



**STA ASSOCIATES
TAVISTOCK HOUSE
UXBRIDGE**

**SURFACE WATER DRAINAGE
TECHNICAL NOTE (DISCHARGE OF
PLANNING CONDITION 4)**

MAY 2019



the journey is the reward

**STA ASSOCIATES
TAVISTOCK HOUSE
UXBRIDGE**

**SURFACE WATER DRAINAGE
TECHNICAL NOTE (DISCHARGE OF
PLANNING CONDITION 4)**

MAY 2019

Project Code:	A/STATAVISTOCK.10
Prepared by:	CG
Approved by:	SF
Issue Date:	May 2019
Status:	1st Issue

**STA Associates
Tavistock House
Uxbridge
Surface Water Drainage Technical Note (Discharge of Planning Condition 4)**

List of Contents

Sections

1	Introduction	1
2	Existing Site and Proposed Development.....	2
3	Condition 4 – Surface Water Drainage	4

Figures

Figure 2.1: Site Location	2
Figure 2.2: Proposed Ground Floor Layout	3

Appendices

APPENDIX A: Hillingdon Borough Council Decision Notice	
APPENDIX B: Site Location Plan	
APPENDIX C: Existing Elevations and Plans	
APPENDIX D: Proposed Ground Floor Plan	
APPENDIX E: EA Indicative Flood Maps	
APPENDIX F: Formpave Permeable Paving Brochure Extracts	
APPENDIX G: SuDS Management and Maintenance Plan	

1 Introduction

- 1.1 Mayer Brown have been commissioned by STA Associates to produce this surface water drainage Technical Note to facilitate the discharge of Planning Condition 4 associated with Hillingdon BC planning reference 71923/APP/2016/4576.
- 1.2 Mayer Brown Ltd produced the Flood Risk Assessment that accompanied the original outline application back in 2016, therefore has experience of working on this project.
- 1.3 The scheme was granted planning permission on two applications, which are as follows:
- Prior Approval Scheme: *“Change of Use from Class B1 (offices) to Class C3 (Dwellings) to provide 12 x self-contained flats”*
 - o HBC Ref APP/2016/3622,
 - o Permission granted 20th December 2016.
 - o Planning Condition 1 addresses drainage
 - Full Planning Application: *“Conversion of roof space to provide 1 x studio flat, 2 x 1-bed apartment and 1 x 2-bed apartment to include 2 side, 4 front and 6 rear dormers with associated parking and amenity space and alterations to the front and rear elevations to include the addition of 16 balconies.”*
 - o HBC Ref 71923/APP/2016/4576,
 - o Permission granted 1st March 2017.
 - o Planning Condition 4 addresses drainage.
- 1.4 The purpose of this Technical Note is to discharge planning **Condition 4** of the Full Planning Application decision notice (see Appendix A) because it primarily addresses the creation of amenity space on the ground floor and associated reduction to the car park. The full wording of condition 4 is contained in section 3 of this report.

2 Existing Site and Proposed Development

Existing Location and Site Description

- 2.1 The application site is located at Tavistock House on the northern side of Rockingham Road in Uxbridge. Tavistock House is located to the west of Uxbridge with the River Colne located to the west and Frays River located to the east. Refer Figure 2.1 and Appendix B for the Site Location Plan.



Figure 2.1: Site Location

- 2.2 The site contains an existing two storey building currently in use as office space (Class B1(a)) and associated car park located underneath Tavistock House at ground floor level, refer to Appendix C for Existing Plans and Elevations.

Proposed Development

- 2.3 The proposed roof level development will provide the following additional residential components:
- One studio apartment
 - Two 1-bedroom apartments
 - One 2-bedroom apartment
- 2.4 The proposals will therefore result in an additional 4 apartments above the 12 apartments proposed as part of the Prior Approval scheme.

3 Condition 4 – Surface Water Drainage

Condition 4

“No development approved by this permission shall be commenced until a scheme for the provision of sustainable water management has been submitted to and approved in writing by the Local Planning Authority. The scheme shall clearly demonstrate that sustainable drainage systems (SUDS) have been incorporated into the designs of the development in accordance with the hierarchy set out in accordance with Policy 5.15 of the London Plan and will:

- i. Provide information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters;*
- ii. Include a timetable for its implementation; and*
- iii. Provide a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime. The scheme shall also demonstrate the use of methods to minimise the use of potable water through water collection, reuse and recycling and will:*
- iv. Provide details of water collection facilities to capture excess rainwater;*
- v. Provide details of how rain and grey water will be recycled and reused in the development.*

Thereafter the development shall be implemented and retained/maintained in accordance with these details for as long as the development remains in existence.

REASON

To ensure the development does not increase the risk of flooding in accordance with Policy OE8 Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012) and London Plan (2016) Policy 5.12.”

Surface Water Drainage Strategy

- 3.1 The flood risk assessment that accompanied the planning application identified that site is not located within a critical drainage area.
- 3.2 The EA and SWMP flood maps identify the site has a low risk of experiencing surface water flooding, refer to Appendix E that shows the flood maps. The SWMP does not identify any surface water flooding incidents in the vicinity of the site.

Surface Water Disposal

- 3.3 A description of the methods used to delay and control the surface water from the site is provided below:
- Rainwater from the roof will discharge into rainwater planters and water butts positioned along the building via the rainwater downpipes, see Appendix D for details.
 - All external parking spaces will be constructed with permeable paving to collect the surface water, and discharge into the existing surface water drainage system.

Surface Water Treatment

- 3.4 Table 26.2 of the SuDS Manual identifies the pollution hazard level associated with the land uses within the Proposed Development as being 'Low'. On a scale from 0-1 a 'Low' pollution hazard level relates to the following pollution hazard indices (See table 26.2 of the SuDS Manual). This is applicable to runoff from residential roofs, driveways, paths, residential parking areas and low traffic roads:
- Total Suspended Solids = 0.5
 - Metals = 0.4
 - Hydrocarbons = 0.4
- 3.5 Table 26.3 of the SuDS Manual sets out the indicative mitigation indices provided by different SuDS features for discharges to surface water.

Permeable Paving

- 3.6 The external parking bays will be constructed using the proprietary system developed by "Formpave", information on this system is contained in Appendix F. Within the "Formpave" system is a product called "Inbitex" which is specialist non-woven geotextile used for separation, filtration and pollution control. It provides initial filtering and cleansing of the run-off, and prevents fine aggregate particles migrating down and clogging lower layers. When wet, micro-organisms from within the layer help remove pollutants and cleanse water being filtered.

- 3.7 Permeable paving provides sufficient pollution mitigation for runoff from low hazard land uses and provides mitigation indices of 0.7, 0.6 and 0.7, which are in excess of the requirement set out in paragraph 3.4.

Adoption and Maintenance

- 3.8 The proposed surface water network will be maintained by a Management Company, organised by the Developer. This should enable tight control over the operation and maintenance of the drainage/SuDS systems on site.

Design Criteria

- 3.9 The new elements of the positive drainage will be designed in accordance with Sewers for Adoption, and BS EN 752 – Drain and sewer systems outside buildings and the Building Regulations - part H (2015).

- 3.10 The surface water network design and rate of surface water runoff would be based on the Modified Rational method and designed in accordance with the Wallingford Procedure. In order to carry out the design of the networks, a number of Global Variables are used. These Global Variables/parameters are related to the location of the site in the UK and have been obtained from Maps for “design and analysis of urban storm drainage – Wallingford procedure”. These are as follows;

- Region = England & Wales
- $M(5-60) = 20.00\text{mm}$
- Ration (r) = 0.400

- 3.11 The new components of the positive surface water system would be designed such that:

- The pipes remain unsurcharged during the 1 in 2 year design storm;
- The system should not flood during the worst case 1 in 30 year storm with a free outfall;
- The surface water run-off would be contained on site for up to and including the worst case 1 in 100 year storm event, plus an additional 40% for climate change;
- The pipe velocities are such that self-cleansing is achieved at lesser more moderate storm intensities :-
 - o Pipe roughness (k_s) = 0.6
 - o Minimum pipe velocity at full flow = 1.00m/s
 - o Percentage Impermeable areas:
 - Buildings = 100%
 - Carriageways, footpaths and parking = 100%
 - Private and Communal Parking = 100%

- Soft Landscaping = 0%

SuDS Management and Maintenance Plan

- 3.12 A SuDS Management and Maintenance Plan has been prepared and is located in Appendix G. This will be confirmed by the Management Company organised by the developer to maintain the surface water drainage system on site once appointed.

Timetable for SuDS Implementation

- 3.13 The construction works associated with the building (including the SuDS system) will commence in autumn 2019.

Water Collection Facilities

- 3.14 Water from the roof of the building will drain via rainwater down pipes and be collected in water butts and rainwater planters positioned along the side of the building.

Rainwater Recycling

- 3.15 Rainwater collected in the water butts (as described above) will be used to irrigate the new soft landscaped areas.
- 3.16 It is not practical to reuse the grey water due to the difficulties in conveying the water back up to the apartments.

Condition 4 Conclusion

- 3.17 Condition 4 states that provision of sustainable water management should be submitted to the Local Planning Authority. This has been discussed in section 3 and is summarised below:
- The design criteria for the amended elements of the surface water drainage network are specified in paragraphs 3.9-3.11.
 - Rainwater planters, water butts and permeable paving will delay and control surface water discharged from the site.
 - Permeable paving and rainwater planters will provide surface water treatment to prevent polluted water leaving the development.
 - The building works and amendments to the existing surface water drainage strategy will commence in autumn 2019.
 - A management and maintenance plan has been produced and will be confirmed once the Management Company has been appointed.
 - Roof water will be collected in rainwater planters and water butts.
 - Water collected in the water butts will be recycled and used to irrigate the soft landscaping at the development.

- 3.18 The building footprint is to remain as existing with minor amendments to the external areas therefore the surface water drainage strategy will remain largely as existing except for the additions discussed above.
- 3.19 It is considered that the information above demonstrates that sustainable water management is provided at the development and, as such, this evidence base provides sufficient information to discharge planning Condition 4.

APPENDIX A: Hillingdon Borough Council Decision Notice



Mr Steve Taylor
4 The Sycamores
Blackwater
Camberley
GU17 0EE

Application Ref:
71923/APP/2016/4576

TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

GRANT OF PLANNING PERMISSION

The Council of the London Borough of Hillingdon as the Local Planning Authority within the meaning of the above Act and associated Orders **GRANTS** permission for the following:-

Description of development:

Conversion of roof space to provide 1 x studio flat, 2 x 1-bed apartments and 1 x 2-bed apartment to include 2 side, 4 front and 6 rear dormers with associated parking and amenity space and alterations to front, side and rear elevations to include the addition of 16 balconies.

Location of development: Rockingham Wharf 5 Rockingham Road Uxbridge

Date of application: 05 January 2017

Plan Numbers: See attached Schedule of plans

Permission is subject to the condition(s) listed on the attached schedule:-

Head of Planning and Enforcement

Date: 1 March 2017

- NOTES:
- (i) Please also see the informatives included in the Schedule of Conditions.
 - (ii) Should you wish to appeal against any of the conditions please read the attached sheet which explains the procedure.
 - (iii) This decision does not convey any approval or consent which may be required under any by-laws, building regulations or under any Act other than the Town and Country Planning Act 1990 (as amended).

TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

GRANT OF PLANNING PERMISSION

Application Ref: 71923/APP/2016/4576

SCHEDULE OF CONDITIONS

- 1 · The development hereby permitted shall be begun before the expiration of three years from the date of this permission.

REASON

To comply with Section 91 of the Town and Country Planning Act 1990

- 2 · The development hereby permitted shall not be carried out except in complete accordance with the details shown on the submitted plans, numbers 431.016.060D, 431.016.061, 431.016.062, 431.016.064, 431.016.063.A and 431.016.066.A and shall thereafter be retained/maintained for as long as the development remains in existence.

REASON

To ensure the development complies with the provisions of the Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012) and the London Plan (2016).

- 3 · No development shall take place until details of all materials and external surfaces, including details of balconies have been submitted to and approved in writing by the Local Planning Authority. Thereafter the development shall be constructed in accordance with the approved details and be retained as such.

Details should include information relating to make, product/type, colour and photographs/images.

REASON

To ensure that the development presents a satisfactory appearance in accordance with Policy BE13 Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012)

SCHEDULE OF CONDITIONS

- 4 · No development approved by this permission shall be commenced until a scheme for the provision of sustainable water management has been submitted to and approved in writing by the Local Planning Authority. The scheme shall clearly demonstrate that sustainable drainage systems (SUDS) have been incorporated into the designs of the development in accordance with the hierarchy set out in accordance with Policy 5.15 of the London Plan and will:
- i. provide information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters;
 - ii. include a timetable for its implementation; and
 - iii. provide a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.
- The scheme shall also demonstrate the use of methods to minimise the use of potable water through water collection, reuse and recycling and will:
- iv. provide details of water collection facilities to capture excess rainwater;
 - v. provide details of how rain and grey water will be recycled and reused in the development.
- Thereafter the development shall be implemented and retained/maintained in accordance with these details for as long as the development remains in existence.

REASON

To ensure the development does not increase the risk of flooding in accordance with Policy OE8 Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012) and London Plan (2016) Policy 5.12.

SCHEDULE OF CONDITIONS

- 5 · No development shall take place until a landscape scheme has been submitted to and approved in writing by the Local Planning Authority. The scheme shall include: -
1. Details of Soft Landscaping
 - 1.a Planting plans (at not less than a scale of 1:100),
 - 1.b Written specification of planting and cultivation works to be undertaken,
 - 1.c Schedule of plants giving species, plant sizes, and proposed numbers/densities where appropriate
 2. Details of Hard Landscaping
 - 2.a Refuse Storage
 - 2.b Cycle Storage (16 spaces)
 - 2.c Means of enclosure/boundary treatments
 - 2.d Car Parking Layouts (including demonstration that 5% of all parking spaces are served by electrical charging points)
 - 2.e Hard Surfacing Materials
 - 2.f External Lighting
 3. Details of Landscape Maintenance
 - 3.a Landscape Maintenance Schedule for a minimum period of 5 years.
 - 3.b Proposals for the replacement of any tree, shrub, or area of surfing/seeding within the landscaping scheme which dies or in the opinion of the Local Planning Authority becomes seriously damaged or diseased.
 4. Schedule for Implementation
 6. Other
 - 6.a Existing and proposed functional services above and below ground
 - 6.b Proposed finishing levels or contours

Thereafter the development shall be carried out and maintained in full accordance with the approved details.

REASON

To ensure that the proposed development will preserve and enhance the visual amenities of the locality and provide adequate facilities in compliance with policies BE13, BE38 and AM14 of the Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012) and Policy 5.17 (refuse storage) of the London Plan (2015).

- 6 · No unit hereby approved shall be occupied until a parking allocation scheme and Parking management plan have been submitted to, and approved in writing by, the Local Planning Authority. Thereafter the parking shall remain allocated for the use of the units in accordance with the approved scheme and management plan and remain under this allocation for the life of the development.

REASON

To ensure that an appropriate level of car parking provision is provided on site in accordance with Policy AM14 Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012) and Chapter 6 of the London Plan (2016).

SCHEDULE OF CONDITIONS

- 7 · Testing shall be carried out after completion but prior to occupation to show that suitable sound insulation has been achieved. The test results shall be submitted to and approved in writing by the local planning authority, prior to occupation.

Reason:

To safeguard the amenity of the future occupants of flats in accordance with policy OE5 Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012)

INFORMATIVES:

- 1 · The decision to GRANT planning permission has been taken having regard to all relevant planning legislation, regulations, guidance, circulars and Council policies, including The Human Rights Act (1998) (HRA 1998) which makes it unlawful for the Council to act incompatibly with Convention rights, specifically Article 6 (right to a fair hearing); Article 8 (right to respect for private and family life); Article 1 of the First Protocol (protection of property) and Article 14 (prohibition of discrimination).
- 2 · The decision to GRANT planning permission has been taken having regard to the policies and proposals in the Hillingdon Unitary Development Plan Saved Policies (September 2007) as incorporated into the Hillingdon Local Plan (2012) set out below, including Supplementary Planning Guidance, and to all relevant material considerations, including The London Plan - The Spatial Development Strategy for London consolidated with alterations since 2011 (2016) and national guidance.

Part 1 Policies:

PT1.BE1	(2012) Built Environment
PT1.EM11	(2012) Sustainable Waste Management

Part 2 Policies

AM7	Consideration of traffic generated by proposed developments.
AM14	New development and car parking standards.
BE13	New development must harmonise with the existing street scene.
BE15	Alterations and extensions to existing buildings
BE19	New development must improve or complement the character of the area.
BE20	Daylight and sunlight considerations.
BE21	Siting, bulk and proximity of new buildings/extensions.
BE22	Residential extensions/buildings of two or more storeys.
BE23	Requires the provision of adequate amenity space.
BE24	Requires new development to ensure adequate levels of privacy to neighbours.
BE38	Retention of topographical and landscape features and provision of new planting and landscaping in development proposals.
H7	Conversion of residential properties into a number of units
H8	Change of use from non-residential to residential
OE1	Protection of the character and amenities of surrounding properties and the local area

SCHEDULE OF CONDITIONS

OE5	Siting of noise-sensitive developments
HDAS-LAY	Residential Layouts, Hillingdon Design & Access Statement, Supplementary Planning Document, adopted July 2006
LDF-AH	Accessible Hillingdon , Local Development Framework, Supplementary Planning Document, adopted January 2010
LPP 3.3	(2016) Increasing housing supply
LPP 3.4	(2015) Optimising housing potential
LPP 3.5	(2016) Quality and design of housing developments
LPP 5.13	(2016) Sustainable drainage
NPPF1	NPPF - Delivering sustainable development
NPPF6	NPPF - Delivering a wide choice of high quality homes
NPPF7	NPPF - Requiring good design

- 3 . On this decision notice policies from the Councils Local Plan: Part 1 - Strategic Policies appear first, then relevant saved policies (referred to as policies from the Hillingdon Unitary Development Plan - Saved Policies September 2007), then London Plan Policies (2016). On the 8th November 2012 Hillingdon's Full Council agreed the adoption of the Councils Local Plan: Part 1 - Strategic Policies. Appendix 5 of this explains which saved policies from the old Unitary Development (which was subject to a direction from Secretary of State in September 2007 agreeing that the policies were 'saved') still apply for development control decisions.

- 4 . The Council will recover from the applicant the cost of highway and footway repairs, including damage to grass verges.

Care should be taken during the building works hereby approved to ensure no damage occurs to the verge or footpaths during construction. Vehicles delivering materials to this development shall not override or cause damage to the public footway. Any damage will require to be made good to the satisfaction of the Council and at the applicant's expense.

For further information and advice contact - Highways Maintenance Operations, Central Depot - Block K, Harlington Road Depot, 128 Harlington Road, Hillingdon, Middlesex, UB3 3EU (Tel: 01895 277524).

- 5 . You are advised that if any part of the development hereby permitted encroaches by either its roof, walls, eaves, gutters, or foundations, then a new planning application may have to be submitted. The validity of this planning permission may be challengeable by third parties if the development results in any form of encroachment onto land outside the applicant's control for which the appropriate Notice under Article 13 of the Town and Country Planning (Development Management Procedure) (England) Order 2015 has not been served.

- 6 . The Party Wall Act 1996 requires a building owner to notify, and obtain formal

SCHEDULE OF CONDITIONS

agreement from, any adjoining owner, where the building owner proposes to:
carry out work to an existing party wall;
build on the boundary with a neighbouring property;
in some circumstances, carry out groundworks within 6 metres of an adjoining building.

Notification and agreements under this Act are the responsibility of the building owner and are quite separate from Building Regulations, or Planning Controls. The Building Control Service will assume that an applicant has obtained any necessary agreements with the adjoining owner, and nothing said or implied by the Council should be taken as removing the necessity for the building owner to comply fully with the Party Wall Act. Further information and advice is to be found in "the Party Walls etc. Act 1996 - explanatory booklet" published by the ODPM, available free of charge from the Residents Services Reception Desk, Level 3, Civic Centre, Uxbridge, UB8 1UW.

7 . Your attention is drawn to the fact that the planning permission does not override property rights and any ancient rights of light that may exist. This permission does not empower you to enter onto land not in your ownership without the specific consent of the owner. If you require further information or advice, you should consult a solicitor.

8 . Nuisance from demolition and construction works is subject to control under The Control of Pollution Act 1974, the Clean Air Acts and other related legislation. In particular, you should ensure that the following are complied with:-

A. Demolition and construction works which are audible at the site boundary shall only be carried out between the hours of 08.00 and 18.00 hours Monday to Friday and between the hours of 08.00 hours and 13.00 hours on Saturday. No works shall be carried out on Sundays, Bank or Public Holidays.

B. All noise generated during such works shall be controlled in compliance with British Standard Code of Practice BS 5228:2009.

C. Dust emissions shall be controlled in compliance with the Mayor of London's Best Practice Guidance' The Control of dust and emissions from construction and demolition.

D. No bonfires that create dark smoke or nuisance to local residents.

You are advised to consult the Council's Environmental Protection Unit (www.hillingdon.gov.uk/noise Tel. 01895 250155) or to seek prior approval under Section 61 of the Control of Pollution Act if you anticipate any difficulty in carrying out construction other than within the normal working hours set out in (A) above, and by means that would minimise disturbance to adjoining premises.

END OF SCHEDULE

SCHEDULE OF CONDITIONS

Address:

Residents Services
London Borough of Hillingdon
3 North Civic Centre, High Street, Uxbridge UB8 1UW
Tel: 01895 250230
www.hillingdon.gov.uk

GRANT OF PLANNING PERMISSION

Application Ref.No.: 71923/APP/2016/4576

SCHEDULE OF PLANS

Transport Statement - received 20 Dec 2016

Design and Access Statement - received 20 Dec 2016

431.016.051 - received 20 Dec 2016

431.016.057 - received 20 Dec 2016

431.016.067 - received 20 Dec 2016

431.016.065 - received 20 Dec 2016

431.016.052 - received 20 Dec 2016

431.016.053 - received 20 Dec 2016

431.016.060D - received 20 Dec 2016

431.016.061 - received 20 Dec 2016

431.016.062 - received 20 Dec 2016

431.016.064 - received 20 Dec 2016

431.016.050 - received 20 Dec 2016

431.016.063.A - received 21 Feb 2017

Flood Risk Assessment - received 20 Dec 2016

431.016.066.A - received 21 Feb 2017

Geo-environmental Desk Study/Preliminary Risk Assessment - received 20 Dec 2016

Noise Assessment - received 20 Dec 2016

TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the office of the First Secretary of State under Section 78 of the Town and Country Planning Act 1990.

If you want to appeal, then you must do so within six months of the date of this notice, using a form which you can get from the Planning Inspectorate at Customer Support Unit, Room 3/15 Eagle Wing, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6PN (Tel 0117 372 8424). Appeal forms can be downloaded from the Planning Inspectorate's website at <http://.Planning-inspectorate.gov.uk>

The Secretary of State can allow a longer period for giving notice of an appeal, but he will not normally be prepared to use this power unless there are special circumstances, which excuse the delay in giving notice of an appeal.

The Secretary of State need not consider an appeal if it seems to him that the local planning authority could not have granted planning permission for the proposed development or could not have granted it without the conditions imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under a development order.

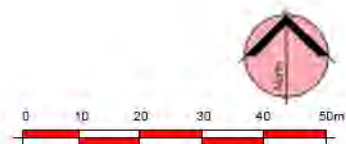
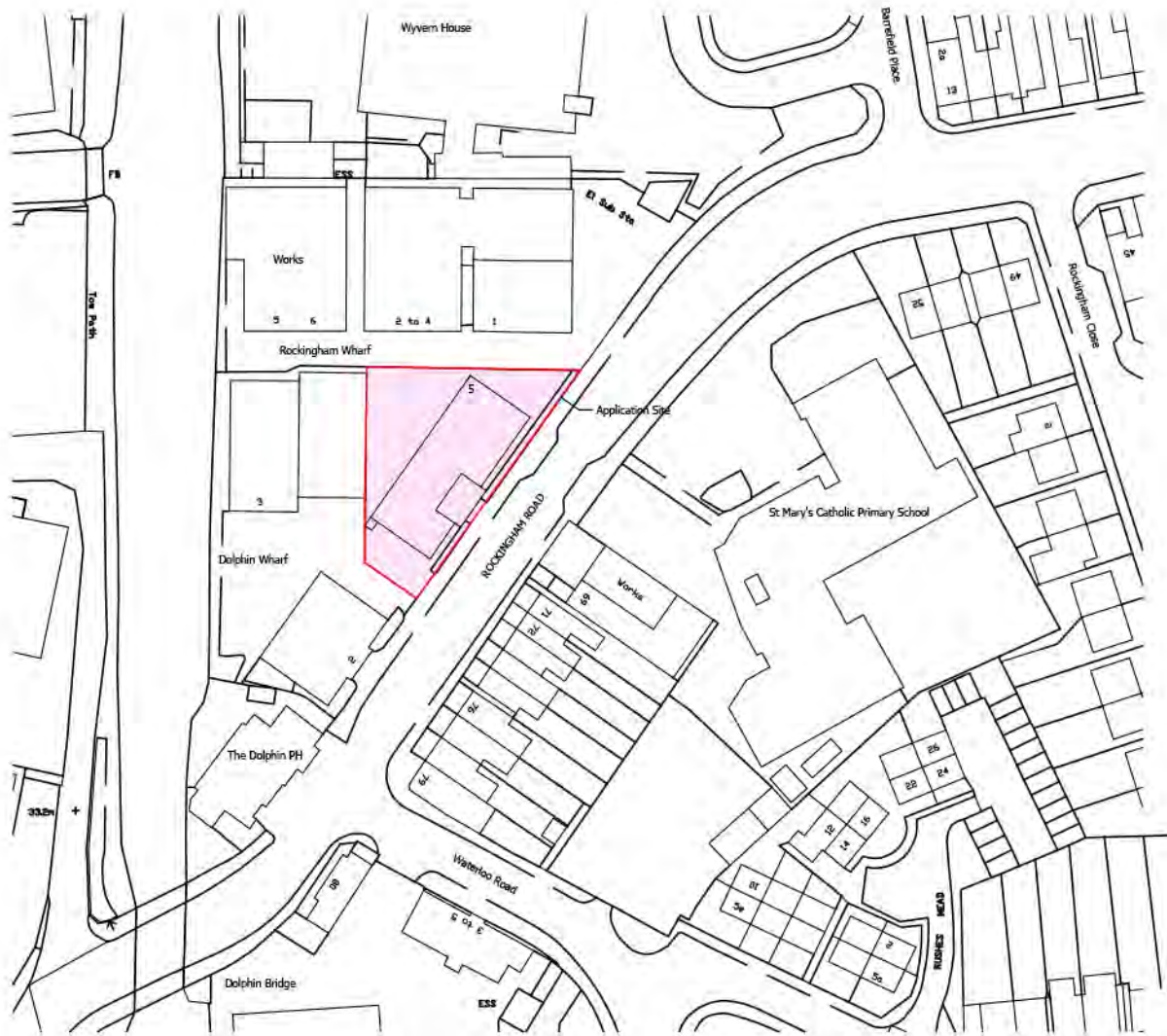
In practice, the Secretary of State does not refuse to consider appeals solely because the local planning authority based their decision on a direction given by him.

Purchase Notices.

If either the local planning authority or the officer of the First Secretary of State refuses permission to develop land or grants it subject to conditions, the owner may claim that he can neither put the land to a reasonably beneficial use by carrying out of any development which has been or would be permitted.

In these circumstances, the owner may serve a purchase notice on the Council (District Council, London Borough Council or Common Council of the City of London) in whose area the land is situated. This notice will require the Council to purchase his interest in the land in accordance with the provisions of Part VI of the Town and Country Planning Act 1990.

APPENDIX B: Site Location Plan



PROJECT: Tavistock House, 5 Rockingham Road
 Uxbridge, UB8 2UB

DWG TITLE: Location Plan

DWG No: 431.018.050

SCALE: 1:1250 @ A4 DATE: August 2016

STA Associates

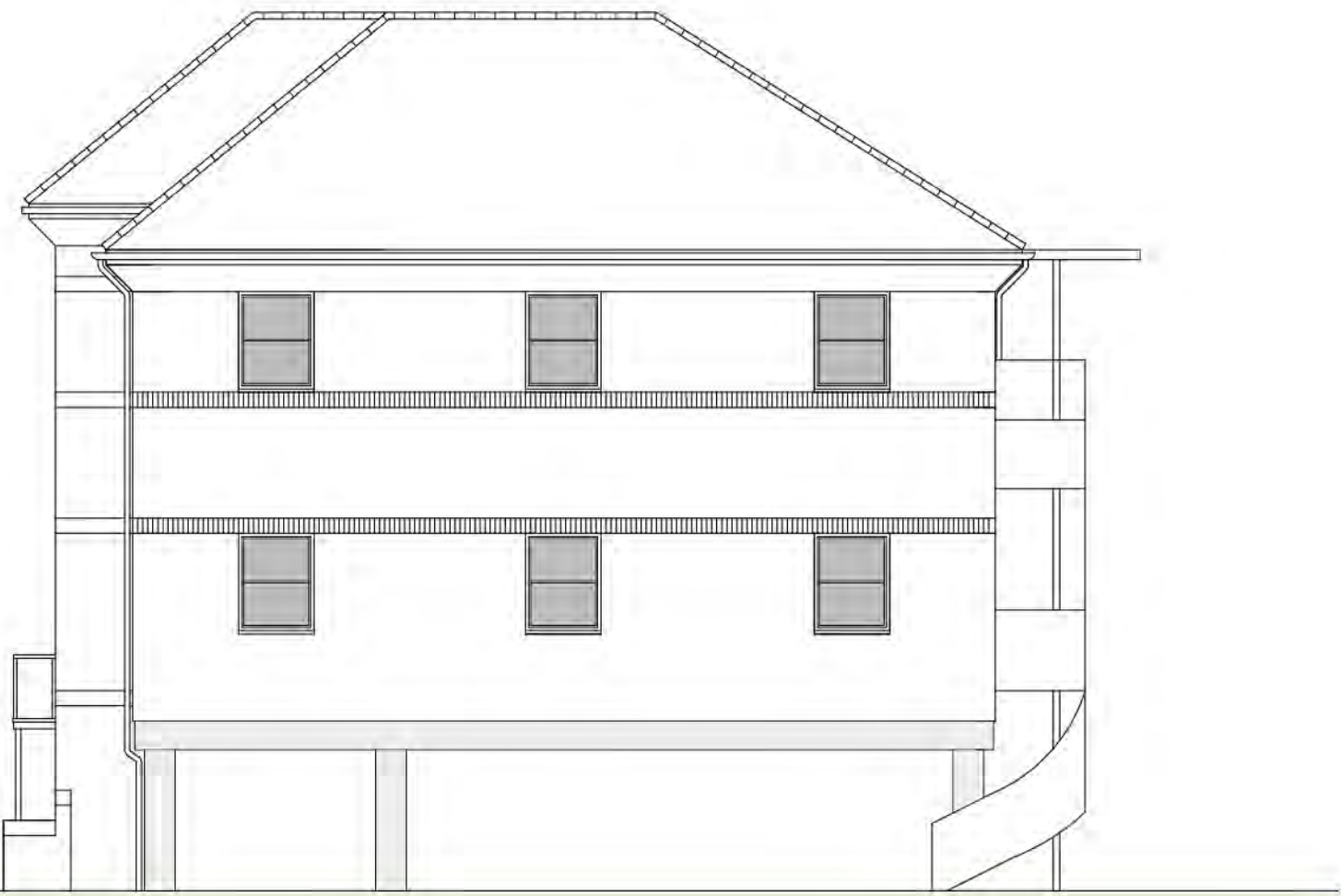
4 The Sycamores, Darby Green, Camberley
 Surrey, GU17 0EE
 www.staassociates.co.uk
 e: Stephen.taylor@sta@gmail.com

APPENDIX C: Existing Elevations and Plans

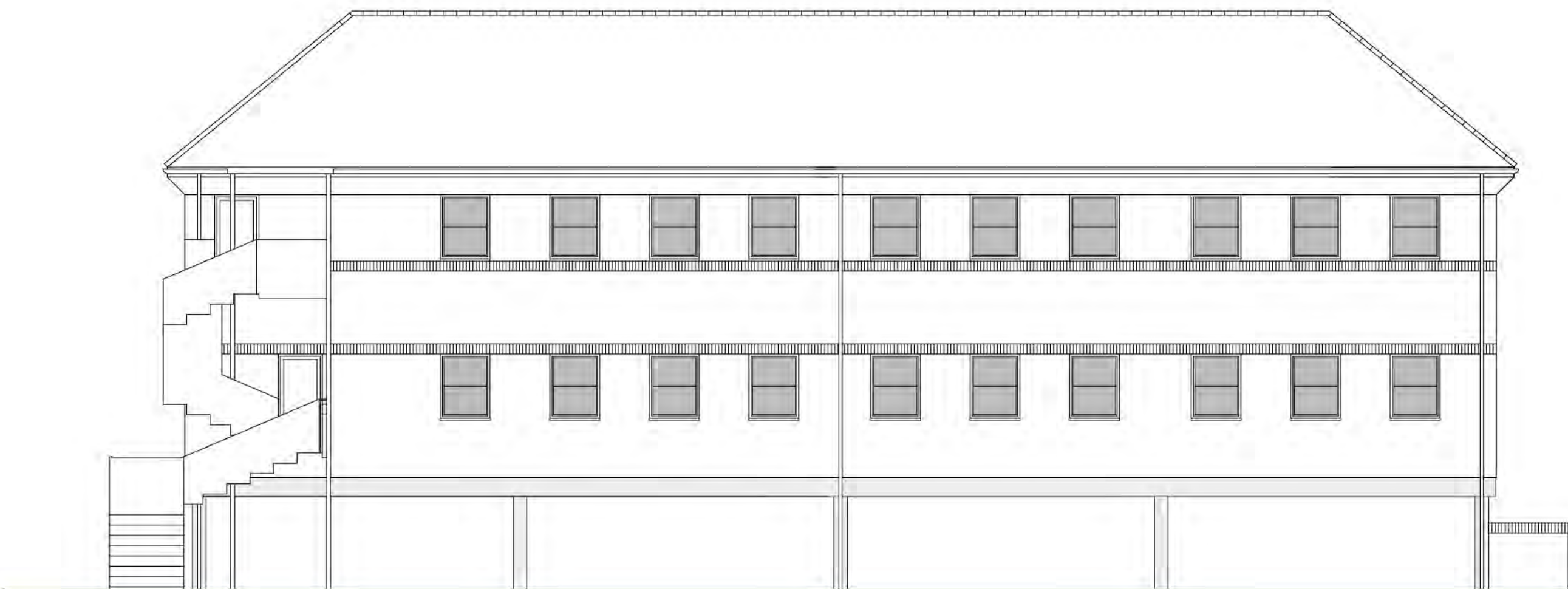
NOTE: The Project Design Proposals shall have no influence upon the External Appearance of the Building



South Elevation (Rockingham Road)



East Elevation



North Elevation



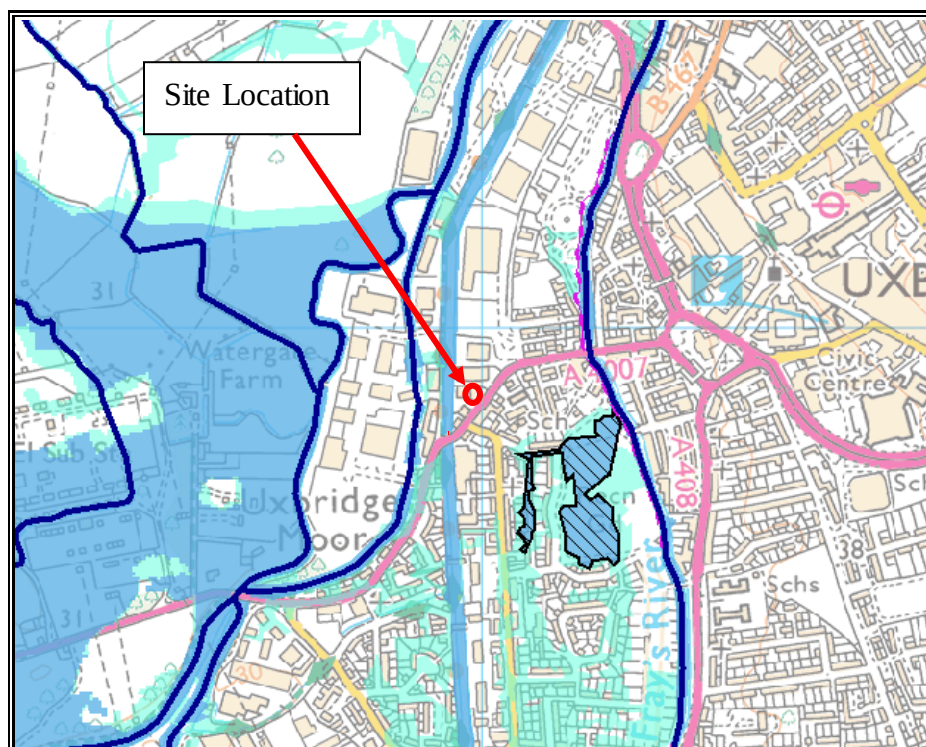
West Elevation

Amendments	Drawing No. 431.016.057	Drawing Title Existing Elevations	Project Tavistock House, 5 Rockingham Road, Uxbridge, UB8 2UB	Client Mr J Emery	Date August 2016	Scale 1:100 & A1 Landscape	Drawn STA
------------	----------------------------	--------------------------------------	---	----------------------	---------------------	----------------------------------	--------------

APPENDIX D: Proposed Ground Floor Plan

APPENDIX E: EA Indicative Flood Maps

ENVIRONMENT AGENCY FLOOD MAP (July 2016) Tavistock House, Uxbridge



London Borough of Hillingdon, Postcode: UB8 2XN Co-ords: E504984, N183956

1. Floodplain

A floodplain is the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.

There are two different kinds of area shown on the Flood Map. They can be described as follows:-

- Dark blue ■ shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:
 - from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year
 - or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.
- Light blue □ shows the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

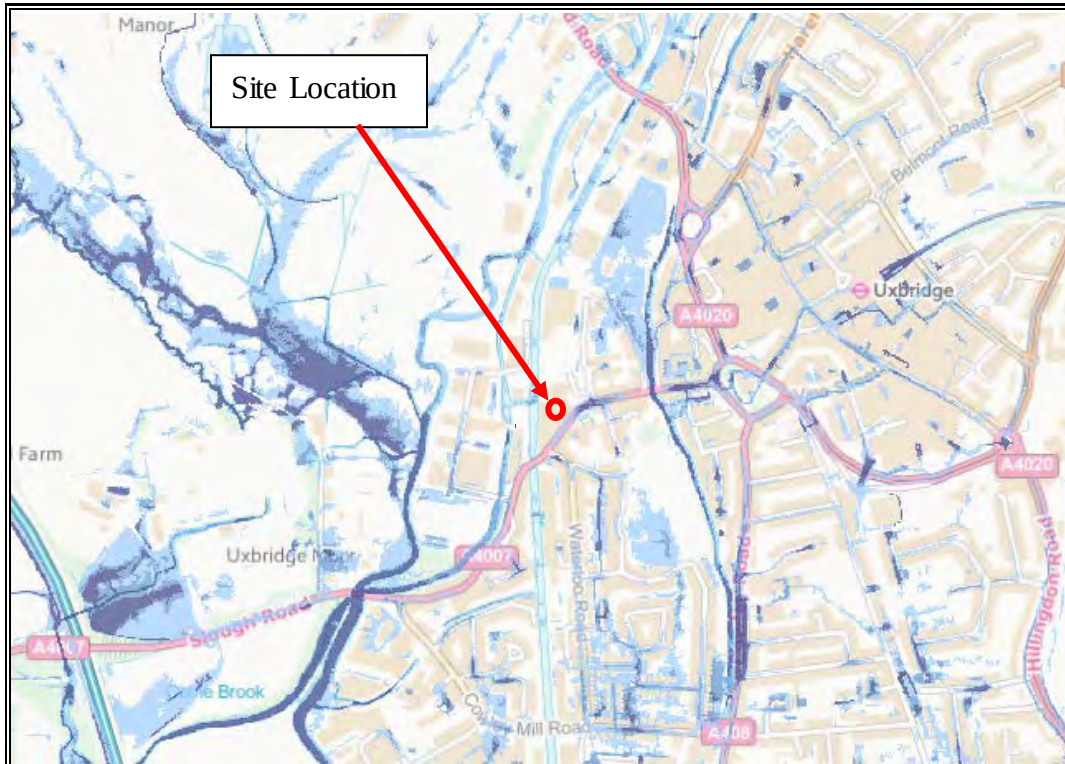
For a fuller explanation of flood likelihood, follow the link at the bottom of the page.

2. Flood Defences

The purple line ■ shows all flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, or floods from the sea with a 0.5% (1 in 200) chance of happening each year, together with some, but not all, older defences and defences which protect against smaller floods. Flood defences that are not yet shown, and the areas that benefit from them, will be gradually added.

Hatched areas ■ benefit from the flood defences shown, in the event of a river flood with a 1% (1 in 100) chance of happening each year, or a flood from the sea with a 0.5% (1 in 200) chance of happening each year. If the defences were not there, these areas would be flooded.

ENVIRONMENT AGENCY SURFACE WATER FLOOD MAP
(July 2016)
Tavistock House, Uxbridge



London Borough of Hillingdon, Postcode: UB8 2XN Co-ords: E504984, N183956

Risk of Flooding from Surface Water

Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.

The shading on the map shows the risk of flooding from surface water in this particular area.

There are four different kinds of area shown on the Flood Map. They can be described as follows:-

- High Risk Area – Each year this area has a greater than 1in30 (3.3%) chance of flooding from surface water:
- Medium Risk Area – Each year this area has between a 1in100 and a 1in30 (1%-3.3%) chance of experiencing flooding from Surface Water:
- Low Risk Area – Each year this area has a between a 1in1000 and 1in100 (0.1%-1%) chance of experiencing flooding from Surface Water.
- Very Low Risk Area – Each year this area has a less than 1in1000 (0.1%) chance of experiencing flooding from Surface Water.

APPENDIX F: Formpave Permeable Paving Brochure Extracts

Principles of SuDS

Sustainable Urban Drainage System

A sustainable urban drainage system (SuDS) is an alternative to the traditional pipes, gullies and culverts approach to a development and its drainage strategy. A SuDS system comprises of components and techniques that are deemed to be more sustainable and deal with storm water at source.

Sustainable urban drainage systems (SuDS) mimic natural drainage processes by employing these three key principles; water quality, water quantity and biodiversity/amenity.

The Formpave Aquaflow system provides the means to not only achieve but excel in the three key SuDS principles. Through considerate design, careful selection of techniques and materials, the Aquaflow blocks and the Aquaflow system deliver the following benefits:

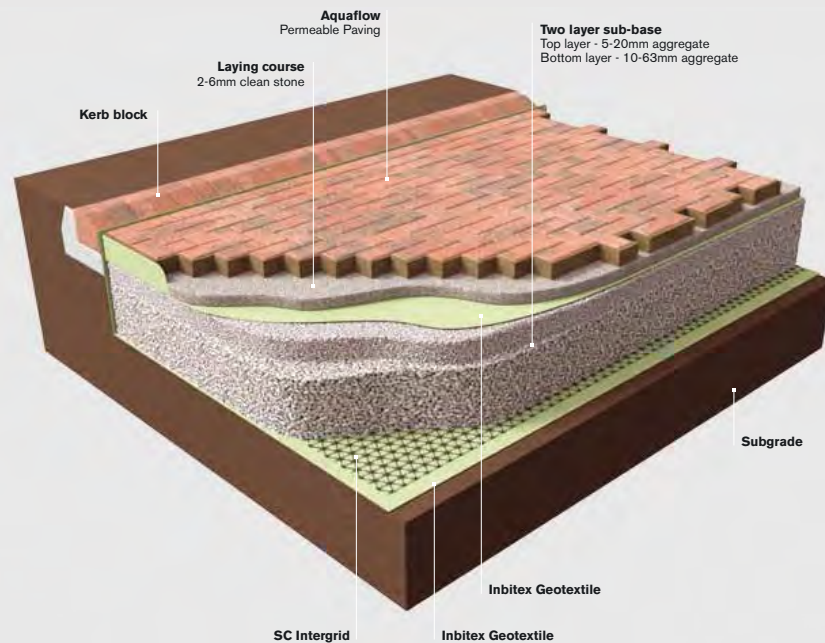
- **Reducing water quantity**
Dealing with surface water at the source reduces the effects of urbanisation and the impact of localised flooding
- **Improving water quality**
Aquaflow provides two levels of storm water treatment; removing harmful pollutants and protecting the environment downstream
- **Contributing to the biodiversity**
Contributing to the biodiversity of development by working in conjunction with other SuDS techniques. Aquaflow allows any hard standings, including roads, to be used as drainage, producing a traditional looking surface with many desirable features.



Featured Project: Kimberley STEM College. Rainwater collected from car park and released into adjoining lake.
Product Type: Aquaflow
Size/Area: 4000m²

Aquaflow®

Sustainable Urban Drainage System



Formpave have used research and design to evolve the Aquaflow permeable paving system into one of the most cost effective and functional SuDS within the marketplace. The Aquaflow system has a unique sub-base design incorporating SC Intergrid which reduces construction costs whilst giving superior structural performance. Water quality improvement is realised through the use of our tried and tested Inbitex Geotextile which removes the requirement for downstream pollution control. The patented Aquaflow system fits neatly within any block paving project, where your paving design becomes your drainage design and vice versa.

Formpave Aquaflow SuDS can be designed to as fully attenuation, fully infiltration or as a partial infiltration system. Attenuation (tanked) systems capture storm water to be collected and released in a controlled manner into sewers and downstream watercourses. Infiltration systems allow rainwater to be infiltrated into the ground mimicking a green field environment. Storm water leaving the Aquaflow system is cleaned and filtered through the Inbitex Geotextile layers that promote microbial action. Water quality improvement allows secondary non-potable uses can be carried out such as flushing toilets and watering the garden.

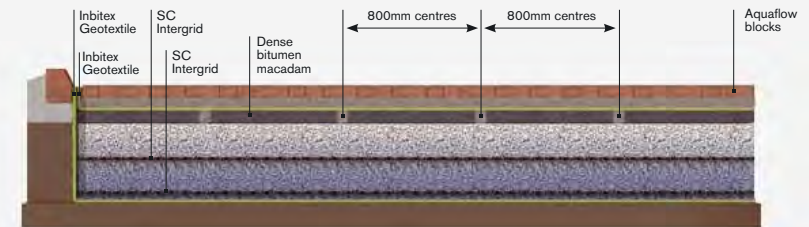
The Aquaflow system can be designed for use in both trafficked and pedestrianised areas, allowing the collection and treatment of storm water from any paved surface.

Advantages of Aquaflow

- Dealing with storm water at source
- Reduces water quantity
- Improves water quality
- Lowers construction costs
- Allows collection of storm water from impermeable surfaces
- Improved maintenance programme.

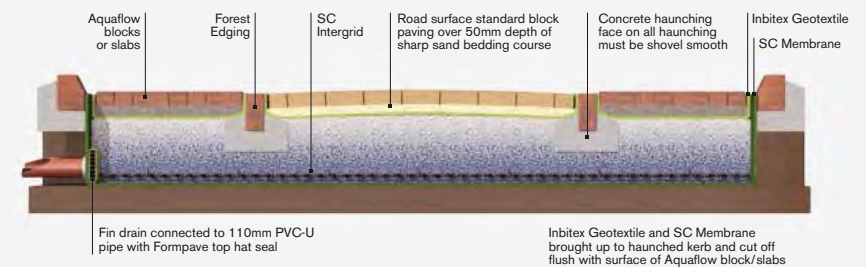
Aquaflow paving with temporary running surfaces

Infiltration system typical adoptable section.



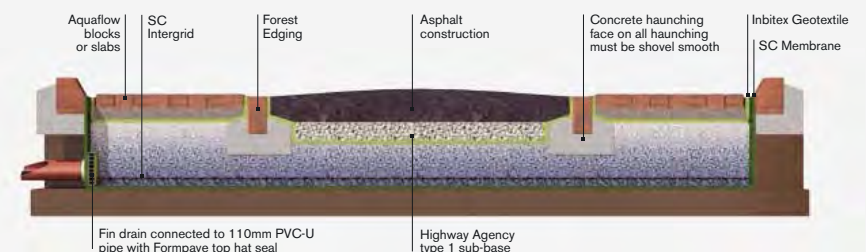
Aquaflow paving in conjunction with standard block paved road surfaces

Tanked system section Aquaflow pavement with undersealing membrane.



Aquaflow paving in conjunction with asphalt road surfaces

Tanked system section Aquaflow pavement with undersealing membrane.



Aquaflow®

Structural performance

SC Intergrid increases the structural performance of the Aquaflow system whilst reducing the depth of sub-base stone.



Twenty years expertise within the paving industry has enabled Formpave to develop the Aquaflow SuDS and refine its basic elements. Through research we introduced the SC Intergrid into our sub-base design which confines and stabilises the sub-base stone and provides the following benefits.

- **Reduced sub-base thickness - minimum 35% reduction**
- **Increased bearing capacity**
- **Reduced construction costs**
- **Reduce environmental impact.**

SC Intergrid increases the structural performance of the Aquaflow system whilst reducing the depth of sub-base stone. In direct comparison with a British Standard structural permeable paving design there is a difference of 250mm between the systems.

This represents 250mm less excavation and disposal of waste materials, saving not only time and costs on any project but also represents a saving of natural resources.

Through design we have been able to produce a knowledge base and set of construction details to suit almost all structural applications for the Aquaflow system, ranging from domestic driveways to heavily trafficked distribution yards.

For real life design advice please contact Design Services on 01594 836 999

Structural design of a permeable paving system Category B (BS7533-13:2009) Car Parking Bay (3% CBR Minimum Ground Strength)	
Aquaflow System	British Standard
80mm block	80mm block
50mm laying course	50mm laying course
350mm sub-base	350mm sub-base
1 layer of SC Intergrid	250mm capping (ground improvement layer)
480mm total construction depth	730mm total construction depth

Aquaflow®

Hydraulic performance, quality & quantity

The advantages of using the Aquaflow system for collection, treatment and control of storm water is realised on the surface and below ground.



The Aquaflow blocks and system comply with SuDS principles and improve water quality in the following ways:

Water quality

- Researched Inbitex Geotextile has proven pollution control benefits, removing the requirement for petrol interceptors and other filtration or treatment systems
- Sub-base stone provides a second level of storm water treatment; discharge from the system is PH neutral.

Quantity benefits realised

- Aquaflow block surface eliminates surface water run off
- Storm water is dealt with at source
- Removes the first 5mm of any rainfall event
- Delays and reduces storm water discharge
- Allows collection of impermeable surface and roof water.

The Aquaflow system is proven both academically and in real life installations. It has been specified on numerous occasions for these SuDS benefits.

In terms of storm water quality and quantity control, the Aquaflow system is proven to be very efficient and has been selected for these key principles for a number of schemes. These principles were a major consideration when selecting our system for Severn Trent Headquarters in Shrewsbury, where water quality is held in the highest regard (see case study on page 12).



Formpave Aquaflow permeable block paving

Formpave conventional block paving

The patented Formpave permeable block is specially designed, incorporating a slot and chamfer which allows water to permeate through the finished surface at a high rate whilst retaining its visual integrity.

The Formpave Aquaflow block can be incorporated alongside Formpave conventional paving without compromising the visual aesthetics of the scheme.

Aquaflow Permeable Block Paving

Aquaflow permeable blocks are specially designed, incorporating a slot and chamfer, allowing water to permeate through the finished surface at a high rate helping to prevent localised flooding.

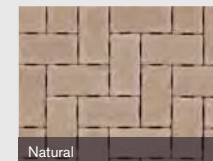
Available in 60mm and 80mm rectangular blocks they sit effortlessly alongside our conventional Royal Forest paving. The Aquaflow block can be specified for all sites designed under BS7533-Pt13.



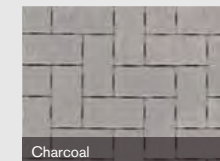
Featured Project: Access Road, Meadowview Homes
Client: Meadowview Homes
Location: Borrowwash, Derbyshire
Sector: Residential
Product Type: Aquaflow 80mm - Charcoal
Size/Area: 750m²



Colours



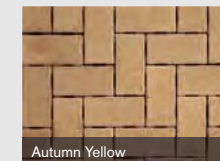
Natural



Charcoal



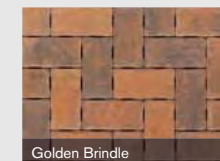
Burnt Red



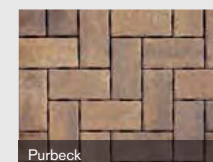
Autumn Yellow



Red Brindle



Golden Brindle



Purbeck



Vendage

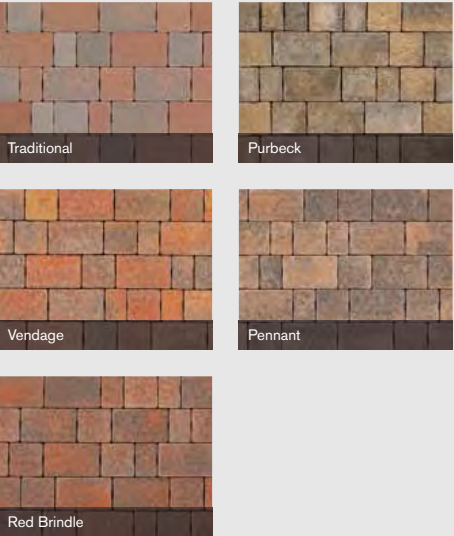


Specification

Block sizes (depth)	60mm	80mm
200 x 100mm (blocks per pack)	424	296
Coverage per pack (m²)	8.48	5.92
Weight per pack (tonne)	1.1	1.04
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa BBA certificate 97/3373	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low	
Finishes	Standard finish	
Finishes (special order)	Bush hammered finish	
Applications	60mm thick for use on footpaths, domestic drives and 80mm thick for use on roads	

The Aquaflow permeable block is best used in combination with the Fompave Aquaflow System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

Colours



Specification

Combined packs		
Block sizes (depth)	60mm	80mm
Mixed blocks per pack		
Made up of the following sizes:	434	310
250 x 150mm (blocks per pack)	140	100
150 x 150mm (blocks per pack)	196	140
100 x 150mm (blocks per pack)	98	70
Coverage per pack (m²)	11.2	8.0
Weight per pack (tonne)	1.47	1.42
Large block only		
Block sizes (depth)	60mm	80mm
250 x 150mm (blocks per pack)	280	200
Coverage per pack (m²)	10.5	7.5
Weight per pack (tonne)	1.38	1.33
Precast concrete block paving Manufactured to: BSEN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low	
Finishes	Olden finish	
Finishes (special order)	Plain finish, bush hammered finish	
Applications	60mm thick for use on footpaths, domestic drives and 80mm thick for use on roads	

The Aquasett permeable blocks are best used in combination with the Formpave Aquaflow System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

† Special order

Aquasett Permeable Block Paving

The Aquasett permeable block paving has an attractive olden finish for use within residential and commercial projects, and is fully compatible with the Aquaflow SuDS system. The specially shaped block allows water to permeate through to the lower levels, helping to prevent localised flooding. Available in mixed packs or large block only. The Aquasett block can be specified for all sites designed under BS7533-Pt13.



Featured Project: Warwick Gates Retirement Complex
Location: Warwick
Congractor: Westpoint Construction
Sector: Local Government
Product Type: Aquasett - Traditional (laid in stretcher bond)/ Pennant (laid in herringbone)
Size/Area: Over 1000m²



Q24 Sustainable Urban Drainage System Specifications

Types(s) of Paving

Formpave AquafLOW permeable concrete block paving.

Reference

AquafLOW, AquafLOW ML, MLE, MLTB, Aquasett or Aquaslab.

Size

As per manufacturer's specification.

Colours

Various colours and finishes available.

Setting Out

Aquaslab Staggered stretcher bond.

Aquasett Staggered stretcher bond or 90° herringbone.

Aquasett combined Staggered stretcher bond.

AquafLOW block
90° herringbone

AquafLOW ML Include stretcher course around edge in conjunction with MLE and MLTB.

Kerbs

Standard kerb system or Forest Edging: both to be haunched with concrete.

Laying course

50mm depth of 2-6mm. single size clean crushed stone to BS EN 13242: 2002. The crushed stone used for the laying course must have a minimum LA Coefficient of 25.

Inbitex Geotextile

As specification.

Depth of Sub-base

It is recommended that a sub-base depth of 350mm should be used. The depth of sub-base may be varied at the discretion of the engineer.

Alternative Sub-base Materials

Recycled sub-base materials such as concrete and treated rail ballast can be used but must meet similar grading and strength specification as the natural aggregates specification. This material should be sourced within 30km of the site to gain maximum BREEAM points.

Sub-base Specification

All granular sub-base material shall comprise crushed rock or concrete possessing well defined edges. It must be sound, clean, non-friable and free from clay or other deleterious matter.

The material must be non-plastic when tested in accordance with BS1377 Test No.4

The crushed stone used for the sub-base must have a minimum LA Coefficient of 25.

The selected test samples shall not be oven dried and should be soaked in water at room temperature for 48 hours before the test. The 100mm deep upper layer of sub-base material should be graded 5mm-20mm to BS EN 13242: 2002.

Intergrid(s)

SC Intergrid Geogrid.

DBM Running Course

To be 20mm dense base binder course manufactured with 100/150 grade bitumen to BS4987. The DBM shall conform with the Requirements of BS 4987

SC Membrane Geomembrane

Generally a taped membrane will be suitable for most applications of the tanked system. If a guaranteed watertight system is required a fully welded system should be installed.

Examples of this type of application would be sites with a high water table, methane contamination, areas above basements or retaining walls. Further advice should be sought from the Formpave design team.

Findrain

150/300mm Findrain to BBA Number 95/85.

Formpave Top Hat Seal

Formpave top hat seal.

NOTE:

For construction details please contact Design Services on 01594 836 999 design.services@formpave.co.uk

Maintenance

Operation & maintenance requirements		
Maintenance schedule	Action	Frequency
Regular maintenance	Sweeping surface to remove debris and contamination	1-2 times a year, typically Spring and after leaf fall in Autumn
Occasional maintenance	Removal of leaves	As required
Remedial actions	Remediate areas of rutting and depressions	As required
	Replace broken/damaged blocks	As required
	Rehabilitate surface with sweeping and reapplication of 2-4mm clean gritstone	As required
Monitoring	Initial inspection	Within 3 months of installation
	Inspection for poor performance and silting	Annually
	Inspect ancillary drainage components i.e. gullies, outfall pipes etc	Annually

For more information please see Ciria SuDS Manual table 20.15

Stone Specifications



Lower sub-base layer

10-63mm clean crushed stone

Sieve sizes	% passing
80mm	100
63mm	90-100
40mm	60-80
20mm	15-30
10mm	0-5

Reference specification BS EN 13242:2002

Material specification Material supplied shall be referred to as 10-63mm clean crushed stone and conform to the above sieve analysis and aggregate testing.



Laying course

2-6mm clean crushed stone

Sieve sizes	% passing
10mm	98-100
6.3mm	80-100
2mm	0-20
1mm	0-5

Reference specification BS EN 13242:2002

Material specification Material supplied shall be referred to as 2-6mm clean crushed stone, typically limestone or granite, gravel is not permitted. This material is to conform to the above sieve analysis and aggregate testing.



Upper sub-base layer

5-20mm clean crushed stone

Sieve sizes	% passing
40mm	100
20mm	90-100
10mm	25-75*
4mm	0-15
2mm	0-5

Reference specification BS EN 13242:2002

Material specification Material supplied shall be referred to as 5-20mm clean crushed stone and conform to the above sieve analysis and aggregate testing.

Aggregate Testing
Los Angeles Coefficient (LA) - Determination of resistance to fragmentation = 20 BS EN 13242:2002. Note: Lower values than those specified signifies better resistance to fragmentation and abrasion and is therefore acceptable.



Surface dressing

2-4mm Quartzite gritstone

Sieve sizes	% passing
6.3mm	100
5mm	95-100
3.35mm	66-90
1.18mm	0-20
600 microns	0-8
63 microns	0-1.5

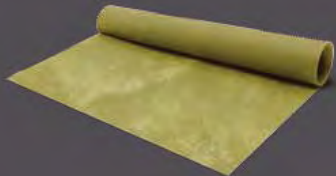
Reference specification BS EN 1097-2:1998
BS EN 1091-8:2000 Annex A

Material specification Material supplied shall be referred to as 2-4mm clean Quartzite and conform to the above sieve analysis and aggregate testing. This defines the 2-4mm surface dressing to be applied to the surface of Aquaflow pavers and subsequently brushed/vibrated between pavers.

Aquaflow® Components

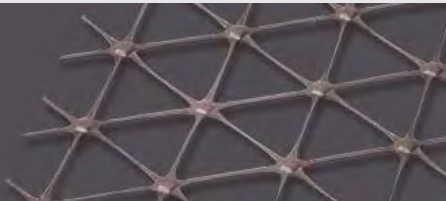
Inbitex Geotextile

Exclusive to Formpave Aquaflow system, this non-woven geotextile is used for separation, filtration and pollution control.



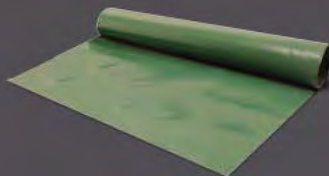
SC Intergrid

Exclusive to Formpave and the Aquaflow system this sub-base stabilisation grid improves structural strength, increases design life and reduces construction costs.



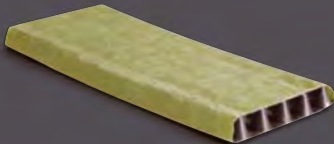
SC Membrane

Exclusive to Formpave and the Aquaflow system this impermeable membrane allows the storage of collecting storm water. Used for the Aquaflow attenuation system it can be welded or taped dependent on the application. A higher grade SC Membrane GT can be specified when contamination is present.



SC Findrain

This drainage component allows efficient and high flow removal of storm water from the Aquaflow system. Wrapped in Inbitex Geotextile which provides further filtration and cleansing.



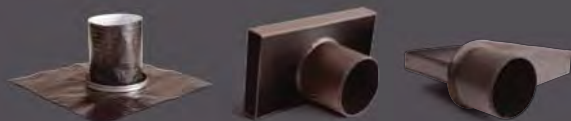
Aquaflow Distribution Tanks

Voided crates that are extremely strong structurally and are wrapped in Inbitex Geotextile, which provides filtration and cleansing. Allows the collection of impermeable surface water catchment, such as roofs to the Aquaflow system.



Top Hats, Tape and Fittings

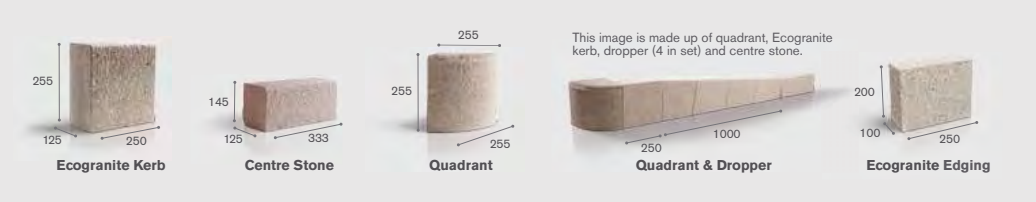
Aquaflow system components.



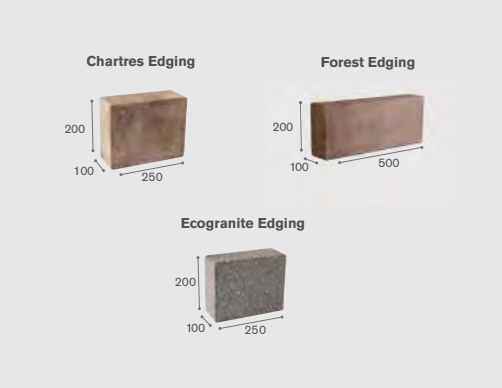
Kerbing & Highways

Kerbs, Demarcation & Tactile Paving

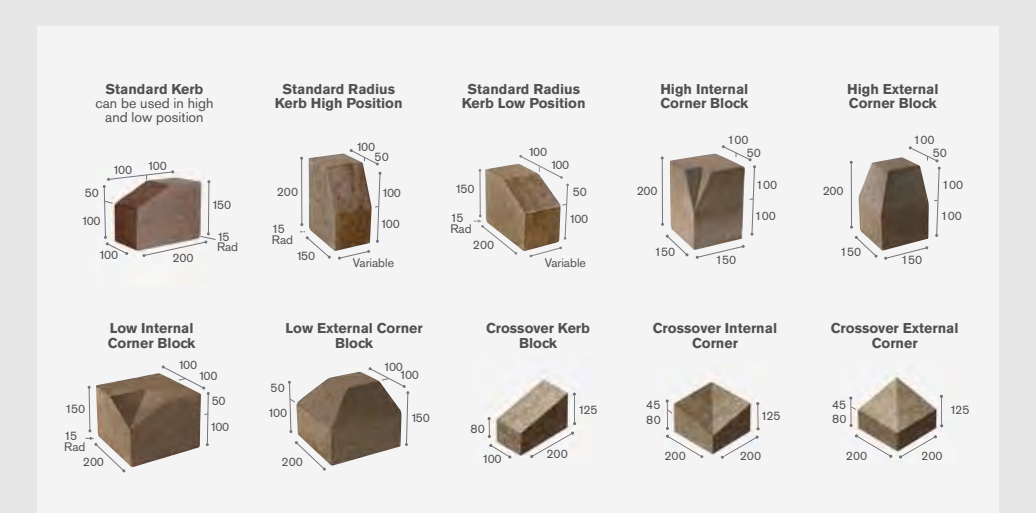
Ecogranite Kerb & Centre Stone



Edgings in Standard, Ecogranite & Chartres colours



Standard Kerbs & Accessories in Standard & Ecogranite colours



Kerb and Edging Colours

For an accurate colour match please request a sample.

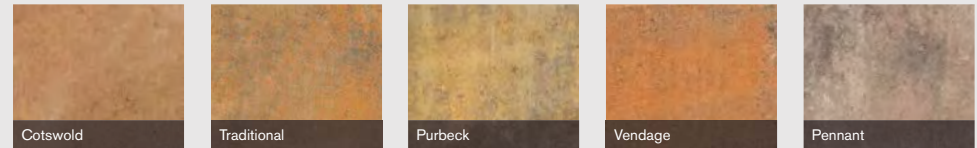
Standard



Ecogranite⁺



Chartres



Note: Transition kerbs are available to complement the Standard Kerbs. All dimensions are in mm. Although every effort is made to ensure consistency of product colour, variations between production batches can occur. Formpave recommend that all products are thoroughly mixed on site by drawing from a minimum of three packs. † Other Ecogranite colours available by special order. For transitions to suit standard and bullnose kerbs, please see conventional brochure or visit formpave.co.uk

Demarcation Block Paving

Demarcation block paving is faced with a coloured non-reflective epoxy paint, available both in the Royal Forest and Aquaflow range, and is suitable for car parks and loading bays. When enhanced visibility is required, Ballotini glass beads are added.

Colours

* Colour purposes only † Special order



Tactile Block Paving

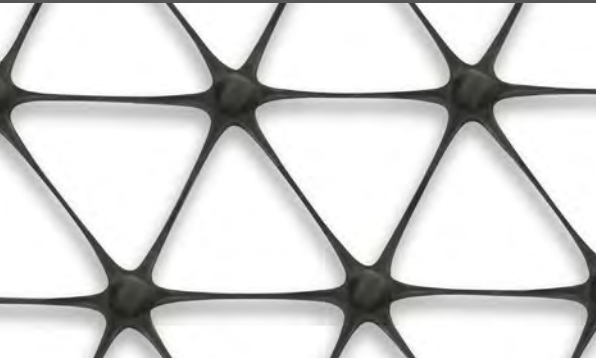
Tactile paving provides a warning to visually impaired pedestrians, to differentiate between where the footway ends and the carriageway begins. Our unique sized, high strength tactile pavers have been specially designed to overcome the breakage problems caused by accidental overrun, experienced by local authorities with larger element tactile paving.

Colours



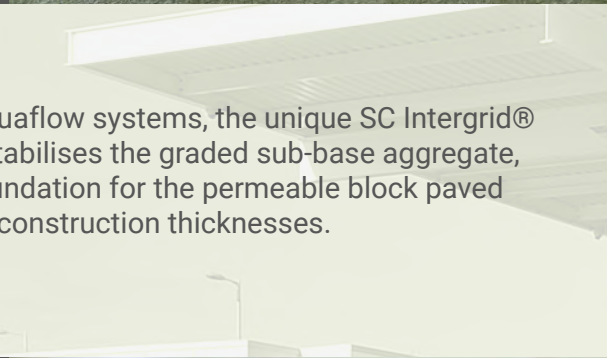
Inbitex®

Exclusive to the Formpave Aquaflow systems this specialist non-woven geotextile is used for separation, filtration and pollution control. Inbitex® provides initial filtering and cleansing of run-off, and prevents fine aggregate particles migrating down and clogging lower layers. When wet, micro-organisms grow within the layer which help remove pollutants and cleanse the water being filtered.



SC Intergrid®

Exclusive to Formpave Aquaflow systems, the unique SC Intergrid® effectively confines and stabilises the graded sub-base aggregate, providing a competent foundation for the permeable block paved surfacing whilst reducing construction thicknesses.



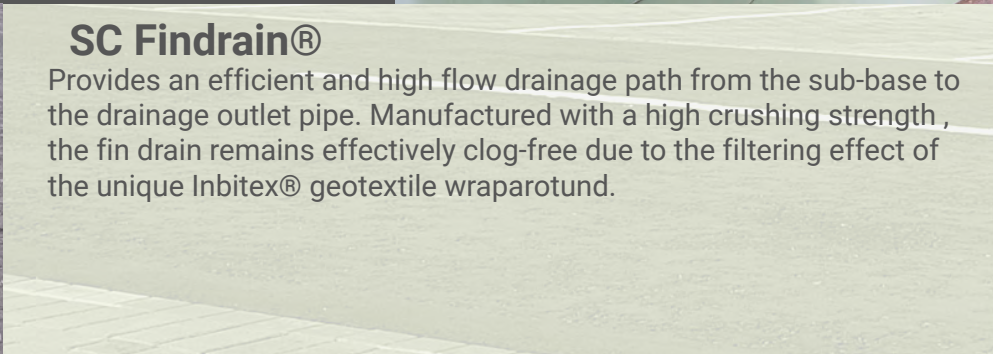
SC Membrane®

This specialist impermeable membrane is exclusive to the Formpave Aquaflow systems and is utilised to create an impermeable barrier around the graded sub-base aggregate thus creating a water retention tank beneath the surface. Joints can be taped or welded depending on application. Where welding is required a high grade membrane is required, SC GT Membrane.



SC Findrain®

Provides an efficient and high flow drainage path from the sub-base to the drainage outlet pipe. Manufactured with a high crushing strength, the fin drain remains effectively clog-free due to the filtering effect of the unique Inbitex® geotextile wraparound.

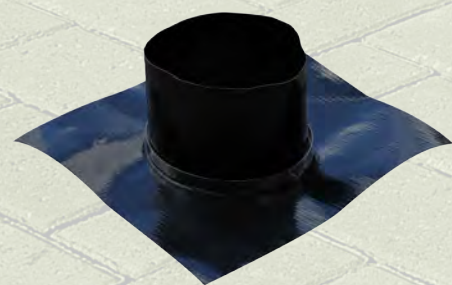


Formpave Aquaflow Distribution Tanks®

Used for connecting rainwater downpipes and other impermeable areas for drainage to the Aquaflow system. Can be used in trafficked areas. Available in three different sizes depending on catchment area.



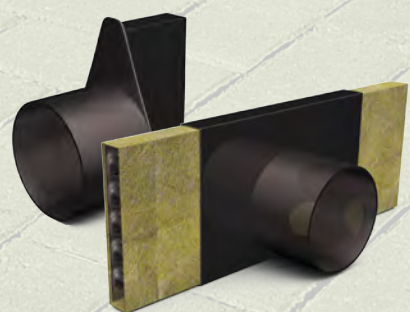
Top Hats



Tape



Fittings



Note: for validity of Formpave Aquaflow system warranty only genuine approved products as described below to be used

Inbitex®: Exclusive to the Formpave Aquaflow systems this specialist non-woven geotextile is used for separation, filtration and pollution control. Inbitex® provides initial filtering and cleansing of run-off, and prevents fine aggregate particles migrating down and clogging lower layers. When wet, micro-organisms grow within the layer which help remove pollutants and cleanse the water being filtered.	• Green 70% polypropylene and 30% polyethylene non-woven geotextile manufactured in accordance with a management system which complies with the requirement of BS EN ISO 9001:2008. • The geotextile shall be unaffected by bacteria and fungi • The geotextile shall be resistant to all naturally occurring soil alkalis and acids (ie to acids of pH2) and shall be non-biodegradable. • The geotextile shall be delivered in polythene wrappers and will only be exposed to sunlight for short periods during installation thereby inhibiting attack by ultra violet light • Roll dimensions – 4.5m x 100m • Mass – 130g/m2 • Roll weight ~ 58.5kg
SC Intergrid®: Exclusive to Formpave Aquaflow systems, the unique SC Intergrid® effectively confines and stabilises the graded sub-base aggregate, providing a competent foundation for the permeable block paved surfacing whilst reducing construction depths.	• Black polypropylene geogrid manufactured in accordance with a management system compliant with of BS EN ISO 9001:2008. • The geogrid class shall be 'punched and stretched' to create ribs having orientations in three equilateral directions. The resulting triangular-shaped apertures are defined by ribs having a high degree of molecular orientation continuous through the node. • The geogrid shall be inert to all chemicals naturally found in soils and shall have no solvents at ambient temperature. It shall not be susceptible to hydrolysis, shall be resistant to aqueous solutions of salts, acids and alkalis, and shall be non-biodegradable. • The geogrid shall have a minimum of 2% finely divided carbon black, as determined by BS 2782:Part 4:Method 452B:1993, well dispersed in the polymer matrix to inhibit attack by ultra violet light • Roll dimensions - 4m x 50m • Mass ~ 0.24kg/m2 • Roll weight ~ 48.5kg
SC Membrane: This specialist impermeable membrane is exclusive to the Formpave Aquaflow systems and is utilised to create an impermeable barrier around the graded sub-base aggregate thus creating a water retention tank beneath the surface. Joints can be taped or welded depending on application.	• Green polyethylene membrane manufactured in accordance with a management system which complies with the requirement of BS EN ISO 9001:2008. • The membrane shall be printed 'Formpave SC Membrane' along the selvedge • The membrane shall be resistant to all naturally occurring soil alkalis and acids (ie to acids of pH2) and shall be non-biodegradable. • The membrane will only be exposed to sunlight for short periods during installation thereby inhibiting attack by ultra violet light • Roll dimensions – 4m (folded to 1m) x 15m • Mass ~460g/m2 • Roll weight ~ 28kg
SC Findrain: Provides an efficient and high flow drainage path from the sub-base to the drainage outlet pipe. Manufactured with a high crushing strength, the fin drain remains effectively clog-free due to the filtering effect of the unique Inbitex® geotextile wraparound.	• Drainage composite comprising black high density polyethylene cusped drainage sheet (25mm thick) wrapped in green Inbitex® geotextile as described above. • The composite shall be resistant to all naturally occurring soil alkalis and acids (ie to acids of pH2) and shall be non-biodegradable. • The composite will only be exposed to sunlight for short periods during installation thereby inhibiting attack by ultra violet light • Roll dimensions – 0.15m x 50m & 0.30m x 50m • Roll diameter ~ 1.0m • Mass ~1400g/m2 • Roll weight ~ 10.5kg & 21kg
Formpave Aquaflow Distribution Tanks: Used for connecting rainwater downpipes and other impermeable areas for drainage to the Aquaflow system. Can be used in trafficked areas. Available in three different sizes depending on catchment area.	• Drainage composite distribution tank comprising a polypropylene void former wrapped in green Inbitex® geotextile as described above & with PVC pipe connector • The composite shall be resistant to all naturally occurring soil alkalis and acids (ie to acids of pH2) and shall be non-biodegradable. • The composite will only be exposed to sunlight for short periods during installation thereby inhibiting attack by ultra violet light • Tank dimensions – Single 354mm x 708mm x 150mm, Double 708mm x 708mm x 150mm, Triple 1062mm x 708mm x 150mm • Nominal volume – Single 0.0375m3, Double 0.075m3, Triple 0.1125m3 • Weight – Single 3kg, Double 6kg, Triple 9kg



APPENDIX G: SuDS Management and Maintenance Plan



**STA ASSOCIATES
TAVISTOCK HOUSE
UXBRIDGE**

**SUSTAINABLE DRAINAGE SYSTEMS -
MANAGEMENT AND MAINTENANCE
PLAN**

MAY 2019



the journey is the reward

**STA ASSOCIATES
TAVISTOCK HOUSE
UXBRIDGE**

**SUSTAINABLE DRAINAGE SYSTEMS -
MANAGEMENT AND MAINTENANCE
PLAN**

MAY 2019

Project Code:	A/STATAVISTOCK.10
Prepared by:	CG
Approved by:	SF
Issue Date:	MAY 2019
Status:	1st Issue

**STA Associates
Tavistock House
Uxbridge
Sustainable Drainage Systems - Management and Maintenance Plan**

List of Contents

Sections

1	Introduction	1
2	Management and Maintenance of SuDS Features	2
3	Maintenance Activities.....	4

Tables

Table 2.1: Permeable Paving Maintenance Requirements	3
--	---

1 Introduction

- 1.1 The proposed surface water drainage network utilises Sustainable Drainage techniques (SuDS) including permeable paving. The management and maintenance of these features is of paramount importance to ensure their effectiveness over the lifetime of the development.
- 1.2 The proposed surface water features will not be adopted by any public body and will be maintained by a Management Company which should enable tight control over the operation and maintenance of the drainage/SuDS systems as proposed in this report.
- 1.3 This Owner's Manual is for advising the required maintenance activities for the sustainable drainage network. This report has been prepared with reference to CIRIA document C753 – The SuDS Manual and provides current best practice guidance on Sustainable Drainage Systems (SuDS) to facilitate their effective implementation within developments.

2 Management and Maintenance of SuDS Features

Introduction

2.1 There are three categories of maintenance activities:

- **Regular Maintenance** (*including inspections and monitoring*) – Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.
- **Occasional Maintenance** – Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (e.g. sediment removal).
- **Remedial Maintenance** – Comprises intermittent tasks that may be required to rectify faults associated with the system.

Health and Safety

2.2 All those responsible for maintenance should take appropriate health and safety precautions of all activities (including lone working, if relevant) and risk assessments should always be undertaken.

Permeable Paving

- 2.3 The primary purpose of the permeable paving is to collect surface water and provide attenuation and treatment.
- 2.4 Permeable paving needs to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Extensive experience suggests that sweeping once a year should be sufficient to maintain an acceptable infiltration rate on most sites. Refer to Table 2.1 below for the relevant Permeable Paving Inspection and Maintenance Activities.

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosphate applied directly into weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost joining material.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspections chambers.	Annually.

Table 2.1: Permeable Paving Maintenance Requirements

3 Maintenance Activities

Regular Maintenance Activities

Inspections and Reporting

- 3.1 Inspections can generally be carried out at monthly site visits and should be subsumed into regular maintenance requirements. During the first year of operation, inspections should ideally be carried out after every significant storm event to ensure proper functioning, but in practice this may be difficult or impractical to arrange.
- 3.2 Typical routine inspection questions that will indicate when occasional or remedial maintenance activities are required, and/or when water quality requires investigation include:
- Are inlets or outlets blocked?
 - Is there evidence of poor water quality? (e.g. algae, oils, milky froth, odour, unusual colourings.)
 - Is there evidence of sediment build up?
 - Is there evidence of ponding above an infiltration surface?
 - Is there evidence of structural damage that requires repair?
 - Are there areas of erosion or channelling over vegetated surfaces?

Litter/Debris Removal

- 3.3 This is an integral part of SuDS maintenance and reduces the risks of inlet and outlet blockages, retains amenity value and minimises pollution risks.

Weed/Invasive plant control

- 3.4 Weeds are generally defined as vegetation types that are unwanted in a particular area. For SuDS, weeds are often alien or invasive species, which do not enhance the technical performance or aesthetic value of the system, or non-native species and the spread of which is undesirable.
- 3.5 In some places, weeding has to be done by hand to prevent the destruction of surrounding vegetation (hand weeding should generally be required only during the first year, i.e. during plant establishment). However, over grassed surfaces, mowing can be an effective management measure. The use of herbicides and pesticides should be prohibited since they cause water quality deterioration. The use of fertilisers should also be limited or prohibited to minimise nutrient loadings which are damaging to water bodies.

Shrub Management

- 3.6 Shrubs tend to be densely planted and are likely to require weeding at the base, especially during the first year to ensure that they get enough water. Shrubs should be selected so they can grow to their maximum natural height without pruning.

Irregular Maintenance Activities

Sediment Removal

- 3.7 To ensure long-term effectiveness, the sediment that accumulates in SuDS should be removed periodically.
- 3.8 Sediment accumulation will typically be rapid for the entire construction period (including time required for the building, turfing and landscaping of all upstream development plots). Once a catchment is completely developed and all vegetation is well-established, sediment mobility and accumulation is likely to drop significantly.

Remedial Maintenance

Structure rehabilitation/repair

- 3.9 There will come a time with most SuDS techniques when a major overhaul of the system is required to remove clogged filters, geotextiles, gravel etc. This will typically be between 10 and 25 years, depending on the technique and factors such as the type of catchment and sediment load.
- 3.10 Major overhaul is most likely to be required on techniques that rely on filtration through soils or aggregates, such as sand filters and infiltration devices. Other SuDS techniques are unlikely to need major overhaul if routine maintenance is undertaken as required.

