

Our Ref: 2205270/LLFA/04RA

Havant Borough Council
Development Control
Civic Offices
Civic Centre Road
Havant
Hampshire
PO9 2AX

16th June 2023

Dear Sir/Madam,

RESPONSE TO CONSULTEE COMMENTS – Land at Palk Road, Havant (REF: APP/22/01231)

Ardent Consulting Engineers (hereafter referred to as 'Ardent') have been commissioned by Bellway Homes Ltd. (Wessex) to address comments raised by the Lead Local Flood Authority (LLFA) and the Environment Agency (EA) with respect to the proposed development on Land at Palk Road, Havant, PO9 1NL (planning application ref: APP/22/01231). Refer to the enclosed responses from the relevant consultees in **Appendix A**.

This response letter aims to address the comments from the relevant consultees stated above. For ease of reference, the responses are detailed, in ***bold italics***, with the Ardent response immediately below. This letter should be read in conjunction with the Flood Risk Assessment produced by Ardent (Ref: 2108040-01A).

This information has been informally submitted to Hampshire County Council, as the LLFA, have they have confirmed that the additional information is acceptable, subject to formal submission.

Environment Agency

Recommend approval subject to condition to accord with FRA and set FFLs at or about 6.93mAOD.

No action. In line with Paragraph 5.3 of the Flood Risk Assessment produced by Ardent (Ref: 2108040-01A), the Finished Floor Levels at the development will be raised to 6.93m AOD, 300mm

above the highest recorded flood level on site for the 1 in 100 year + 37%CC event (6.63m AOD).

Where necessary, the advice of relevant experts should be sought:

- ***Details and adequacy of an emergency plan***

As the Finished Floor Levels at the development will be raised to 6.93m AOD, 300mm above the highest recorded flood level on site for the 1 in 100 year + 37%CC event (6.63m AOD), safe refuge will be available throughout the development for all occupants in the event of a flood under this scenario.

Additionally, whilst a small extent of the modelled flood outline encroaches into the access road (Palk Road), the northern half of the road remains flood free and would therefore be accessible by vehicular transport and pedestrians, enabling safe access and egress to the wider area. Furthermore, the levels within the area of the access road covered by the 1 in 100 year + 37%CC event are shown to be largely similar to the flood level and therefore the flood depths at this area of the site are negligible.

LLFA

In order for us to provide a substantive response, the following information is required:

Confirmation that floor levels for development in the low surface water flood risk area will be above modelled flood levels (this is in addition to the modelled Flood Zone area that considers climate change).

It is proposed that FFLs are set at 6.93m AOD for the residential development (300mm above the 100 year + 37% flood level). Based on the EA surface water flood map and the topographic survey (**Appendix B**), the maximum predicted flood level for the 1 in 1000yr event is 6.85m AOD at the eastern part of the site falling to 6.54m AOD at the south-western part.

Therefore, predicted surface water flood levels are below the proposed FFLs for the residential development. Additionally, the proposed development sets the road through the site at 300mm below the properties and the flow path route will be changed slightly through the site to follow the roads before connecting back into the Hermitage Stream.

Confirmation of whether there is an existing connection to the surface water sewer or whether approval has been sought from the water company for a connection into the

sewer. An alternative proposal for a new private surface water sewer serving the site and discharging to the watercourse could also be acceptable.

Southern Water were approached and have accepted the principles applied at the site for a new connection into the public network. The full response (Ref. DSA000019841) is provided in **Appendix A** where it is stated '*The Flood Risk Assessment document indicates surface water flows no greater than existing levels being connected into the public system proving betterment of the surface water flows which would be satisfactory to Southern Water*'.

A Section 106 application will be submitted in due course to Southern Water once the detailed design of the drainage connection has been completed. The proposals will be in accordance with the *Code for Adoptions* and are therefore considered appropriate.

Peak rainfall allowances should be included for the 1 in 30-year storm event in the calculations, and be shown to not cause flooding.

The Microdrainage model calculations have been re-run to include for the 1 in 30-year results, including an allowance for climate change, which show no flooding under this scenario. The updated MicroDrainage calculations are attached in **Appendix C**.

Permeable paving areas may need to be increased so that all runoff from roads is suitably treated prior to entering attenuation tanks.

The inclusion of above ground SuDS features is limited by the flood risk to the site which prevents any features being located within the open space in the south of the site. The extent of permeable paving has been increased on site to ensure all runoff from roads is suitable treated prior to entering the attenuation tanks. This is shown in the updated Drainage Strategy Drawing (2108040-001C) in **Appendix D**. The permeable paving has remained outside of areas including the existing Southern Water surface water sewer, as well as the proposed private foul water sewers. Permeable paving has also been avoided in areas expected to be required for utility connections to the proposed development.

Flooded extents should also be shown on the layout showing the flood exceedance flow routes.

The indicative extents of the minor flooding in the 1 in 100 year, including climate change, event have been included on the drainage strategy drawing (2108040-001D).

As stated in the FRA produced by Ardent (Ref. 2108040-01A), the surface water flood extents shown on site are largely associated with the Hermitage Stream. Flooding extents are shown on the Foul and Surface Water Drainage Strategy Drawing (Ref. 218040-001A). This shows the extents to be confined mostly to the southwest of the site and outside the extent of all residential and commercial development and is therefore of negligible significance.

Exceedance flow routes are identified on the Foul and Surface Water Drainage Strategy Drawing (Ref. 218040-001B), indicating flows will drain towards the highway network and subsequently flow towards the Hermitage Stream beyond the site's southern boundary.

We trust that the above addresses the queries raised by the Environment Agency and LLFA in relation to the proposed development. However, please do not hesitate to contact me if there are any further clarifications required.

Yours sincerely,

Charlie Cooper

Charlie Cooper
Associate Director

*Encl: Appendix A – Environment Agency and LLFA Consultee Responses
Appendix B – Topographical Survey
Appendix C – Updated Microdrainage Calculations
Appendix D – 2108040-001D Surface and Foul Water Drainage Strategy*

CC: Thomas Callaway – Hampshire County Council (LLFA)

Appendix A



Hampshire County Council

Universal Services
The Castle
Winchester, Hampshire SO23 8UD

Tel: 0300 555 1375
Fax 01962 847055
www.hants.gov.uk

Enquiries to	Thomas Callaway	My reference	SWM/2023/0035
Direct Line	03707 798982	Your reference	F/21/91183
Date	9 February 2023	Email	swm.consultee@hants.gov.uk

Dear Sir/Madam,

Redevelopment of a brownfield site to include the provision of 4No. Apartment blocks comprising of 90No. residential dwellings (including 27 affordable units) (Use class C3 residential), parking, public open space, landscaping and other associated works, including demolition of existing buildings on site, with access from Palk Road at Land at, Palk Road, Havant(Application No. APP/22/01231

Hampshire County Council as Lead Local Flood Authority has provided comments in relation to the above application in our role as statutory consultee on surface water drainage for major developments.

This response does not reflect the position of Hampshire County Council as the Highway Authority. If there is a potential for the drainage features to be offered for adoption, this will need to be discussed separately with Highways development planning as they might not be considered acceptable by the Highway Authority.

In order to assist applicants in providing the correct information to their Local Planning Authority for planning permission, Hampshire County Council has set out the information it requires to provide a substantive response at <https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/planning>

The County Council has reviewed the following documents relating to the above application:

- Flood Risk Assessment & Drainage Strategy 2108040-01 Rev. A (Arden, 7/12/22)

Director of Universal Services
Patrick Blogg

The site is brownfield and is within Flood Zone 1. Climate change modelling has been considered for the Flood Zone, and development is proposed outside of the area at risk. The site is predominantly within an area at very low risk of flooding from surface water, however a portion of the site is at low risk. Floor levels for development in this area should take account of modelled surface water flooded depths. Flood risk is increased adjacent to the site due to the proximity to a watercourse.

The site consists of a lot of made ground and groundwater levels are relatively high, meaning that infiltration will not work as a surface water drainage strategy. A watercourse is adjacent to the site and a surface water sewer passes through the site. The proposed development would result in a reduction in impermeable area.

The discharge rate from the site is to be reduced to the 1 in 100 year greenfield runoff rate, which would provide significant betterment for all storm events based on the existing brownfield runoff rate. Runoff is to be attenuated through permeable paving and attenuation tanks, with two restricted discharge connections into the surface water sewer which discharges to the adjacent watercourse.

If the site already drains to the surface water sewer, the water company may accept any reduction in flows. Otherwise an agreement must be made between the applicant and water company to connect to the sewer. Should this not be possible, a suitable alternative may be possible by way of constructing a private surface water sewer on-site to discharge to the watercourse.

Calculations have been provided for the storage and network, showing very minor flooding at the 1 in 100 year event. Climate change allowances have not been applied to the 1 in 30 year event, this is required to determine whether any flooding occurs in the network for this event. Flood exceedance flow routes have been shown on the layout.

Water treatment and runoff quality has been considered through the simple index approach. Not all roads will be draining through the permeable paving so consideration should be given to providing more permeable paving where road drainage is draining directly to an attenuation tank. Maintenance information has also been provided.

In order for us to provide a substantive response, the following information is required:

- Confirmation that floor levels for development in the low surface water flood risk area will be above modelled flood levels (this is in addition to the modelled Flood Zone area that considers climate change).
- Confirmation of whether there is an existing connection to the surface water sewer or whether approval has been sought from the water

company for a connection into the sewer. An alternative proposal for a new private surface water sewer serving the site and discharging to the watercourse could also be acceptable.

- Peak rainfall allowances should be included for the 1 in 30 year storm event in the calculations, and be shown to not cause flooding.
- Permeable paving areas may need to be increased so that all runoff from roads is suitably treated prior to entering attenuation tanks.
- Flooded extents should also be shown on the layout showing the flood exceedance flow routes.

We require this further information before we can make a decision on whether to recommend to the Local Planning Authority that planning permission is granted.

As a statutory consultee, the County Council has a duty to respond to consultations within **21 days**. The 21 day period will not begin until we have received sufficient information to enable us to provide a meaningful response.

Please ensure all data is sent to us via the relevant Local Planning Authority.

If you require additional guidance on providing the correct information, we recommend you use our **Surface Water Management Pre-application service** which will enable discussions with the reviewing engineer and scope out works that would address the points raised. For full details, please visit: <https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/planning> and click on [pre-application advice request form](#).

This response has been provided using the best knowledge and information submitted by the applicant as part of the planning application at the time of responding and is reliant on the accuracy of that information.

Yours faithfully,



Thomas Callaway
Senior FWM Project Officer

General guidance for the application

It is important to ensure that the long-term maintenance and responsibility for Sustainable Drainage Systems is agreed between the Local Planning Authority and the applicant before planning permission is granted. This should involve discussions with those adopting and/or maintaining the proposed systems, which could include the Highway Authority, Planning Authority, Parish Councils, Water Companies and private management companies.

For SuDS systems to be adopted by Hampshire Highways it is recommended that you visit the website at:

<https://www.hants.gov.uk/transport/developers/constructionstandards> for guidance on which drainage features would be suitable for adoption.

Where the proposals are connecting to an existing drainage system it is likely that the authorities responsible for maintaining those systems will have their own design requirements. These requirements will need to be reviewed and agreed as part of any surface water drainage scheme.

Works in relation to ordinary watercourses

PLEASE NOTE: If the proposals include works to an ordinary watercourse, under the Land Drainage Act 1991, as amended by the Flood and Water Management Act 2010, prior consent from the Lead Local Flood Authority is required. **This consent is required as a separate permission to planning.**

Information on ordinary watercourse consenting can be found at the following link

<https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/c/hangewatercourse>

It is strongly recommended that this information is reviewed before Land Drainage consent application is made.

For guidance on providing the correct information, we recommend you use our **Ordinary Watercourse Consents Pre-application service** and help avoid delays occurring at the formal application stage. A Pre-application service for Ordinary Watercourse Consents is available, allowing consents to go through in a smoother, often more timely manner. For full information please visit:

<https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/c/hangewatercourse>

Havant Borough Council
Development Control
Civic Offices
Civic Centre Road
Havant
Hampshire
PO9 2AX

Our ref: HA/2023/124806/01-L01
Your ref: APP/22/01231
Date: 07 February 2023

Dear Planning,

REDEVELOPMENT OF A BROWNFIELD SITE TO INCLUDE THE PROVISION OF 4NO. APARTMENT BLOCKS COMPRISING OF 90NO. RESIDENTIAL DWELLINGS (INCLUDING 27 AFFORDABLE UNITS) (USE CLASS C3 RESIDENTIAL), PARKING, PUBLIC OPEN SPACE, LANDSCAPING AND OTHER ASSOCIATED WORKS, INCLUDING DEMOLITION OF EXISTING BUILDINGS ON SITE, WITH ACCESS FROM PALK ROAD LAND AT, PALK ROAD, HAVANT

Thank you for the consulting the Environment Agency on the above application.

We have reviewed the information as submitted and set out our position and comments below.

Environment Agency Position

The proposed development will only meet the National Planning Policy Framework's requirements in relation to flood risk if the following **planning condition** is included on any planning permission granted.

Condition

The development shall be carried out in accordance with the submitted flood risk assessment (Flood Risk Assessment for Land at Palk Road, Bedhampton, Havant dated December 2022 carried out by: Ardent Consulting Engineers) and the following mitigation measures it details

- [5.4] Finished floor levels of the resident aspect of this proposal shall be set no lower than 6.93 metres above Ordnance Datum (AOD)

These mitigation measures shall be fully implemented prior to occupation and subsequently in accordance with the scheme's timing/phasing arrangements. The

Environment Agency
Guildbourne House Chatsworth Road, Worthing, West Sussex, BN11 1LD.
Customer services line: 03708 506 506
www.gov.uk/environment-agency

Cont/d..

measures detailed above shall be retained and maintained thereafter throughout the lifetime of the development.

Reason

To reduce the risk of flooding to the proposed development and future occupants

Advice to LPA/Applicant

Flood resistance and resilience

We strongly recommend the use of flood resistance and resilience measures. Physical barriers, raised electrical fittings and special construction materials are just some of the ways you can help reduce flood damage.

To find out which measures will be effective for this development, please contact your building control department. In the meantime, if you'd like to find out more about reducing flood damage, visit the Flood Risk and Coastal Change pages of the planning practice guidance. The following documents may also be useful:

Department for Communities and Local Government: Preparing for floods

<http://www.planningportal.gov.uk/uploads/odpm/4000000009282.pdf>

Department for Communities and Local Government: Improving the flood performance of new buildings: <https://www.gov.uk/government/publications/flood-resilient-construction-of-new-buildings>

The following issues are not within our direct remit or expertise, but nevertheless are important considerations for managing flood risk for this development. Prior to deciding this application we recommend that consideration is given to the issues below. Where necessary, the advice of relevant experts should be sought.

- Adequacy of rescue or evacuation arrangements
- Details and adequacy of an emergency plan
- Provision of and adequacy of a temporary refuge
- Details and adequacy of flood proofing and other building level resistance and resilience measures
- Details and calculations relating to the structural stability of buildings during a flood
- Whether insurance can be gained or not
- Provision of an adequate means of surface water disposal such that flood risk on and off-site isn't increased

Although the majority of the site will likely remain dry in a 100 year return period plus 37% climate change event, the flood risk assessment states Palk Road will be used to vacate the site. As demonstrated in the flood risk assessment, Palk Road will be partially affected by flooding from a 100 year return period plus 37% climate change event, which could restrict access and egress for emergency services.

The Environment Agency does not normally comment on or approve the adequacy of flood emergency response procedures, as we do not carry out these roles during a flood. Our involvement with this development during an emergency will be limited to delivering flood warnings to occupants. In all circumstances where warning and emergency response are fundamental to managing flood risk, we advise local planning authorities to formally consider the emergency planning and rescue implications of new development in making their decisions.

Environmental Permit

The Environmental Permitting (England and Wales) Regulations 2016 require a permit or exemption to be obtained for any activities which will take place:

- on or within 8 metres of a main river (16 metres if tidal)
- on or within 8 metres of a flood defence structure or culverted main river (16 metres if tidal)
- on or within 16 metres of a sea defence
- involving quarrying or excavation within 16 metres of any main river, flood defence (including a remote defence) or culvert
- in a floodplain more than 8 metres from the river bank, culvert or flood defence structure (16 metres if it's a tidal main river) and you don't already have planning permission

For further guidance please visit <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits> or contact our National Customer Contact Centre on 03708 506 506 (Monday to Friday, 8am to 6pm) or by emailing enquiries@environment-agency.gov.uk.

The applicant should not assume that a permit will automatically be forthcoming once planning permission has been granted, and we advise them to consult with us at the earliest opportunity.

Signing up for flood warnings

The applicant/occupants should phone Floodline on 0345 988 1188 to register for a flood warning, or visit <https://www.gov.uk/sign-up-for-flood-warnings>. It's a free service that provides warnings of flooding from rivers, the sea and groundwater, direct by telephone, email or text message. Anyone can sign up.

Flood warnings can give people valuable time to prepare for flooding – time that allows them to move themselves, their families and precious items to safety. Flood warnings can also save lives and enable the emergency services to prepare and help communities.

For practical advice on preparing for a flood, visit <https://www.gov.uk/prepare-for-flooding>.

To get help during a flood, visit <https://www.gov.uk/help-during-flood>.

For advice on what to do after a flood, visit <https://www.gov.uk/after-flood>.

Yours faithfully

Mrs Sophie Brown
Sustainable Places Planning Advisor

Direct dial 0203 0257 250

Direct e-mail planningSSD@environment-agency.gov.uk



Department of Planning and Development
Havant Borough Council
Public Service Plaza
Civic Centre Road
Havant
Hampshire
PO9 2AX

Your ref
APP/22/01231

Our ref
DSA000019841

Date
13/02/2023

Contact
Tel 0330 303 0119

Dear Sir/Madam,

Proposal: Redevelopment of a brownfield site to include the provision of 4No. Apartment blocks comprising of 90No. residential dwellings (including 27 affordable units) (Use class C3 residential), parking, public open space, landscaping and other associated works, including demolition of existing buildings on site, with access from Palk Road.

Site: APP/22/01231: - Land at Palk Road, Havant.

Thank you for your letter dated 23/01/2023.

Please see the attached extract from Southern Water records showing the approximate position of our existing public foul and surface water sewers within the development site. The exact position of the public assets must be determined on site by the applicant in consultation with Southern Water before the layout of the proposed development is finalised.

It appears that the applicant is proposing to abandon/divert a public foul sewer. Any public sewer diversion proposals shall be approved by Southern Water under Section 185 of the Water Industry Act. An application should be made using Southern Water's Get Connected Service at developerservices.southernwater.co.uk

- The public foul sewers requires a clearance of 3 metres on either side of the gravity sewer to protect it from construction works and to allow for future access for maintenance.
- The 750 mm public surface water sewer requires a clearance of 4 metres on either side of the gravity sewer to protect it from construction works and to allow for future access for maintenance.
- No development or tree planting should be carried out within 3 metres of the external edge of the public gravity sewer without consent from Southern Water.
- No soakaways, swales, ponds, watercourses or any other surface water retaining or conveying features should be located within 5 metres of public or adoptable gravity sewers.

- All existing infrastructure should be protected during the course of construction works.

Please refer to: southernwater.co.uk/media/3011/stand-off-distances.pdf

It is possible that a sewer now deemed to be public could be crossing the development site. Therefore, should any sewer be found during construction works, an investigation of the sewer will be required to ascertain its ownership before any further works commence on site.

In order to protect drainage apparatus, Southern Water requests that if consent is granted, a condition is attached to the planning permission; for example, the developer must advise the local authority (in consultation with Southern Water) of the measures which will be undertaken to divert the public sewers, prior to the commencement of the development.

Our investigations indicate that Southern Water can facilitate foul sewerage disposal to service the proposed development. Southern Water requires a formal application for a connection to the public sewer to be made by the applicant or developer.

To make an application visit Southern Water's Get Connected service: developerservices.southernwater.co.uk and please read our New Connections Charging Arrangements documents which are available on our website via the following link: southernwater.co.uk/developing-building/connection-charging-arrangements

The Flood Risk Assessment document indicates surface water flows no greater than existing levels being connected into the public system proving betterment of the surface water flows which would be satisfactory to Southern Water.

The supporting documents make reference to drainage using Sustainable Drainage Systems (SuDS).

Under certain circumstances SuDS will be adopted by Southern Water should this be requested by the developer. Where SuDS form part of a continuous sewer system, and are not an isolated end of pipe SuDS component, adoption will be considered if such systems comply with the latest Design and Construction Guidance (Appendix C) and CIRIA guidance available here:

water.org.uk/sewerage-sector-guidance-approved-documents/

ciria.org/Memberships/The_SuDS_Manual_C753_Chapters.aspx

Where SuDS rely upon facilities which are not adoptable by sewerage undertakers the applicant will need to ensure that arrangements exist for the long-term maintenance of the SuDS facilities. It is critical that the effectiveness of these systems is maintained in perpetuity. Good management will avoid flooding from the proposed surface water system, which may result in the inundation of the foul sewerage system.

Thus, where a SuDS scheme is to be implemented, the drainage details submitted to the Local Planning Authority should:

- Specify the responsibilities of each party for the implementation of the SuDS scheme.
- Specify a timetable for implementation.



- Provide a management and maintenance plan for the lifetime of the development.

This should 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 Council's technical staff and the relevant authority for land drainage consent should comment on the adequacy of the proposals to discharge surface water to the local watercourse.

Land uses such as general hard standing that may be subject to oil/petrol spillages should be drained by means of appropriate oil trap gullies or petrol/oil interceptors.

We request that should this planning application receive planning approval, the following informative is attached to the consent: Construction of the development shall not commence until details of the proposed means of foul sewerage and surface water disposal have been submitted to, and approved in writing by, the Local Planning Authority in consultation with Southern Water.

This initial assessment does not prejudice any future assessment or commit to any adoption agreements under Section 104 of the Water Industry Act 1991. Please note that non-compliance with the Design and Construction Guidance will preclude future adoption of the foul and surface water sewerage network on site. The design of drainage should ensure that no groundwater or land drainage is to enter public sewers.

For further advice, please contact Southern Water, Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX (Tel: 0330 303 0119).

Website: southernwater.co.uk or by email at: SouthernWaterPlanning@southernwater.co.uk

Yours faithfully,

Future Growth Planning Team
Developer Services

southernwater.co.uk/developing-building/planning-your-development

Requested By:



Appendix B

Appendix C

Ardent Consulting Engineers		Page 1
4th Floor, Diamond House 36-38 Hatton Garden London EC1N 8EB		
Date 09/06/2023 16:17 File Palk Rd combined 09.06....	Designed by ccooper Checked by	
Micro Drainage	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.400	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.600
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	29.652	0.198	149.8	0.040	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	23.636	0.158	149.6	0.055	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	7.680	0.051	150.6	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	20.786	0.139	149.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	14.792	0.099	149.4	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	25.370	0.127	200.0	0.025	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	23.816	0.119	200.1	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	24.753	0.083	298.2	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	9.201	0.061	150.8	0.068	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	23.788	0.543	43.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.60	6.700	0.040	0.0	0.0	0.0	0.82	14.5	5.4
1.001	50.00	6.08	6.502	0.095	0.0	0.0	0.0	0.82	14.5	12.9
1.002	50.00	6.20	6.269	0.151	0.0	0.0	0.0	1.06	42.3	20.4
1.003	50.00	6.53	6.218	0.151	0.0	0.0	0.0	1.07	42.4	20.4
1.004	50.00	6.76	6.079	0.193	0.0	0.0	0.0	1.07	42.4	26.2
2.000	50.00	5.46	5.650	0.025	0.0	0.0	0.0	0.92	36.6	3.4
2.001	50.00	5.89	5.523	0.064	0.0	0.0	0.0	0.92	36.6	8.6
1.005	50.00	7.22	5.329	0.306	0.0	0.0	0.0	0.91	64.0	41.4
3.000	50.00	5.19	6.000	0.068	0.0	0.0	0.0	0.82	14.4	9.3
3.001	50.00	5.45	5.939	0.068	0.0	0.0	0.0	1.52	26.9	9.3

Ardent Consulting Engineers		Page 3
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Micro Drainage Network 2020.1		

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
4.004	7.200	5.865	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs		0	Number of Storage Structures
Number of Online Controls		4	Number of Time/Area Diagrams
Number of Offline Controls		0	Number of Real Time Controls

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Orifice Manhole: 15, DS/PN: 1.002, Volume (m³): 1.7

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 6.269

Hydro-Brake® Optimum Manhole: 20, DS/PN: 1.007, Volume (m³): 2.4

Unit Reference	MD-SHE-0119-7000-1300-7000
Design Head (m)	1.300
Design Flow (l/s)	7.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	119
Invert Level (m)	5.208
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	7.0
Flush-Flo™	0.382	7.0
Kick-Flo®	0.810	5.6
Mean Flow over Head Range	-	6.1

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	4.2	1.200	6.7	3.000	10.4	7.000	15.5
0.200	6.5	1.400	7.2	3.500	11.2	7.500	16.0
0.300	6.9	1.600	7.7	4.000	11.9	8.000	16.6
0.400	7.0	1.800	8.1	4.500	12.6	8.500	17.0
0.500	6.9	2.000	8.6	5.000	13.2	9.000	17.5
0.600	6.7	2.200	9.0	5.500	13.8	9.500	18.0
0.800	5.7	2.400	9.3	6.000	14.4		
1.000	6.2	2.600	9.7	6.500	15.0		

Orifice Manhole: 23, DS/PN: 4.002, Volume (m³): 0.8

Diameter (m) 0.070 Discharge Coefficient 0.600 Invert Level (m) 6.544

Hydro-Brake® Optimum Manhole: 25, DS/PN: 4.004, Volume (m³): 2.1

Unit Reference	MD-SHE-0096-4000-0900-4000
Design Head (m)	0.900
Design Flow (l/s)	4.0

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<u>Storage Structures for Storm</u>																										
<u>Porous Car Park Manhole: 14, DS/PN: 1.001</u>																										
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	30, 100
Climate Change (%)	40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	13	15 Winter	30	+40%	30/15 Summer	100/15 Summer		
1.001	14	30 Winter	30	+40%	30/15 Summer			
1.002	15	120 Winter	30	+40%	30/15 Summer			
1.003	16	120 Winter	30	+40%				
1.004	17	15 Winter	30	+40%	100/240 Winter			
2.000	20	240 Winter	30	+40%	30/15 Summer			
2.001	7	240 Winter	30	+40%	30/15 Summer			
1.005	18	240 Winter	30	+40%	30/15 Summer			
3.000	19	480 Winter	30	+40%	100/120 Winter			
3.001	20	360 Winter	30	+40%	30/60 Winter			
1.006	19	240 Winter	30	+40%	30/15 Summer			
1.007	20	240 Winter	30	+40%	30/15 Summer			
4.000	21	15 Winter	30	+40%	30/15 Summer			
4.001	22	15 Winter	30	+40%	30/15 Summer			
4.002	23	120 Winter	30	+40%	30/30 Winter			
5.000	24	240 Winter	30	+40%	30/60 Summer			
5.001	27	240 Winter	30	+40%	30/15 Summer			
6.000	25	240 Winter	30	+40%	30/30 Summer			
6.001	29	240 Winter	30	+40%	30/15 Summer			

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4th Floor, Diamond House 36-38 Hatton Garden London EC1N 8EB		
Date 09/06/2023 16:17	Designed by ccooper	
File Palk Rd combined 09.06....	Checked by	
Micro Drainage		Network 2020.1

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

US/MH		Return Climate		First (X)	First (Y)	First (Z)	Overflow	Water Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow Act.	(m)
4.003	24	240 Winter	30	+40%	30/15 Summer			6.468
4.004	25	15 Winter	30	+40%	30/15 Summer			6.494

US/MH		Surcharged	Flooded	Flow / Overflow		Half Drain	Pipe	Level	
PN	Name	Depth (m)	Volume (m³)	Cap.	(l/s)	Time (mins)	Flow (l/s)	Status	Exceeded
4.003	24	0.237	0.000	0.10			3.9	SURCHARGED	
4.004	25	0.371	0.000	0.13			3.9	SURCHARGED	

<

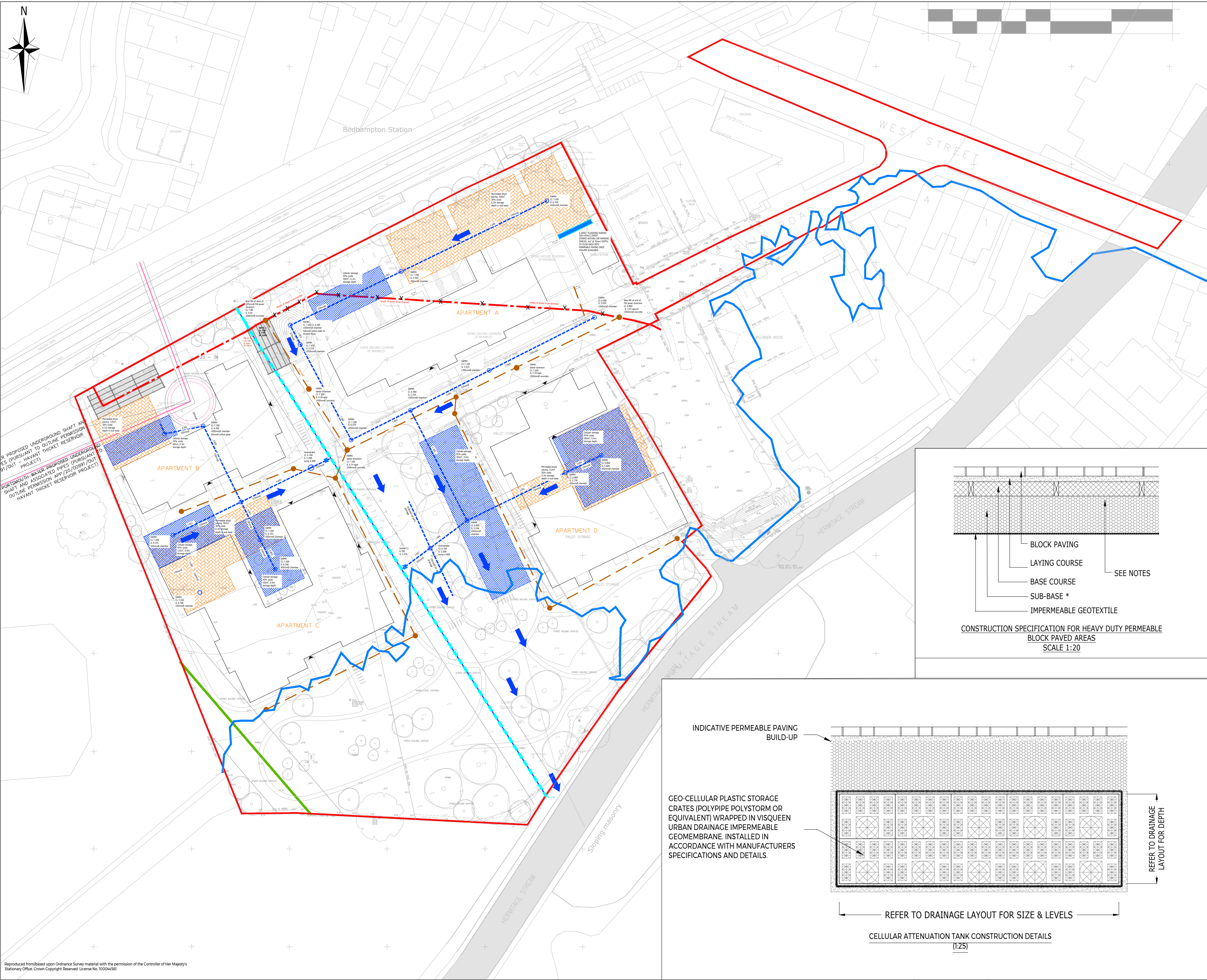
Ardent Consulting Engineers		Page 12
4th Floor, Diamond House 36-38 Hatton Garden London EC1N 8EB		
Date 09/06/2023 16:17 File Palk Rd combined 09.06....	Designed by ccooper Checked by	
Micro Drainage Network 2020.1		

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	13	7.450	0.600	0.269	1.41		19.5	FLOOD
1.001	14	7.196	0.544	0.000	0.91	60	12.5	FLOOD RISK
1.002	15	7.186	0.692	0.000	0.14		4.6	FLOOD RISK
1.003	16	6.316	-0.127	0.000	0.12		4.5	OK
1.004	17	6.306	0.002	0.000	0.26		9.6	SURCHARGED
2.000	20	6.313	0.438	0.000	0.42		14.1	SURCHARGED
2.001	7	6.301	0.553	0.000	0.22		7.4	SURCHARGED
1.005	18	6.296	0.667	0.000	0.39		22.4	SURCHARGED
3.000	19	6.286	0.136	0.000	0.19	434	2.4	SURCHARGED
3.001	20	6.286	0.197	0.000	0.09		2.4	SURCHARGED
1.006	19	6.288	0.742	0.000	0.12	422	6.4	SURCHARGED
1.007	20	6.283	0.775	0.000	0.12		7.0	SURCHARGED
4.000	21	7.293	0.443	0.000	1.42		19.1	FLOOD RISK
4.001	22	7.072	0.333	0.000	2.90		35.7	FLOOD RISK
4.002	23	6.789	0.095	0.000	0.35	87	4.7	SURCHARGED
5.000	24	6.604	0.254	0.000	0.12	331	1.5	SURCHARGED
5.001	27	6.603	0.298	0.000	0.09		1.5	SURCHARGED
6.000	25	6.608	0.258	0.000	0.18	335	2.3	SURCHARGED
6.001	29	6.605	0.302	0.000	0.15		2.3	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	13	2
1.001	14	
1.002	15	
1.003	16	
1.004	17	
2.000	20	
2.001	7	
1.005	18	
3.000	19	
3.001	20	
1.006	19	
1.007	20	
4.000	21	
4.001	22	
4.002	23	
5.000	24	
5.001	27	
6.000	25	
6.001	29	

Appendix D



NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
- DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
- ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
- DRAWING BASED ON PROPOSED SITE LAYOUT PLAN, DRAWING NUMBER 21085 - 101 - Proposed Site Layout BY AD, DATED NOV 2022
- TOPOGRAPHICAL SURVEY BY DORSET LAND SURVEYING, DRAWING NUMBER 7726, DATED 10.21.2021.
- PREDICTED FLOOD EXTENTS WERE MODELLED BY ARDENT CONSULTING ENGINEERS. THE FLOOD MODELLED WAS A 1 IN 100 YR EVENT WITH A 37% ACCOUNTING FOR CLIMATE CHANGE.
- THE MINIMUM FINISHED FLOOR LEVEL SHOULD BE SET AT 6.93mAOD.
- AREAS WITHIN THE PREDICTED FLOOD EXTENTS AND THE PROPOSED DEVELOPMENT BOUNDARY TO REMAIN AT EXISTING LEVELS .

PERMEABLE PAVING NOTES

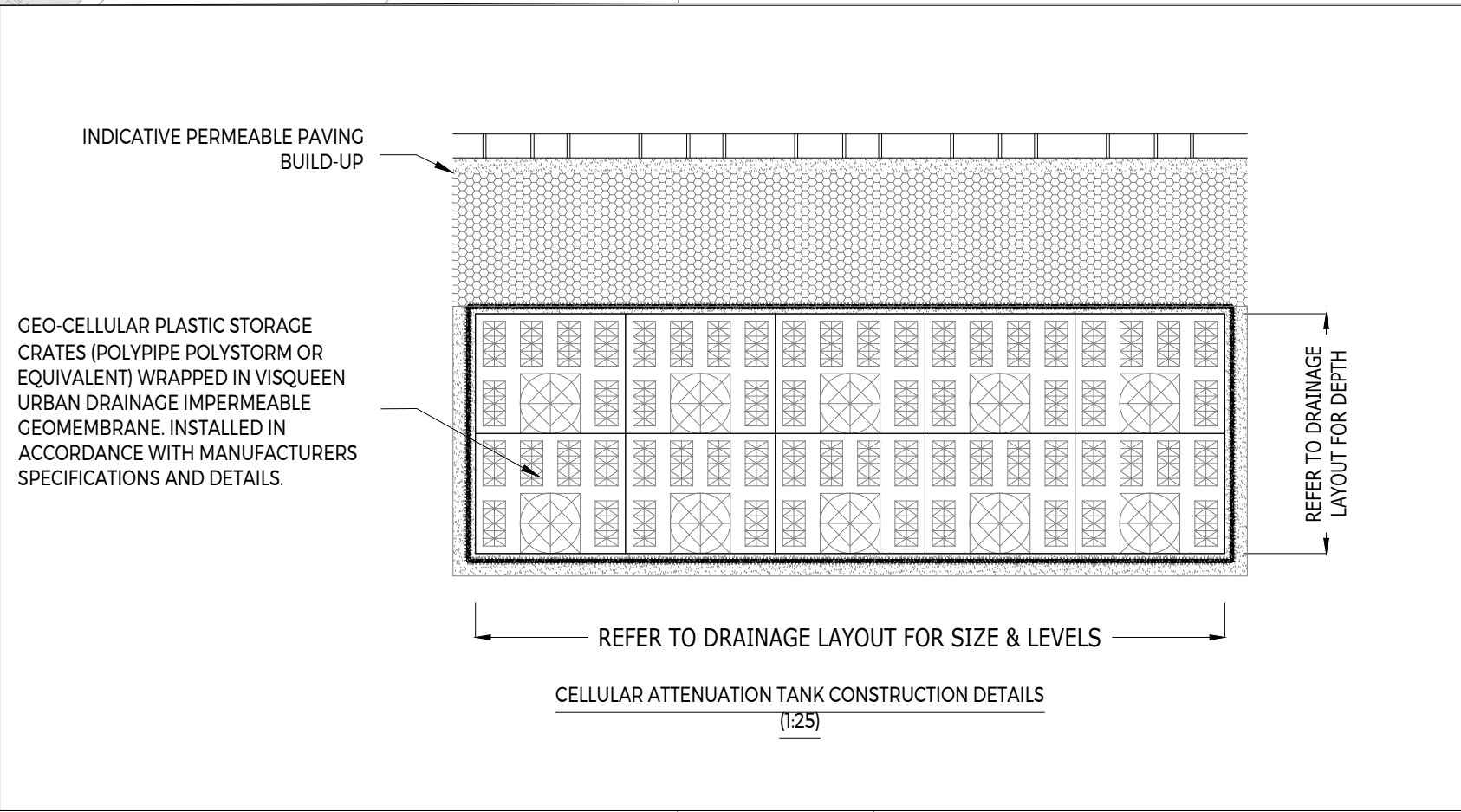
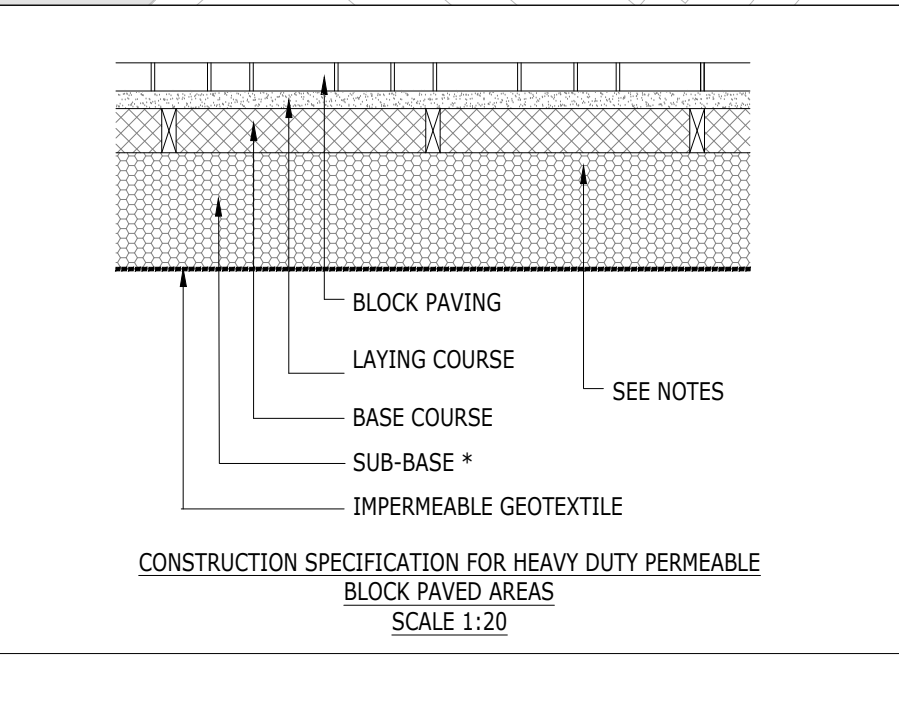
HEAVY DUTY: TO BE USED FOR ALL SHARED DRIVES, PARKING COURTS AND PRIVATE ACCESS ROADS

* THE FORMATION OF THE PERMEABLE PAVING SUB-BASE MUST NOT EXCEED A GRADIENT OF 1/40.

FOR STEEPER GRADIENTS, USE MAXIMUM GRADIENT OF 1/40 FOR FORMATION, APPLYING VERTICAL STEPS AS NECESSARY, BUT ENSURING MINIMUM SUB-BASE THICKNESS IS ALWAYS ACHIEVED.

PERMEABLE PAVING CONSTRUCTION SPECIFIED ABOVE IS SUITABLE FOR CBR VALUES OF BETWEEN 2% & 5%. FOR CBR VALUES OUTSIDE OF THIS RANGE, REFER BACK TO THE ENGINEER FOR CLARIFICATION.

ALL MATERIAL SPECIFICATION AND WORKMANSHIP OF PERMEABLE PAVING CONSTRUCTION TO BE STRICTLY IN ACCORDANCE WITH RECOMMENDATIONS BY MARSHALLS.



- KEY**
- SITE BOUNDARY
 - INDICATIVE FOUL WATER SEWER
 - INDICATIVE SURFACE WATER SEWER
 - INDICATIVE PERMEABLE PAVING (30% VOIDS)
 - INDICATIVE ATTENUATION TANK (95% VOIDS)
 - EXISTING SOUTHERN WATER SURFACE WATER SEWER
 - EXISTING SOUTHERN WATER FOUL SEWER
 - EXISTING SOUTHERN WATER FOUL SEWER TO BE ABANDONED
 - HYDROBRAKE FLOW CONTROL STRUCTURE
 - ✕ NON-RETURN VALVE
 - 1 IN 100 YEAR + 37% CC FLUVIAL FLOOD EXTENT
 - EXCEEDANCE FLOW ROUTES

D	FLOOD VOLUME ADDED	TA	CC	BC	09.06.23
C	MINOR UPDATES	TA	CC	BC	24.05.23
B	UPDATED FOR LLFA COMMENTS	TA	CC	BC	16.05.23
A	PLANNING ISSUE	TD	CC	BC	11/11/22
Rev	Description	Drn	Chk	App	Date

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Client

BELLWAY HOMES (WESSEX)

Project Title

LAND AT PALK ROAD, HAVANT

Drawing Title

FOUL AND SURFACE WATER DRAINAGE STRATEGY

A2 Scale	Date	Designed by
1:500	MAY 23	TD
Drawn by	Checked by	Approved by
FH	CC	BC
Drawing Number	2108040-001	
Rev	D	