Technical design note

Project name	Himley Village, Bicester - Phase 1B Reserved Matters Application		
Design note title	Phase 1B Infrastructure Drainage Strategy		
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Introduction

The following technical note is intended to support a Reserved Matters application by Cala Homes, for Phase 1B (Infrastructure Only) at their proposed development of the site known as Himley Village, to the north west of Bicester Town.

The site has previously been awarded outline planning permission (ref 14/02121/OUT for up to 1,700 residential dwellings, a retirement village, commercial and social facilities, energy centre, school and associated infrastructure.

A subsequent Non Material Amendment has been submitted & approved under reference 22/03492/NMA to allow for a reduced scope of development to be submitted as phase 1A, which has resulted in the extent of development under this Reserved Matters application being limited to those highway access works shown within the boundary of Hydrock drawings 27141-HYD-XX-XX-DR-D-0001 Spine Rd Jct and 27171-HYD-XX-XX-DR-D-0002 Secondary Rd Jct.

As part of this application, Conditions 11 and 34 requires that a drainage strategies for foul and surface water drainage are proposed. It is the intention of this Technical Note to inform the overall strategy for an as yet to be determined masterplan layout.

> Condition 11.
>
> Prior to the submission of the first reserved matters application, a full surface water drainage scheme for the site, based on sustainable drainage principles and an assessment of the hydrological and hydro-geological context of the development, shall have been submitted to and approved in writing by the local planning authority. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.
>
> The scheme shall also include:
> · Discharge Rates
> · Discharge Volumes
> · Sizing of features - attenuation volume
> · Infiltration in accordance with BRE365
> · Detailed drainage layout with pipe numbers
> · SUDS - Swales, Ponds, Permeable Paving, Filter Strips, Rain Gardens
> · Network drainage calculations
> · Phasing

Reason - To mitigate the risk of surface water flooding, protect water quality and biodiversity on the site in accordance with Government guidance contained within the Eco Town PPS and the National Planning Policy Framework. This information is required prior to commencement of any development as it is fundamental to the acceptability of the scheme.

Condition 34.

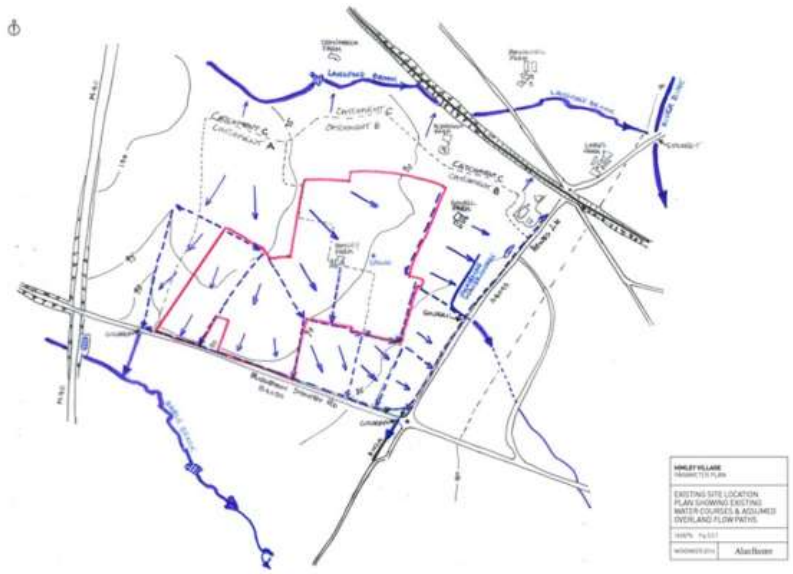
Prior to the commencement of the development, a foul drainage strategy for conveyance and treatment, detailing any on and/or off site drainage works, shall be submitted to and approved by the Local Planning Authority. No discharge of foul or surface water from the site shall be accepted into the public system until the drainage works referred to in the strategy have been completed. No dwelling shall be occupied until the foul drainage has been provided in accordance with the approved strategy.

Reason - The development may lead to sewage flooding; to ensure that sufficient capacity is made available to treat and convey foul flows from the new development; and in order to avoid adverse environmental impact upon the community and water environment in accordance with Government guidance contained within the Eco Town PPS and the National Planning Policy Framework. This information is required prior to commencement of any development as it is fundamental to the acceptability of the scheme

The below drainage strategy should be read in conjunction with Alan Baxter report dated December 2014 and approved as part of the outline as that sets out the philosophy of the surface water drainage strategy for the whole development.

Existing Drainage Regime

As an agricultural greenfield site, the application site benefits from numerous ditches to control surface water runoff, this network of ditches can be viewed in Figure 3.3 of the Ala Baxter FRA (reproduced below)



The ditches on the application site form a land drainage network to serve the site and they convey surface water to existing water courses. The site predominantly falls to the south and east through the ditches and

a long ditch that runs parallel to the B4030, the ditch is culverted along the new commercial development in the south east and is piped to the south where it is understood to discharge into the Gable Brook.

There is no foul drainage within the application site boundary itself, however a connection point has been identified to the east of the site in Howes Lane

Proposed Development Description

The outline approval for this site includes for 1,700 residential units, a retirement village, commercial and social facilities, energy centre, school and associated infrastructure.

Proposed Surface Water Drainage Strategy

In accordance with the approved FRA, the drainage strategy will utilises positive outfalls into the local ditch network at 2l/s/ha in all rainfall events up to and including the 1:100 + 40% Climate Change event. The pre-existing drainage rates per 1ha of catchment are reproduced below from a Microdrainage assessment based on a 0.255 soil factor. The 2l/s/ha is considered as long term storage "trickle rate" and whilst it sits above the current QBar and 1:1 year rates is below the current 30 and 100 year return period discharge rates.

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.255
Area (ha)	1.000	Urban	0.000
SAAR (mm)	683	Region Number	Region 6

Results	l/s
QBAR Rural	1.2
QBAR Urban	1.2
Q1 year	1.1
Q1 year	1.1
Q30 years	2.8
Q100 years	4.0

The drainage strategy for this development will rely on sustainable conveyance and discharge methods to ensure a suitable level of treatment is provided along with the correct volume of attenuation to permit the restricted flow rates.

It is accepted that the outline approved strategy has a reliance on linear swales across the site and these will be utilised where practicable however it should be acknowledged that the parameter plan formed around this would be prohibitive in terms of placemaking, they are also prohibitive in providing the required unit numbers/density for the site due to the width of corridor required for such lengths and generally aren't compatible with the use of trees unless shallow enough which results in the use of underdrains which reduce the efficacy of the swale. Accordingly in this instance the applicant proposes to utilise a similarly natural solution whereby source control SuDS such as porous paving, rain gardens, SuDS tree pits, filter drains are used in tandem with swales & basins to assist in delivering the best possible green infrastructure for the site.

Where appropriate, consideration could be given to provide features such as permanent water within SuDS ponds, and sediment depressions within basins, to provide further treatment of runoff and assist with amenity/biodiversity targets.

The current topography of the wider site allows for three distinct catchments, each with independent connections to the existing network, all would utilise green initiatives for attenuation. These are;

The Western access network - 0.479 ha with a swale for conveyance & storage

The "Main" network - 7.02 ha with numerous basins & swales for storage

The Eastern access - 2.13 ha with a large basin and secondary swale for storage

The impermeable catchment area (not site area), peak flow rate and maximum discharge volume for each catchment are shown below.

Network	Impermeable area	Exg Qbar runoff rate	Exg Q100 runoff rate	Max Proposed Discharge Rate (1:100+40%CC)	Max Discharge Vol (1440 minute 100 year Winter + 40 %)
Main Network	7.02 ha	8.5 l/s	28.08 l/s	14.5 l/s	1700 m3
Eastern Network	2.13 ha	2.55 l/s	6.13 l/s	4.0 l/s	622 m3
Western Access Network	0.479 ha	0.56 l/s	1.9 l/s	1.0 l/s	153 m3

As the development design progresses, each residential phase will be submitted with a detailed drainage strategy plan to include pipe sizes, gradients, manhole schedules, attenuation volumes & treatment levels.

Ground Conditions/Infiltration

Infiltration has not been considered for utilisation as yet due to the existing ground conditions and likelihood of shallow groundwater presence.

The Alan Baxter outline approved strategy confirms that Hyder's Surface Water Drainage Strategy included limited infiltration testing in 2010 which indicated little infiltration quality in the soils.

Proposed Foul Water Drainage Strategy

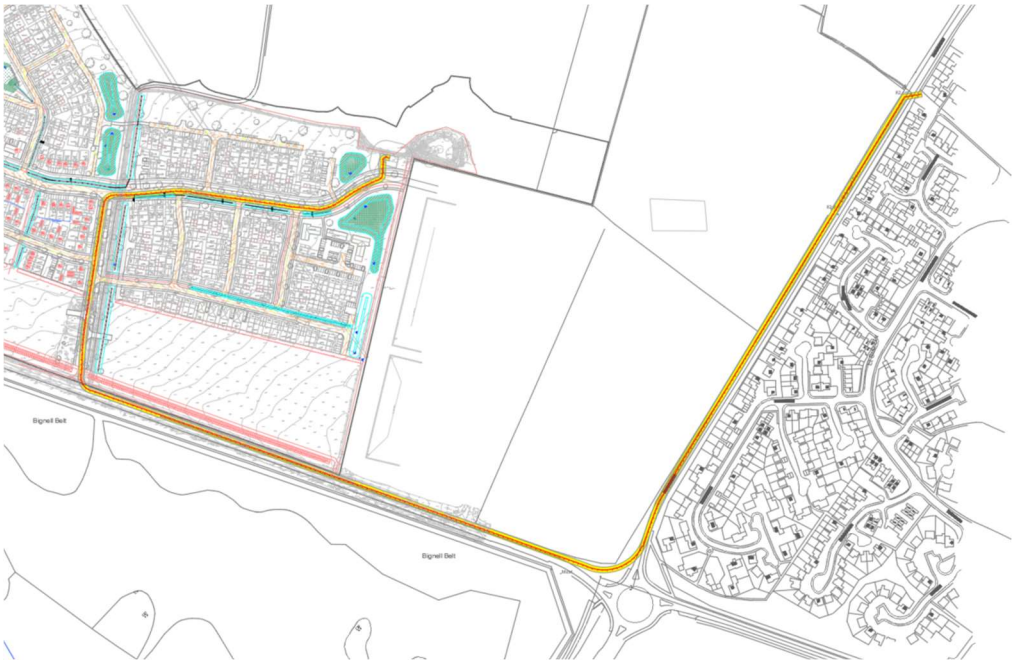
There are no existing foul sewers within the application site itself.

Initial conversations with Thames Water have implied that a suitable point of connection in Howes Lane to the east of the site boundary is a potential point of connection. The receiving sewers do not currently provide sufficient capacity for the development however Thames Water are obligated to upgrade to suit the phases of development as it proceeds.

The first 500-unit phase of the application site is to drain via gravity into a new foul pumping station in the north east of the site, this will then be conveyed in a rising main which will travel south into Middleton Stony Lane before heading east and north into Howes Lane where it will discharge into a new chamber constructed over the existing 225mm foul sewer.

The first 500 units will produce a peak flow of 23.4l/s and we expect the pumped rate to be half of this, at 11.7l/s. The pumping station will require emergency storage of 80m3 which should be provided offline and adjacent to the station where practicable.

An extract of the proposed foul sewer route is shown below.



Management & Maintenance

This development will encompass various built forms with differing ownership obligations and maintenance requirements, including

- Highway gullies, pipes and manholes, swales or raingarden to be owned and maintained by Oxfordshire County Council highways dept once offered and approved for adoption under Section 38
- Sewers, swales, basins, hydrobrakes and outfalls to be owned and maintained by Thames Water once offered and approved for adoption under Section 104.
- Private pipework, porous paving, rain gardens to be owned and maintained by private entities such as home owners of management companies.

All drainage features require regular monitoring and maintenance to ensure they continue to operate correctly and efficiently. Drainage features can be maintained by a range of people, including, but not limited to, property owners, highway authority or management companies, Maintenance operations are categorised under three levels: Regular Maintenance, Occasional Maintenance and Remedial Maintenance.

Regular Maintenance: Consists of basic tasks to be carried out on a frequent and predictable schedule. Inspections and monitoring of the feature should be undertaken during these visits. During the first year of operation these visits should be undertaken monthly and after all major storm events to ensure each drainage feature is operating to its design standard.

Occasional Maintenance: Consists of tasks which are required to be undertaken on a less frequent and predictable basis, such as sediment removal of the ditches.

Remedial Maintenance: These are intermittent tasks required to rectify faults which occur within the drainage feature. These are undertaken as required, but anticipated to be infrequent as long as the best practice guidance during design, construction and maintenance are followed.

Table 1 (below summarises the recommended maintenance activities required for a typical detention basin to be included in the proposed drainage scheme.

Table 1 - Drainage components operation and maintenance activities (extract from CIRIA C753 SuDS manual)

Operation and maintenance activity	Drainage component
	Detention Basin
Regular maintenance	
Inspection	X
Litter and debris removal	X
Grass cutting	X
Weed and invasive plant control	O
Shrub management (including pruning)	O
Bank vegetation management	O
Aquatic vegetation management	O
Occasional maintenance	
Sediment management	X
Vegetation replacement	O
Vacuum sweeping and brushing	NA
Remedial maintenance	
Structure rehabilitation / repair	O

Key

X – Will be required

O- May be required

Water Quality

First Flush

The CIRIA C753 SuDS manual sets out standards of good practice in order to protect the water quality of receiving water courses and ground water. The SuDS manual states that where possible "no runoff should be discharged from the site to receiving surface waters or sewers for the majority of small (eg <5mm rainfall events) rainfall events". This is to capture the "first flush" which contains the most concentrated level of pollutants as a result of pollutant build up on surfaces during dry periods.

Trapped Road Gullies

All adoptable highway road gullies are to be trapped. These will intercept sediment and potential pollutants in the surface water runoff.

SuDS

Each component of the drainage strategy will be assessed for its treatment qualities in addition to its attenuation capabilities.

Water Quality Analysis

General access roads & built environment are deemed to have a low-level pollution hazard as stated within chapter 26 of the SuDS manual. Heavier use roads As this access road forms only the initial application and

does not function until later stages of development (i.e. it will not drain any traffic until further water management & quality control systems are implemented) we consider this an appropriate designation. A simple index approach is therefore recommended to determine what measures are required to deal with any pollution that may arise. Table 2 and 3 are extracts from chapter 26 of the SuDS manual, identifying the level of pollution hazard and pollution mitigation index respectively. The total pollution hazard indices must be less than or equal to the total SuDS mitigation indices.

Table 2 - Pollution hazard indices for different land use classifications (extract from CIRIA C753 SuDS manual)

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydro-carbons
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
All roads except low traffic roads & trunk roads.	Medium	0.7	0.6	0.7

Table 3 - Indicative SuDS mitigation indices for discharges to surface waters (extract from CIRIA C753 SuDS manual)

Land Use	Mitigation Indices		
Type of SuDS component	TSS	Metals	Hydrocarbons
Swale	0.5	0.6	0.6
Pond	0.7	0.7	0.5
Permeable Pavement	0.7	0.6	0.7
Mitigation Total **Total SuDS mitigation index = mitigation index1 + 0.5 (mitigation index2 + 3)**	1.2	1.25	1.2

Table 3 confirms the total mitigation index of the anticipated SuDS to be implemented on site will be greater or equal to pollution hazard index in table 2. The inclusion of multiple SuDS components will

therefore be satisfactory for dealing with any potential pollution arising from the development. No other mitigation measures would be required.

Summary & Conclusion

Whilst there will be a requirement to produce further details of the wider site drainage strategy as each phase develops, it is believed that the aforementioned details will be sufficient to offer comfort at this time that it is viable to propose a sustainable drainage solution suitable for such a large scale development.

Whilst we do not propose to exactly mimic the outline strategy in physical form, the intention is to follow the treatment, storage and runoff philosophy with a wider range of established methods to ensure that a well-designed, cohesive mixed use development is the resulting form. Provision of the Phase 2 Infrastructure Package allows for a development-wide SuDS strategy whilst keeping phase-specific details within their respective application packages.