REPORT REF: HB/slh23156/J672B

DOCUMENT CONTROL

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DISTRIBUTION

1.0 INTRODUCTION

This report is intended to outline the proposed maintenance regime of non-adopted Sustainable Drainage Systems (SuDS) pertinent to the site at Mansfield Bowling Club.

This report seeks to meet the criteria necessary to discharge the pre-commencement planning condition 8 which relates the maintenance of SuDS;

"No development shall take place until details of a sustainable urban drainage system and scheme of maintenance shall be submitted to and approved in writing by the local planning authority. Such system shall be based on a 1:100 year event with 30% provision for climate change demonstrating 50% attenuation of all runoff, demonstrating greenfield levels of runoff. The system shall be implemented as part of the development and thereafter retained and maintained."

Reference should be made to Surface Water Drainage Strategy drawing no. J672-400 Rev. C provided in **Appendix A** for location of proposed SUDS.

2.0 SCOPE

This report considers whole life design & maintenance criteria for associated SuDS features. These include lined permeable block paving/lined permeable tennis courts, green roofs and rain gardens. The design and management of attenuation features need to consider all of the following issues to ensure that risks to performance are minimised:

- Hydraulic design objectives of the scheme;
- Amenity objectives;
- Ecological benefits;
- Health and safety issues, e.g. effective inlet and outlet structures that are easy to

maintain.

Regular inspection, monitoring and maintenance will be required to ensure the effective long term efficiency of SuDS on site. This will be included as part of the overall site management company contract and would form part of the non-adopted estate road maintenance regime.

A management company will be in place, which will employ suitable landscape contractors to maintain the SuDS. They should have a comprehensive knowledge of the development and visit the site on a regular basis to undertake routine care such as cleaning of inlet and outlet pipework, grass cutting, tree and shrub maintenance, sweeping and litter picking. Attendance will ensure regular monitoring of the drainage system, a rapid response to maintenance needs, and a feeling of ownership of the SuDS features.

As part of the management company contract, the following landscape maintenance procedures will be applied:

- **Management Plan** - describing the management objectives for a site over time, and the management strategies that will be employed to both realise these objectives and reconcile any potential conflicts that may arise.
- **Specification** - detailing the conditions under which the work will be done, the materials to be used and the standard of work required.
- **Schedule of Work** – itemising the tasks to be undertaken and the frequency at which they will be performed.

As landscape maintenance contract periods are usually 1 or 3 years duration, this is a convenient starting point for SuDS maintenance contracts. The frequency of regular maintenance tasks in a contract period will vary from fort-nightly to monthly periods, unless in situations where grass or weed growth requires a higher frequency of work.

Maintenance tasks which suit a performance approach commonly include plant growth, grass cutting, pruning and tree maintenance. However, work tasks such as sweeping paths, regular litter collection and cleaning road surfaces will require work at an agreed frequency with a more specific timing such as weekly, monthly or annually. Where the frequency and timing of tasks is critical then a mixture of performance and frequency specification is necessary to ensure effective maintenance. This type of specification is useful where SuDS features require regular attention.

SuDS maintenance tends towards a frequency requirement to ensure a predictable standard of care which can be recorded on site and which provides a reasonable basis for pricing work. A convenient frequency for many tasks is at a monthly inspection as this is the usual minimum site attendance required in a landscape specification. The monthly frequency provides for an inspection of all SuDS features and checking of all inlets and outlets.

It is recommended that SuDS are not handed over to those responsible for maintenance until upstream construction has ceased, the contributing catchment has stabilised, and any necessary rehabilitation of downstream components has been undertaken by the contractor. However, if maintenance agreements have to be put in place in advance of this

time, and the level of construction activity in the contributing catchment is still high, bespoke temporary maintenance specifications should be prepared that take account of high sediment accumulation rates and the increased risks of potential spillages.

3.0 SURFACE WATER DRAINAGE OWNERSHIP PROPOSALS

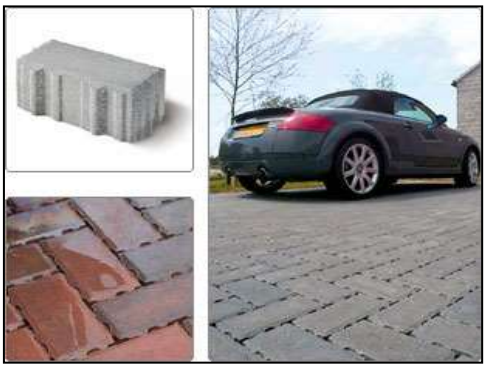
It is the intention that ownership and responsibility of all the various surface water drainage elements within the site boundary up to the combined connection to the Thames Water sewer are to be managed and maintained by a private management company.

4.0 SUDS MAINTENANCE PROPOSALS

The proposed drainage strategy utilises sustainable drainage techniques to ensure that the site can accommodate all storm events up to and including the 1 in 100 year storm event with allowances for future climate change.

It is the intention that all non-adoptable SuDS features such as permeable paving, rain gardens and green roofs to be maintained by a private management company. The tables below outline the typical maintenance requirements of the SuDS components throughout the drainage strategy. These have been informed by the guidance outlined within CIRIA C753 and water authority SuDS Guidance. The following information would be supplemented by manufacturer's specifications where applicable and be obviously dependent on the type of system involved.

Maintenance Regime for Permeable Paving



Description:
Pavements that allow rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored before discharging to the sewerage system.

Location:
Part of the private access road and the car parking areas. Sub-base storage depth of 350mm is provided for structural purposes and is in accordance with BS EN 7533-13. Refer Surface Water Drainage Strategy drawing no. J672-400.

J672B – Mansfield Bowling Club

SuDS Maintenance Schedule

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 – particular attention is to be paid to areas where water runs on to pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate 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 strip, has been raised to within 50mm of the level of paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance of the pavement or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper sub-structure by remedial sweeping	Every 10-15 years or as required
Monitoring	Initial inspection	Monthly for 3 months after installation
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action	3-monthly, 48 hours after large storm
	Inspect silt accumulation rates and establish appropriate brushing rates	Annually
	Monitor inspection chambers	Annually

Maintenance Regime for Green Roofs

Description:
Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover/landscaping. The roof is likely to consist of an impermeable layer, a substrate or growing medium and a drainage layer (although not all green roofs require a drainage layer). Green roofs are designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.

Location:
A green roof is proposed on the eastern apartment block to provide sufficient surface water treatment of roof runoff. The green roof is to include a 500mm vegetation/gravel border. Refer Surface Water Drainage Strategy drawing no. J672-400.

MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
Regular Maintenance	Inspect all components for proper operation including: 1. Soil substrate for erosion; 2. Drain inlets to ensure flows from the drainage layer to below ground drainage are unrestricted, Underside of the roof for leakage and structural integrity.	Annually and after severe storms
	Remove debris and litter	Six monthly, or as required.
	During establishment period / first 12-15 months, replace dead plants as required.	Monthly, then annually after 1st year.
	Mow grass, remove invasive weeds and manage planting as required	Six monthly, or as required.
Remedial Actions	Erosion channels should be stabilised with extra soil substrate and sources of erosion to be investigated and mitigated for.	As required
	Drain inlets that have been settled, cracked, or moved to be repaired as appropriate.	As required
Monitoring	Inspect/check all inlets, outlets and vents to ensure that they are in good condition and operating sufficiently.	Annually and after large storms

Maintenance Regime for Rain Gardens

Description:
Raingardens are planted areas that are designed to provide a drainage function as well as contribute to the soft landscape. They are located where surface water runoff flows from surrounding impermeable surfaces/landscaping and collect the polluted first flush volume in shallow planted basins.

Location:
Along the southern boundary of the private road at the south of the site. They are proposed in the planted areas to act as surface water interception features. Refer Surface Water Drainage Strategy drawing no. J672-400.

MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
Regular Maintenance	Litter and debris removal from site	Monthly
	Mow filter strip 75-100mm not to exceed 150mm leaving cuttings in situ	Monthly
	Inspect and clear inlets, outlets, and overflows	Monthly
	Pruning, trimming and general landscape care	Monthly
Occasional Maintenance	Removal of silt from pre-treatment structure	As required
	Surface reinstatement by forking or scarifying	As required
	Replacement of mulch with shredded prunings from site or composted bark	As required
Remedial Work	Level reinstatement due to erosion or damage	As required
	Repair or replace inlets, outlets or overflow structures	As required

APPENDIX A

Surface Water Drainage Strategy drawing no. J672-400 Rev. B.

SURFACE WATER STRATEGY

NORTHERN CATCHMENT
DRAINED AREA: 2191m²
DISCHARGE RESTRICTION: 13l/s
PROPOSED STORAGE (PERMEABLE TENNIS COURT): 73m³
TOTAL STORAGE REQUIREMENT*: 40m³

SOUTHERN CATCHMENT
DRAINAED AREA: 3381m²
DISCHARGE RESTRICTION: 35l/s
PROPOSED STORAGE (PERMEABLE PAVING): 63m³
TOTAL STORAGE REQUIREMENT*: 55m³

* 1 in 100-YEAR RETURN PERIOD PLUS 30% ALLOWANCE FOR CLIMATE CHANGE

THE ABOVE FIGURES ARE INTENDED TO DEMONSTRATE THAT THE STORAGE REQUIREMENT CAN BE PROVIDED ON-SITE. THE VOLUME AND MEANS OF STORAGE PROVISION WILL BE SUBJECT TO REFINEMENT DURING THE DETAILED DESIGN STAGE.

FLOW CONTROL CHAMBER TO RESTRICT SURFACE WATER DISCHARGE TO MAXIMUM RATE OF 13l/s (FOR ALL STORMS UP TO AND INCLUDING THE 100-YEAR INCLUSIVE OF 30% CLIMATE CHANGE). DISCHARGE RATE AGREED IN PRINCIPLE BY THAMES WATER AND IN ACCORDANCE WITH APPROVED FLOOD RISK ASSESSMENT.

UTILISE EXISTING 150mm CONNECTION TO EXISTING THAMES WATER COMBINED SEWER. INVERT LEVEL OF EXISTING CONNECTION 48.443mAOD (SUBJECT TO CONFIRMATION AT DETAILED DESIGN)

FLOW CONTROL CHAMBER TO RESTRICT SURFACE WATER DISCHARGE TO MAXIMUM RATE OF 35l/s (FOR ALL STORMS UP TO AND INCLUDING THE 100-YEAR INCLUSIVE OF 30% CLIMATE CHANGE). DISCHARGE RATE AGREED IN PRINCIPLE BY THAMES WATER AND IN ACCORDANCE WITH APPROVED FLOOD RISK ASSESSMENT.

UTILISE EXISTING CONNECTION TO EXISTING THAMES WATER COMBINED MANHOLE REF. 7201
REPLACE 100mmØ PIPE WITH 225mmØ PIPE.

PROPOSED COMBINED PIPE INVERT LEVEL 49.810mAOD AT CROSSING OF EXISTING THAMES WATER COMBINED EGG-SHAPED SEWER. APPROXIMATE CLEARANCE OF 0.54m

LINED PERMEABLE PAVING WITH OPEN-GRADED SUB-BASE TO PROVIDE SURFACE WATER STORAGE IN PARKING BAYS.
AREA: 119m²
SUB-BASE DEPTH: 0.35m
POROSITY: 0.3
TOTAL STORAGE VOLUME: 12.5m³

STRUCTURAL LOADING REQUIREMENTS FOR SUB-BASE OF PARKING AREA RESULT IN MINIMUM SUB-BASE DEPTH OF 350mm IN ACCORDANCE WITH BS EN 7533-13

EXISTING THAMES WATER COMBINED EGG-SHAPED SEWER (1150m x 790mm) INVERT LEVEL OF SEWER WHERE SURVEY TERMINATED 47.10mAOD.

LINED PERMEABLE PAVING WITH OPEN-GRADED SUB-BASE TO PROVIDE SURFACE WATER STORAGE.
AREA: 528m²
SUB-BASE DEPTH: 0.35m
POROSITY: 0.3
TOTAL STORAGE VOLUME: 50.5m³

STRUCTURAL LOADING REQUIREMENTS FOR SUB-BASE OF PARKING AREA RESULT IN MINIMUM SUB-BASE DEPTH OF 350mm IN ACCORDANCE WITH BS EN 7533-13

SUB-BASE FORMATION TO SLOPE TOWARDS CENTRAL 'DRAINAGE TRENCH' WHERE PERFORATED PIPE WRAPPED IN SPECIALIST GEO-TEXTILE SEPARATION MEMBRANE COLLECTS FLOWS (MAX 1:40 MIN 1:100 FALL TO PIPE)

RAINWATER DOWNPIPES CONNECTED TO CATCHPIT INSPECTION CHAMBER AND DISCHARGED TO PERMEABLE PAVING SUB-BASE THROUGH DIFFUSER UNIT WRAPPED IN SPECIALIST GEO-TEXTILE SEPARATION MEMBRANE (PERMAVOID OR SIMILAR APPROVED)

LINED PERMEABLE TENNIS COURT WITH 150mm DEEP OPEN-GRADED SUB-BASE TO PROVIDE SURFACE WATER STORAGE.
AREA: 1630m² (46.6m x 35m)
SUB-BASE DEPTH: 150mm
POROSITY: 0.3
TOTAL STORAGE VOLUME: 73m³

STRUCTURAL LOADING REQUIREMENTS FOR SUB-BASE OF THE TENNIS COURT RESULT IN MINIMUM SUB-BASE DEPTH OF 150mm

SUB-BASE FORMATION TO SLOPE TOWARDS CENTRAL 'DRAINAGE TRENCH' WHERE PERFORATED PIPE WRAPPED IN SPECIALIST GEO-TEXTILE SEPARATION MEMBRANE COLLECTS FLOWS (MAX 1:40 MIN 1:100 FALL TO PIPE)

POSITION AND DEPTH OF EXISTING THAMES WATER COMBINED EGG-SHAPED SEWER (1170m x 830mm) UNDER PROPOSED BUILDING TO BE CONFIRMED BY DETAILED SURVEY.
APPROXIMATE LEVEL OF 48.850mAOD AND DEPTH OF 2.3m UNDER PROPOSED BUILDING.

BUILD-OVER AGREEMENT SUBJECT TO THAMES WATER APPROVAL AND DIMENSIONAL SURVEY TO FACILITATE COORDINATION WITH FOUNDATIONS.

PROPOSED GREEN ROOF TO PROVIDE SUFFICIENT SURFACE WATER TREATMENT OF ROOF RUNOFF.
EXTENT OF GREEN ROOF TO BE CO-ORDINATED WITH REQUIREMENTS FOR PV PANELS/PLANT AS NECESSARY.
TO INCLUDE MINIMUM 500mm VEGETATION/GRAVEL BORDER TO PERIMETER OF ROOF.

GREEN ROOF TO BE IN ACCORDANCE WITH LANDSCAPE ARCHITECT PLANTING DESIGN AND INCLUDE INTENSIVE SUBSTRATE, FILTER FLEECE, DRAINAGE LAYER (WITH SUITABLE INFILL) AND SUFFICIENT WATERPROOFING/SEPARATION LAYERS.

PROPOSED INTERCEPTION RAIN GARDENS WITH FREE-DRAINING SOIL TO CAPTURE EXCEEDANCE FLOWS FROM ADJACENT LANDSCAPING

KEY

- SITE BOUNDARY
- CENTRELINE OF EXISTING THAMES WATER COMBINED SEWER & MANHOLE (LARGE EGG-SHAPED SEWER - REFER TO PIPETRACK GYROSCOPIC MAPPING SURVEY BY INFOTEC REF. INF-3078-D01(P) FOR FULL DETAILS OF SURVEYED SEWER
- PROPOSED COMBINED WATER SEWER & MANHOLE
- PROPOSED SURFACE WATER SEWER & 1200Ø MANHOLE
- PROPOSED PERFORATED SURFACE WATER SEWER
- PROPOSED FLOW CONTROL MANHOLE (HYDROSLIDE OR SIMILAR APPROVED)
- PROPOSED SURFACE WATER SEWER AND INSPECTION CHAMBER (600Ø) MAX DEPTH TO INVERT 5m
- SURFACE WATER CATCHPIT INSPECTION CHAMBER (450Ø), 150mm SEWER AND PERMEABLE PAVING INLET DIFFUSER UNIT
- PROPOSED CHANNEL DRAIN (ACO OR SIMILAR APPROVED) ACO ACCESS UNIT (SA) & ACO SUMP UNIT (SO) WITH 150mm DRAIN CONNECTION (OUTFALL)
- INDICATIVE FOUL WATER SEWER AND INSPECTION CHAMBER (450Ø) MAX DEPTH TO INVERT 3m
- PROPOSED LINED PERMEABLE PAVING
- PROPOSED LINED PERMEABLE TENNIS COURT
- PROPOSED GREEN ROOF WITH 500mm VEGETATION/GRAVEL BORDER
- PROPOSED INTERCEPTION RAIN GARDEN
- PRIVATE SURFACE WATER YARD/ROAD GULLY
- INDICATIVE EXCEEDANCE FLOW ROUTE
- PROPOSED FINISHED FLOOR LEVEL

NOTES:
1. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER
3. DO NOT SCALE FROM THIS DRAWING. WORK FROM DIMENSIONS ONLY.
4. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.
5. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ATTENUATION PROVISION BASED ON 50% REDUCTION OF EXISTING RUNOFF RATES WITH SIMULATIONS UP TO AND INCLUDING THE 1:100 + 40% EVENT.
7. LAYOUT SHOWN BASED UPON BPTW PARTNERSHIP ARCHITECTS MASTERPLAN REF: 17-067 SK100 REVISION P9.
8. DISCHARGE RATES AND POINT OF CONNECTION SUBJECT TO CCTV SURVEY CONFIRMATION AND APPROVAL BY THAMES WATER.
9. LEVELS SHOWN ARE FOR INDICATIVE PURPOSES ONLY AND WILL BE SUBJECT TO FINISHED BUILDING AND EXTERNAL LANDSCAPING LEVELS AND DETAILED DESIGN.

CDM NOTES:
THE ATTENTION OF THE CLIENT AND THE PRINCIPAL CONTRACTOR IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:

1. WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND TELECOMS WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
2. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
3. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LIAISON WITH THE RELEVANT BUS COMPANIES TO ENSURE ALL ROUTES ARE MAINTAINED DURING THE HIGHWAY WORKS.

TRAFFIC MANAGEMENT:
7. THE CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING AND MAINTAINING A SATISFACTORY TRAFFIC MANAGEMENT SYSTEM FOR THE DURATION OF THE WORKS.
8. ALL TRAFFIC MANAGEMENT PROPOSALS SHALL BE SUBMITTED TO AND AGREED WITH THE LOCAL AUTHORITY AND POLICE CONSTABULARY PRIOR TO IMPLEMENTATION

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

Rev	Description	Drn	Chk	App	Date
B	UPDATED TO REFLECT PLANNING SITE LAYOUT	HB	JC	TRF	08.11.17
A	CLIENT NAME UPDATED	HB	JC	TRF	01.11.17

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Client
GENERATOR (MANSFIELD BC) LTD.

Project Title:
MANSFIELD BOWLING CLUB

Drawing Title:
SURFACE WATER DRAINAGE STRATEGY

A1 Scale	Date	Designed by
1:250	26.10.17	HB
Drawn by	Checked by	Approved by
HB	JC	TRF

Drawing Number: J672-400
Rev: B