Elizabeth Way
Statement of Common Ground
Between Wiltshire Council and Barratt Homes

Wiltshire Housing Site Allocations Plan Examination
Date: 2nd April 2019

April 2019

STATEMENT OF COMMON GROUND

Signed on behalf of Wiltshire Council (LPA):	
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Date:	03/04/19
Position:	Head of Spatial Planning

Signed on behalf of Barratt Homes (Party):	
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Date:	3 APRIL 2019
Position:	DIRECTOR

1.0 INTRODUCTION

1.1 This Statement of Common Ground (SoCG) has been prepared and agreed between Barratt Homes and Wiltshire Council (WC). This document identifies the matters agreed with regards to Policy H2 and 'Site Allocation H2.3 Elizabeth Way' of the Wiltshire Housing Site Allocations Plan (WHSAP) (including Schedule of Proposed Changes) for approximately 355 dwellings and supporting documents to assist the Inspector during the Examination of the Local Plan. WC have identified this site as a proposed allocation for residential development through their site selection process, having considered all other reasonable alternatives and appropriate evidence.

1.2 Barratt Homes have an interest in part of the land proposed to be allocated under Site Allocation H2.3 (shown on the site Location Plan at **Appendix 1**). Information has previously been submitted by Barratt Homes in the form of representations to the Wiltshire Housing Site Allocations Plan consultation process. The wider site encompasses a total of four land parcels with individual landowners including; Barratt Homes, HGT Developments LLP, Persimmon Homes and Wiltshire Council (as landowners).

1.3 Wiltshire Council have identified land at Elizabeth Way (of which Barratt Homes control part), as a proposed allocation for residential development through the Wiltshire Housing Site Allocations DPD, having considered all other reasonable alternatives. This process included the assessment of relevant evidence and responses received from the various consultations with key stakeholders and the public.

1.4 Technical work in relation to the site has been undertaken by Barratt Homes.

1.5 This SoCG is provided without prejudice to other matters of details that Barratt Homes, or appointed person(s) on their behalf may wish to raise during the hearings. Insofar that Barratt Homes have outstanding concerns in relation to other aspects of the policy for this site allocation or other parts of the WHSAP, these matters are set out in the representations to the WHSAP.

1.6 Barratt Homes has been promoting their land holding and engaging through the Plan process since early 2017 to support the allocation, to progress site master planning, and address technical matters.

2.0 DESCRIPTION OF SITE AND SURROUNDINGS

2.1 The proposed allocation site is located to the south of Elizabeth Way, Trowbridge and comprises a total of approximately 21.24 hectares of agricultural land (as PC63). Barratt Homes land holdings cover 6.33 hectares of agricultural land. The site plan for the land controlled by Barratt Homes is attached (Appendix 1).

2.2 The wider site allocation extends over a significant area of agricultural land quite markedly enclosed by existing residential development to the western and southern boundaries and the Elizabeth Way distributor road to the north. Beyond the relief road is farmland and then the settlement of Hilperton.

2.3 The west/north west of the site is bound by the rear gardens of residential properties on Wyke Road.

2.4 The south west of the site is bound by the rear gardens of residential properties on Victoria Road, Albert Road, Osborne Road and Albany Close.

2.5 The east/south east of the site is bounded by Elizabeth Way including the roundabout onto Trowbridge Road

2.6 An outline planning application has been submitted on part of the proposed allocation to the west of the site. The illustrative masterplan submitted as part of the planning application indicatively shows how this part of the site could be developed to deliver up to 170 residential units. The application was validated on 5th February 2016 and given the reference number 16/00672/OUT. The planning application has not yet been determined. The illustrative masterplan is attached at **Appendix 2**.

2.7 The remainder of the site has not been subject to any applications but has been actively promoted for development through the preparation of the WHSAP.

Ecology, Biodiversity and Green Infrastructure

2.8 The allocation site comprises mainly of pasture fields bordered by intensively managed hedgerows that would not preclude or prevent development subject to appropriate protection and enhancement of features of interest.

2.9 No part of the allocation site is subject to any statutory designations. Although the Bath and Bradford Bats Special Area of Conservation (SAC) is located approximately 10km to the north-west of the site. It is recognised that the site may be used by bats associated with the SAC, but this would need to be confirmed by further on-site surveys.

Landscape Quality and Character

2.10 The character of the site is relatively open and offers views through the existing urban edge of the town and eastwards to the village of Hilperton. The dominant feature in the landscape is Elizabeth Way which would serve as access to the site. Mature and semi-mature hedgerows and trees are also a feature in the landscape.

2.11 Hilperton Brook crosses the north west portion of the site.

2.12 The allocation site is not subject to any specific landscape planning designations.

Agricultural Land

2.13 The site has Grade 3a and 3b agricultural land classification.

Heritage Assets

2.14 The south-eastern boundary of the allocation site is adjacent to the Hilperton Road Conservation Area. The church of St Michael and All Angels lies within a western projection of the Hilperton Conservation Area (a grade II listed Anglican Parish Church dating from the late 15th (or possibly 12th) century). Three further listed buildings are located approximately 150m southwest of southern extreme of the allocation site and comprise Rock Villa and its associated boundary (grade II) and next door to the east, Nos 15 and 17 Victoria Road (grade II), Fieldways Highfield (grade II*) and its boundary wall (Grade II) are located adjacent to the south of the allocation site.

2.15 The Trowbridge General Cemetery (Historic Parks & Gardens) is located 130m south of the site.

Strategic and Local Transport Infrastructure

2.16 The allocation site is located south of Elizabeth Way which provides a connection between Wyke Road roundabout and Hilperton roundabout and will be the main point of access for the site allocation.

2.17 There is an existing 3m wide shared footway / cycleway along Elizabeth Way on the site frontage facilitating pedestrian and cycle access. In addition, there are three public footpaths running through the site, including HILP8, HILP5 and HILP 54.

2.18 The local highway and PROW networks provide good opportunities for pedestrians and cyclists with good connectivity to the local area.

2.19 In summary, the local highway and PROW networks provide good opportunities for pedestrians and cyclists on low speed residential roads with good connectivity to the local area. There are opportunities to provide new routes through the site allocation for walking and cycling that would also serve the existing built-up area and that could improve connectivity for a wider area of the town. These should be explored and, wherever practicable, provided in order to encourage a reduction in private car journeys (paragraph 5.65 of WHSAP).

2.20 There are several bus stops in the vicinity of the site. The nearest bus stops are as follows:

- Victoria Road;
- Horse Road;
- Wyke Road;
- Hilperton Road.

2.21 The nearest railway station is Trowbridge Railway Station, located approximately 2.7km south west of the centre of the site.

Noise and Air Quality

2.22 Traffic along Elizabeth Way is the key source of noise to the site. The development will be required to respond appropriately to this potential source of noise through consideration of the proximity of dwellings to the road and the provision, as necessary,

- Children's Play Areas;
- Habitat Creation and Improvement Areas & Native Tree and Hedgerow Planting;
- A Landscape Corridor on the site allocation boundary to Elizabeth Way;
- Sustainable Drainage Systems (SUDS); and
- Improved Footpath and Cycleways.

Housing Provision (12.26ha)

3.7 The site allocation is primarily proposed for housing, alongside areas of Public Open Space. The draft site allocation H2.3 of the WHSAP Proposed Change PC64 proposes a total of 355 dwellings to be developed across the entire site allocation.

3.8 The overall approach for the master plan (Appendix 3) should be to produce a scheme which is well designed, built to high standards and provide a balanced mix of housing types and tenures, including with gardens, to address generational demands and affordable housing provision.

Accessibility

3.9 It is agreed appropriate that vehicular access is provided via Elizabeth Way along the edge of the site. It is agreed that it would be appropriate for the land in Barratt's control to be accessed direct via a vehicular access from Elizabeth Way.

3.10 Pedestrian and cycle access will be explored and could be provided on the western site boundary by connecting to the cycle path which runs along the south western boundary of Barratt's land holdings and the Public Right of Way which runs along the north western boundary. In addition to this, there are other networks proposed through the site linking in with the surrounding existing networks. These points of access provide direct links with the existing residential area and local services and facilities, including bus services.

4.0 AREAS OF AGREEMENT

4.1 The following section clearly sets out each of the key areas which the parties have now agreed to.

Site Boundary

4.2 The site allocation boundary map set out within the Wiltshire Housing Site Allocations Plan Schedule of Proposed Changes PC63 Annex D is agreed.

Sustainable Development and Proposed Housing Numbers

4.3 It is agreed that the site has the potential to deliver a well-integrated development within an existing built up area through high quality design and place shaping, the comprehensive development of the allocation site can integrate well with the neighbouring communities.

4.4 It is agreed that the site allocation will form a major contribution towards meeting the housing requirement of the adopted Wiltshire Core Strategy for Trowbridge.

4.5 It is agreed that the Wiltshire Housing Site Allocations Plan evidence base supports the allocation of the site for development. The allocations have been made in general conformity with the Settlement Strategy outlined in the Wiltshire Core Strategy Policy 1, as well as Core Policy 29 of the Wiltshire Core Strategy.

4.6 It is agreed that the allocation of the site is the most appropriate strategy when considered against reasonable alternatives.

4.7 It is agreed that the site allocation is in a sustainable location on the edge of Trowbridge and therefore is accessible to local opportunities for employment, accessible to retail and community provision facilities.

Access

4.8 It is agreed that it is appropriate for Barratts land holdings to be accessed directly from Elizabeth Way, as shown on the masterplan at **Appendix 4**.

Transport

4.9 The site is within close proximity to existing bus stops along Wyke Road, Victoria Road, Horse Road and Hilperton Road. Pedestrian and cycle linkages will need to be incorporated through the site to Victoria Road to provide acceptable links to the existing bus routes. As stated in paragraph 5.66 of the WHSAP there are opportunities to provide new routes for walking and cycling that would also serve the existing built-up area and that could improve connectivity for a wider area of the town. These should be explored and, wherever practicable, provided in order to encourage a reduction in private car journeys. These are identified on the masterplan.

Landscape

4.10 It is agreed that if designed appropriately (high quality design and place shaping), with adequate landscape strategy responding to site context including the relationship with Trowbridge and Hilperton village that the site could be developed without adverse landscape impacts.

Ecology

4.11 It is agreed that development of the site would be suitably mitigated through the Trowbridge Bat Mitigation Strategy to ensure that it would not have an impact on Bats. It is agreed that if appropriate surveys demonstrate that Bechstein bats use corridors of native landscaping then the development proposals and site layout should allow for the long-term protection of appropriate and proportionate corridors of native landscaping consistent with the Plan requirements and the Trowbridge Bat Mitigation Strategy, albeit noting that the Bat Mitigation Strategy is in draft only and is subject to representations. It is agreed that appropriate and proportionate onsite and possibly offsite mitigation could be required as part of the development of the allocation.

Heritage

4.12 It is agreed that heritage assets should not constrain development of the site, as development can take place in accordance to paragraph 5.64 of the WHSAP and Proposed Change 65.

Utilities

4.13 It is agreed that there are no known technical issues relating to utilities that would prevent the site from being delivered for development.

Drainage Strategy

4.14 It is agreed that the online Environmental Agency (EA) flood map confirms the vast majority of the site lies within Flood Zone 1, appropriate for residential development. There are small areas shown to lie within Flood Zones 2 and 3 with a medium to high probability of flooding. The majority of the site is therefore appropriate for development, with small areas which would be maintained as flood storage areas. The development proposals for the site will manage surface water run-off in accordance with the requirements as set out in paragraph 5.63 of the WHSAP and Proposed Change PC66.

4.15 A Surface Water Drainage Strategy has been prepared by Quad Consulting, on behalf of Barratt, in agreement with the Local Lead Flood Authority and is appended to this SoCG at Appendix 5. This strategy demonstrates that it is possible to provide a drainage strategy for the land within Barratt's control without reliance on the other parts of the allocation. On the basis of this drainage strategy it is agreed that the site can therefore be delivered through a phased or comprehensive approach.

Noise Strategy

4.16 It is agreed that noise, air and water quality is not considered to be a constraining factor in the development of the allocation site. Barratt Homes agree that the potential impacts of development on their land will be assessed, and appropriate mitigation incorporated into the detailed proposals as necessary in accordance with paragraph 6.63 of the WHSAP.

Archaeology

4.17 It is agreed that further investigations are required to assess the presence of any surviving archaeological remains. Development will take place in accordance to paragraph 5.64 of the WHSAP and Proposed Change PC65 which states "*The site comprises historic field boundaries and has high archaeological value. …. The relationship between development proposals and these heritage assets will need to be rigorously addressed through detailed design including provision for open greenspace in any layout.*". The detailed investigation

at the planning application stage, heritage and archaeology are not considered to be a constraining factor in the development of Barratt Homes land.

Deliverable development proposal

4.18 Barratt Homes can confirm that their land parcel proposed for allocation is available now. Subject to the necessary planning permission being granted, development will be deliverable before the end of the plan period.

Proposed Development Trajectory for Barratt Homes landholding

4.19 A development trajectory for the Barratts part of the site allocation is set out below, based on their proposed level of development. Trajectories are also provided for the whole site allocation at the level proposed in the WHSAP, as proposed to be changed and also the higher level (combination of the levels of development proposed by the three private landowners - Persimmon Homes, Barratts and HGT Developments LLP). This sees first residential completions in 2020/2021 then completion by 2026.

Year	Development Site Only (assumes one outlet)	355 Dwellings (assumes two outlets)	450 Dwellings (assumes two outlets)
2018/19			
2019/20			
2020/21	60	120	120
2021/22	60	120	120
2022/23	55	115	120
2023/24			60
2024/25			30
2025/26			
2026/27			

4.20 The lead-in times for the site are primarily associated with the planning process. The trajectory reflects the fact there is a current outline planning application submitted on the site.

5.0 AREAS OF DISAGREEMENT

5.1 This section sets out the areas to which Barratt Homes disagrees with the draft allocation as proposed by Wiltshire Council:

- Barratt Homes contest the level of housing proposed through the draft Wiltshire Housing Site Allocations Plan, as it would be an under delivery of housing on a site of this scale. The technical documents produced for each of the land holdings for the entire allocation have taken all of the site constraints into consideration and with this in mind, the overall site could accommodate - 450 dwellings.

- It is not agreed that Para 5.62 of the Wiltshire Housing Site Allocations Consultation Plan document (July 2018 submission version) is justified. Barratt Homes do not consider it possible to ensure the viability, and thus deliverability, of the scheme without knowing the extent of the contributions required for the delivery of the 'Trowbridge Recreation Management Mitigation Strategy' known now as Trowbridge Bat Mitigation Strategy (PC 52).

- Barratt Homes consider that the allocation should be identified in policy as per the other larger/complex sites in the Plan with the same provision that development will take place in accordance with a masterplan. A masterplan has been prepared for the wider allocation and is attached at **Appendix 3.**

APPENDIX 1

Site Plan

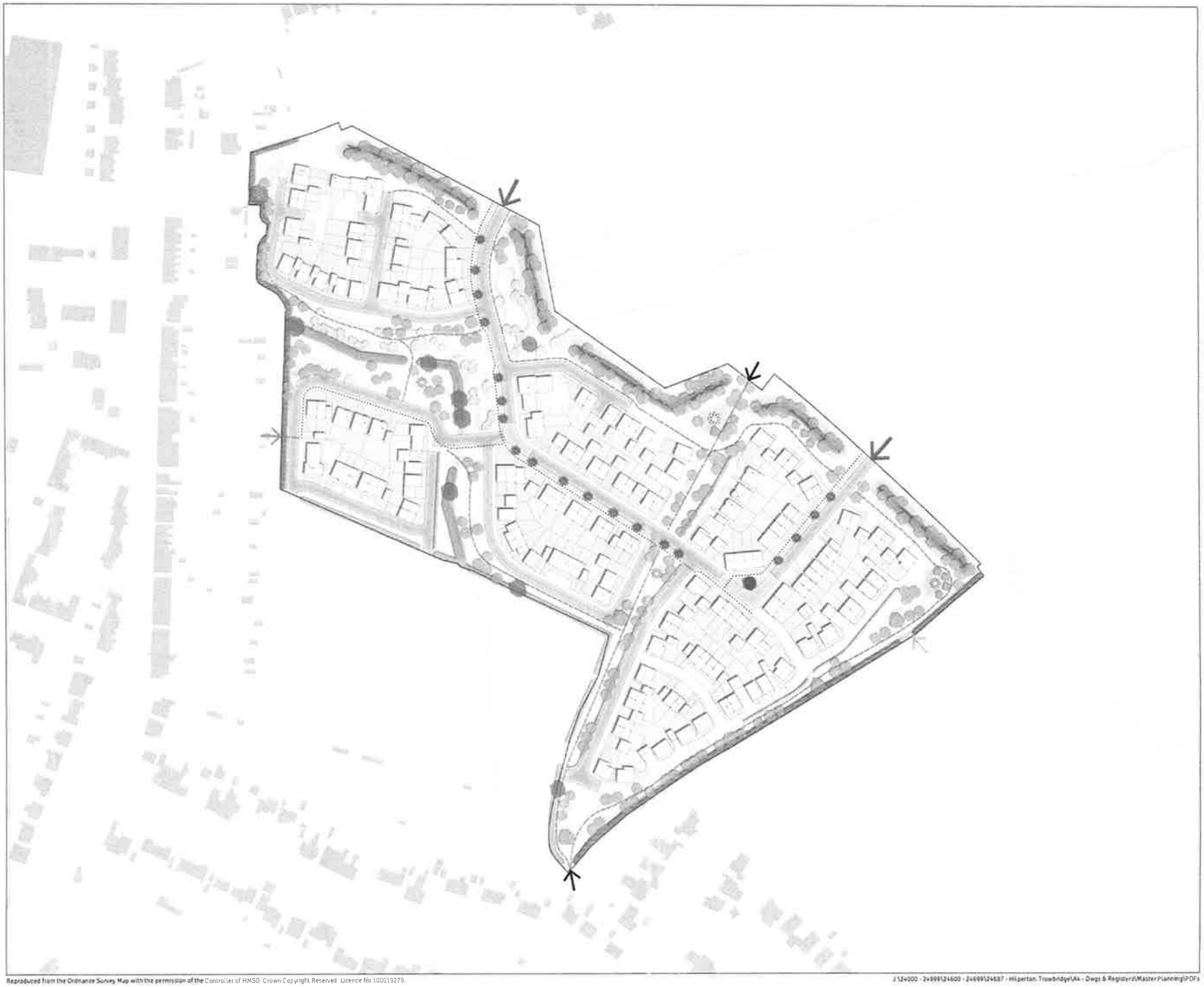
Aerial Site Location Plan

Site Boundary

Other land controlled by
Barratt Homes

APPENDIX 2

Illustrative Masterplan



The scaling of this drawing cannot be assured

- Application Site Boundary
- Proposed Vehicular Access
- Retained PROW Access
- Pedestrian & Cycle Access
- Potential Footpath Access
- Indicative Residential Development
- Public Open Space
- Cycleway (3m wide)
- Footpath
- Indicative Drainage Features
- Formal Play Areas
- Planted Noise Bund with 1m Acoustic Fence
- Strategic Boundary Planting

Note: Please refer to Pegasus Drawing Ref.4786_11C & Ref.4786_17 for more details of the proposed Landscape Masterplan

N

Land West of Elizabeth Way, Trowbridge

Illustrative Masterplan

18.04.17	1:1000@A1 1:2000@A3	GR	AT
24687	9301		A

BARTON WILLMORE

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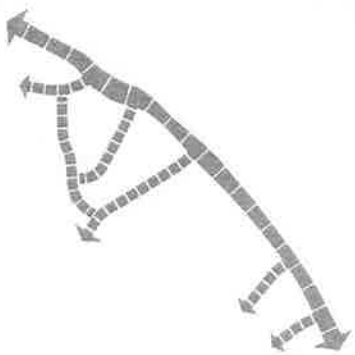
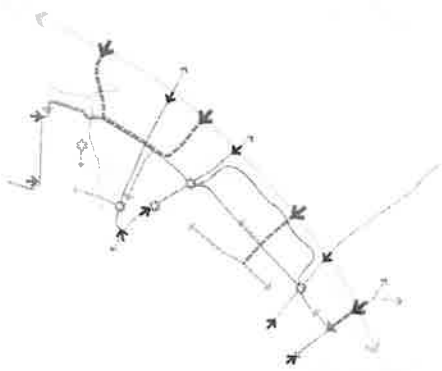
APPENDIX 3

Indicative Masterplan



GREEN LINKS

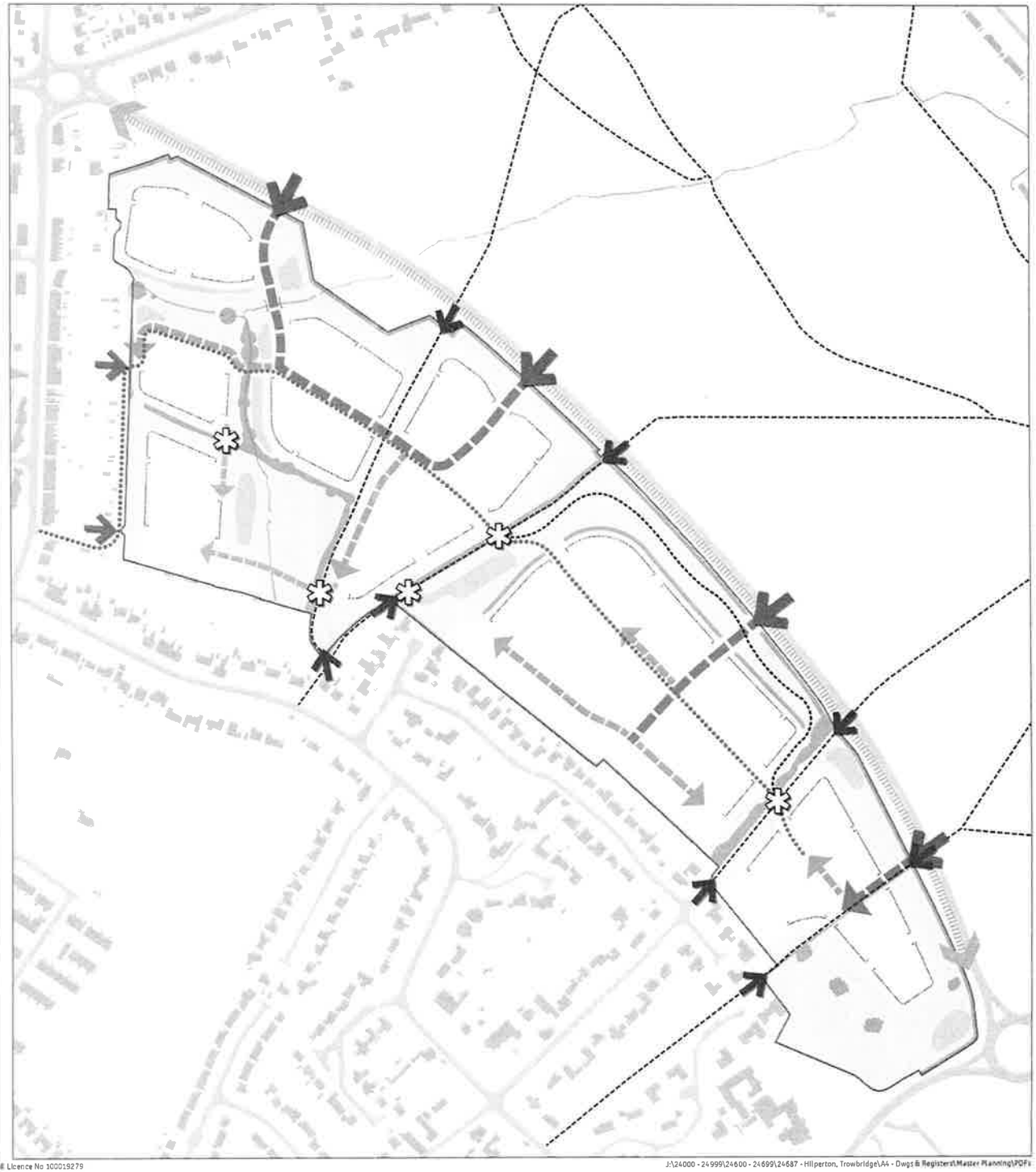
The design diagram has been largely influenced by existing landscape assets, including vegetation, the watercourse, and PROW. These are linked together to create a green infrastructure network of public spaces that provide for local amenity, movement, drainage, and wildlife.



MOVEMENT NETWORKS

A network of retained and proposed routes connect the land interests within the housing allocation. Four points of vehicular access are shown of Elizabeth Way, which features a strategic cycle route.

NTS



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Rev A - Update to Development Area (10.04.18 GR)

- Housing Allocation
- Existing PROW
- Bridleway
- Diverted PROW
- Development Area
- Public Open Space
- Watercourse
- Existing Vegetation and Buffer Planting
- Primary Movement Route
- Secondary Movement Route
- Potential Access Route
- Elizabeth Way Strategic Cycle Route
- Vehicle Access
- Retained Pedestrian Access
- Pedestrian/Cycle Access
- Key Pedestrian Access Between Land Interests
- Cycle Route
- Key Pedestrian Movement Routes
- Indicative Drainage Locations

N

0 20 40 60 80 100m

Land to the South West of Elizabeth Way

Concept Diagram

27.03.18	1:2500@A2 NTS @A3	GR/DR	AJT
26137	9310		A

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Appendix 4

Masterplan for Barratt's Land Holdings Only

Concept Masterplan

- Application Boundary
- Existing Trees & Hedgerows
- Existing Urban Areas
- Vehicular Access
- Pedestrian Access
- Diverted PRoW
- Indicative Footway
- Roads
- Roads
- Residential Development
- Residential Frontage
- Public Open Space
- Buffer Planting/Hedge
- Indicative Planting
- Potential Equipped Play Area
- Indicative Drainage

Appendix 5

Barratt Homes Drainage Strategy

QuadConsult
ENGINEERS IN PARTNERSHIP
Consulting Civil & Structural Engineers

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Proposed Development, Elizabeth Way, Trowbridge

Report

on

Surface Water Drainage Strategy – Barratt Homes Land

Date	Dec 2018
Project no.	17023
Revision	2

Proposed Development, Elizabeth Way, Trowbridge

Surface Water Drainage Strategy – Barratt Homes Land

Document Control

Responsible for	Job Title	Name	Date	Signature
Content	Project Engineer	Mike Pope	12/12/2018	
Checked	Director	Steve McCarthy	12/12/2018	
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Revision History

Revision	Date	Purpose/Status	Approved
0	12th Dec 2018	ISSUE	SPM
1	6th March 2019	ISSUE	SPM
2	14th March 2019	ISSUE	SPM
3			
4			
5			
6			

Distribution

	Function Title	Company	Name
1	Technical Manager	Barratt Homes	John Needham
2	Senior Planner	Barton Wilmore	Robyn Nicholl
3			

CONTENTS

List of Figures

References

C753 The SuDS Manual - CIRIA

Abbreviations

Ha	Hectares
CC	Climate Change
Q_{BAR}	The mean annual maximum flow rate

1.0 INTRODUCTION

1.1 QuadConsult Ltd have been appointed as Civil Engineering Consultants by Barratt Homes for a proposed residential development in the land to the South of Elizabeth Way, Trowbridge, BA14 7LQ (ST865592).

1.2 The overall development consists of four independent parcels, who's drainage strategies have been considered collectively in document *Surface Water Drainage Strategy Rev 2*. The subject parcel in consideration within this report is the Barratt Homes Parcel as shown in *Figure 1 and detailed in Table 1* below, with the net developable areas shown;

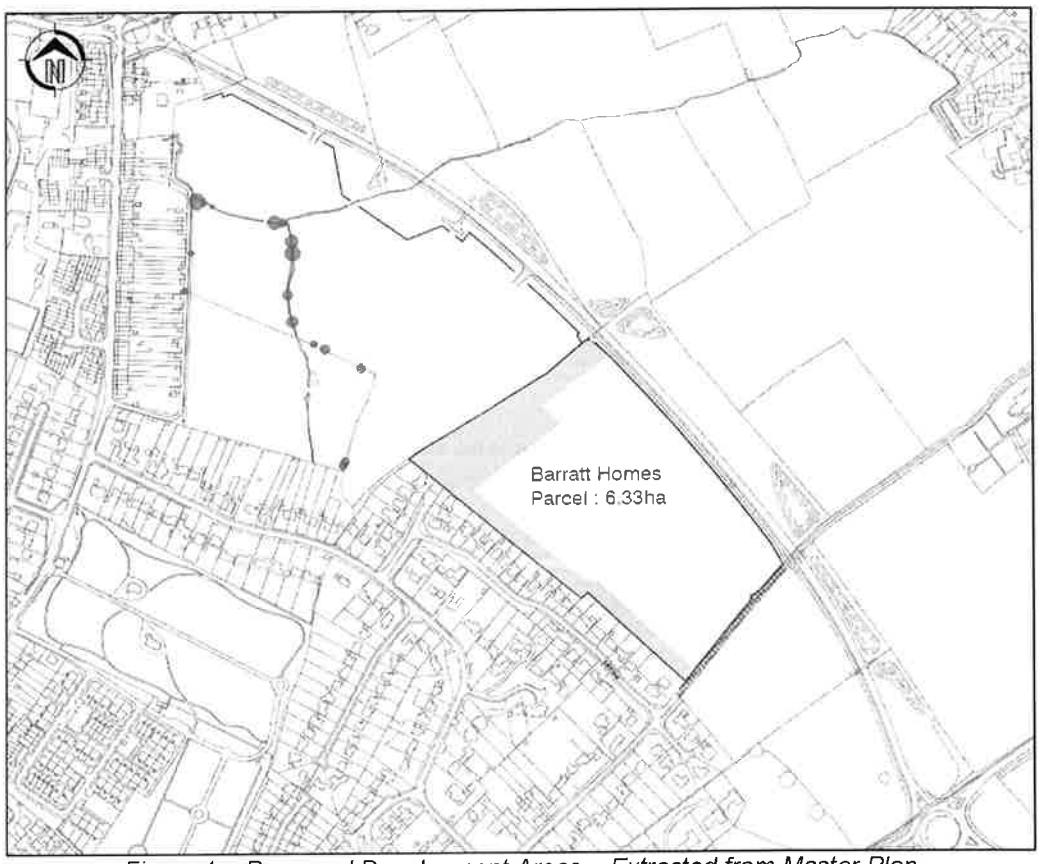

Figure 1 – Proposed Development Areas – Extracted from Master Plan
© Ordnance Survey

Table 1 – Development Area Summary

DEVELOPER	SITE AREA (ha)	NET DEVELOPABLE AREA (ha)
Barratt Homes	6.33	5.50*

** taken as positively drained site area with additional 10% allowance for urban creep i.e. areas NOT shown in green in Figure 1 are expected to be positively drained and attenuated.*

1.3 The purpose of this report is to outline the specific drainage strategy for the parcel identified, which includes determination of its discharge rate and the surface water impact downstream, (if any), of the proposed development. We will also set out any required mitigation measures as required (i.e. exceedance events, amenity, biodiversity and water quality).

2.0 PRE-DEVELOPMENT DISCHARGE RATES

2.1 The development site is considered 100% permeable throughout in its current greenfield form. There is a general fall from the South East to the western most point of the site adjacent Osborne Road.

2.2 The site currently drains to the west, resulting in a small degree of reported garden flooding to the rear of Albert Road and Osborne Road during greater storm events.

2.3 To the north of the development site, sits the recently completed Elizabeth Way link road along with its associated drainage (i.e. balancing ponds and swales). These drainage systems were created to ensure that the discharge from the link road itself has no negative impact on the overall Hilperton Marsh catchment. The highway drains to a pair of swales/ditches on the south side of the road. These offer a conveyance route as well as a method of capturing any exceedance flows which may overwhelm the highways carrying capacity. These swales/ditches terminate at the balancing ponds, which in turn discharge to the watercourse leaving the site at a time when the watercourse it is at a suitably low level.

2.4 Beyond the Elizabeth Way link road, the topography dictates that existing overland flows fall towards a primary watercourse which dissects the northern part of the marsh site from Dymott Square in the East to the final discharge adjacent Wyke Road.

2.5 This unnamed watercourse, crosses under the Elizabeth Way link road and passes between the balancing ponds, downstream of the proposed development boundary, finally leaving the marsh at Wyke Road.

2.6 The pre-development greenfield run-off rates for the development site has been calculated in *Appendix A*, with a summary in Table 2 below;

Table 2 – Pre-Development Greenfield Run-Off Rates (based on total site area)

DEVELOPER	Q_{BAR} (l/s)	Q1 YEARS (l/s)	Q30 YEARS (l/s)	Q100 YEARS (l/s)
BARRATT	30.1	23.5	57.4	72.9

3.0 PROPOSED SURFACE WATER DISCHARGE RATES & ATTENUATION VOLUMES

3.1 Due to the localised flooding surrounding the downstream watercourse areas during the higher frequency storms, it is proposed that the pre-development discharge rate is restricted to provide a reduction in flood risks at the identified location as well as within the wider downstream catchment.

3.2 As such, we propose that the discharge is restricted to the pro rata Q_{BAR} rate (the mean annual maximum flow rate) for all positively drained elements associated with the development boundary, except for public open spaces, which will remain as their pre-development rates.

3.3 It is therefore recommended that all the captured surface water is directed to a basin or pond, from where it can be held back and discharged at the pre-development average annual maximum flow rate (Q_{BAR}) using a flow control device, such as a Hydrobrake.

3.4 Based upon the pro-rata discharge rates for the positively drained areas, storage requirements have been calculated for the development catchment. This includes an additional 10% for urban creep allowance (added to account for future extensions / hard landscaping of gardens). The adjusted discharge rate can be found in *Appendix B* with *Appendix C* containing the associated storage estimation calculation with a summary in Table 3 below;

Table 3 – Proposed Discharge Rate (based on development footprint) and Associated Storage Requirements

DEVELOPER	NET DEVELOPABLE AREA (ha) Δ	Q_{BAR} (l/s) *	ESTIMATED 100YR+40%CC STORAGE REQUIRED (m^3)
BARRATT	5.50*	26.2	2300

Δ - taken from Table 1 (subject to change at detailed design – any variation will be reflected in Q_{BAR} rate)

* - based on positively drained areas (with 10% urban creep added i.e. Net Developable Area)

3.5 The run off from public open spaces and other areas which does not get captured by the proposed highway and plot drainage infrastructure will be unaltered from its pre-development state but will benefit from the existing informal drainage arrangement being formalised into an improved swale / drainage ditch providing an enhanced conveyance method downstream, increasing storage capacity, amenity, water quality and safety to nearby residents.

3.6 Due to the shallow invert level of the discharge ditches and swales, surface storage in the form of basins is recommended throughout.

3.7 The overall design ensures that there is substantial reduction in flows from the development up to and including the 100 year + 40% CC storm event by restricting to the pre-development Q_{BAR} rate. This will in turn lower the downstream water levels of more extreme events and safeguard downstream catchments from the higher frequency storms.

4.0 PROPOSED SURFACE WATER DRAINAGE

4.1 Part H of the Building Regulations and current best practice requires a sequential approach for the disposal of surface water. Investigations should be undertaken to determine if it can be reused initially, then treated and disposed of at source via infiltration, following which watercourses and positive drainage systems can be considered.

4.2 Rainwater reuse on residential schemes is somewhat limited due to required commitment to maintenance by each private owner. Should the maintenance not be carried out, health and safety issues could be present, and so greywater has been discounted at this stage. Consideration of water butts for private garden use is highly recommended however.

4.3 It is assumed that infiltration is not possible due to the site being a historic marsh, resulting in high water tables with limited soakage being demonstrated in nearby tests. We would therefore propose to restrict surface discharge to Q_{BAR} and attenuate surface water for all storm events up to and including the 100-year + 40%CC storm event. Surface water flows would be restricted via control device such as a Hydrobrake with attenuation stored in a detention basin.

4.4 We recommend that additional soakaway testing be carried out to BRE 365 standards at the proposed location of the basin at detailed design stage to verify what, if any, infiltration can be utilised as well confirming the water table levels. Should they be found to be within 1m of the bottom of the proposed basin, it is to be lined to ensure that there is no groundwater ingress. The same lining application is recommended for all proposed Swales / Ditches as required.

4.5 As there are no definitive ditches within the development boundary with the greater part of the existing site draining to a ditch abutting the site at its western most point at the gated access of a public right of way. It is suggested that a dry swale is created along the southern boundary of the site to formalise the existing arrangement, with an additional swale incorporated to the north west of the site. As well as maintaining the status quo, they will also provide the function of cut-off trenches and be sized to capture the proposed pond/basin's-controlled discharge up to and including the 100-year+40%CC flows as well as the 100-year uncontrolled discharge from undeveloped areas. The calculations for which can be found in *Appendix D* with a summary in Table 4 below with a typical section included in *Appendix H*;

Table 4 – Uncontrolled Discharge Rates (based on uncaptured flows)

DEVELOPER	SITE AREA (ha)	UNDEVELOPED AREA (ha)	Q100 YEARS (l/s)
BARRATT	6.33	0.83	9.6

4.6 The southern boundary channel will also provide the flow path to a formalised outlet, reducing the risk of garden flooding in the residences to the south which exhibits currently in the extreme events. Minimum channel dimension calculations can be found in *Appendix E*.

4.7 The existing ditch adjacent the public right of way has been identified to drain to the Wessex Water piped network via an existing grating, from where it is believed to discharge to the 450mm pipe and headwall within the watercourse bisecting the Council owned land to the west.

4.8 **THE PROPOSED STRATEGY OFFERS SUBSTANTIAL BENEFITS TO BOTH THE RECEIVING WATERCOURSE AND THE RESIDENCES BEYOND AS THEY ARE SAFEGUARDED FROM THE DEVELOPMENT BOUNDARY CONTRIBUTION TO ALL STORM EVENTS OVER AND ABOVE THE IMPLEMENTED Q_{BAR} DISCHARGE RATES.**

4.9 **THIS BENEFIT IS FURTHER ENHANCED WITH THE ADDITION OF A SWALE TO THE SOUTH OF THE RESIDENTIAL PARCELS, OFFERING AN ENHANCED FLOW PATH FOR**

ALL SURFACE WATER FLOWS WHILST SAFEGUARDING EXISTING NEIGHBOURING PROPERTIES FROM LOCALISED FLOODING CAUSED BY HILPERTON MARSH RUNOFF.

4.10 Further to the detailed drainage strategy. An additional arrangement was considered, in which the potential of off-setting the attenuation requirement of the development boundary to within the Council owned land was assessed with a view of alleviating downstream flood risks. It was proposed that a large combined basin/pond may provide the required 2300CuM of attenuation while providing additional storage to provide displacement to existing flood flows to the south of the marsh, relocating flood risks further to the north and away from existing residences.

4.11 As part of this process, CIRIA C753 Chapter 23.4 freeboard recommendations off 300mm were considered along with the recorded incoming pipe invert levels, outgoing bed levels and available footprint, which resulted in a total available storage volume of 1205CuM identified.

4.12 Due to the required attenuation volume for the site exceeding that available, the off-site storage option has been discounted at this stage. A schematic of the arrangement has been included in Appendix J of this report.

5.0 EXCEEDANCE FLOWS

5.1 The existing site topography dictates drainage in an east to west direction towards the watercourse within the downstream greenfield area.

5.2 We have been informed by Wiltshire Council Drainage Officers that garden flooding occurs to the west of the site in exceedance events, due part to the lack of conveyance towards the aforementioned catchment watercourse. The existing drainage arrangement and flood risks have been included in *Appendix F* of this report.

5.3 To better manage future exceedance flows, construction of a proposed Swale is recommended along the southern boundary of the development boundary, primarily to offer the conveyance for the development runoff to a formal outlet, from which, the existing route to the Wessex water inlet within the ditch leaving the site can be improved and maintained. This arrangement offers the added benefit of capturing the exceedance flows up to the 100-year storm event (being sized to accommodate the anticipated uncontrolled 100-year greenfield runoff elements as well as controlled Q_{BAR} basin discharge flows). An additional cut off trench / swale is recommended for the northwest area to provide the same function locally.

5.4 This proposed drainage strategy has been included in *Appendix G* with the proposed Swale detail in *Appendix H*.

6.0 SUMMARY OF DESIGN BENEFITS

6.1 The overall design ensures that there is a substantial reduction in flows from the development. The 'positively drained' areas will be attenuated and discharged at their pre-development Q_{BAR} rates, lowering the downstream water levels of more extreme events and in turn safeguarding downstream catchments from the higher frequency storms.

6.2 The long-term management of runoff is also improved and aligns with best practice with the addition of on-site attenuation, managing storms closer to source with the addition of formalised drainage Swales providing a new channels to manage runoff.

6.3 In addition to the above, as the development area was traditionally a marsh, groundwater recharge will be in part maintained by the availability of water in both the proposed pond/basin and swale.

6.4 Flood risk management – as discussed in section 5, the incorporation of the Swales into the design provides a level of security to residential units abutting the development boundary. This intercept traditional exceedance event run off from reaching them. The south side of the southern Swale and west side of the northern will be built up with the excavated material to provide a bund and prevent overtopping from exceedance flows entering them.

6.5 Water Quality – both the swales and basin/pond are effective at removing polluting suspended solids through filtration and sedimentation. The vegetation traps organic material particles that are then incorporated into the soil while the vegetation takes up any nutrients.

6.6 Amenity – as well as providing vital water quality benefits, the swales and basin can be introduced for visual interest, providing wildlife habitat, and softening the impact of the new development. Public open spaces are to be included within the development also.

6.7 Biodiversity – it is recommended that an ecological survey be carried out by a qualified ecologist prior to development, in line with the best practice standards of the Institute of Ecology and Environmental Management and other bodies. Any net loss / gain or change for biodiversity resulting from development is to be recorded, and measures to be implemented to deliver enhancement is to be identified at detailed design.

APPENDIX A
Greenfield Run-Off Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	6.327	Urban	0.000
SAAR (mm)	750	Region Number	Region 8

Results l/s

QBAR Rural	30.1
QBAR Urban	30.1
Q100 years	72.9
Q1 year	23.5
Q30 years	57.4
Q100 years	72.9

APPENDIX B
Greenfield Run-Off Calculations
(Adjusted for Development Area)

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	5.500	Urban	0.000
SAAR (mm)	750	Region Number	Region 8

Results l/s

QBAR Rural	26.2
QBAR Urban	26.2
Q100 years	63.4
Q1 year	20.4
Q30 years	49.9
Q100 years	63.4

APPENDIX C
Storage Estimation Calculations

Columbus House Village Way Cardiff CF15 7NE	Hilperton Marsh Parcel C - Barratt SW Attenuation
Date 15/08/2018 File ATTENUATION PARCEL C - ...	Designed by MP Checked by SPM
Micro Drainage	Source Control 2017.1.2

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	41.907	0.407	26.2	916.1	O K
30 min Summer	42.029	0.529	26.2	1195.8	O K
60 min Summer	42.150	0.650	26.2	1476.0	O K
120 min Summer	42.262	0.762	26.2	1738.8	Flood Risk
180 min Summer	42.317	0.817	26.2	1866.6	Flood Risk
240 min Summer	42.346	0.846	26.2	1935.7	Flood Risk
360 min Summer	42.374	0.874	26.2	2002.3	Flood Risk
480 min Summer	42.382	0.882	26.2	2021.1	Flood Risk
600 min Summer	42.378	0.878	26.2	2011.7	Flood Risk
720 min Summer	42.371	0.871	26.2	1994.1	Flood Risk
960 min Summer	42.354	0.854	26.2	1954.0	Flood Risk
1440 min Summer	42.313	0.813	26.2	1857.1	Flood Risk
2160 min Summer	42.240	0.740	26.2	1687.9	Flood Risk
2880 min Summer	42.161	0.661	26.2	1502.8	O K
4320 min Summer	42.024	0.524	26.2	1183.8	O K
5760 min Summer	41.914	0.414	26.2	931.7	O K
7200 min Summer	41.832	0.332	26.2	745.3	O K
8640 min Summer	41.774	0.274	25.8	613.5	O K
10080 min Summer	41.736	0.236	25.3	527.1	O K
15 min Winter	41.956	0.456	26.2	1028.4	O K
30 min Winter	42.093	0.593	26.2	1343.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	861.8	26
30 min Summer	90.705	0.0	1141.6	41
60 min Summer	56.713	0.0	1501.4	70
120 min Summer	34.246	0.0	1816.9	128
180 min Summer	25.149	0.0	2002.3	188
240 min Summer	20.078	0.0	2131.6	246
360 min Summer	14.585	0.0	2321.8	364
480 min Summer	11.622	0.0	2465.2	482
600 min Summer	9.738	0.0	2579.6	588
720 min Summer	8.424	0.0	2674.8	632
960 min Summer	6.697	0.0	2826.9	760
1440 min Summer	4.839	0.0	3035.6	1018
2160 min Summer	3.490	0.0	3391.6	1432
2880 min Summer	2.766	0.0	3581.3	1820
4320 min Summer	1.989	0.0	3848.8	2564
5760 min Summer	1.573	0.0	4096.7	3288
7200 min Summer	1.311	0.0	4262.5	3968
8640 min Summer	1.129	0.0	4397.6	4592
10080 min Summer	0.994	0.0	4503.6	5248
15 min Winter	138.153	0.0	969.8	26
30 min Winter	90.705	0.0	1280.4	40

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	42.229	0.729	26.2	1660.8	Flood Risk
120 min Winter	42.355	0.855	26.2	1958.3	Flood Risk
180 min Winter	42.417	0.917	26.2	2104.6	Flood Risk
240 min Winter	42.451	0.951	26.2	2186.0	Flood Risk
360 min Winter	42.487	0.987	26.2	2269.9	Flood Risk
480 min Winter	42.500	1.000	26.2	2300.9	Flood Risk
600 min Winter	42.500	1.000	26.2	2301.1	Flood Risk
720 min Winter	42.492	0.992	26.2	2282.7	Flood Risk
960 min Winter	42.465	0.965	26.2	2218.9	Flood Risk
1440 min Winter	42.412	0.912	26.2	2092.6	Flood Risk
2160 min Winter	42.314	0.814	26.2	1860.8	Flood Risk
2880 min Winter	42.199	0.699	26.2	1589.9	O K
4320 min Winter	41.987	0.487	26.2	1100.3	O K
5760 min Winter	41.835	0.335	26.2	752.5	O K
7200 min Winter	41.744	0.244	25.5	546.0	O K
8640 min Winter	41.709	0.209	23.2	466.6	O K
10080 min Winter	41.689	0.189	20.8	422.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	1684.1	70
120 min Winter	34.246	0.0	2036.6	126
180 min Winter	25.149	0.0	2243.9	184
240 min Winter	20.078	0.0	2388.3	242
360 min Winter	14.585	0.0	2600.4	356
480 min Winter	11.622	0.0	2760.0	470
600 min Winter	9.738	0.0	2886.5	590
720 min Winter	8.424	0.0	2992.1	686
960 min Winter	6.697	0.0	3158.8	796
1440 min Winter	4.839	0.0	3377.9	1090
2160 min Winter	3.490	0.0	3800.0	1556
2880 min Winter	2.766	0.0	4012.7	1992
4320 min Winter	1.989	0.0	4317.0	2728
5760 min Winter	1.573	0.0	4590.2	3400
7200 min Winter	1.311	0.0	4776.6	3960
8640 min Winter	1.129	0.0	4929.2	4584
10080 min Winter	0.994	0.0	5051.5	5248

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.630

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.210	4	8	1.210	8	12	1.210

Model Details

Storage is Online Cover Level (m) 42.500

Tank or Pond Structure

Invert Level (m) 41.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2215.8	0.500	2301.9	1.000	2388.2

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0223-2620-1000-2620
Design Head (m)	1.000
Design Flow (l/s)	26.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	223
Invert Level (m)	41.500
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	26.2
Flush-Flo™	0.367	26.2
Kick-Flo®	0.739	22.7
Mean Flow over Head Range	-	21.8

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	7.5	1.200	28.6	3.000	44.4	7.000	67.0
0.200	22.2	1.400	30.8	3.500	47.8	7.500	69.3
0.300	26.0	1.600	32.8	4.000	51.0	8.000	71.5
0.400	26.2	1.800	34.7	4.500	54.0	8.500	73.6
0.500	25.8	2.000	36.5	5.000	56.9	9.000	75.7
0.600	25.1	2.200	38.2	5.500	59.6	9.500	77.7
0.800	23.6	2.400	39.9	6.000	62.1		
1.000	26.2	2.600	41.4	6.500	64.6		

APPENDIX D
Greenfield Run-Off Calculations
(Uncontrolled – from public open spaces)

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.830	Urban	0.000
SAAR (mm)	750	Region Number	Region 8

Results 1/s

QBAR Rural	4.0
QBAR Urban	4.0
Q100 years	9.6
Q1 year	3.1
Q30 years	7.5
Q100 years	9.6

APPENDIX E
Minimum Channel Volume Calculations

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Project				Job Ref.	17023
Hilperton Marsh – Channel Calculations					
Section				Sheet no./rev.	1
Option B Swale					
Calc. by	Date	Chk'd by	Date	App'd by	Date
MP	05/12/18	SPM	05/12/18	SPM	05/12/18

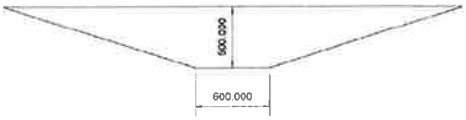
Channel discharge based on Swale type channel with a grassed surfacing.

where M = Hydraulic Radius (L)
Q = discharge (m^3/s)
A = 1.082 - cross sectional area of channel (m^2) *based on 1:4 sides*
P = 3.883 - hydraulic radius (m), (area wetted perimeter of the channel)
i = 0.037 - slope of the water surface
n = 0.050 - roughness coefficient of the channel (Constructed Channel with Vegetal Lining - Minimal)

$$M = \frac{A}{P}$$

$$= \frac{1.082}{3.883}$$

$\therefore = \underline{0.279}$



$$V = \frac{1}{n} M^{2/3} i^{1/2}$$

$$= \frac{1}{0.050} 0.279^{2/3} 0.037^{1/2}$$

$\therefore = \underline{1.642}$

Q = AV
= 1.082 x 1.642
$\therefore$ = **1.777** m^3/s *or* ***1777l/s***

Approximate Length (L) of Swale in flow path– 366m
Storage within highway section = A x L
= 1.082 x 366
= 396m³

Proposed Discharge to channel via hydrobrake (from pond/ basin) = 26.2l/s (Qbar)
Uncontrolled 100 year flow from existing catchment (i.e. not positively drained) = 9.6l/s
Anticipated total 100 year post development flow from catchment = 35.8l/s (reduced from 72.9l/s)

Anticipated Channel Flow = 35.8/s (100 year+40%CC)
Anticipated Swale flow (Max) of 35.8l/s < Swale capacity of 1777l/s

APPENDIX F
Pre-Development Drainage

LEGEND

CURRENT SURFACE WATER FLOW PATH

APPROXIMATE FLOOD RISK AREA (EXISTING - SHOWN INDICATIVELY BASED ON TOPOGRAPHY)

PRE-DEVELOPMENT RUN-OFF RATES (l/s)

Q_{BAR}	30.1
Q1 YEAR	23.5
Q30 YEARS	57.4
Q100 YEARS	72.9

Rev	Date	Description	By

Dimensions to be verified on site.
This drawing should not be scaled. Use figured dimensions only
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Client: BARRATT HOMES built around you

Project: Fare Land Trust, Trowbridge

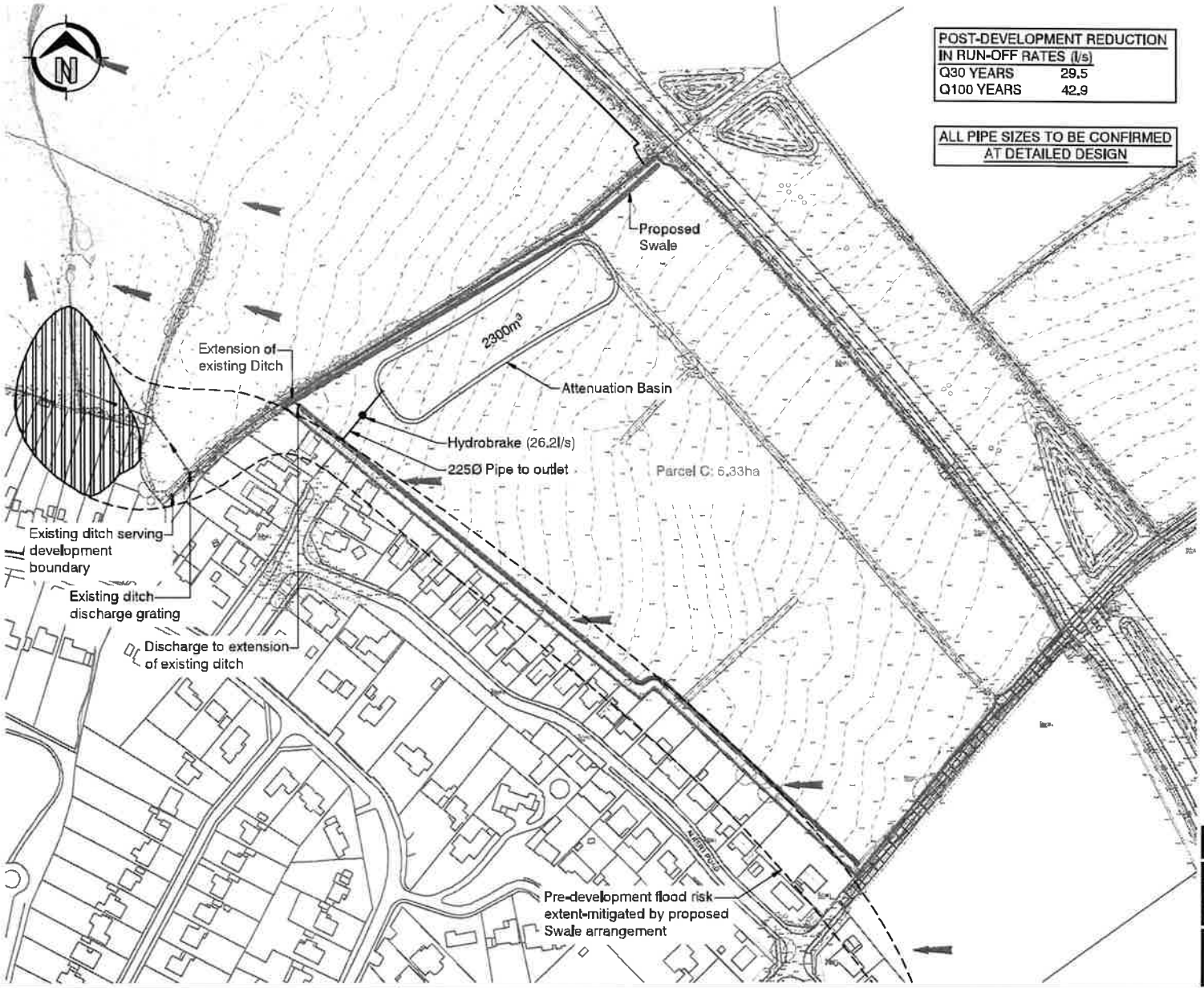
Title: BARRATT HOMES PRE-DEVELOPMENT FLOWS

Designed by	Drawn by	Checked by	Date	Scales @ A3 size
MP	MP	SPM	AUG 18	1:500

Project No	Drawing No	Revision
17023	C-159	0

File name: [illegible]

APPENDIX G
Post-Development Drainage



POST-DEVELOPMENT REDUCTION IN RUN-OFF RATES (l/s)	
Q30 YEARS	29.5
Q100 YEARS	42.9

ALL PIPE SIZES TO BE CONFIRMED AT DETAILED DESIGN

LEGEND

- PROPOSED SW FLOW PATH
- FLOOD ZONE 2
- FLOOD ZONE 3
- SWALE - SEE TYPICAL DETAIL
- FLOW CONTROL DEVICE (HYDROBRAKE)
- PIPE TO INLET/OUTLET
- ATTENUATION BASIN
- APPROXIMATE FLOOD RISK AREA AFTER ADDITION OF ATTENUATION. FLOW CONTROL AND SWALE CONVEYANCE
- PRE-DEVELOPMENT EXTENT OF FLOOD RISK / MITIGATED BY STRATEGY

PRE-DEVELOPMENT RUN-OFF RATES (l/s)

Q_{BAR}	30.1
Q1 YEAR	23.5
Q30 YEARS	57.4
Q100 YEARS	72.9

POST-DEVELOPMENT RUN-OFF RATES (l/s) FROM ALL DEVELOPED AREAS COMBINED

Q_{BAR}	26.2
Q1 YEAR	20.4
Q30 YEARS	N/A
Q100 YEARS	N/A

POST-DEVELOPMENT RUN-OFF RATES (l/s) FROM UNALTERED AREAS (i.e. PUBLIC OPEN SPACES)

Q_{BAR}	4.0
Q1 YEAR	3.1
Q30 YEARS	7.5
Q100 YEARS	9.6

POST-DEVELOPMENT RUN-OFF RATES (l/s) TOTALS

Q_{BAR}	34.1
Q1 YEAR	23.5
Q30 YEARS	27.9
Q100 YEARS	30.0

Rev	Date	Description	By

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Consulting Civil & Structural Engineers

Client: BARRATT HOMES built around you

Project: Fare Land Trust, Trowbridge

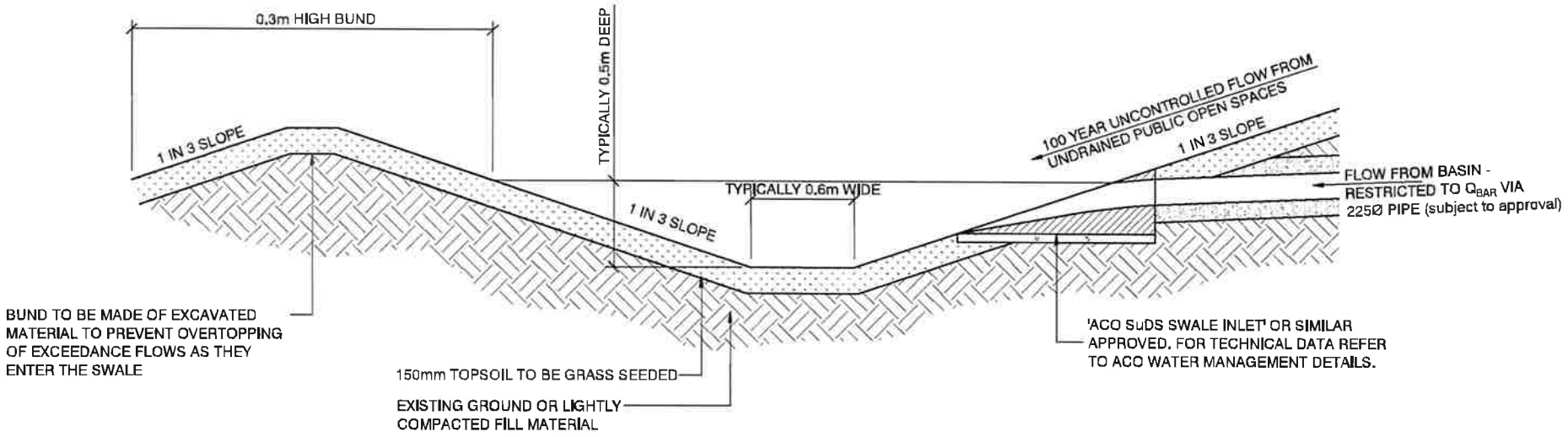
Title: BARRATT HOMES POST-DEVELOPMENT FLOWS

Designed by	Drawn by	Checked by	Date	Scale @ A1 size
MP	MP	SPM	AUG 18	1:500

Project No	Drawing No	Revision
17023	160	1

File name: 17023-160-Post-Development Flows.dwg

APPENDIX H
Typical Swale Detail



TYPICAL SECTION THROUGH PROPOSED SWALE

SCALE 1:25

Rev	Date	Description	By

Dimensions to be verified on site.
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Drawing Status: **APPROVAL**

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Consulting Civil & Structural Engineers

Client: BARRATT HOMES built around you

Project: Fare Land Trust, Trowbridge

Title: TYPICAL SWALE DETAIL

Designed by	Drawn by	Checked by	Date	Scales @ A3 size
MP	MP	SPM	AUG 2018	1:25
Project No		Drawing No		Revision
17023		C-158		0

File name: 17023-158 Typical Swale Detail.dwg

APPENDIX I
Wessex Water Communication

From:	Gillian Sanders <Gillian.Sanders@wessexwater.co.uk>
Sent:	10 December 2018 11:00
To:	Mike Pope
Subject:	WW Resp ST85NE/437 Fare Trust Land - Hilperton Marsh, Trowbridge
Attachments:	Appendix G - Post-Development Drawing.pdf

Dear Mike,

Thank you for your phone call and email below. I note your progression through the options in the SuDS hierarchy in developing the surface water strategy for the proposed site at Hilperton Marsh.

I appreciate that ground conditions are not suitable for infiltration. The next option via the SuDS hierarchy is direct to a watercourse, in your planning submission we will expect to see explanation as to why a connection direct to the watercourse is not possible. We acknowledge that whilst a requisition will be available to cross third party land, agreement will also be required from the riparian owner of the watercourse for a new discharge. In exceptional circumstances the water company can initiate a compulsory purchase order but this complex and protracted process is something we seek to avoid and is not recommended in this instance. If agreement cannot be gained from the riparian owner of the adjacent watercourse then we accept that a connection to the adjacent existing public surface water sewer is acceptable in principle (the fact that it is a short length of pipe is also a factor here).

In accordance with the infrastructure charging arrangements connections can be sought to the nearest like for like (or larger) sewer. We will be unable to accept a connection from a 225mm sewer into an existing 150mm sewer. The 150mm sewer will require upsizing to at least 225mm or the connection extended to the 450mm surface water sewer (at the developer's cost). Furthermore we understand the flow control should be on the outlet from the swale to protect the surface water network from exceedance flows. We can review the detail as the site progresses through the planning process and if any other improvements to the existing network may be required (in accordance with Wessex Water's charging arrangements).

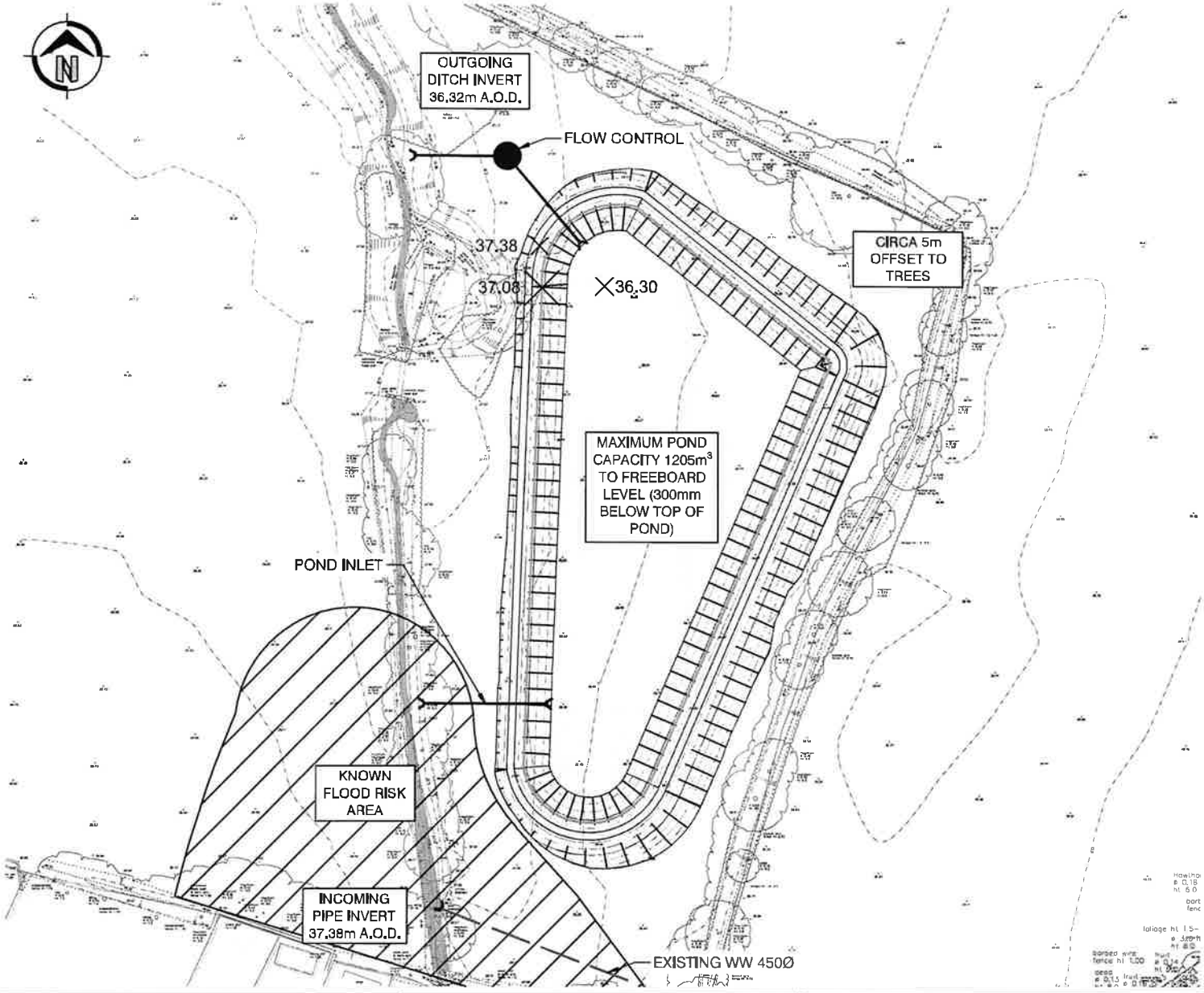
I hope this is satisfactory. Any further queries please do contact me.

Regards

Gillian Sanders
Planning Liaison Manager

Wessex Water
Claverton Down Bath BA2 7WW
Contact number 01225 526303
Mobile number 07899 967595
wessexwater.co.uk

APPENDIX J
Off-Site Pond Option



NOTE

Water level shown including 300mm freeboard.

Rev	Date	Description	By

Dimensions to be verified on site.
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Consulting Civil & Structural Engineers

Client: BARRATT HOMES built around you

Project: Fare Land Trust, Trowbridge

Title: OFF-SITE POND ARRANGEMENT

Designed by	Drawn by	Checked by	Date	Scales @ A3 size
MP	MP	SPM	MAY 19	NTS
Project No		Drawing No		Revision
17023		163		0

File name: 17023-163-Pond Plan.dwg