Report on Drainage Strategy to Accompany Planning Application 3/2021/1134 Condition 12
Land East of Chipping Lane, Longridge

by

Barratt Manchester

Revision	Date	Prepared By	Revision Notes
-	15.03.24	CD	First Issue
A	26.06.24	CD	Appendix G added
B	26.09.24	CD	Additional clarity of flow rates added to the report; Developable areas plan in Appendix I revised Flow control details added to Appendix J Proposed surface modelled to highlight areas where overland flow would collect, and shown in Appendix K

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1. Introduction

The following document has been prepared to assist the designer's preparation and the readers understanding of the drainage theory and calculations in one reference document.

This document covers all Phases 1, 2, & 3 of the Chipping Lane development, in order to demonstrate how the full site drains; supporting evidence has been provided. See Appendix A for the planning reference drawing.

The document has also been prepared in order to discharge the following drainage condition linked with the **3/2021/1134** full consent planning permission for the development of 47 no. homes off Chipping Lane, Longridge:

Condition 12

No development shall commence in any phase until a detailed, final surface water sustainable drainage strategy for the site has been submitted to, and approved in writing by, the Local Planning Authority.

The detailed surface water sustainable drainage strategy shall be based upon the site specific flood risk assessment and indicative surface water sustainable drainage strategy submitted and sustainable drainage principles and requirements set out in the National Planning Policy Framework, Planning Practice Guidance and Defra Technical Standards for Sustainable Drainage Systems. No surface water shall be allowed to discharge to the public foul sewer(s), directly or indirectly.

The details of the drainage strategy to be submitted for approval shall include, as a minimum:

a) *Sustainable drainage calculations for peak flow control and volume control for the:*
   i. *100% (1 in 1 year) annual exceedance probability event;*
   ii. *3.3% (1 in 30 year) annual exceedance probability event;*
   iii. *1% (1 in 100 year) annual exceedance probability event + 30% climate change allowance, with an allowance for urban creep*

   Calculations must be provided for the whole site, including all proposed surface water drainage systems.

b) *Final sustainable drainage plans appropriately labelled to include, as a minimum:*
   i. *Site plan showing all permeable and impermeable areas that contribute to the drainage network either directly or indirectly, including surface water flows from outside the curtilage as necessary*
   ii. *Sustainable drainage system layout showing all pipe and structure references, dimensions and design levels, to include all proposed surface water drainage systems up to and including the final outfall;*
   iii. *Details of all sustainable drainage components, including landscape drawings showing topography and slope gradient as appropriate*
   iv. *Drainage plan showing flood water exceedance routes in accordance with Defra Technical Standards for Sustainable Drainage Systems*
   v. *Finished Floor Levels (FFL) in AOD with adjacent ground levels for all sides of each building and connecting cover levels to confirm minimum 150mm+ difference for FFL*

vi. *Details of proposals to collect and mitigate surface water runoff from the development boundary*

vii. *Measures taken to manage the quality of the surface water runoff to prevent pollution protect groundwater and surface waters, and delivers suitably clean water to sustainable drainage components.*

c) *Evidence of an assessment of the site conditions to include site investigation and test results to confirm infiltration rates and groundwater levels in accordance with BRE 365.*

d) *Evidence of an assessment of the existing on-site watercourse to be used, to confirm that these systems are in sufficient condition and have sufficient capacity to accept surface water runoff generated from the development.*

e) *Evidence that a free-flowing outfall can be achieved. If this is not possible, evidence of a surcharged outfall applied to the sustainable drainage calculations will be required.*

The sustainable drainage strategy shall be implemented in accordance with the approved details.

2. Site Details

Development Name	Bowland Meadows, Chipping Lane
Site Address	Land off Chipping Lane, Longridge, Preston, PR3 2NA
Longitude, Latitude (or OS Grid Ref)	360321; 437929
Site Description	7 No. open grassed fields separated by mature hedgerows and sporadic trees. Currently used by livestock for grazing.
Site Area (Ha)	14.41Ha Approx.
Site Area used for calculating Greenfield Run-Off Rates (Ha)	10.52Ha Approx. developable area, this excludes large areas of open spaces.
Existing Impermeable Area (Ha)	0Ha
Is the Site Steeply Sloping (Y/N), If “Yes” Typical Gradient.	No

Table 1

Refer to Appendix B for the pre-development topographical surveys for the site.

Site specific site investigations was carried out by soiltechnics for each phase individually. Extracts of the report which include existing ground conditions and soakaway testing can be found in Appendix D.

3. Pre-Development Greenfield Runoff Rates

A flood risk assessment which covers Phases 2 & 3, was carried out by Betts Hydro, in December 2018. This document states that the surface water discharge rate should be restricted to 13.6l/s/Ha, calculated using the HR Wallingford tool for greenfield runoff rates on uksuds.com. This FRA was

revised in November 2021 to include for all planning layout amendments. See Appendix F for the latest revision of the full report.

Return Period	Greenfield Rate (L/s/Ha)
1 in 1 Year (l/s)	11.8
QBar	13.6
1 in 30 Year (l/s)	23.1
1 in 100 Year (l/s)	28.3

Table 2

4. Soakaway Testing

Soakaway testing was undertaken by soiltechnics for both phases, results can be found in Appendix D.

Ground conditions are typically 0.3m of topsoil overlaying cohesive Devensian Till to beyond depths of 4.7m. The Till is comprised of initially 1-1.5m of low to high strength clay, below which the shear strength increases. Varying amounts of silt, sand and gravel were also found.

4No soakaway tests were carried out as part of the site investigation. It was considered that the Devensian Till is impermeable and therefore indicates that infiltration drainage is NOT a feasible option.

5. Pre-Development Hydrology

Surface water management hierarchy is to first discharge via infiltration. As this is not a viable option on this development the second option would be to drain to watercourses. See Appendix H for the pre-development overland flow routes. The drainage is designed to follow these routes to existing watercourse *Higgin Brook* where possible. A hydraulic assessment of Higgin Brook was undertaken by Betts Hydro in July 2016. See Appendix H for the latest revision of the report.

6. Post-Development Surface Water Allowable Discharge Rates

Discharge rates have been limited to existing greenfield runoff rates of Qbar for all storm return periods. Refer to the phase specific FRA, and Tables 2 & 3 above for details of the greenfield runoff rates.

See Appendix I for the development area plan.

Surface Water Network	Development Phase	Developable Area (Ha)	Greenfield Rate (L/s/Ha)	Allowable Discharge Rate L/s
1	1	4.32	8.3	35.9
	2A	1.80	13.6	24.5
2	2B	2.69	13.6	36.6
3	3	1.71	13.6	23.3
			Total	**120.2**

Table 3

Please refer to the drainage network plans within Appendix J.

7. Design Parameters

M5-60	18.800
Ratio R	0.282
MADD Factor	2.0
Climate Change Allowance	30%
Urban Creep	10%

Table 4

Point of Connection	S325	S415
Drainage Layout Drawing Number	459/ED/202	459/ED/202
Proposed Impermeable Areas Drg No	459/ED/204	459/ED/204
Lowest FFLs	107.700	111.900
Maximum TWL for Design	106.750	111.100
Discharge Location Minimum Levels	103.500	108.469
Surcharge Outfall Levels	104.400	109.370
Point of Connection	Watercourse	
Point of Connection approved by UU (Y/N)	Yes	

Table 5

8. Summary of Drainage Design

The drainage has been designed in accordance with the site specific FRA produced by Betts Hydro. Phases 2 & 3 was designed in accordance with the Phase 2 & 3 document dated November 2021.

The drainage has also been designed to comply with DEFRA's non-statutory technical standards for sustainable drainage systems dated March 2015. Compliance to such is demonstrated within Section 13.

All surface water networks will drain to the adjacent watercourse named Higgin Brook. Discharge rates have been limited to existing greenfield runoff rates of Qbar for all storm return periods.

Attenuation storage is provided in the form of oversized pipes under highways and public open spaces. Attenuation storage in the highways is sized to provide attenuation for all flows up to and including 1 in 30 year storm events.

For storm events exceeding 1 in 30 year events, long term storage is provided in above ground storage areas to ensure no flooding to properties occurs for all storm events up to and including 1 in 100 year 6 hour storm event plus a 30% allowance for climate change.

All MicroDrainage simulations are available in Appendix J, a summary of the results are shown below:

1 in 1 Year Simulations

Drainage Network	**Pre-Development Flow Rates l/s**	**Allowable Discharge Rate l/s**	**Actual Discharge Rate l/s**
Network 1	52.3	60.4	49.9
Network 2	31.7	36.6	35.7
Network 3	20.2	23.2	22.7
Total	**104.2**	**120.2**	**108.3**

Development Phase	Developable Area Ha	Allowable Discharge Rate l/s/Ha	Actual Discharge Rate L/s/Ha
Phase 1	4.32	8.3	8.2
Phase 2A	1.80	13.6	8.2
Phase 2B	2.69	13.6	13.3
Phase 2	4.49	13.6	11.3
Phase 3	1.71	13.6	13.3
Phase 2 & 3	**6.20**	**13.6**	**11.8**

Table 6

The 1 in 1 year simulations demonstrate a rate less than the required restriction of Qbar. Please note that urban creep has been included for all areas, and has increased the actual flow rates. Should urban creep be removed, the actual flow rates would be also be less than pre-development flow rates. Please see Section 8 for more information on Urban Creep.

1 in 30 Year Simulations

Drainage Network	Pre-Development Flow Rates l/s	Allowable Discharge Rate l/s	Actual Discharge Rate l/s
Network 1	102.1	60.4	49.9
Network 2	62.1	36.6	35.6
Network 3	39.5	23.2	22.7
Total	**203.7**	**120.2**	**108.2**

Development Phase	Developable Area Ha	Allowable Discharge Rate l/s/Ha	Actual Discharge Rate L/s/Ha
Phase 1	4.32	8.3	8.2
Phase 2A	1.80	13.6	8.2
Phase 2B	2.69	13.6	13.2
Phase 2	4.49	13.6	11.2
Phase 3	1.71	13.6	13.3
Phase 2 & 3	**6.20**	**13.6**	**11.8**

Table 7

The 1 in 30 year simulations demonstrate a rate less than the required restriction of Qbar. It also demonstrates a betterment of 47% compared to the pre-development scenario.

1 in 100 Year Simulations

Drainage Network	Pre-Development Flow Rates l/s	Allowable Discharge Rate l/s	Actual Discharge Rate l/s
Network 1	125.2	60.4	49.9
Network 2	76.1	36.6	40.1
Network 3	48.4	23.2	25.6
Total	**249.7**	**120.2**	**115.6**

Development Phase	Developable Area Ha	Allowable Discharge Rate l/s/Ha	Actual Discharge Rate L/s/Ha
Phase 1	4.32	8.3	8.2
Phase 2A	1.80	13.6	8.2
Phase 2B	2.69	13.6	14.9
Phase 2	4.49	13.6	12.2
Phase 3	1.71	13.6	15.0
Phase 2 & 3	**6.20**	**13.6**	**13.0**

Table 8

The 1 in 100 year simulations demonstrate a rate less than the required restriction of Qbar. It also demonstrates a betterment of 54% compared to the pre-development scenario.

1 in 100 Year Simulations + 30% Climate Change

Drainage Network	Pre-Development Flow Rates l/s	Allowable Discharge Rate L/s	Actual Discharge Rate L/s
Network 1	125.2	60.4	49.9
Network 2	76.1	36.6	41.8
Network 3	48.4	23.2	26.4
Total	**249.7**	**120.2**	**118.1**

Development Phase	Developable Area Ha	Allowable Discharge Rate l/s/Ha	Actual Discharge Rate L/s/Ha
Phase 1	4.32	8.3	8.2
Phase 2A	1.80	13.6	8.2
Phase 2B	2.69	13.6	15.5
Phase 2	4.49	13.6	12.6
Phase 3	1.71	13.6	15.4
Phase 2 & 3	**6.20**	**13.6**	**13.4**

Table 9

The 1 in 100 year simulations demonstrate a rate less than the required restriction of Qbar. It also demonstrates a betterment of 53% compared to the pre-development scenario.

9. Urban Creep

When calculating the proposed impermeable areas for the development, an additional 10% has been added to all areas of domestic properties. This 10% is used to represent Urban Creep. The 10% has been applied to all phases; and is shown on the impermeable areas plans. These increased areas have been used on all pipes for all simulations within MicroDrainage, to enable us to design and model the system with greater areas of impermeability. The MicroDrainage calculations are found in Appendix J.

10. Design for Exceedance

All surface water drainage models have been modelled for storm events greater than the 1 in 100 year event to determine the impact of flooding. There was no flooding shown during this flood event, see Appendix K for the overland flow routing plans.

This demonstrates that properties are unlikely to flood during extreme flood events.

11. Maintenance

All Surface Water (coloured blue) on the attached maintenance plans in Appendix L, will be put forward for adoption under a S104 agreement with United Utilities. Prior to issue of the Vesting Declaration by United Utilities, the drainage shown on the included plan will be maintainable by Barratt Manchester and at the expense of Barratt Manchester.

All areas of public open space will be transferred to the management company for adoption and maintenance. This includes the overflow areas/ponds (coloured purple) on the maintenance plans. The management and maintenance will be funded by the purchasers/owners of the development by way of an annual fee levied on the owner. In order to ensure the long term operation of the swales, the maintenance contract will stipulate regular maintenance of the SUDS network, in accordance with this management plan.

All highway gullies, highway drains and culverts on the maintenance plans (coloured green) will be put forward for adoption under a 38 agreement with Lancashire County Council (LCC). After issue of the highway final certificate, the highways and highway drains, and gullies will be maintainable by the Local Highway Authority at the public expense. Prior to issue of the final Certificate by LCC, the highway drains shown on the included plan will be maintainable by Barratt Manchester and at the expense of Barratt Manchester.

All foul drainage (coloured brown) on the maintenance plans, will be put forward for adoption under a S104 agreement with United Utilities. Prior to issue of the Vesting Declaration by United Utilities, the drainage shown on the included plan will be maintainable by Barratt Manchester and at the expense of Barratt Manchester.

See Appendix L for the operation and maintenance manual for the specific maintenance schedule and reporting.

12. Compliance with DEFRA's Non-statutory Technical Standards for Sustainable Drainage Systems dated March 2015

Flood risk outside the development

Criteria	Designers Comments
S1 Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (**S2** and **S3** below) and volume control technical standards (**S4** and **S6** below) need not apply.	The surface water discharges to existing watercourse/sewer, therefore this criteria does not apply.

Peak flow control

Criteria	Designers Comments
S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.	All proposed discharge rates are less than or equal to Qbar. Therefore this criteria is deemed to comply.
S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.	The site is greenfield therefore not applicable. Therefore, this criteria is deemed to comply.

Volume control

Criteria	Designers Comments
S4 Where reasonably practicable, for greenfield development, 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 runoff volume for the same event.	As the infiltration test results do not allow infiltration drainage, it is not possible to reduce the run-off volume to the greenfield volume, therefore Criteria S6 will apply.
S5 Where reasonably practicable, for developments which have been previously developed, 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 must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.	The site is Greenfield therefore not applicable.
S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with **S4** or **S5** above, the runoff volume must be	As the infiltration test results do not allow infiltration drainage, it is not possible to reduce the run-off volume to the greenfield volume, therefore the discharge rate has been reduced

discharged at a rate that does not adversely affect flood risk.	to a maximum of Qbar for all rainfall events up to and including 1 in 100 year 6 hour event.

Flood risk within the development

Criteria	Designers Comments
S7 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.	The drainage system has been designed to ensure no flooding occurs for any part of the site for a 1 in 30 year event. Micro drainage simulation for a 1 in 30 year event are attached in Appendix J
S8 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.	The drainage system has been designed to ensure no flooding to properties occurs for any part of the site for a 1 in 100 year 6 Hour event. For flows in excess of the 1 in 30 year event, flows are allowed to overflow into Long Term Storage areas located in public open spaces. Some minor flooding to highways is accepted for the 1 in 100 year 6 hour event. Flooding is only permitted where it can be demonstrated that minor flooded is contained wholly within the adopted highway and will not flood properties. The location and flood extent are shown on the Flood Routing and Overland Flow drawing. Micro drainage simulation for a 1 in 100 year event are attached in Appendix J
S9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed	All surface water drainage models have been modelled for storm events greater than the 1 in 100 Year event to determine the impact of flooding. The Flood locations are shown on the attached Flood Routing and over land flow drawing. Any exceedance flooding has been demonstrated to be managed within the site where reasonably practicable.

Structural integrity

Criteria	Designers Comments
S10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.	All Sewers are to be covered under a S104 agreement with United Utilities for future adoption. All sewers to be built to UU adoptable standards. A 12 month maintenance period is standard with all S104 sewers

S11 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.	All main sewers to be constructed to adoptable standards. All SUDS to be constructed in accordance with the Typical details as provided.

Designing for maintenance considerations

Criteria	Designers Comments
S12 Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.	Surface Water Pump Stations are not proposed on this development. A Foul ONLY Pump Stations is provided only where it is not possible to drain foul by gravity.

Construction

Criteria	Designers Comments
S13 The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.	All Sewers are to be covered under a S104 agreement with United Utilities for future adoption. All sewers to be built to UU adoptable standards. Connection to the ordinary watercourse will require LLFA land drainage consent. Details of the works have been submitted to the LLFA and subsequently approved. No works to within 8m of an ordinary watercourse will be permitted without LLFA approval.
S14 Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.	All Sewers are to be covered under a S104 agreement with United Utilities for future adoption. All sewers to be built to UU adoptable standards. A 12 month maintenance period is standard with all S104 sewers. Connection to the ordinary watercourse will require LLFA land drainage consent. Details of the works have been submitted to the LLFA and subsequently approved. No works to within 8m of an ordinary watercourse will be permitted without LLFA consent.

13. Condition 12 Conclusion

No development shall commence in any phase until a detailed, final surface water sustainable drainage strategy for the site has been submitted to, and approved in writing by, the Local Planning Authority.

Decision Notice 3/2021/1134 was a replan of 03/2018/0975 for just 47 plots. The original drainage design was carried out for Phases 2 & 3 of the development (03/2018/0975). The replan was merely plot substitution of 47 units. The road and main drainage strategy remains the same, hence much of the information relating to the surface water strategy remains suitable for both applications, and may date back to previous years.

See this report for the drainage strategy for Phases 2 & 3 of the development.

The detailed surface water sustainable drainage strategy shall be based upon the site specific flood risk assessment and indicative surface water sustainable drainage strategy submitted and sustainable drainage principles and requirements set out in the National Planning Policy Framework, Planning Practice Guidance and Defra Technical Standards for Sustainable Drainage Systems.

The site specific flood risk assessment dated November 2021 was prepared for Phases 2 & 3 of the development, and is shown in Appendix F.

As this replan application does not amend the flood risk, nor require an amendment of the drainage strategy approved under the Phases 2 & 3 application, an amended FRA is not required for this application.

See Appendix F for the Flood Risk Assessment by Betts Hydro dated November 2021.

No surface water shall be allowed to discharge to the public foul sewer(s), directly or indirectly.

All surface water drainage to the adjacent existing ordinary watercourses, in accordance with the drainage strategy. Only foul sewers are draining to public foul sewers. Refer to the drainage layouts within Appendix J.

The details of the drainage strategy to be submitted for approval shall include, as a minimum:

a) Sustainable drainage calculations for peak flow control and volume control for the:

i. 100% (1 in 1 year) annual exceedance probability event;

ii. 3.3% (1 in 30 year) annual exceedance probability event;

iii. 1% (1 in 100 year) annual exceedance probability event + 30% climate change allowance, with an allowance for urban creep

Calculations must be provided for the whole site, including all proposed surface water drainage systems.

MicroDrainage simulations results for the full site are included within Appendix J. This includes simulations for Phases 1, 2 & 3 of the development. This includes simulations for the 1 in 1 year, 1 in 30 year, and 1 in 100 + 30% storm events.

b) Final sustainable drainage plans appropriately labelled to include, as a minimum:

i. *Site plan showing all permeable and impermeable areas that contribute to the drainage network either directly or indirectly, including surface water flows from outside the curtilage as necessary*

Impermeable areas plans for the full site are included within Appendix J. This includes areas for Phases 1, 2 & 3 of the development. The impermeable areas include a 10% increase in impermeable area to domestic properties to include an allowance for urban creep.

ii. Sustainable drainage system layout showing all pipe and structure references, dimensions and design levels, to include all proposed surface water drainage systems up to and including the final outfall;

Drainage layouts and network plans showing pipes, structures, dimensions, levels and pipe codes are included within Appendix J.

iii. Details of all sustainable drainage components, including landscape drawings showing topography and slope gradient as appropriate

All proposed landscaping plans are located within Appendix M, which includes planting and SuDS details. In addition, all external levels plans are located within Appendix N, which shows how each SuDS feature ties into the proposed development and existing topography.

iv. Drainage plan showing flood water exceedance routes in accordance with Defra Technical Standards for Sustainable Drainage Systems

Flood water exceedance routes are shown on flood routing plans in Appendix K, along with existing overland flow routes located in Appendix H. All compliance with DEFRA Technical Standards are shown within Section 12 of this report.

v. Finished Floor Levels (FFL) in AOD with adjacent ground levels for all sides of each building and connecting cover levels to confirm minimum 150mm+ difference for FFL

Finished floor levels are shown on the external levels plans shown in Appendix N. These show that adjacent ground levels for all sides of each building are at least 150mm lower than the FFLs.

vi. Details of proposals to collect and mitigate surface water runoff from the development boundary

There are no proposals to collect and mitigate surface water from the development boundary. Overland flow routes located within Appendix K show how the proposed design level design aims to mimic overland flow routes as much as possible.

vii. *Measures taken to manage the quality of the surface water runoff to prevent pollution protect groundwater and surface waters, and delivers suitably clean water to sustainable drainage components.*

Silt traps have been provided on the overflow, as the basin empties back into the sewer network, silts will be filtered out preventing them getting into the watercourse. Please see the drainage layouts located in Appendix J for more details.

c) *Evidence of an assessment of the site conditions to include site investigation and test results to confirm infiltration rates and groundwater levels in accordance with BRE 365.*

Site investigations have been carried out for each phase separately. See Appendix D for the site investigation regarding this phase of the development.

Soil infiltration testing was carried out in 2 no. trial pits during the preparation of the site investigation report. Infiltration testing is detailed within Paragraph 4.3.10 and Section 7.6 of Appendix D.

d) *Evidence of an assessment of the existing on-site watercourse to be used, to confirm that these systems are in sufficient condition and have sufficient capacity to accept surface water runoff generated from the development.*

Existing on site watercourses were modelled as part of the Phase 1 development of the report, titled Hydraulic Assessment. The report has been approved under previous planning applications.

The hydraulic assessment is located within Appendix H.

e) *Evidence that a free-flowing outfall can be achieved. If this is not possible, evidence of a surcharged outfall applied to the sustainable drainage calculations will be required.*

The assessment of peak water levels was provided in the Hydraulic Assessment in Appendix H. The peak proposed water levels for the 1 in 100 year event are shown in Table 4 on Page 16. The surcharge levels for the outfall positions are shown in Table 5 within this document.

Drainage simulations have been included within Appendix J including simulations for the 1 in 30 year rainfall events in a surcharged outfall.

The sustainable drainage strategy shall be implemented in accordance with the approved details.