 1.200 | 1.7 | 3.000 | 2.6 | 7.000 | 3.8 |
| 0.200 | 1.4 | 1.400 | 1.8 | 3.500 | 2.8 | 7.500 | 4.0 |
| 0.300 | 1.4 | 1.600 | 1.9 | 4.000 | 3.0 | 8.000 | 4.1 |
| 0.400 | 1.4 | 1.800 | 2.1 | 4.500 | 3.1 | 8.500 | 4.2 |
| 0.500 | 1.3 | 2.000 | 2.2 | 5.000 | 3.3 | 9.000 | 4.3 |
| 0.600 | 1.3 | 2.200 | 2.2 | 5.500 | 3.4 | 9.500 | 4.4 |
| 0.800 | 1.4 | 2.400 | 2.3 | 6.000 | 3.6 | | |
| 1.000 | 1.6 | 2.600 | 2.4 | 6.500 | 3.7 | | |

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| Micro Drainage | | Source Control 2016.1 |

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

Half Drain Time : 779 minutes.


| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Outflow (l/s) | Max Volume (m ³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|-------------------|------------------------------|--------|
| 15 min Summer | 85.430 | 0.640 | 0.0 | 1.8 | 1.8 | 106.8 | O K |
| 30 min Summer | 85.508 | 0.718 | 0.0 | 1.9 | 1.9 | 119.8 | O K |
| 60 min Summer | 85.588 | 0.798 | 0.0 | 1.9 | 1.9 | 133.2 | O K |
| 120 min Summer | 85.661 | 0.871 | 0.0 | 2.0 | 2.0 | 145.4 | O K |
| 180 min Summer | 85.696 | 0.906 | 0.0 | 2.0 | 2.0 | 151.2 | O K |
| 240 min Summer | 85.713 | 0.923 | 0.0 | 2.0 | 2.0 | 154.1 | O K |
| 360 min Summer | 85.720 | 0.930 | 0.0 | 2.0 | 2.0 | 155.2 | O K |
| 480 min Summer | 85.708 | 0.918 | 0.0 | 2.0 | 2.0 | 153.2 | O K |
| 600 min Summer | 85.686 | 0.896 | 0.0 | 2.0 | 2.0 | 149.5 | O K |
| 720 min Summer | 85.662 | 0.872 | 0.0 | 2.0 | 2.0 | 145.6 | O K |
| 960 min Summer | 85.614 | 0.824 | 0.0 | 2.0 | 2.0 | 137.6 | O K |
| 1440 min Summer | 85.541 | 0.751 | 0.0 | 1.9 | 1.9 | 125.4 | O K |
| 2160 min Summer | 85.456 | 0.666 | 0.0 | 1.9 | 1.9 | 111.2 | O K |
| 2880 min Summer | 85.383 | 0.593 | 0.0 | 1.8 | 1.8 | 98.9 | O K |
| 4320 min Summer | 85.250 | 0.460 | 0.0 | 1.7 | 1.7 | 76.7 | O K |
| 5760 min Summer | 85.140 | 0.350 | 0.0 | 1.7 | 1.7 | 58.4 | O K |
| 7200 min Summer | 85.050 | 0.260 | 0.0 | 1.6 | 1.6 | 43.4 | O K |
| 8640 min Summer | 84.976 | 0.186 | 0.0 | 1.6 | 1.6 | 31.0 | O K |
| 10080 min Summer | 84.917 | 0.127 | 0.0 | 1.5 | 1.5 | 21.2 | O K |
| 15 min Winter | 85.510 | 0.720 | 0.0 | 1.9 | 1.9 | 120.2 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m ³) | Discharge Volume (m ³) | Time-Peak (mins) |
|------------------|--------------|----------------------------------|------------------------------------|------------------|
| 15 min Summer | 229.506 | 0.0 | 109.0 | 26 |
| 30 min Summer | 129.480 | 0.0 | 123.3 | 41 |
| 60 min Summer | 73.048 | 0.0 | 139.5 | 70 |
| 120 min Summer | 41.211 | 0.0 | 157.7 | 128 |
| 180 min Summer | 29.485 | 0.0 | 169.5 | 188 |
| 240 min Summer | 23.250 | 0.0 | 178.1 | 246 |
| 360 min Summer | 16.634 | 0.0 | 191.2 | 364 |
| 480 min Summer | 13.117 | 0.0 | 201.3 | 482 |
| 600 min Summer | 10.910 | 0.0 | 209.1 | 582 |
| 720 min Summer | 9.385 | 0.0 | 215.8 | 626 |
| 960 min Summer | 7.387 | 0.0 | 226.4 | 750 |
| 1440 min Summer | 5.273 | 0.0 | 242.2 | 1010 |
| 2160 min Summer | 3.763 | 0.0 | 258.7 | 1412 |
| 2880 min Summer | 2.962 | 0.0 | 271.2 | 1824 |
| 4320 min Summer | 2.101 | 0.0 | 287.2 | 2604 |
| 5760 min Summer | 1.647 | 0.0 | 298.7 | 3360 |
| 7200 min Summer | 1.363 | 0.0 | 307.9 | 4112 |
| 8640 min Summer | 1.168 | 0.0 | 315.1 | 4832 |
| 10080 min Summer | 1.025 | 0.0 | 321.3 | 5464 |
| 15 min Winter | 229.506 | 0.0 | 122.4 | 26 |

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 | 85.599 | 0.809 | 0.0 | 1.9 | 1.9 | 135.0 | O K |
| 60 min Winter | 85.690 | 0.900 | 0.0 | 2.0 | 2.0 | 150.2 | O K |
| 120 min Winter | 85.778 | 0.988 | 0.0 | 2.0 | 2.0 | 164.8 | O K |
| 180 min Winter | 85.821 | 1.031 | 0.0 | 2.1 | 2.1 | 172.1 | O K |
| 240 min Winter | 85.844 | 1.054 | 0.0 | 2.1 | 2.1 | 175.9 | Flood Risk |
| 360 min Winter | 85.862 | 1.072 | 0.0 | 2.1 | 2.1 | 178.9 | Flood Risk |
| 480 min Winter | 85.857 | 1.067 | 0.0 | 2.1 | 2.1 | 178.1 | Flood Risk |
| 600 min Winter | 85.842 | 1.052 | 0.0 | 2.1 | 2.1 | 175.6 | Flood Risk |
| 720 min Winter | 85.819 | 1.029 | 0.0 | 2.1 | 2.1 | 171.8 | O K |
| 960 min Winter | 85.764 | 0.974 | 0.0 | 2.0 | 2.0 | 162.5 | O K |
| 1440 min Winter | 85.665 | 0.875 | 0.0 | 2.0 | 2.0 | 146.1 | O K |
| 2160 min Winter | 85.548 | 0.758 | 0.0 | 1.9 | 1.9 | 126.5 | O K |
| 2880 min Winter | 85.440 | 0.650 | 0.0 | 1.9 | 1.9 | 108.5 | O K |
| 4320 min Winter | 85.248 | 0.458 | 0.0 | 1.7 | 1.7 | 76.4 | O K |
| 5760 min Winter | 85.095 | 0.305 | 0.0 | 1.6 | 1.6 | 50.9 | O K |
| 7200 min Winter | 84.974 | 0.184 | 0.0 | 1.6 | 1.6 | 30.7 | O K |
| 8640 min Winter | 84.881 | 0.091 | 0.0 | 1.5 | 1.5 | 15.2 | O K |
| 10080 min Winter | 84.816 | 0.026 | 0.0 | 1.4 | 1.4 | 4.4 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|-----------------------|---------------|---------------------|-----------------------|------------------|
| 30 min Winter | 129.480 | 0.0 | 138.5 | 41 |
| 60 min Winter | 73.048 | 0.0 | 156.6 | 70 |
| 120 min Winter | 41.211 | 0.0 | 176.9 | 126 |
| 180 min Winter | 29.485 | 0.0 | 190.1 | 184 |
| 240 min Winter | 23.250 | 0.0 | 200.0 | 242 |
| 360 min Winter | 16.634 | 0.0 | 214.7 | 356 |
| 480 min Winter | 13.117 | 0.0 | 225.7 | 470 |
| 600 min Winter | 10.910 | 0.0 | 234.7 | 580 |
| 720 min Winter | 9.385 | 0.0 | 242.3 | 686 |
| 960 min Winter | 7.387 | 0.0 | 254.2 | 790 |
| 1440 min Winter | 5.273 | 0.0 | 271.8 | 1086 |
| 2160 min Winter | 3.763 | 0.0 | 290.6 | 1540 |
| 2880 min Winter | 2.962 | 0.0 | 304.2 | 1968 |
| 4320 min Winter | 2.101 | 0.0 | 322.4 | 2808 |
| 5760 min Winter | 1.647 | 0.0 | 335.7 | 3576 |
| 7200 min Winter | 1.363 | 0.0 | 346.2 | 4256 |
| 8640 min Winter | 1.168 | 0.0 | 354.7 | 4928 |
| 10080 min Winter | 1.025 | 0.0 | 361.6 | 5456 |

| | | |
|---|---------------------------------------|---|
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| Micro Drainage | Source Control 2016.1 | |


Rainfall Details

| | |
|-----------------------|---------------------------------|
| Rainfall Model | FEH |
| Return Period (years) | 100 |
| Site Location | GB 524150 212350 TL 24150 12350 |
| C (1km) | -0.028 |
| D1 (1km) | 0.303 |
| D2 (1km) | 0.297 |
| D3 (1km) | 0.282 |
| E (1km) | 0.321 |
| F (1km) | 2.478 |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 0.750 |
| Cv (Winter) | 0.840 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +40 |

Time Area Diagram

Total Area (ha) 0.260

| Time (mins) | Area | Time (mins) | Area | Time (mins) | Area |
|-------------|---------|-------------|---------|-------------|----------|
| From: | To: | From: | To: | From: | To: |
| | (ha) | | (ha) | | (ha) |
| 0 | 4 0.087 | 4 | 8 0.087 | 8 | 12 0.087 |

| | | |
|---|---------------------------------------|---|
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| Micro Drainage | Source Control 2016.1 | |

Model Details

Storage is Online Cover Level (m) 85.900

Porous Car Park Structure

| | | | |
|--------------------------------------|---------|-------------------------|------|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 10.4 |
| Membrane Percolation (mm/hr) | 3000 | Length (m) | 53.5 |
| Max Percolation (l/s) | 463.7 | Slope (1:X) | 0.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 84.790 | Membrane Depth (m) | 0 |

Hydro-Brake Optimum® Outflow Control

| | |
|-----------------------------------|----------------------------|
| Unit Reference | MD-SHE-0059-2000-1690-2000 |
| Design Head (m) | 1.690 |
| Design Flow (l/s) | 2.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 59 |
| Invert Level (m) | 84.000 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|
| Design Point (Calculated) | 1.690 | 2.0 |
| Flush-Flo™ | 0.259 | 1.4 |
| Kick-Flo® | 0.527 | 1.2 |
| Mean Flow over Head Range | - | 1.5 |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100 | 1.3 | 1.200 | 1.7 | 3.000 | 2.6 | 7.000 | 3.8 |
| 0.200 | 1.4 | 1.400 | 1.8 | 3.500 | 2.8 | 7.500 | 4.0 |
| 0.300 | 1.4 | 1.600 | 1.9 | 4.000 | 3.0 | 8.000 | 4.1 |
| 0.400 | 1.4 | 1.800 | 2.1 | 4.500 | 3.1 | 8.500 | 4.2 |
| 0.500 | 1.3 | 2.000 | 2.2 | 5.000 | 3.3 | 9.000 | 4.3 |
| 0.600 | 1.3 | 2.200 | 2.2 | 5.500 | 3.4 | 9.500 | 4.4 |
| 0.800 | 1.4 | 2.400 | 2.3 | 6.000 | 3.6 | | |
| 1.000 | 1.6 | 2.600 | 2.4 | 6.500 | 3.7 | | |



Consulting Civil & Structural Engineers

APPENDIX 7

Maintenance Schedule

Maintenance of the SUDS permeable paving and Hydrobrake. This maintenance schedule must be included within the as built drawings with the Operations Manual. Marbrook Ltd are responsible for maintenance of all SUDS features post construction. The Main Contractor is responsible for the correct supervision and maintenance of all SUDS features during construction.

| Actions required | Frequency | Comments |
|---|--|--|
| Litter removal and general debris | Monthly | |
| Inspect for evidence of poor operation and/ or weed growth. If required take remedial action. | Three times per year preferably 48 hrs after large storms | |
| Stabilise and mow adjacent landscape areas where appropriate | Three times per year | |
| Inspect silt accumulation rates and establish appropriate brushing frequencies. Remove weeds | Annually | |
| Check silt traps for accumulation of debris and remove | Three times per year | |
| Upvc distribution pipes are located under the access road and car park as the as built drawings. Inspect the locality for signs of collapse in the blockwork as this may mean an unexpected failure of the distribution pipes has occurred | Annually | This is highly unlikely however a contractor with knowledge of the systems should replace accordingly |
| Brushing and suction sweeping or alternatively jet washing and suction sweeping to remove silt and debris. This is particularly important during autumn with falling leaves. Replacing of lost grit/material may be required | As required but expected annually | a contractor with knowledge of the systems should carry out these works |
| Resetting of uneven blocks by lifting block area, removing bedding materials and relaying to match original design. | As required (if infiltration performance is reduced as a result of significant blocking) | |
| Hydrobrake Inspection. There are no moving parts or power requirements. Hydro International do provide an ongoing maintenance regime which can be signed up to Tel 01275 878371 | Three times per year preferably 48 hrs after large storms | In the unlikely event of failure Hydro International should be contacted for advice and or replacement |
| The door at the front of the unit is intended to allow an emergency drain down of the manhole chamber or tank in case of a blockage at the inlet of the unit. It can be operated from the surface, allowing the chamber to be emptied prior to freeing the blockage from the inlet of the unit. On release of the pull cable, the door will close under its own weight and does not require any mechanism that may contribute to debris being caught around the unit. | | |