Technical design report

Project name	27280 - Bicester Motion Innovation Quarter		
Design note title	Discharge of Condition 16 & 17		
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1. Introduction

1.1 Scope of The Report

Hydrock have been appointed by Bicester Motion to provide a Drainage Strategy report for the approval of Oxfordshire County Council Lead Local Flood Authority.

The proposed technical report will be in accordance with national guidelines and will incorporate a 'best practise' approach in reducing the impact of the flooding caused by the new development.

The report highlights the key stakeholders in terms of ownership and maintenance to ensure the drainage system is kept well maintained and reduce the risk of failure. Should the network fail at any point, clearly defined ownership liabilities will ensure that problems can quickly be rectified thereby reducing the impact of potential damaged caused by flooding.

1.2 Limitations of The Report

This report has been prepared in connection with the scope as described above and considers the instructions and requirements of the client's needs. It is not intended for and should not be relied upon by any third party.

The information received is summarised within this report. In the event that the information is relied upon and is subsequently found to be incorrect, Hydrock Consultants accepts no responsibility for any direct and/or consequential loss that may occur as a result.

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1.3 References / Design Codes

- BS EN 752 - Drain and Sewer Systems Outside Buildings.
- Building Regulations Approved Document Part H - Drainage and waste disposals.
- Sewer Sector Guidance (where applicable).
- Local Authority Guidance.
- CIRIA C753 - SuDS Manual.
- National Planning Policy Framework (NPPF).
- DEFRA Non-Statutory Technical Standards for Sustainable Drainage.

2. Relevant Conditions

Condition 16:

"No development shall take place until a detailed design and associated management and maintenance plan of surface water drainage for the site using sustainable drainage methods, to include a fully detailed list of all SuDS features to be used on site, has been submitted to and approved in writing by the Local Planning Authority.

The detailed design shall be based on the principles as set out in: Ridge Flood Risk and Drainage Assessment, 12th November 2019. 5002854-RDG-XX-ST-PL-C-0503-B-F.A.S.T. -Surface Water Drainage DRAWING 5002854-RDG-XX-XX-DOC-C-0552 App D SW Drainage Strategy 5002854-RDG-XX-XX-DOC-C-0552 App E Source Control Calc 5002854-RDG-XX-XX-DOC-C-0552-3.0-F.A.S.T.- Flood Risk and Drain REPORT and shall include:

a) Information about the design storm period and intensity (1 in 30 & 1 in 100 (+40% allowance for climate change), discharge rates and volumes (both pre and post development), temporary storage facilities, means of access for maintenance, the methods employed to delay and control surface water discharged from the site, and the measures taken to prevent flooding and pollution of the receiving groundwater and/or surface waters;

b) Any works required off-site to ensure adequate discharge of surface water without causing flooding or pollution (which should include refurbishment of existing culverts and headwalls or removal of unused culverts where relevant);

c) Flood water exceedance routes, both on and off site;

d) A timetable for implementation;

e) Site investigation and test results to confirm infiltrations rates.

The surface water drainage scheme shall be implemented in accordance with the approved detailed design prior to the first use of any building commencing and shall be managed and maintained thereafter in accordance with the agreed management and maintenance plan.

Reason: To ensure that the development is served by sustainable arrangements for the disposal of surface water, to comply with Policy ESD6 of the Cherwell Local Plan 2011 – 2031 Part 1, Saved Policy ENV1 of the Cherwell Local Plan 1996 and Government advice in the National Planning Policy Framework. This information is required prior to commencement of the development as it is fundamental to the acceptability of the scheme."

Condition 17:

"No buildings hereby permitted shall be bought into use until confirmation has been provided in advance and in writing to the Local Planning Authority that either:

a) all water and wastewater network upgrades required to accommodate the additional flows from the development have been completed; or

b) an infrastructure phasing plan has been agreed with Thames Water to allow additional business units to first be bought into use. Where an infrastructure phasing plan is agreed no use of the buildings shall take place other than in accordance with the agreed infrastructure phasing plan.

Thereafter, the approved water infrastructure improvement works shall be implemented in accordance with the approved details unless otherwise agreed in writing by the Local Planning Authority.

Reason: The development may lead to sewage flooding and network reinforcement works are anticipated to be necessary to ensure that sufficient capacity is made available to accommodate additional flows anticipated from the new development. Any necessary reinforcement works will be necessary in order to avoid sewer flooding and/or potential pollution incidents, to comply with Policy ESD8 of the Cherwell Local Plan 2011-2031 Part 1."

3. Condition 16 – Surface Water

3.1 Previous Consultants Strategy

As part of the initial planning submission Ridge had a proposal of infiltrating direct to ground to form the main method of disposal for the surface water drainage strategy.

However, infiltration tests were undertaken by Ridge (Report 5015203-RDG-XX-ST-DOC-C-00GCA01) during summer months in 6 locations. No infiltration was recorded in three of the locations with infiltration rates in the other three ranged from 1.6 x 10-5 to 7.75 x 10-5 m/s. Groundwater level monitoring during summer were recorded between 0.31m bgl and 2.54m bgl with an average GW level of 1.3m across the site historically and during recent investigation work undertaken by Hydrock (monitoring is still ongoing) between 0.30m – 1.21m bgl.

Whilst infiltration rates show that discharge into natural soils may work in some areas of the site in the summer months, the presence of a shallow groundwater table (which is close to surface in winter) show a thin unsaturated zone with the base of any proposed soakaways within the already saturated zone based on the monitoring results. As such based on the data, there is limited available storage capacity to consider drainage via infiltration viable.

In addition, it should be noted that shallow infiltration will only be viable where Made Ground is not present. As Made Ground is present across the site and locally deep where Made Ground – Landfill is present, this should only be considered where Made Ground is removed to prevent the risk of mobilising contaminants within the soils. Furthermore silt/clay from the weathered Cornbrash Formation is present which may limit infiltration at shallow depths.

As such, based on the potential contamination and the shallow groundwater levels, infiltration drainage is not considered suitable, therefore alternative measure will need to be explored

3.2 Pre-Development Surface Water Catchment Areas

Below is an indication of the pre-development catchment type area for the site.

Table 3.1: Pre-Development Catchment Areas

Catchment	**Area 1** (sqm)	**Area 2** (sqm)
Impermeable		
Building / Roof	0	0
Roads / Hardstanding	0	0
Permeable		
Soft Landscaping	28,030	8,040
Total Area	**36,070**	

3.3 Pre-Development Surface Water Run-Off Rates - Greenfield

In order to determine the post-development surface water flows, an assessment has been carried out on the pre-development to ensure that the run-off from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network.

In line with the Non-Statutory Technical Standard for Sustainable Drainage S2 (Peak Flow Control) it is a requirement that on new developments consideration be given to limit discharge as close as reasonably

practical to the equivalent 'Greenfield' rate for the corresponding storm event. Below considers what the maximum surface water discharge from the site would be if the site was 'Greenfield' i.e., not developed:

Table 3.2: Pre-Development Greenfield Run-Off Rates

Storm Event	Maximum Run-Off Rate (l/s) Area 1	Maximum Run-Off Rate (l/s) Area 2
Q1 Year (1 in 1 Year)	9.2	2.6
Q30 Year (1 in 30 Year)	24.5	7.0
Q100 Year (1 in 100 Year)	34.5	9.9
Qbar	**10.8**	**3.1**

3.4 Pre-Development Flood Exceedance

Topographical survey information indicates that, overland flows would follow the site topography and be directed south / southeast towards the existing watercourse.

3.5 Run-off Destinations

An appraisal should be undertaken to confirm the most suitable and sustainable method for managing surface water runoff from the development in accordance with the following hierarchy as highlighted in Part H of Building Regulations and the National Planning Policy Framework (NPPF):

1. Infiltration to the ground using a sustainable drainage system.
2. If this is not feasible, discharge to a watercourse or river; generally, at a controlled rate unless it does not affect flood risk e.g., if to the sea or an estuary.
3. Discharge at a controlled rate to a surface water sewer or drain.
4. Discharge at a controlled rate to a combined sewer system, with the approval from the Water Authority.
5. Only if the above have all been investigated and it has been proved that none of these options are suitable will discharge at a controlled rate to a foul sewer system, with the approval from the Water Authority.

The discharge of surface water run-off has been considered in accordance with the hierarchical approach:

Table 3.3: Review of the Drainage Hierarchy

Method	Reasoning	Suitability
Interception / Reuse	No achievable due to the type of building (symphonic requirements)	X
Infiltration	Refer to section 3.1	X
Surface Water Body	Discharge to the adjacent watercourse feasible.	✓
Surface Water Sewer	Not applicable.	X
Combined Sewer	Not applicable.	X
Foul Water Sewer	Not applicable.	X

3.6 SuDS Assessment

The design of the surface water drainage system should seek to implement and maximise the use of Sustainable Drainage Systems (SuDS) where possible.

The primary purpose of a SuDS system is to manage surface water run-off within a development via mimicking natural methods, attenuating additional water volume generated by the introduction of impermeable areas whilst providing a degree of water treatment to run-off alongside amenity and biodiversity benefits to the local community.

The suitability and benefits of the various potential SuDS systems for the proposed development should be considered, which will aim to maximise the 4 pillars of SuDS:

- Water Quantity (Controlling runoff);
- Water Quality (Managing quality of runoff);
- Amenity (Create and sustain better places for people);
- Biodiversity (Create and sustain better places for nature).

The implementation of SuDS can be divided into the management of sources and of the wider site and even region, with preference given to source control.

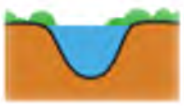
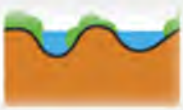
3.7 Suitability of SuDS Elements

The drainage design should adopt the principles of SuDS where appropriate taking into consideration the site context and location. The principals of SuDS are that they should be designed to maximise the opportunities and benefits that can be secured surface water run-off management in terms of quality, quantity, flood risk, and amenity. The implementation and selection of SuDS techniques is largely dependent on the site layout and context. Some SuDS techniques may be more appropriate than others.

The suitability of SuDS components has been assessed as follows:

Table 3.4: Suitability of SuDS Components

Hierarchy	System	Description	Suitability
Source Control	Green Roofs 	A planted soil layer on the roof of a building: stores water in the soil layer to be absorbed by vegetation. Reduces runoff and treats pollutants.	No.
	Rainwater Harvesting 	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally.	No.
	Permeable Surfaces 	Surfaces that allow water to penetrate into underlying layers to be stored, collected, or made to infiltrate to groundwater.	Yes.

	Bioretention Area 	A vegetated area with gravel and sand layers below designated to channel, filter and cleanse water vertically, to then be stored, collected or made to infiltrate to groundwater.	No.
Hierarchy	**System**	**Description**	**Suitability**
Site and Regional Control	Filter Strip 	Grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	Yes.
	Soakaway 	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	No.
	Swale 	Shallow depressions to convey and filter water. May be 'wet' with above ground attenuation or 'dry' with a gravel layer. Can be made to infiltrate to groundwater.	Yes.
	Hardscape Storage 	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	No.
	Pond / Basin 	Store and treat water. Ponds have a level of standing water whereas basins are generally dry. Can be made to infiltrate to groundwater.	Yes.
	Wetland 	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	No.
	Underground Storage	Water can be stored in tanks, gravel, or plastic crates beneath the ground to provide attenuation.	No.

3.8 Interception Storage

Interception can be defined as the capture and retention on site of the first 5mm of the majority of all rainfall events. Interception mechanisms have been assessed to show the site is compliant for zero run-off from the first 5mm for 80% of events during the summer and 50% in winter.

Table 3.5: Interception Storage Systems

System	Reasoning	
Green Roofs	All surfaces that have green / blue roofs	X
Rainwater Harvesting	All surfaces drained to RWH systems designed whether for surface water management or just water supply, provided the RWH system design is based on regular daily demand for non-potable water	X
Soakaways / Infiltration	Areas of the site drained to systems that are designed to infiltrate run-off for events greater than a 1 month return period.	X
Permeable Pavements	All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement.	✓
Filter Strips / Swales	Roads drained by filters strips / swales, where the longitudinal gradient of the vegetated area is less than 1:100, are suitable for interception delivery for impermeable areas up to 5 times the base of the vegetated surface area receiving the runoff.	✓
Infiltration Trenches	Roads drained by infiltration trenches can be considered to provide interception	X
Detention Basins	Areas of the site drainage to detention basin with a flat base can be assumed to comply. The area of the basin that is assumed to contribute to interception of run-off should be below the outlet of the basin.	✓
Bioretention / Rain Gardens	Areas of the site drainage to unlined bioretention components can be assume to comply where the impermeable area is less than 5 times the vegetated surface area receiving run-off/ They can be designed to deliver interception for larger areas, where suitable infiltration capacity is available.	X
Ponds	Areas drained by ponds (with a permanent water pool that is effectively maintained by the outlet structure) are not assumed to deliver interception	X

4. Post-Development Surface Water Management Strategy

4.1 Proposed Surface Water Drainage Strategy

The below ground surface drainage system will now connect all new rainwater pipes, channels, and gullies at ground floor level and discharge firstly through preamble paving, into a conveyance pipe which runs along the car park edge into a series of offline / online basins. The run-off will then be discharged into the adjacent existing watercourse at the suitable Qbar rate. The site will be split in two areas, either the of the entrance, to account for levels and increased SuDS methods.

Permeable paving will be specified to all areas around the buildings as well as the car parks and bays. Open graded crushed rock will act as storage, while also conveying to the various basins, south of the site.

Pipework will be kept at a minimal with only conveyance pipes used to discharge the un-off towards the basins.

It will be a gravity system without the need for pumping.

Where applicable, the surface water management strategy has incorporated the recommendations of the 'Non-Technical Standards for Sustainable Drainage' and general 'good practice' in terms of providing a Sustainable Drainage System (SuDS) that does not adversely impact flood risk either within the site or beyond the development boundary.

4.2 Post-Development Surface Water Catchment Areas

Below is an indication of the post-development catchment type area.

Table 4.1: Pre vs Post-Development Catchment Areas

Catchment	**Area 1** (sqm)	**Area 2** (sqm)
Impermeable		
Building / Roof	0	0
Roads / Hardstanding	0	0
Permeable		
Soft Landscaping	28,030	8,040
Total Area	**36,070**	

4.3 Post-Development Surface Water Run-Off Rates - Greenfield

In order to determine the post-development surface water flows an assessment has been carried out to ensure that the flows from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network.

Due to the nature of the development and its current arrangement, it is considered feasible for this site to reduce to Greenfield Run-off Rates and restricting to 10.8 and 3.1 l/s respectively.

4.4 Allowance for Climate Change and Urban Creep

In accordance with EA guidance, an allowance for climate change has been incorporated into the design (40%) to ensure that the proposed surface water network has a suitable degree of resilience. These allowances vary with the expected lifetime of the development.

4.5 Post-Development Surface Water Volumes

In line with the Non-Statutory Technical Standard for Sustainable Drainage S4 & S5 (Volume Control), where reasonably practicable, for Greenfield developments the runoff volume from the development to any highway drain, sewer, or surface water body in the 1 in 100 year, 6-hour rainfall event should never exceed the Greenfield Run-Off Volume for the same event.

Table 4.2: Pre- vs Post-Development Run-Off Volumes for the 1-in-100 year, 6-hour Rainfall Event

Pre-Development Run-Off Volume	Post-Development Run-Off Volume	-/+ (m^3)	Betterment (%)
958	1708	750	-75%

Where there is an increase in the volume of run-off as a result of the development, infiltration or other SuDS techniques should be considered to mitigate volume run-off. However due to the soil type onsite, minimal infiltration will occur therefore infiltration techniques are considered unsuitable for the site. It is therefore proposed to utilise further SuDS features to attenuate storm water on site prior to discharge into the existing downstream network.

In line with the Non-Statutory Technical Standard for Sustainable Drainage S6 (Flood Risk), where it has not been possible to reduce all the additional volume by infiltration or other SuDS techniques, the volume of run-off should be discharged in accordance with one of the following rates of run-off, whichever is the higher.

Table 4.3: Discharge Limits

Volume requirements	
The peak discharge rate has been reduced to pre-development 1-year peak flow rate	X
The peak discharge rate has been reduced to the site's estimated mean annual flood flow rate (Qbar). OR	✓
The peak discharge rate has been reduced to 2l/s/ha.	
The limiting discharge rate requires a flow rate of less than 5l/s at a discharge point, therefore up to 5l/s	X

4.6 Post-Development Flood Exceedance

In line with the Non-Statutory Technical Standard for Sustainable Drainage S9 (Flood Risk) In the event that there is a failure of the surface water drainage network beyond the design storm or through other circumstances, exceedance flows will be directed away from buildings and critical infrastructure. Flows from the buildings, main car park and central link road will be directed south of the site towards the existing watercourse. The north link road with fall back to the building, but the low point will be created in the paving to direct exceedance away from the units. Bays to the north will fall north away from the site.

4.7 Water Quality

Consideration must be given both during construction and post-development to ensure that water quality is not negatively impacted. Table 26.2 of The SuDS Manual identifies the overall pollution hazard indices from the site, as shown below.

Table 4.4: Pollution Hazards

Land Use	Hazard Level	TSS	Metal	Hydro-carbons	
Other roofs (typically commercial / industrial roofs)	Low	0.3	0.2-0.8	0.05	✓
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads / motorways	Medium	0.7	0.6	0.7	✓

Table 26.3 of The SuDS Manual provides various mitigation indices for discharge to surface waters. The mitigation indices for SuDS elements that are included within the proposed development are shown below.

Table 4.5: Pollution Mitigation

Indicative SuDS mitigation indices for discharge of surface water			
	Mitigation indices		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately 1 in 1 year return period event, for inflow concentration relevant to the contributing drainage area		

Refer to below tables for a summary comparing the mitigation and pollution indices for each identified land usage classification.

Other Roofs	TSS	Metals	Hydrocarbons
Pollution Index	0.3	0.2	0.05
Mitigation Index (PP & Basin)	1.2	1.1	1.3
Net Pollution	-0.9	-0.9	-1.25
Comments	Permeable paving and basins will work as a management train downstream of the roof outlets.		

Residential Carpark	TSS	Metals	Hydrocarbons
Pollution Index	0.7	0.6	0.7
Mitigation Index (Permeable Paving)	1.7	1.7	1.9
Net Pollution	-1.0	-1.1	-1.2
Comments	Permeable paving, swales and basins effectively mitigates the pollution risk from the car park. Propriety systems (Aqua Swirls) will also be applied for further mitigation		

Based on the above tables the water quality criteria of document Ciria C753 - The SuDS Manual is satisfied.

Provided that the mitigation indices of the various treatment trains meet or exceed the requirements of each pollutant, it is expected that there will be no reduction in the quality of water being discharged into the watercourse.

4.8 Quality of Surface Water Run-off: Post-Development

In line with the SuDS suitability, the design should seek to provide an appropriate level of water treatment to effectively mitigate the pollution risk associated with the site and not affect the quality of water downstream.

The proposed layout has multiple primary drivers of pollutant risks to the discharge point. The sources, pollutants and mitigations are as follows:

» Carpark

In accordance with Environment Agency Document PPG3 (now withdrawn but considered best practice guidance) the proposed as the car park is greater than 50 spaces or 800m2 it is considered to be 'high risk' in terms of pollution to the surface water network and as such mitigations is deemed to be required. Permeable paving will be proposed to capture hydrocarbons, prior to release into the watercourse.

» Gullies

Gullies and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network.

4.9 Quality of Surface Water Run-off: During Construction

It is anticipated that the during construction adequate provisions will be put in place to ensure the existing drainage is protected to prevent material which could have a negative impact on water quality entering the system.

Some pollution mitigation techniques that are to be considered include:

- Monitoring and managing disposal of site waste. Make sure all waste is correctly dealt with to stop it from spreading.
- Keeping materials such as sand and cement secure. Materials should be located where there isn't risk of them being washed into the drainage system.
- Covering up all drains to prevent waste from ending up in the system.
- Keep the road and paths to the site clean at all times. This will prevent silt and other pollutants from running off into any bodies of water.
- Properly collect and treat any wastewater that is produced.
- Temporary installation of screens within manholes to capture any debris.

4.10 Ownership and Maintenance

The key elements of the foul and surface water drainage system will require periodic maintenance to prevent failure of the system and/or a reduction in capacity of the networks as a whole and the following matrix therefore sets out the various drainage items to be maintained, identifies who is responsible and the frequency of maintenance.

The proposed SuDS features will require maintenance including litter and debris removal, sediment removal, vegetation maintenance and remediation to any damaged structures.

The maintenance requirements will be the responsibility of a private maintenance company. All inspection and maintenance works should take into consideration the implications of 'lone working'. An assessment should be carried out and the risks mitigated accordingly.

Table 4.6: Proposed Schedule of Maintenance for Below Ground Drainage

Permeable Paving - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced

		due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.

Reference should be made to the manufacturer recommendations where applicable

Swale - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain height within specified design range	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for > 48 hours.	Monthly, or when required.
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half early.
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding.	As required.
	Relevel uneven surfaces and reinstate design levels	As required.

	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.

Filter Strip - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain height within specified design range	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g. oils).	Monthly (at start, then half yearly).
	Check flow spreader and filter strip surface for evens gradients.	Monthly (at start, then half yearly).
	Inspect gravel flow spreader upstream of filter strip for clogging.	Monthly (at start, then half yearly).
	Inspect silt accumulation rate and establish appropriate removal frequencies.	Monthly (at start, then half yearly).
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding.	As required.
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance,	As required.

break up silt deposits and prevent compaction of the soil surface.	
Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
Remove and dispose of oils or petrol residues using safe standard practices.	As required.

Detention Basin - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and debris	Monthly.
	Cut grass - for spillways and access routes	Monthly (during growing season), or as required.
	Cut grass - meadow grass in and around basin	Half yearly (spring - before nesting season, and autumn.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect banksides, structure, pipework etc for evidence of physical damage	Monthly.
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required.
	Check any penstocks and other mechanical devices.	Annually.
	Tidy all dead growth before start of season.	Annually.
	Remove sediment from inlets, outlets and forebay.	Annually (or as required).
	Manage wetland plants in outlet pool - where provided.	Annually (as set out in chapter 23 of CIRIA C753).
Occasional maintenance	Reseed areas of poor vegetation growth.	As required.

	Prune and trim any trees and removed cuttings.	Every 2 years, or as required.
	Remove sediment from inlets, outlets, forbay and main basin when required.	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided).
Remedial actions	Repair erosion or other damage by re-turfing or reseeding.	As required.
	Realignment of rip-rap.	As required.
	Repair / rehabilitation of inlets, outlets and overflows.	As required.
	Relevel uneven surfaces and reinstate design levels.	As required.

The following information should be passed to the development operator to ensure that future maintenance is carried out in a safe and proper manner.

A formal review of the risks should be undertaken on an annual basis:

Table 4.7: Proposed Operational Schedule for Below Ground Drainage

Operation	Risks	Mitigating Measures
Access to manholes for Inspection and Maintenance.	1. Confined spaces	1. Entry to confined space to be minimised and, where unavoidable, to be carried out by appropriately trained personnel
Removal of silt from outfall	1. Risk to members of the public 2. Open Water	1. Access to hazardous areas by members of the public to be prohibited. 2. To be carried out by appropriately trained personnel
Removal of silt from drainage channel	1. Risk to members of the public	1. Access to hazardous areas by members of the public to be prohibited

Provided that the surface and foul water strategies as set out in this report, are implemented, it is expected that the primary residual failure would be as a result of some form of failure of the site drainage system during the life of the development. Therefore, regular, ongoing maintenance as set out in the Operations and Maintenance Manual, will be required to ensure that the capacity of the system is maintained as designed.

4.11 Summary

This confirms that there is a change in strategy, whereas Ridge surface design intent was to infiltrate at source, which was unviable due to geological parameters, the new strategy disposes to the next hierarchical approach, and is in line with current standards. With above in mind and considering this is a change from the original Ridge strategy, it is felt that this condition can be discharged accordingly, with all information updated and presented, as requested.

5. Condition 17 – Foul Water

5.1 Previous Consultants Strategy

As part of the initial planning submission Ridge had a proposal of discharging the foul downstream of the adjacent site, just off of Skimmingdish Lane via a onsite pump station and rising main.

5.2 Pre-Development Foul Water Drainage

Public: There are no foul water sewers within the vicinity of the site, including within Skimmingdish Lane.

For the purpose of this report the drainage has been taken from the sewer asset map information only. It is recommended a full drainage CCTV survey is undertaken to determine accurate routes of the existing drainage so the proposed network can be suitably coordinated.

Private: There are no foul water drains within the site extents. The development to the northwest (Technical Site) collects existing infrastructure and discharges to an existing pump station, prior to ultimately discharging to a sewer asset further west of that site.

5.3 Post-Development Foul Water Drainage

The below-ground foul drainage system will now connect all new soil, waste and ventilating pipes, sanitary appliances and gullies at ground level and discharge to a pump station near the entrance of the site. The discharge will then be pumped via a rising main west of the site which ultimately connects to the existing private pump station within the Technical Site, via a "daisy chain" method, within the ownership boundary.

Comments from the supplier on the intended method:

"Proposal is to use a New PS to serve this new commercial development but pumping to gravity network which subsequently drains to the existing PS. Both systems then under the same private ownership by the same client. When pumping to another downstream PS then to save duplication of the emergency storage at the existing PS (daisy chain) it is common to use the downstream PS's HLA to inhibit the upstream New PS, this is best undertaken by hard wired cable running between the 2 PS's which runs in separate cable duct which can largely run in same trench as the RM as it is laid. The New PS Control Panel is then equipped with an inhibit override so that if the downstream PS hits HLA then the upstream New PS is prevented from pumping until this downstream HLA drops out and un-inhibits. The New PS then provides its own Emergency Storage at this facility, whilst the downstream existing PS stores at its own facility. The benefit in daisy chaining in this fashion is that the current pump rate to the Thames Sewer is maintained at the requested and restricted 3.8 lit/sec rate. Another benefit in daisy chaining in this fashion is that the septicity risk is reduced as more flows coming in to the same retained volume within the RM's and systems."

It is intended that only waste flows considered to be 'Domestic' shall be discharged into the foul drainage system. If the site wishes to discharge 'Trade Effluent' into the foul drainage system then will be required to make a formal application to the Sewerage Undertaker accordingly.

The design of all foul sewers and lateral drains must conform to BS EN 752, BS EN 16933, Building Regulations 2010 Part H, planning policy and best practice guidelines (such as SSG Appendix C – Design and Construction Guidance.) wherever applicable. Sanitary systems within building should be designed in accordance with BS EN 12056-2.

5.4 Summary

This confirms that there is a change in strategy, whereas Ridge foul design intent was to discharge offsite within Skimmingdish Lane, the new strategy can keep the flows within the site and discharge to an existing pump station mimicking the existing rate; therefore, not increasing the flow. With above in mind and considering this is a change from the original Ridge strategy, it is felt that this condition is no longer relevant for this site, as there are no additional flows from the development, therefore can be discharged accordingly.

Appendix A – Drainage Designs

SEE INSERT

PROPOSED DRAINAGE - STORM

150Ø@1:100 — STORM WATER DRAIN - **PVCu**
(Structured walled pipe required at diameter >150mm)
Approx. gradient and diameter as noted, 100mm Ø UNO

SW-01 — STORM WATER MANHOLE
PC Ring 1.2m Ø UNO

SW-01 — STORM WATER INSPECTION CHAMBER
PVCu 450mm Ø. Max 1.2m depth - reduced access to 3.0m
Connections over 150mm - chamber to be **RANGE 600**
NOTE: Drawn to 900mm Ø for clarity

RE — STORM RODDING EYE
Ø as noted

SILT TRAP

CONCRETE ENCASEMENT TO PIPE
Refer to limits of cover table drawing 7101

01 & 01A — RAIN WATER OUTLET
Shown indicative, refer to architect for setting out.
Branch Ø to suit RWO diameter.
01 - Outlet connects into standard 90° rest bend.
01A - Indicates access required in above slab plumbing for rodding, refer to service engineers drawings for details.

AG — RAIN WATER OUTLET ACCESS GULLY
Branch Ø to be max 100mm .
AG - Outlet connects to gully.

RG — ROAD GULLY (to be trapped)

YG — YARD GULLY (to be trapped)

PG — PAVED AREA GULLY (to be trapped)

ACO — DRAINAGE CHANNEL
(Refer to layout for specification)

TH — THRESHOLD DRAINAGE CHANNEL
(Assumed not required. Architect to confirm.
Refer to architect for details / specification)

LEGEND

PROPOSED DRAINAGE - FOUL

100Ø@1:100 — FOUL WATER DRAIN - **PVCu**
Approx. gradient and diameter as noted, 100mm Ø UNO

FW-01 — FOUL WATER MANHOLE
PC Ring 1.2m Ø UNO

FW-01 — FOUL WATER INSPECTION CHAMBER
PVCu 450mm Ø. Max 1.2m depth - reduced access to 3.0m
Connections over 150mm - chamber to be **RANGE 600**
NOTE: Drawn to 900mm Ø for clarity

Note: All internal foul MH's and IC's to have recessed covers. double sealed and locking to prevent odours. Refer to layout for location.

SAC — FOUL WATER SHALLOW ACCESS CHAMBER
Max depth to invert 600mm from GL, 300mm Ø

RE — FOUL RODDING EYE
Ø as noted

YG — FOUL YARD GULLY (to be trapped)
Gully reference as noted on drawing.
Cover grade to suit loading.

FD — FLOOR DRAIN (to be trapped)
Internal use only, refer to architect for details / specification.
Roddable from above slab into standard (01) fitting.
Floor Drain / Gully to be kept charged to avoid odours.

01 & 01A — FOUL OUTLET / STACK POSITION
Shown indicative, refer to architect for setting out.
All branches 100mm Ø UNO.
01 - Outlet connects into standard 90° rest bend.
01A - Indicates access required in above slab plumbing for rodding, refer to service engineers drawings for details.
SVP - Indicates soil vent pipe by service engineer: with access.

PUBLIC AND PRIVATE EXISTING/PROPOSED DRAINAGE

150Ø@1:100 — EXISTING PUBLIC FOUL SEWER

150Ø@1:100 — EXISTING PUBLIC STORM SEWER

150Ø@1:100 — EXISTING PUBLIC COMBINED SEWER

150Ø@1:100 — EXISTING PRIVATE FOUL SEWER

150Ø@1:100 — EXISTING PRIVATE STORM SEWER

150Ø@1:100 — PROPOSED PUBLIC STORM SEWER (BY OTHERS)

150Ø@1:100 — PROPOSED PUBLIC FOUL SEWER (BY OTHERS)

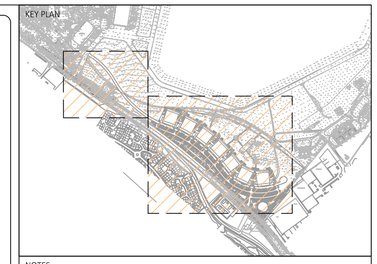
FOUNDATIONS

INDICATES PIPE THROUGH FOUNDATION

T.O.F. 0.000 — TOP OF FOUNDATION (TYPICAL)

INSERT
SCALE 1:1000

KEY PLAN



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4. Levels shown in metres above Ordnance Datum (mAOD).
5. All private drainage to comply with current Building Regulations, BS EN-752 Drain and Sewer systems outside Buildings and other relevant British Standards and Codes of Practices.
6. All external drainage within trafficked areas with less than 1.2m cover to have type Z concrete bed and surround. All external drainage within landscaped areas with cover less than 0.6m to have type Z concrete bed and surround. All drainage with greater cover than the minimum required to have type S bed and surround.
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12. The Contractor should comply with hs(g) 47 "Avoiding Danger from Underground Services" when excavating around existing services.
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14. Contractor to provide temporary screens in each of the down stream manholes during the construction period of the development in accordance with SFA 2.9.10 and the local sewerage undertakers requirements.
15. All in-situ concrete and precast concrete components to be manufactured using Sulphate Resisting Portland Cement, (SRPC) to BS 4027, if required, subject to soil conditions. Manhole components to be to BS EN 1917:2002.
16. All ironwork to be kite marked by BSI or certified by equal inspection authority.
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REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P01	SUITABLE FOR STAGE 3					
	J.MAGEE	03/11/23	J.MAGEE	03/11/23		

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CLIENT
BICESTER MOTION LIMITED

PROJECT
BICESTER MOTION

TITLE
DRAINAGE LAYOUT
SITE WIDE

HYDROCK PROJECT NO.	SCALE @ A1
C-27280	1:1000

STATUS DESCRIPTION	STATUS
SUITABLE FOR STAGE 3	S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
27280-HYD-00-ZZ-DR-C-7010	P01

GROUNDWATER AND CONTAMINATED LAND ISSUES HIGHLIGHTED WITHIN VARIOUS REPORTS. GEOTECHINCAL ENGINEER HAS REVIEWED CONDITIONS AND FULLY CONFIRMED INFILTRATION UNVIABLE. DISCHARGE TO WATER COURSE PROPOSED AS THE ALTERNATIVE DISPOSAL MEASURE.

DRAINAGE NOT SUBMITTED TO LLFA AS PART OF SECTION 73. CONDITIONS STILL STATE INFILTRATION AND AUTHORITY HAVE NOT RECIEVED OR COMMENTED ON CHANGE IN DRAINAGE STRATEGY. FURTHER CONDITIONS MAY BE REQUESTED. TBC.

SA-06 - INFILTRATION RATE: FAILED
REFER TO RIDGE
5015203-RDG-XX-ST-DOC-C-00GCA01-A

SA-05 - INFILTRATION RATE: 4.89x10-5
REFER TO RIDGE
5015203-RDG-XX-ST-DOC-C-00GCA01-A
DEPTH: 72.470

INDICATES KERBDRAIN

LEVELS TO TIE INTO EXISTING

INDICATES SUMP TO CONVEY FLOWS FROM SUB-BASE

STACKS SHOWN INDICATIVE. M&E TO CONFIRM LOCATIONS

KERBDRAIN TO DRAIN INTO SUB-ASE

ALLOW SPUR FOR FUTURE PHASE

INDICATES SUB BASE STORAGE ZONE

RWP'S SHOWN INDICATIVE. ARCHITECTS

SMH_101
CL: 73.94
DP=1.232m
IL(300Ø): 72.71
IL(300Ø): 72.71

SMH_102
CL: 73.99
DP=1.361m
IL(300Ø): 72.63
IL(300Ø): 72.63

SMH_103
CL: 73.95
DP=1.335m
IL(300Ø): 72.61
IL(300Ø): 72.61

SMH_104
CL: 73.87
DP=1.328m
IL(300Ø): 72.57
IL(300Ø): 72.57
IL(300Ø): 72.54

SMH_105
CL: 73.30
DP=0.907m
IL(300Ø): 72.39
IL(300Ø): 72.39

SMH_110
CL: 73.99
DP=1.144m
IL(300Ø): 72.85

SMH_044
CL: 74.18
DP=1.074m
IL(300Ø): 73.11

SMH_112
CL: 74.11
DP=3.400m

SMH_114

FMH_034
CL: 73.86
DP=0.861m
IL(100Ø): 73.00

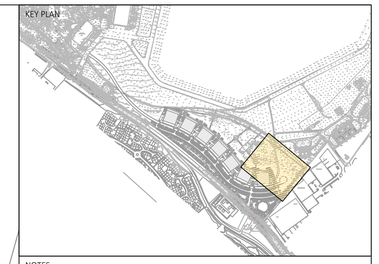
FMH_033

FMH_035

407
74.000

300Ø@1:301
300Ø@1:300
300Ø@1:275
300Ø@1:384
300Ø@1:302
1000@1:48
1000@1:53
1000@1:38

KEY PLAN



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	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P01	SUITABLE FOR STAGE 3					
	J.MAGEE	03/11/23	J.MAGEE	03/11/23		

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CLIENT
BICESTER MOTION LIMITED

PROJECT
BICESTER MOTION

TITLE
DRAINAGE LAYOUT
SHEET 1

HYDROCK PROJECT NO.	SCALE @ A1
C-27280	1:250

STATUS DESCRIPTION	STATUS
SUITABLE FOR STAGE 3	S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
27280-HYD-00-ZZ-DR-C-7011	P01

RWP'S SHOWN INDICATIVE. ARCHITECTS TO CONFIRM LOCATIONS

INDICATES SUB BASE STORAGE ZONE

DEPTH INCREASED TO ALLOW FOR POTENTIAL FUTURE PHASES TO SPUR ONTO GRAVITY CONNECTION

HIT AND MISS KERBS TO ALLOW RUN-OFF TO SWALE

INDICATES FREEBOARD LEVEL: 73.100

SA-04 - INFILTRATION RATE: 7.75x10-5
REFER TO RIDGE
5015203-RDG-XX-ST-DOC-C-00GCA01-A
DEPTH: 70.910

SWALE TO DISCHARGE TO SUB BASE

PUMP STATION CONTROL PANEL TO HAVE INHIBIT OVERRIDE SO THAT IF THE DOWNSTREAM PUMP STATION HITS HLA THEN THE UPSTREAM STATION IS PREVENTED FROM PUMPING UNTIL THE DOWNSTREAM HLA DROPS OUT AND UN-INHIBITS. THE NEW PS PROVIDES ITS OWN EMERGENCY STORAGE AT THIS FACILITY, WHILST THE DOWNSTREAM EXISTING PUMP STATION STORES ITS OWN

SEE PACKAGE PUMP STATION - PPS-01 NOTE

GRASSCRETE (SYSTEM C) - GC-01 (7)
TO BE LOCATED BENEATH CAR PARK.
DRAINED AREA = 2916m²
SRP = 1 IN 100 YR + 40% CLIMATE CHANGE.
STORAGE PROVIDED IN OPEN GRADED CRUSHED ROCK (OGCR) TYPE 3 OR SIMILAR WITH MIN 30% VOIDS.
2781m² x 400mm DEEP

DRY BASIN - BA-02
MAX STORAGE VOLUME = TBCm³
MAX WATER LEVEL = TBC
MAX DEPTH = TBCmm
STORAGE PROVIDED IN ABOVE GROUND BASIN
142m² (BASE) x 1100mm DEEP (WITH 1:4 SIDE SLOPES)
TOP OF BASIN = 73.400
BASE OF BASIN = 72.100
FREEBOARD = 300mm

DRY BASIN - BA-02
MAX STORAGE VOLUME = TBCm³
MAX WATER LEVEL = TBC
MAX DEPTH = TBCmm
STORAGE PROVIDED IN ABOVE GROUND BASIN
142m² (BASE) x 1100mm DEEP (WITH 1:4 SIDE SLOPES)
TOP OF BASIN = 73.400
BASE OF BASIN = 72.100
FREEBOARD = 300mm

INDICATES FREEBOARD LEVEL: 73.100

INDICATES PROPOSED HEADWALL AS PART OF THE S278 WORKS

DRY BASIN - BA-01
MAX STORAGE VOLUME = TBCm³
MAX WATER LEVEL = TBC
MAX DEPTH = TBCmm
STORAGE PROVIDED IN ABOVE GROUND BASIN
105m² (BASE) x 1100mm DEEP (WITH 1:4 SIDE SLOPES)
TOP OF BASIN = 73.400
BASE OF BASIN = 72.100
FREEBOARD = 300mm

INDICATES PROPOSED CULVERT AS PART OF THE S278 WORKS

BASE OF WATERCOURSE AT HEADWALL

HEADWALL - HW-01 (5)
HEADWALL BY ALTHON
TYPE: HC3
IL: 72.060
PIPE Ø: 300mm
HEIGHT: 800mm
WIDTH: 1300mm
DEPTH: 900mm

FLOW CONTROL MANHOLE - FC-01
HYDRO-BRAKE FLOW CONTROL.
DISCHARGE LIMITED TO:
10.8l/s
CL: 73.500
IL: 72.100
HEAD: 1m

RISK
POSSIBLE BREAK OUT OF PROPOSED / EXISTING CULVERT. COORDINATION REQUIRED WITH OFFSITE DRAINAGE TO CONFIRM VIABILITY

FLOW CONTROL MANHOLE - FC-01
HYDRO-BRAKE FLOW CONTROL.
DISCHARGE LIMITED TO:
3.1l/s
CL: 73.500
IL: 72.100
HEAD: 1m

PACKAGE PUMP STATION - PPS-01
XL25,000 PPS (BY TT PUMPS)
TANK SIZE = 2.2mØ x 2.9m DEEP (INCL. SUMP)
SIZED IN ACCORDANCE WITH BREGS REQUIREMENTS
D400 CVR AIRTIGHT COVER LOCKABLE.
DISCHARGE LEVEL: 77.400
CL: 73.460
TWL: 71.360
IL(IN): 69.730
EMERGENCY STORAGE (12HR WORKING DAY): 20m3

OFFSITE DRAINAGE TAKEN FROM BM-LE-HAD-XX-DR-CE-001-005 REV A

SKIMMINGDISH LANE

GROUNDWATER AND CONTAMINATED LAND ISSUES HIGHLIGHTED WITHIN VARIOUS REPORTS. GEOTECHINCAL ENGINEER HAS REVIEWED CONDITIONS AND FULLY CONFIRMED INFILTRATION UNVIABLE. DISCHARGE TO WATER COURSE PROPOSED AS THE ALTERNATIVE DISPOSAL MEASURE.

DRAINAGE NOT SUBMITTED TO LLFA AS PART OF SECTION 73. CONDITIONS STILL STATE INFILTRATION AND AUTHORITY HAVE NOT RECEIVED OR COMMENTED ON CHANGE IN DRAINAGE STRATEGY. FURTHER CONDITIONS MAY BE REQUESTED. TBC.

KEY PLAN

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REV						
P01	SUITABLE FOR STAGE 3					
	J.MAGEE	03/11/23	J.MAGEE	03/11/23		
REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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CLIENT
BICESTER MOTION LIMITED

PROJECT
BICESTER MOTION

TITLE
DRAINAGE LAYOUT
SHEET 2

HYDROCK PROJECT NO.	SCALE @ A1
C-27280	1:250

STATUS DESCRIPTION	STATUS
SUITABLE FOR STAGE 3	S2

DRAWING NO. (PROJECT-CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
27280-HYD-00-ZZ-DR-C-7012	P01

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LEVELS TO TIE INTO EXISTING

INDICATES KERBDRAIN

ROAD TO FALL TOWARDS KERBDRAIN

INDICATES SUMP TO CONVEY FLOWS FROM SUB-BASE

STACKS SHOWN INDICATIVE. M&E TO CONFIRM LOCATIONS

RWP'S SHOWN INDICATIVE. ARCHITECTS TO CONFIRM LOCATIONS

INDICATES PETROL INTERCEPTOR. AQUA SWIRL BY SDS.

SWALE TO DISCHARGE TO SUB BASE

INDICATES BAFFLE IN SUB BASE

INDICATES SUB BASE STORAGE ZONE

INDICATES FREEBOARD LEVEL: 74.100

HIT AND MISS KERBS TO ALLOW RUN-OFF TO SWALE

SA-03 - INFILTRATION RATE: FAILED
REFER TO RIDGE
5015203-RDG-XX-ST-DOC-C-00GCA01-A

SMH_026
CL: 75.44
DP=1.501m
IL(300Ø): 73.94

SMH_033
CL: 74.98
DP=1.475m
IL(300Ø): 73.51
IL(300Ø): 73.51

SMH_032
CL: 74.94
DP=1.294m
IL(300Ø): 73.65

SMH_039
CL: 74.48
DP=1.223m
IL(300Ø): 73.25
IL(300Ø): 73.25

SMH_038
CL: 74.45
DP=1.066m
IL(300Ø): 73.38

SMH_045
CL: 74.26
DP=1.278m
IL(300Ø): 72.98
IL(300Ø): 72.98

SMH_035
CL: 75.23
DP=1.833m
IL(300Ø): 73.40
IL(300Ø): 73.40

SMH_034
CL: 75.05
DP=1.632m
IL(300Ø): 73.42
IL(300Ø): 73.42

SMH_036
CL: 75.17
DP=1.845m
IL(300Ø): 73.34
IL(300Ø): 73.36
IL(300Ø): 73.33

SMH_031
CL: 75.43
DP=1.487m
IL(300Ø): 73.94

SMH_041
CL: 74.74
DP=1.604m
IL(300Ø): 73.14
IL(300Ø): 73.14

SMH_040
CL: 74.55
DP=1.375m
IL(300Ø): 73.17
IL(300Ø): 73.17

SMH_037
CL: 74.92
DP=1.370m
IL(300Ø): 73.55

SMH_042
CL: 74.66
DP=1.564m
IL(300Ø): 73.12
IL(300Ø): 73.12
IL(300Ø): 73.10

SMH_025
CL: 74.90
DP=0.895m
IL(100Ø): 74.00
IL(100Ø): 74.00
IL(100Ø): 74.00

SMH_022
CL: 75.40
DP=0.898m
IL(100Ø): 74.50
IL(100Ø): 74.50
IL(100Ø): 74.50

SMH_006
CL: 74.95
DP=3.246m
IL(150Ø): 71.70
IL(150Ø): 71.70

SMH_005
CL: 75.19
DP=3.193m
IL(150Ø): 71.99
IL(100Ø): 74.30
IL(150Ø): 71.99

FMH_007
CL: 74.71
DP=3.305m
IL(150Ø): 71.41
IL(100Ø): 73.80
IL(150Ø): 71.41

FMH_008
CL: 74.47
DP=3.359m
IL(150Ø): 71.11
IL(150Ø): 71.11

FMH_009
CL: 74.24
DP=3.416m
IL(150Ø): 70.82
IL(100Ø): 73.30
IL(150Ø): 70.82

SMH_028
CL: 74.40
DP=0.901m
IL(100Ø): 73.50
IL(100Ø): 73.50
IL(100Ø): 73.50

SMH_043
CL: 74.42
DP=1.169m
IL(300Ø): 73.25

SMH_047
CL: 74.32
DP=1.435m
IL(300Ø): 72.88
IL(300Ø): 72.88

SMH_048
CL: 74.12
DP=1.309m
IL(300Ø): 72.85
IL(300Ø): 72.85
IL(300Ø): 72.82

SMH_007
CL: 73.90
DP=1.217m
IL(600Ø): 72.69
IL(300Ø): 72.99
IL(600Ø): 72.69

SMH_008
CL: 73.74
DP=1.217m
IL(600Ø): 72.53
IL(600Ø): 72.53

SMH_009
CL: 73.61
DP=1.207m
IL(300Ø): 72.71
IL(600Ø): 72.41
IL(600Ø): 72.41

SMH_006
CL: 74.50
DP=1.667m
IL(600Ø): 72.91
IL(300Ø): 73.21
IL(600Ø): 72.91

403 75.500
404 75.000
405 74.500

FMH_023 FMH_021 FMH_026 FMH_024 FMH_029 FMH_027

GRASSCRETE (SYSTEM C) - GC-01 (4)
TO BE LOCATED BENEATH CAR PARK.
DRAINED AREA = 1798m²
SRP = 1 IN 100 YR + 40% CLIMATE CHANGE.
STORAGE PROVIDED IN OPEN GRADED CRUSHED ROCK (OGCR) TYPE 3 OR SIMILAR WITH MIN 30% VOIDS.
912m² x 400mm DEEP

GRASSCRETE (SYSTEM C) - GC-01 (5)
TO BE LOCATED BENEATH CAR PARK.
DRAINED AREA = 1846m²
SRP = 1 IN 100 YR + 40% CLIMATE CHANGE.
STORAGE PROVIDED IN OPEN GRADED CRUSHED ROCK (OGCR) TYPE 3 OR SIMILAR WITH MIN 30% VOIDS.
1145m² x 400mm DEEP

GRASSCRETE (SYSTEM C) - GC-01 (6)
TO BE LOCATED BENEATH CAR PARK.
DRAINED AREA = 1838m²
SRP = 1 IN 100 YR + 40% CLIMATE CHANGE.
STORAGE PROVIDED IN OPEN GRADED CRUSHED ROCK (OGCR) TYPE 3 OR SIMILAR WITH MIN 30% VOIDS.
1346m² x 400mm DEEP

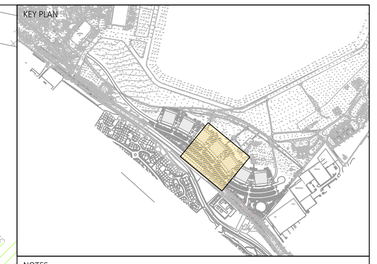
BASE OF EXISTING WATERCOURSE (73.280)

INDICATES EXISTING WATERCOURSE

PD100F ACO ROAD DRAIN D400

SKIMMINGDISH LANE

KEY PLAN



NOTES

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4. Levels shown in metres above Ordnance Datum (mAOD).
5. All private drainage to comply with current Building Regulations, BS EN-752 Drain and Sewer systems outside Buildings and other relevant British Standards and Codes of Practices.
6. All external drainage within trafficked areas with less than 1.2m cover to have type Z concrete bed and surround. All external drainage within landscaped areas with cover less than 0.6m to have type Z concrete bed and surround. All drainage with greater cover than the minimum required to have type S bed and surround.
7. All drainage to be laid soffit to soffit unless otherwise shown.
8. The Contractor is to verify the line, level and diameter of existing sewers before commencing drainage works.
9. All foul drainage to be minimum 100mm diameter, all surface water drainage to be minimum 150mm diameter unless otherwise shown.
10. Cover levels shown on this drawing refer to approximate surface levels. It is the contractors responsibility to ensure that access covers and frames are set at the final surface levels.
11. Where possible the contractor is to orientate manhole biscuits and covers to locate them parallel to kerbs and paving.
12. The Contractor should comply with hs(g) 47 "Avoiding Danger from Underground Services" when excavating around existing services.
13. It is the contractors responsibility to determine the location and depth of all existing services, mains and cables prior to construction.
14. Contractor to provide temporary screens in each of the down stream manholes during the construction period of the development in accordance with SFA 2.9.10 and the local sewerage undertakers requirements.
15. All in-situ concrete and precast concrete components to be manufactured using Sulphate Resisting Portland Cement, (SRPC) to BS 4027, if required, subject to soil conditions. Manhole components to be to BS EN 1917:2002.
16. All ironwork to be kite marked by BSI or certified by equal inspection authority.
17. All redundant connections to be capped off and grouted from the down stream manhole.
18. All new drainage pipes to be jetted, CCTV surveyed with DVD recording and any defects highlighted to the supervising officer. Following the rectification of any defects, the drain is to be re-surveyed with CCTV and the recordings made available to the project manager/engineer.
19. Prior to commencing the works the contractor is to confirm details of the existing drainage system as noted on the drawing.
20. Prior to commencing the works the contractor is to undertake the drainage investigation work as noted on the drawing.

REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P01	SUITABLE FOR STAGE 3					
	J.MAGEE	03/11/23	J.MAGEE	03/11/23		

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CLIENT
BICESTER MOTION LIMITED

PROJECT
BICESTER MOTION

TITLE
DRAINAGE LAYOUT
SHEET 3

HYDROCK PROJECT NO.	SCALE @ A1
C-27280	1:250

STATUS DESCRIPTION	STATUS
SUITABLE FOR STAGE 3	S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)
27280-HYD-00-ZZ-DR-C-7013

REVISION
P01

GROUNDWATER AND CONTAMINATED LAND ISSUES HIGHLIGHTED WITHIN VARIOUS REPORTS. GEOTECHINCAL ENGINEER HAS REVIEWED CONDITIONS AND FULLY CONFIRMED INFILTRATION UNVIABLE. DISCHARGE TO WATER COURSE PROPOSED AS THE ALTERNATIVE DISPOSAL MEASURE.

DRAINAGE NOT SUBMITTED TO LLFA AS PART OF SECTION 73. CONDITIONS STILL STATE INFILTRATION AND AUTHORITY HAVE NOT RECEIVED OR COMMENTED ON CHANGE IN DRAINAGE STRATEGY. FURTHER CONDITIONS MAY BE REQUESTED. TBC.

POTENTIAL AREA OF CONTAMINATION "THE DUMP" FULL EXTENT TO BE CONFIRMED

SA-01 - INFILTRATION RATE: 2.08x10-5
REFER TO RIDGE
5015203-RDG-XX-ST-DOC-C-00GCA01-A
DEPTH: 75.090

INDICATES KERBDRAIN

ROAD TO FALL TOWARDS KERBDRAIN

RWP'S SHOWN INDICATIVE. ARCHITECTS TO CONFIRM LOCATIONS

STACKS SHOWN INDICATIVE. M&E TO CONFIRM LOCATIONS

DEPTH INCREASED TO ALLOW FOR POTENTIAL FUTURE PHASES TO SPUR ONTO GRAVITY CONNECTION

ALLOW SPUR FOR FUTURE PHASE

INDICATES PETROL INTERCEPTOR. AQUA SWIRL BY SDS.

HIT AND MISS KERBS TO ALLOW RUN-OFF TO SWALE

INDICATES BAFFLE IN SUB BASE

INDICATES SUB BASE STORAGE ZONE

RUNS AT 1:100 AS ASSUMED >5WC'S UPSTREAM AND ALLOWANCE FOR FUTURE PHASES

SA-02 - INFILTRATION RATE: FAILED
REFER TO RIDGE
5015203-RDG-XX-ST-DOC-C-00GCA01-A

PD100F ACO ROAD DRAIN D400

SMH_014
CL: 76.43
DP=1.476m
IL(300Ø): 74.95

SMH_015
CL: 76.46
DP=1.982m
IL(300Ø): 74.47
IL(300Ø): 74.47

SMH_016
CL: 76.46
DP=2.281m
IL(300Ø): 74.18
IL(300Ø): 74.18

SMH_017
CL: 76.35
DP=2.245m
IL(300Ø): 74.10
IL(300Ø): 74.10

SMH_018
CL: 76.37
DP=2.658m
IL(300Ø): 73.71
IL(300Ø): 73.90
IL(300Ø): 73.90

SMH_021
CL: 75.95
DP=1.779m
IL(300Ø): 74.17
IL(300Ø): 74.17

SMH_022
CL: 76.05
DP=2.038m
IL(300Ø): 74.01
IL(300Ø): 74.01

SMH_023
CL: 76.29
DP=2.245m
IL(300Ø): 73.96
IL(300Ø): 73.96

SMH_019
CL: 76.42
DP=1.493m
IL(300Ø): 74.93

SMH_024
CL: 76.12
DP=2.258m
IL(300Ø): 73.90
IL(300Ø): 73.90
IL(300Ø): 73.86

SMH_020
CL: 75.94
DP=1.508m
IL(300Ø): 74.43

SMH_027
CL: 75.46
DP=1.680m
IL(300Ø): 73.78
IL(300Ø): 73.78

SMH_028
CL: 75.54
DP=1.861m
IL(300Ø): 73.68
IL(300Ø): 73.68

SMH_029
CL: 75.69
DP=2.033m
IL(300Ø): 73.66
IL(300Ø): 73.66

SMH_025
CL: 75.90
DP=1.445m
IL(300Ø): 74.45

SMH_030
CL: 75.69
DP=2.121m
IL(300Ø): 73.60
IL(300Ø): 73.60
IL(300Ø): 73.57

SMH_004
CL: 75.05
DP=1.713m
IL(300Ø): 73.64
IL(600Ø): 73.34
IL(600Ø): 73.34

SMH_002
CL: 75.89
DP=2.951m
IL(150Ø): 72.94
IL(150Ø): 72.94

SMH_003
CL: 75.56
DP=2.057m
IL(600Ø): 73.50
IL(600Ø): 73.50

SMH_001
CL: 75.71
DP=2.122m
IL(300Ø): 73.59
IL(600Ø): 73.59

FMH_001
CL: 76.26
DP=2.954m
IL(100Ø): 75.30
IL(150Ø): 73.30

FMH_016
CL: 76.37
DP=0.872m
IL(100Ø): 75.50
IL(100Ø): 75.50
IL(100Ø): 75.50

FMH_019
CL: 75.87
DP=0.869m
IL(100Ø): 75.00
IL(100Ø): 75.00
IL(100Ø): 75.00

FMH_003
CL: 75.66
DP=3.080m
IL(150Ø): 72.58
IL(100Ø): 74.80
IL(150Ø): 72.58

FMH_004
CL: 75.42
DP=3.133m
IL(150Ø): 72.29
IL(150Ø): 72.29

SMH_005
CL: 74.86
DP=1.966m
IL(300Ø): 73.43
IL(600Ø): 73.13
IL(600Ø): 73.13

FMH_018
FMH_020
402
76.000

401
76.500
FMH_017
FMH_015

GRASSCRETE (SYSTEM C) - GC-01 (1)
TO BE LOCATED BENEATH CAR PARK.
DRAINED AREA = 1544m²
SRP = 1 IN 100 YR + 40% CLIMATE CHANGE.
STORAGE PROVIDED IN OPEN GRADED CRUSHED ROCK (OGCR) TYPE 3 OR SIMILAR WITH MIN 30% VOIDS.
847m² x 400mm DEEP

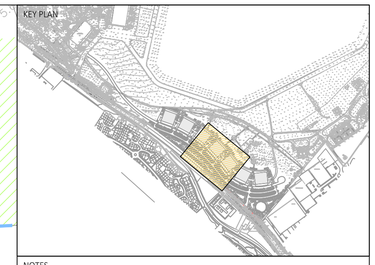
GRASSCRETE (SYSTEM C) - GC-01 (2)
TO BE LOCATED BENEATH CAR PARK.
DRAINED AREA = 1796m²
SRP = 1 IN 100 YR + 40% CLIMATE CHANGE.
STORAGE PROVIDED IN OPEN GRADED CRUSHED ROCK (OGCR) TYPE 3 OR SIMILAR WITH MIN 30% VOIDS.
923m² x 400mm DEEP

GRASSCRETE (SYSTEM C) - GC-01 (3)
TO BE LOCATED BENEATH CAR PARK.
DRAINED AREA = 1898m²
SRP = 1 IN 100 YR + 40% CLIMATE CHANGE.
STORAGE PROVIDED IN OPEN GRADED CRUSHED ROCK (OGCR) TYPE 3 OR SIMILAR WITH MIN 30% VOIDS.
943m² x 400mm DEEP

SKIMMINGDISH LANE

RISK
NO TOPOGRAPHICAL SURVEY PRESENT ALONG CENTRAL PORTION OF SKIMMINGDISH LANE. SURVEY REQUIRED TO DETERMINE FEASIBILITY OF OUTFALL LEVEL

KEY PLAN



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7. All drainage to be laid soffit to soffit unless otherwise shown.
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REV	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P01	J.MAGEE	03/11/23	J.MAGEE	03/11/23		

REVISION NOTES/COMMENTS
P01 SUITABLE FOR STAGE 3

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e: bristolcentral@hydrock.com

CLIENT
BICESTER MOTION LIMITED

PROJECT
BICESTER MOTION

TITLE
DRAINAGE LAYOUT
SHEET 4

HYDROCK PROJECT NO.	SCALE @ A1
C-27280	1:250

STATUS DESCRIPTION	STATUS
SUITABLE FOR STAGE 3	S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
27280-HYD-00-ZZ-DR-C-7014	P01