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EAST SUSSEX COUNTY COUNCIL

PROPOSED RESIDENTIAL DEVELOPMENT

THE GROVE SCHOOL, ST LEONARDS-ON-SEA, HASTINGS, EAST SUSSEX

FLOOD RISK ASSESSMENT

JANUARY 2015

the journey is the reward

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FLOOD RISK ASSESSMENT

JANUARY 2015

Project Code:	**MBA-Hastings.10**
Prepared by:	**TdlR**
Approved by:	**tpm**
Issue Date:	**January 2015**
Status:	**for planning application**

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East Sussex County Council

Proposed Residential Development

The Grove School,
St Leonards-on-Sea,
Hastings, East Sussex
Flood Risk Assessment

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1 Introduction

1.1 East Sussex County Council has commissioned Mayer Brown Ltd to undertake a Flood Risk Assessment to support a planning application for a proposed residential development at the former Grove School Campus, St. Leonards-on-Sea, Hastings. The proposed development will consist of 210 dwellings.

1.2 This report considers whether the development lies within an area at risk of flooding, and provides mitigation measures for any identified flood risk.

1.3 The Environment Agency's (EA) indicative flood map (**Appendix A**) indicates that the 9.4 hectare site is located entirely within Flood Zone 1; which has a low (<1% or 1 in 1000) annual probability of experiencing flooding from fluvial or tidal sources.

1.4 This FRA has been compiled in accordance with "National Planning Policy Framework (NPPF)" published by Communities and Local Government in March 2012 (Ref. 8.1), ''Technical Guidance to the National Planning Policy Framework'' (Ref. 8.2), 'CIRIA C624: Development and Flood Risk Guidance' (Ref. 8.3) and 'Environment Agency (EA) Guidance Notes 1' (Ref. 8.4).

1.5 As outlined in EA Flood Risk Assessment (FRA) Guidance Note 1, for development proposals on sites comprising more than one hectare in areas in Flood Zone 1, the FRA should consider:

- The surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the development.
- Information about the surface water disposal measures already in place and their state of maintenance.
- An assessment of the volume of surface water run-off likely to be generated from the proposed development.
- Allowance in design for how the increased frequency and intensity of rainfall that is predicted as a result of climate change will affect the proposal.
- Information about other potential sources of flooding, if any, that may affect the site e.g. streams, surface water run-off, sewers, groundwater, reservoirs, canals and other artificial sources or any combination of these; including details on how these sources of flooding will be managed safely within the development proposal.

2 Site Location and Description

Site Location

2.1 The application site is located in the historical town of St. Leonards-on-Sea, lying to the west of central Hastings, refer to the site location map in **Figure 1**. The areas to the north-east and south can be described as urban, whilst the north-west area is undeveloped woodland.

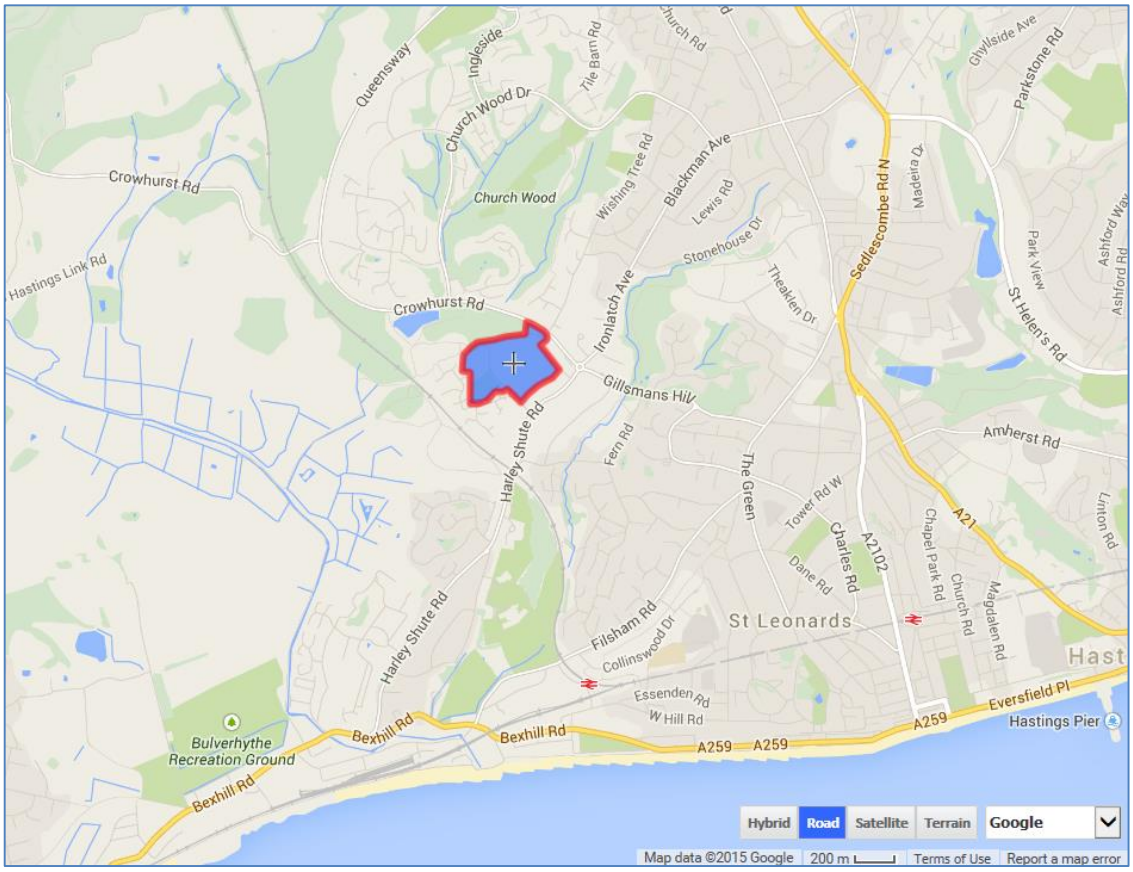

Figure 1: Site Location Map

2.2 The site falls under the administrative boundary of East Sussex County Council and of Hastings Borough Council. The postcode to the site is TN38 9JP and the approximate coordinates at the centre of the site are E578535 N110428.

2.3 The site is bounded to the south by residential properties and Darwell Close, to the west by residential properties, to the north by Dogkennel Wood and to the east by Crowhurst Road and residential properties.

2.4 The site can be described as “Brownfield” as it is has previously been developed in the form of a secondary school. The school has been unoccupied for some time and in recent months the school buildings have been demolished, although paved areas remain intact.

Topography

2.5 The application boundary covers a total area of approximately 9.4 hectares. The site is comprised of a mix of school buildings (now demolished) and car parks, sports fields and undeveloped woodland.

2.6 A topographical survey of the existing site is provided in **Appendix B** of this report. The high ground of the site is in the north-eastern corner currently used as a car park, approximately 44.5mAOD. The levels generally fall south-west towards the pond in the south-east corner. The lowest point on the site lies by the pond in the south-west, approximiaately19.3mAOD.

2.7 The site has a general gradient but with steep banks in various locations. The area comprising the sports field has been regraded to a plateau with a shallow gradient from north to south and a steep bank on the west and south edges.

Geology

2.8 The published geological map of the area (BGS Online 1:50,000) indicates the following geological sequence underlies the site:

- Superficial drift deposits: The site sits partly on alluvium (clay, silt, sand and gravel) fluvial deposit. This is generally known to be soft saturated soil.
- Solid Geology: This consists of the Tunbridge Wells Sand Formation and the Wadhurst Clay Formation (Mudstone).

2.9 Landis soil maps show the site to be entirely comprised of clayey soils, which would impede drainage, as such it is likely that infiltration features will not be suitable. However this should be confirmed at detailed design stage in accordance with BRE 365 soil soakage tests.

Hydrogeology

2.10 With reference to EA data, the site is not located within a Source Protection Zone.

2.11 The site is located above a secondary aquifer, which the EA describe as:

Cont’d….

"Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers."

Hydrology

2.12 As previously mentioned the site contains a small water body in the form of a pond (approx. 0.5ha), located in the south-western corner of the site. The nearest watercourse is the Combe Haven River approximately 1000 metres south-west of the site.

2.13 As the site slopes downwards towards the south west then the existing surface water drainage follows this fall. The outfall for all the existing site drainage is a pipe located under the low point of the school access road near to the Darwell Close entrance. This pipe leads into a lined ditch course which in turn outfalls to the pond in the south west of the site.

2.14 The pond provides attenuation of the site runoff and has an outlet to a watercourse leading off the site to the west.

2.15 After reviewing the Southern Water and Environment Agency maps for the area it is clear that this outlet from the pond leads to the Combe Haven River network via a series of streams and culverts.

2.16 The entire site is located within an Environment Agency Flood Zone 1.

2.17 Flood risk and mitigation measures are addressed in Section 5 of this report.

3 Proposed Development

3.1 The planning application proposes to develop approximately 7.8ha of the 9.4ha site for residential use. An illustrative 'master plan' is included in **Appendix C**, which provides an indication of the general site layout.

3.2 The application seeks outline planning permission for the construction of a residential development for up to 210 dwellings, comprising of 190 houses and 20 flats.

3.3 It is intended that the proposed development will be accessed from two points on Darwell Close to the south. There would be a pedestrian/cycle access from Crowhurst Road to the north-east.

3.4 The existing site was formally comprised of the school buildings and associated car parks to the north, sports-field in the south and woodland in the south-west. The school buildings have been demolished in recent months. The car parks and paved areas remain intact.

3.5 The development takes place on the area of the former school building, car parks and sports fields. The woodland remains undeveloped.

3.6 The development proposals will include a new surface water drainage system, incorporating SuDS features and attenuation facilities as necessary. The design intent will be to improve upon the existing drainage facilities of the former use of the site as a school and to provide an efficient drainage system, such that flood risk is reduced for the site and for downstream properties.

3.7 The site currently has varying levels with steep banks in several areas. The housing layout will require regrading of these to shallower falls, consistent with an accessible housing layout. This is turn will allow a drainage system with suitable gradient to allow efficient operation working under the force of gravity.

3.8 The existing lined ditch and pond will remain as the outfall for the site drainage.

3.9 The development proposed is entirely residential. This places the site in the "More Vulnerable" category, according to Table 2 of NPPF – Technical Guidance Document.

3.10 The surface water arrangement for the proposed development will address this and be discussed in section 6 of this report.

4 National Policy, Strategic Flood Risk Assessment & Local Planning Policy

National Planning Policy

4.1 NPPF sets out a robust approach to the Sequential Test and intended to provide a rigorous understanding of flood risk. Its aim is to steer new development to areas at the lowest probability of flooding i.e. Flood Zone 1.

4.2 *The proposed development is entirely located in Flood Zone 1 (little to no risk of flooding) and it is sequentially appropriate. Therefore, proposed development passes the Sequential Test and application of the Exception Test is not necessary.*

4.3 The proposed development is a residential scheme, and therefore, can be classified as ''More Vulnerable' to risk of flooding. It is consistent with the appropriate uses for Flood Zone 1, as outlined in Table 2 of NPPF -Technical Guidance Document.

Strategic Flood Risk Assessment

4.4 A Strategic Flood Risk Assessment (SFRA) for Hastings Borough Council was carried out in May 2008 and updated in November 2014 (Ref 5). The primary objective of the SFRA was is to identify the areas within a development plan area that are at risk from all forms of flooding. In addition, the SFRA has specific objectives to provide background information and evidence to be used in the development of the Borough Council's Planning Strategy and Development Strategy and to identify broad locations for future development.

4.5 The strategy details the Council's recommendations for developments in Flood Zone 1 regarding Flood Risk and Drainage:

"If the development is within Flood Zone 1 and is greater than 1ha, the following recommendations and comments are made.

- *The developer should check whether the site has been identified as at flood risk from other sources by the SFRA by referring to relevant maps. If so, a more detailed assessment of this risk over the lifetime of the development must be made.*
- *A drainage impact assessment must be carried out by a suitable professional to identify the impact of the proposed development on surface*

water drainage and recommend the approach to controlling runoff to the required discharge rates.

- *The FRA must show that flood risk will be reduced overall. NPPG (Table 3) confirms that all types of development are deemed suitable in Flood Zone 1.*

One critical aspect of large sites in Flood Zone 1 is the need to ensure rainfall runoff is adequately managed through the incorporation of Sustainable Drainage Systems (SuDS)."

Building Regulations, Approved Document H; 2010

4.6 The Building Regulations are concerned with the health, safety, welfare and convenience of persons in and about buildings and others who may be affected by buildings or matter connected with buildings.

4.7 The Approved Document H (Ref 8.7) provides practical information on drainage disposal. It stipulates that an adequate foul water drainage system is required to carry water from appliances within the building to one of the following, listed in order of priority:

- Public sewer,
- Private sewer communicating with a public sewer,
- Septic tank with secondary treatment/ wastewater treatment system,
- Cesspool.

4.8 It stipulates that foul water drainage systems are constructed so as not to be in an area where there is a risk of flooding.

5 Flood Risk & Mitigation

5.1 In theory there are four principal types / sources of flooding that could affect a development of this scale. These are described in the following paragraphs with proposed mitigation measures described where necessary. The relevant sections and mitigation measures have come about through review of the policy documents outlined in section 4.

5.2 Fluvial and Tidal Flooding

The Environment Agency's (EA) indicative flood map shows that the development site and surrounding area is located entirely in Flood Zone 1 (**Appendix A**); which has a low probability risk of experiencing flooding from fluvial sources. This has been confirmed through correspondence with the EA (**Appendix D**).

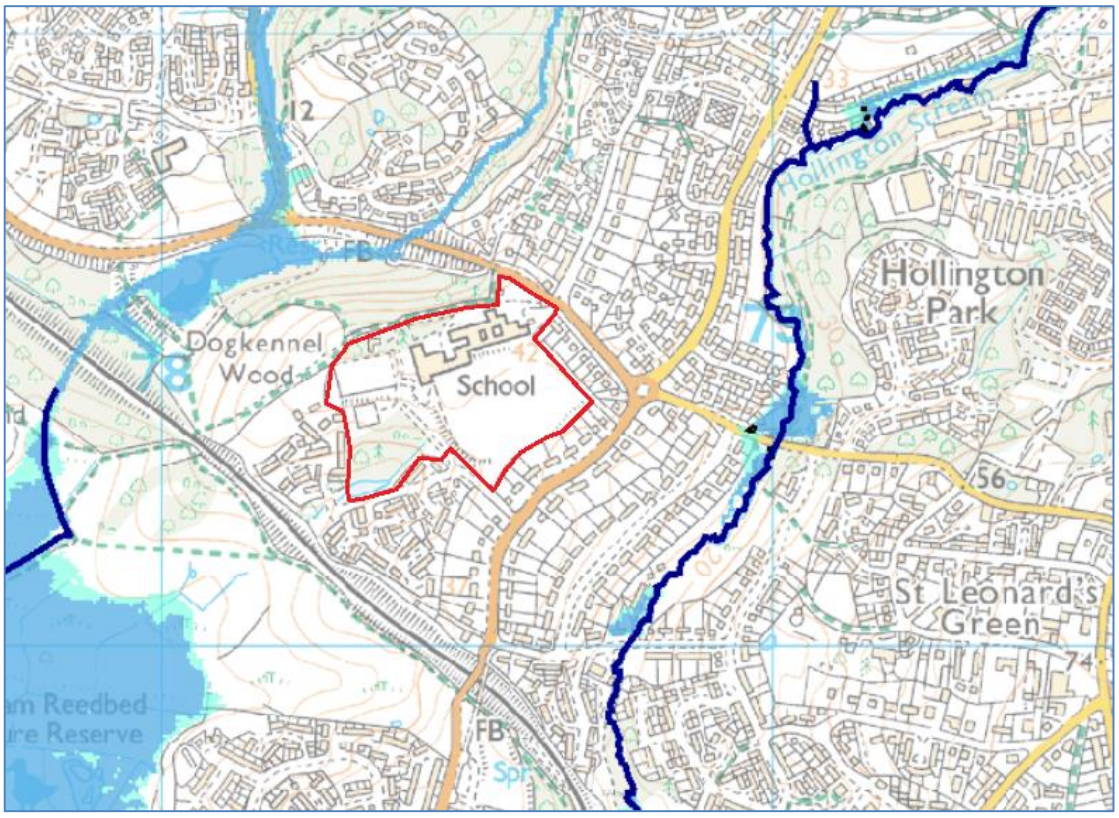

Figure 2: Environment Agency Flood Zone Map

5.3 As the site is located entirely in Flood Zone 1, and is therefore within the lowest risk category for flooding, the sequential test has been satisfied and there are no mitigation measures required for tidal/fluvial flooding.

Groundwater Flooding

5.4 The SFRA identifies that there has been no indication that groundwater flooding forms any significant risk in the area surrounding and including the site. The EA groundwater map shows that the site bedrock is a 'Secondary A' aquifer and as such is at a low risk of groundwater flooding.

5.5 There is a residual risk with the possibility of the failure of the proposed water mains serving the site. However, any groundwater flooding that would occur should be intercepted by the proposed surface water system and conveyed away from any dwellings.

Surface Water Flooding

5.6 Surface water (overland) flooding results from rainfall that fails to infiltrate the ground and travels over the surface. This is exacerbated by urban development with low permeability of surfaces or low permeability soils and geology (such as clayey soils). Overland flow is likely to occur at the base of an escarpment and low points in terrain.

5.7 Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be taken into account in spatial planning for urban developments. In addition, surface water flooding can be exacerbated if development increases the percentage of impervious area.

5.8 The EA flood map and SFRA identify this site as having a low or very low surface water flood risk. However in the south-western corner of the site, the EA surface water map indicates some risk of flooding. This is most likely due to the variable topography and general low lying nature of the area surrounding the pond. The current development plans leave this area undeveloped. This FRA will demonstrate that the proposed development plans do not increase the flood risk in this area and will provide some improvement of the current situation.

5.9 The proposed development is to include SuDS measures to prevent surface water flooding. In particular the following measures are considered:-

- Paved surfaces of the driveways, car parking and patio areas should be of permeable construction and/or contain a soakage/attenuation storage layer in the sub-base.

Cont'd….

- Modular geo-cellular systems, with a high void ratio to provide below ground storage and possible infiltration.

5.10 At the detailed design stage checks will be made to ensure that an adequate level of protection against flooding internally of the new properties is achieved.

5.11 The Surface Water Drainage Strategy will be discussed further in section 6 of this report.

Sewer Flooding / Infrastructure Failure

5.12 The SFRA does not identify a risk of Sewer Flooding at the site location.

5.13 Flooding has been reported recently by residents south of the site in Darwell Close. This has also been witnessed by the authors of this report. It is apparent that this flooding is due to lack of maintenance of the existing site drainage network.

5.14 The school has been unoccupied for some months and in more recent times the buildings have been demolished. It would appear that these factors have contributed to a lack of maintenance of existing drainage systems. It is possible that demolition activities have led to blockage of the existing drains.

5.15 Surface water drains in the former school access road and also drains leading off the sports fields have become blocked. Water is observed to be backing up and flooding out of manhole chambers, leading to overland flows on the school access road. This flow overspills the road edge and follows the topography to run south west through the gardens of numbers 6 to 14 (even no's) of Darwell Close. The flow route follows the line of a major gas main situated within the gardens. At no 14 the flood flow passes back into the development site and into the pond in the south-west corner.

5.16 Maintenance of the existing drainage system, to clear blockages, will allow runoff to remain in the pipe network and pass into the lined ditch and then the existing pond in the south west of the site. This should alleviate this flood risk in Darwell Close in the short term (pre-development).

5.17 The development proposals would require a completely new drainage system, designed to provide betterment of the current system. This would alleviate the flood risk for the site and for neighbouring properties for the long term.

Cont'd….

5.18 There is a residual risk of failure of existing surface water systems at developed areas above the height of the development (to the north). During exceptional conditions of wet weather the capacity of the surface water system may be inadequate even though it has been designed in accordance with current design standards. Under such conditions sewers may surcharge and surface water may escape from those manhole covers positioned below the hydraulic gradient. The development layout should be designed in a manner to provide overland flood routes that avoid flooding of the residential properties.

6 Surface Water Drainage

Existing Surface Water Drainage

6.1 The site is considered as 'brownfield' in its former use as a school, containing a mixture of hardstanding area, roofs and pavements. This can be broken down as:

- Impermeable Roofs: 0.8003ha
- Hardstanding: 0.913ha
- Impermeable Roads/Paths: 0.3787ha
- **Total Impermeable Area: 2.092ha**

6.2 The site currently drains to an outfall pipe located under the school access road near Darwell Close. This pipe has a diameter of 300mm, and falls by approx. 0.42m over a length of 9.69m (- length and fall to be confirmed by further site survey). The maximum pipe flow is then calculated as 303l/s at a velocity of 4.3m/s.

6.3 The capacity of the lined ditch, from the pipe outlet to the pond, is somewhat greater than this.

6.4 Maximum existing run-off rates were calculated for 30 year return period storms (the standard at the time of the pre-development) using Micro Drainage software. The output results indicate the maximum flow rate as **198 l/s**; corresponding with a 15 min winter event. See **Appendix E**.

6.5 This illustrates that the pipe outlet is sufficient to cater for the runoff for the entire impermeable area of the site as existing, for the 1 in 30 year events, without need for attenuation.

Proposed Surface Water Drainage

6.6 The proposed development will increase the impermeable area of the site, breakdown as follows:

- Impermeable Roofs: 1.31ha
- Hardstanding: 0.26ha
- Impermeable Roads/Paths: 1.04ha
- **Total Impermeable Area: 2.61ha**
- **Impermeable Area Increase: 0.518ha**

6.7 In order to improve the existing drainage situation the proposed drainage strategy is to be designed to accommodate the increased impermeable area and for storm events up to 1 in 100 year return period and with an allowance of +30% for climate change effects.

6.8 The Environment Agency is predominantly concerned about the quantity, rate and quality of surface water run-off leaving the developed site.

6.9 Sustainable Urban Drainage Systems (SUDS) are a range of techniques that aim to mimic the way rainfall drains in natural systems and so reduces the hydraulic and hydrological impact on the local area and downstream catchments. There are a number of options available to impose surface water restrictions on proposed development plots such as oversized sewers, below ground storage tanks, permeable paving, or infiltration systems. Approved document Part H sets out a hierarchy for surface water disposal, which encourages a sustainable approach.

- An adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable,
- A Watercourse, or where that is not reasonably practicable,
- A Sewer.

6.10 As previously mentioned, the soils and underlying geology would impede drainage and hence the use of SuDS infiltration devices, such as soakaways, is not included in this assessment. In due course and following further soil investigation and permeability testing, it may prove to be that some drainage by infiltration can be considered.

6.11 The site will make use of geo-cellular storage tanks and permeable paving with voided sub-base to provide attenuation storage. The permeable paving also provides water quality treatment effects for the water run-off from parking areas.

6.12 There are a number of places on the developed site that could accommodate offline geo-cellular storage tanks; e.g. beneath the MUGA and beneath the Open Space. Storage volumes in excess of 500m^3 can be provided at these locations with the depth of the storage kept to within 2m of the ground surface. An indicative surface water drainage strategy layout drawing is provided at **Appendix F**.

6.13 The proposed drainage strategy uses permeable paving in various locations (see **Appendix F**). Calculation suggest that's a further attenuation storage volume of some 250m^3 can be provide in this way. The storage will also provide water quality treatment of the surface run-off from the parking areas.

6.14 The proposed drainage strategy utilises a network of traditional pipes which outfall to the lined ditch and then the existing pond, at a rate restricted with a flow control device to the maximum existing outfall pipe flow (303l/s – see para 6.2).

6.15 The outfall rate into the pond and subsequently into watercourse to the Combe Haven river network will not be increased above those of the existing situation. The provision of attenuation features to cater for 1 in 100 year events and with a +30% allowance for climate change will greatly reduce the water flow to the pond and downstream features, thereby improving the flood risk for the development site and downstream properties.

6.16 Preliminary calculations for the strategic SuDS areas have been undertaken to confirm the adequacy of the proposals. These use the source control module of Micro Drainage to simulate the SuDS areas and the impermeable area discharging into them. The software runs hydrographs for a range of storm events to determine the critical duration storm.

6.17 The results for the 1 in 100 year plus 30% events can be found in **Appendix E**. These indicate an attenuation storage volume requirement of **641m^3** and a maximum outlet flow of **253 l/s**. As described above, these volumes and flows can be readily accommodated by the indicative drainage strategy shown in **Appendix F**.

6.18 Maintenance of the proposed surface water drains of the residential development would offered to Southern Water, via a S104 Agreement. This would enable tight control over the operation and maintenance of the drainage/SuDS systems on site.

6.19 It is anticipated that the pond in the south west of the site will remain unchanged. Further it should be anticipated that the pond will not be adopted by Southern Water but will remain in the same ownership as the rest of the application site. Southern Water will however require assurance from the site owner with regard to long term maintenance arrangements for the pond.

7 Conclusions

7.1 The assessment has been undertaken in accordance with National Planning Policy Framework (NPPF), published by the Department for Communities and Local Government in March 2012.

7.2 The site covers to a total area of approximately 9.4 hectares and can be described as "brownfield" as it is previously developed land (formerly a school).

7.3 The site is located entirely within a low risk Flood Zone 1 (<1% annual probability of fluvial/tidal flooding). It therefore satisfies the sequential test.

7.4 The proposed development drainage will use sustainable underground attenuation storage and permeable paving features, as well as traditional pipework and manholes.

7.5 All surface water run-off from the proposed development will be attenuated to existing run off rates using underground storage facilities and by storage in sub-base layers to driveway and car park areas. The SuDS features will ensure no increase in flood water running off the site for storm events up to and including those with a return period of 1 in 100yrs, and with a 30% increase in rainfall to account for climate change. The increased site storage capacity, to accommodate 1 in 100 year storm +30% for climate change effects, provides betterment of the current situation (1 in 30 year storm).

7.6 An indicative surface water drainage strategy layout is contained in **Appendix F** of this report. This is to demonstrate that the surface water solution can be implemented on the site. The drainage layout will be subject to detailed calculation and design at a later stage, but taking account of the principles set out in this report.

7.7 The finished levels of the development proposals are such that buildings will not be subject to overland flow from potential flood waters generated on-site or from upstream areas or properties. In the unlikely event that overland flow will occur the resulting run-off would be directed to overland flood routes that avoid any residential properties.

7.8 All the sources of flooding that could be caused by the proposed development have been considered and it can be concluded that, with the potential mitigation methods including appropriate maintenance of the existing drainage features that are to remain, the potential flood risk from and to the development proposal is low.

7.9 Having completed a level 1 Flood Risk Assessment it is clear that Level 2 or 3 Assessments are not required for this site.

8 References

8.1 Communities and Local Government, 2012, National Planning Policy Framework (NPPF) – Development and Flood Risk, HMSO, London.

8.2 Technical Guidance to the National Planning Policy Framework (NPPF), March 2012, Communities and Local Government. HMSO, London.

8.3 Development and flood risk guidance for the construction industry- C624, 2004, CIRIA, London.

8.4 FRA Guidance Note 1: Development with a Critical Drainage area or greater than 1 hectare (ha) in Flood Zone 1 , April 2012, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/311502/LIT_9193.pdf, Environment Agency.

8.5 Level 1 Strategic Flood Risk Assessment (SFRA), November 2014, Hastings Borough Council.

8.6 The Building Regulations, Approved Document H, 2010, HM Government.

8.7 Report No. 124 Flood estimation of small catchments, 1994, Institute of Hydrology.

8.8 The Sustainable Drainage (SUDS) Manual, 2007, CIRIA.

8.9 Flood and Water Management Act, April 2010, DEFRA.

APPENDIX A: EA Flood Map for Planning (Rivers and Sea)


EA Flood Map For Planning
Former Grove School, Hastings, TN38 9JP
Legend
High
Low
Medium
Shornden Reservoir
Silverhill
Google earth
© 2015 Google
N
1 km

APPENDIX B: Topographic Survey

Dogkennel Wood

The St Leonards Academy
Darwell Campus
(Secondary School)

CROWHURST ROAD

CAR PARK

3" (75mm) Gas main.

Sub Sta

WISHING TREE CLOSE

WISHING TREE LANE

MEADOWSWEET CLOSE

NEWTS WAY

DARWELL CLOSE

THE

HARLEY SHUTE ROAD

Note:
Do not scale this drawing.
All levels and dimensions are to be checked on site.
This drawing is to be read in conjunction with all relevant consultants' requirements, drawings and specifications.
Any discrepancies between consultants' drawings to be reported to the Contract Administrator before any relevant work commences.

Notes

1:500

0 10m 20m 30m 40m 50m

This drawing combines the Ordnance Survey information with the Topographic Survey - pre demolition. The buildings on site have now been removed.

N

Rev	Date	Description	Drawn	Checked
P1	13.01.14	First issue	OS	PD
C	12.02.15	Demolition overmarkings removed.	PD	PED

Status: OPA

The Grove School
St Leonards, Hastings.

Block Plan - Pre Demolition Ordnance Survey & Topograpic Survey combined.

Scale 1:500 @ A0 | Job 4360 | Dwg AL05 | Rev C

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APPENDIX C: Architects' Indicative Layout

Accommodation & legend.		Parking.	Dwellings.	Affordable home plots.
	Flats - shown thus - one three storey block provides 6 no 2 bedroom, 3 person flats & 14no 1 bedroom, 2 person flats. Plots 56 to 75 provide 2 person and 3 person affordable homes		20	56 to 75 three storey flats. 14no 1 bed, 2p. 6no 2 bed 3p. 20 Flats.
	Resident parking spaces.	20+1 dis		
	56 no 2 Bedroom 4 person Terraced houses - Type 1 - drawn thus. No garages but detached car ports provided.		56	plots 12 & 13, 17 & 18, 195 - 198. 8 houses
	Resident parking spaces.	56		
	74no 3 Bedroom 5 person detached, semi detached or terraced houses - Type 2 -drawn thus. Footprint includes 6mx3m garage and drive in all cases.		74	plots 10, 11, 148 to 151,158 & 159 8 houses
	Resident parking spaces & garages.	148		
	42no 4 Bedroom 6 or 7 person detached, semi detached or terraced houses - as type 2 but with additional bedroom over garage drawn thus. Footprint includes 6mx3m garage and drive in all cases.		42	plots 76 to 78, 90 & 91 5 houses.
	Resident parking spaces.	84		
	6no 4 or 5 bedroom detached or semi detached houses - Type 4 - drawn thus. Footprint includes double garage and drive in all cases. 5th bedroom requires a bedroom and bathroom above the garage.		6	plots 120 & 121 2 houses.
	Resident parking spaces.	12		
	12no 3 Bedroom, 6 person, detached, semi detached or terraced houses Type 5 drawn thus. Footprint includes 6mx3m garage and drive in all cases.		12	plots 74, 75, 87, 88, 128 to 133 10 houses.
	Resident parking spaces.	24		
	Sub total Resident Spaces.	344		
	Visitor parking area 1.	4		
	Visitor parking area 2.	4		
	Visitor parking area 3.	8		
	Visitor parking area 4.	9		
	Visitor parking area 5.	10		
	Visitor parking area 6.	7		
	Visitor parking area 7.	9		
	Visitor parking area 8.	17		
	Visitor parking area 9.	3		
	Visitor parking area 10.	3		
	Visitor parking area 11.	17		
	Visitor parking area 12.	3		
	Visitor parking area 13.	8		
	Visitor parking area 14.	8		
	Visitor parking area 15.	2		
	Visitor parking area 16.	2		
	Visitor parking area 17.	3		
	Visitor parking area 18.	3		
	Visitor parking area 19.	9		
	Visitor parking area 20.	3		
	Sub total Visitor Spaces. Excludes disabled bays.	132		
	Totals.	476	210	53 (25%)

Areas crossed thus are suggested owners car ports as opposed to parking spaces.

Trees shown in this way are existing trees to remain.

Trees shown in this way are existing trees to be removed.

Trees shown in this way are suggested as new trees. The preference is to plant compact columnar birch trees to create a single type avenue effect to replace lost trees using Betula Pendula "Obelisk" & to enhance street scenes.

NB - Houses 134 to 146 are shown elevated above the Old School Drive to permit foul drainage from occupied areas to exit to higher ground at the rear as the buildings are located at the lowest point on the site with the least potential for gravity foul drainage design.

Housing Density is limited by the retention of the existing woodland/pond area. If this were excluded the site area would be 7.506 ha and a revised calculation would give rise to a density of 27.97 DPH which approximates to the norm of 30 DPH for this type of development.

Ordnance Survey, (c) Crown Copyright 2013. All rights reserved. Licence number 100022432

1:1250 0 10m 50m 100m

N

NB - Houses 134 to 146 are shown elevated above the Old School Drive to permit foul drainage from occupied areas to exit to higher ground at the rear as the buildings are located at the lowest point on the site with the least potential for gravity foul drainage design.

Housing Density is limited by the retention of the existing woodland/pond area. If this were excluded the site area would be 7.506 ha and a revised calculation would give rise to a density of 27.97 DPH which approximates to the norm of 30 DPH for this type of development.

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Any discrepancies between consultants' drawings to be reported to the Contract Administrator before any relevant work commences.

Notes

As drawn 190 houses plus a three storey block of flats (20 flats) giving a total of 210 dwellings on a site area of 9.326 hectares (22.5 DPH). Development density is reduced by the retention of woodland on site and a 15m margin adjacent to ancient woodland along the north boundary.
Both semi detached and terraced houses with three or more bedrooms have integral garages. The Multi Use games area is shown relocated onto a former basket ball court area and edge of woodland. It is suggested that an elevated boardwalk area is provided in the woodland as a fitness trail and wildlife observation path. This is not a scheme. It has been produced as a study to assess the road and infrastructure potential of the site given the limitations of access, topography and the available development area, taking into account natural and utility limitations as they are presently understood. This study assumes that the gas mains are re routed to make best use of the land available. Suggested road names are notions based upon the history of the site and have not been agreed with anyone. The suggestions should aid communication during public consultations.

Rev	Date	Description	Drawn	Checked
P I	03.02.15	First Issue	pd	PED
A	11.02.15	Road width adjusted to suit tracking information from Highways consultant	pd	PED

Status: OPA

Former Grove School site
St. Leonards, Hastings

Location plan & housing layout study

Scale	Job	Dwg	Rev
1: 1250 @ A1	4360	AD031	A

MILLERBOURNE ARCHITECTS
332 Kingsway
Hove East Sussex
BN3 4QW
T: 01273 411399
design@ miller-bourne.co.uk

APPENDIX D: EA/Local Council Correspondence

Please quote: DCQ/15/00097 DA70010T/TT
Your Reference:
Date: 29 January 2015
Please ask for: Mr T Tanner
Telephone direct: (01424) 783336
Email: ttanner@hastings.gov.uk
Web: www.hastings.gov.uk/planning

Development Management
Aquila House, Breeds Place,
Hastings, East Sussex TN34 3UY

www.hastings.gov.uk/planning

Mr T de la Rosa,
Mayer Brown Limited
Lion House
Oriental Road
Woking, Surrey
GU22 8AR

Dear Mr de la Rosa,

Enquiry Number: DCQ/15/00097
Subject: Content of Flood Risk Assessment
Location: Former The St Leonards Academy Darwell Campus, Darwell Close, St Leonards-on-sea, TN38 9JP

I am writing in response to your e-mail of 22 January 2015.

As stated in your e-mail the site appears to be entirely within flood zone 1. From my research it does not appear that we have any additional flood risk data. However, I can advise you that a pond is located in the south west corner of the site and this part of the site is also crossed by a watercourse. As you are aware the site was previously occupied by a school and the Education Service at East Sussex County Council (ESCC) may have information regarding whether any localised flooding has taken place at the site or the surrounding area. I recommend contacting Alice Smyth at ESCC for further information - e-mail: Alice.Smyth@eastsussex.gov.uk

With regard to the content of the report, as the site is not within a flood risk zone I am of the opinion that it will be necessary to ensure that the issue of surface water flooding is fully considered. If the application is to be submitted with a drainage layout it will be necessary to demonstrate that the drainage layout is adequate for dealing with the surface water generated by roofs and hard surfaces etc, as well as for servicing the development more generally. If the drainage layout is to be dealt with by a planning condition I recommend submitting details regarding what level of surface water is likely to be generated (i.e. during periods of heavy rainfall) so that the information can be used to inform the drainage layout at a later stage.

In my opinion it will also be necessary to consider flooding from groundwater, the existing pond and watercourse, and from existing drainage infrastructure and other artificial sources in the area.

Please contact me if you have any further questions.

Yours sincerely,

T. B. Tanner

T Tanner
Planning Officer

Tom de la Rosa

From: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Sent: 30 December 2014 14:50
To: Tom de la Rosa
Subject: FW: 141229/ssd/5629/CW FW: Scope for Flood Risk Assessment - Former St. Leonards Academy Darwell Campus, St. Leonards-on-sea, TN38 9JP
Attachments: FZ1_FRA_ Guidance notes.pdf

Dear Tom

Further to your enquiry, we can confirm this site is in flood zone 1 so we do not have any data available.

Please find attached a guidance document to assist in conducting an FRA.

Yours sincerely

Customers & Engagement
Solent and South Downs
The Environment Agency - South East

External: 01903 703831
Internal: 723 3831
email: ssdenquiries@environment-agency.gov.uk

From: Tom de la Rosa [mailto:tdelarosa@mayerbrown.co.uk]
Sent: 19 December 2014 16:22
To: Enquiries, Unit
Subject: Scope for Flood Risk Assessment - Former St. Leonards Academy Darwell Campus, St. Leonards-on-sea, TN38 9JP

Dear Sir / Madame,

We are firm of consulting engineers that have recently been commissioned to undertake a Flood Risk Assessment (FRA) that will support the planning submission for a proposed development located at former Darwell Campus of St. Leonards Academy, St. Leonards-on-sea. Post code: TN38 9JP, co-ords: E 578491, N 110405.

The proposal is for the construction of a residential development (see attached plans) on a greenfield site.

According to the Environment Agency's (EA) indicative flood map the site is located in a Flood Zone 1 area (see attached), however it is a large site (22.5ha).

Bearing the above information in mind could you please confirm the necessary guidance / scope to carry out a FRA out at this location, as well as this if you have data regarding previous flooding event this would be much appreciated.

Regards,

Tom de la Rosa

Tom de la Rosa,
Mayer Brown Limited
Lion House
Oriental Road
Woking
Surrey
GU22 8AR

T: 01483 750 508
F: 01483 750 437
E: tdelarosa@mayerbrown.co.uk

www.mayerbrown.co.uk

APPENDIX E: Micro Drainage Calculations

Summary of Results for 30 year Return Period

Half Drain Time : 9 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	1.221	0.221	0.0	194.4	194.4	151.5	O K
30 min Summer	1.226	0.226	0.0	194.8	194.8	154.5	O K
60 min Summer	1.186	0.186	0.0	191.2	191.2	127.2	O K
120 min Summer	1.098	0.098	0.0	182.9	182.9	67.2	O K
180 min Summer	1.037	0.037	0.0	177.0	177.0	25.4	O K
240 min Summer	1.005	0.005	0.0	173.7	173.7	3.3	O K
360 min Summer	1.000	0.000	0.0	137.3	137.3	0.0	O K
480 min Summer	1.000	0.000	0.0	109.8	109.8	0.0	O K
600 min Summer	1.000	0.000	0.0	92.3	92.3	0.0	O K
720 min Summer	1.000	0.000	0.0	80.1	80.1	0.0	O K
960 min Summer	1.000	0.000	0.0	64.0	64.0	0.0	O K
1440 min Summer	1.000	0.000	0.0	46.5	46.5	0.0	O K
2160 min Summer	1.000	0.000	0.0	33.8	33.8	0.0	O K
2880 min Summer	1.000	0.000	0.0	26.9	26.9	0.0	O K
4320 min Summer	1.000	0.000	0.0	19.5	19.5	0.0	O K
5760 min Summer	1.000	0.000	0.0	15.5	15.5	0.0	O K
7200 min Summer	1.000	0.000	0.0	13.0	13.0	0.0	O K
8640 min Summer	1.000	0.000	0.0	11.3	11.3	0.0	O K
10080 min Summer	1.000	0.000	0.0	10.0	10.0	0.0	O K
15 min Winter	1.263	0.263	0.0	198.2	198.2	180.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.035	0.0	295.3	14
30 min Summer	49.499	0.0	389.8	22
60 min Summer	30.811	0.0	482.5	38
120 min Summer	18.615	0.0	583.7	70
180 min Summer	13.715	0.0	643.8	98
240 min Summer	10.995	0.0	688.9	126
360 min Summer	8.034	0.0	756.4	0
480 min Summer	6.428	0.0	806.9	0
600 min Summer	5.404	0.0	847.8	0
720 min Summer	4.687	0.0	882.5	0
960 min Summer	3.743	0.0	939.7	0
1440 min Summer	2.723	0.0	1025.4	0
2160 min Summer	1.979	0.0	1117.7	0
2880 min Summer	1.577	0.0	1187.3	0
4320 min Summer	1.143	0.0	1291.8	0
5760 min Summer	0.910	0.0	1370.6	0
7200 min Summer	0.762	0.0	1434.4	0
8640 min Summer	0.659	0.0	1488.5	0
10080 min Summer	0.583	0.0	1535.6	0
15 min Winter	76.035	0.0	334.3	14

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	1.258	0.258	0.0	197.7	197.7	176.4	O K
60 min Winter	1.190	0.190	0.0	191.6	191.6	129.9	O K
120 min Winter	1.059	0.059	0.0	179.1	179.1	40.7	O K
180 min Winter	1.000	0.000	0.0	169.1	169.1	0.0	O K
240 min Winter	1.000	0.000	0.0	135.7	135.7	0.0	O K
360 min Winter	1.000	0.000	0.0	99.2	99.2	0.0	O K
480 min Winter	1.000	0.000	0.0	79.4	79.4	0.0	O K
600 min Winter	1.000	0.000	0.0	66.7	66.7	0.0	O K
720 min Winter	1.000	0.000	0.0	57.9	57.9	0.0	O K
960 min Winter	1.000	0.000	0.0	46.2	46.2	0.0	O K
1440 min Winter	1.000	0.000	0.0	33.6	33.6	0.0	O K
2160 min Winter	1.000	0.000	0.0	24.4	24.4	0.0	O K
2880 min Winter	1.000	0.000	0.0	19.5	19.5	0.0	O K
4320 min Winter	1.000	0.000	0.0	14.1	14.1	0.0	O K
5760 min Winter	1.000	0.000	0.0	11.2	11.2	0.0	O K
7200 min Winter	1.000	0.000	0.0	9.4	9.4	0.0	O K
8640 min Winter	1.000	0.000	0.0	8.1	8.1	0.0	O K
10080 min Winter	1.000	0.000	0.0	7.2	7.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.499	0.0	437.7	24
60 min Winter	30.811	0.0	546.6	42
120 min Winter	18.615	0.0	658.5	72
180 min Winter	13.715	0.0	723.1	0
240 min Winter	10.995	0.0	772.8	0
360 min Winter	8.034	0.0	847.1	0
480 min Winter	6.428	0.0	903.7	0
600 min Winter	5.404	0.0	949.6	0
720 min Winter	4.687	0.0	988.4	0
960 min Winter	3.743	0.0	1052.4	0
1440 min Winter	2.723	0.0	1148.5	0
2160 min Winter	1.979	0.0	1251.8	0
2880 min Winter	1.577	0.0	1329.8	0
4320 min Winter	1.143	0.0	1446.8	0
5760 min Winter	0.910	0.0	1535.0	0
7200 min Winter	0.762	0.0	1606.6	0
8640 min Winter	0.659	0.0	1667.1	0
10080 min Winter	0.583	0.0	1719.8	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.092

Time (mins) From:	To:	Area (ha)
0	4	2.092

Model Details

Storage is Online Cover Level (m) 3.000

Cellular Storage Structure

Invert Level (m) 1.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	720.0	720.0	1.100	0.0	832.0
1.000	720.0	832.0			

Pipe Outflow Control

Diameter (m) 0.300 Entry Loss Coefficient 0.500
Slope (1:X) 23.1 Coefficient of Contraction 0.600
Length (m) 9.690 Upstream Invert Level (m) 0.000
Roughness k (mm) 0.600

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 27 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	1.738	0.738	0.0	236.8	236.8	504.9	O K
30 min Summer	1.821	0.821	0.0	242.9	242.9	561.7	O K
60 min Summer	1.809	0.809	0.0	241.9	241.9	553.2	O K
120 min Summer	1.703	0.703	0.0	234.1	234.1	480.5	O K
180 min Summer	1.580	0.580	0.0	224.7	224.7	396.9	O K
240 min Summer	1.465	0.465	0.0	215.4	215.4	318.1	O K
360 min Summer	1.281	0.281	0.0	199.8	199.8	191.9	O K
480 min Summer	1.152	0.152	0.0	188.1	188.1	104.1	O K
600 min Summer	1.066	0.066	0.0	179.8	179.8	44.8	O K
720 min Summer	1.015	0.015	0.0	174.7	174.7	9.9	O K
960 min Summer	1.000	0.000	0.0	148.3	148.3	0.0	O K
1440 min Summer	1.000	0.000	0.0	107.1	107.1	0.0	O K
2160 min Summer	1.000	0.000	0.0	77.3	77.3	0.0	O K
2880 min Summer	1.000	0.000	0.0	61.2	61.2	0.0	O K
4320 min Summer	1.000	0.000	0.0	44.1	44.1	0.0	O K
5760 min Summer	1.000	0.000	0.0	34.8	34.8	0.0	O K
7200 min Summer	1.000	0.000	0.0	29.0	29.0	0.0	O K
8640 min Summer	1.000	0.000	0.0	25.0	25.0	0.0	O K
10080 min Summer	1.000	0.000	0.0	22.0	22.0	0.0	O K
15 min Winter	1.856	0.856	0.0	245.4	245.4	585.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.285	0.0	703.6	16
30 min Summer	84.226	0.0	918.5	26
60 min Summer	52.662	0.0	1153.3	44
120 min Summer	31.800	0.0	1392.8	78
180 min Summer	23.353	0.0	1537.3	110
240 min Summer	18.644	0.0	1639.4	142
360 min Summer	13.543	0.0	1783.5	202
480 min Summer	10.792	0.0	1889.3	262
600 min Summer	9.043	0.0	1979.3	318
720 min Summer	7.823	0.0	2054.3	370
960 min Summer	6.219	0.0	2179.0	0
1440 min Summer	4.493	0.0	2361.7	0
2160 min Summer	3.241	0.0	2555.3	0
2880 min Summer	2.568	0.0	2699.6	0
4320 min Summer	1.847	0.0	2912.8	0
5760 min Summer	1.461	0.0	3071.2	0
7200 min Summer	1.217	0.0	3198.2	0
8640 min Summer	1.048	0.0	3304.7	0
10080 min Summer	0.923	0.0	3396.6	0
15 min Winter	128.285	0.0	782.2	16

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	1.966	0.966	0.0	253.2	253.2	661.0	O K
60 min Winter	1.938	0.938	0.0	251.2	251.2	641.4	O K
120 min Winter	1.764	0.764	0.0	238.7	238.7	522.8	O K
180 min Winter	1.578	0.578	0.0	224.5	224.5	395.1	O K
240 min Winter	1.413	0.413	0.0	211.1	211.1	282.4	O K
360 min Winter	1.168	0.168	0.0	189.5	189.5	114.7	O K
480 min Winter	1.023	0.023	0.0	175.5	175.5	15.5	O K
600 min Winter	1.000	0.000	0.0	155.8	155.8	0.0	O K
720 min Winter	1.000	0.000	0.0	134.8	134.8	0.0	O K
960 min Winter	1.000	0.000	0.0	107.2	107.2	0.0	O K
1440 min Winter	1.000	0.000	0.0	77.4	77.4	0.0	O K
2160 min Winter	1.000	0.000	0.0	55.9	55.9	0.0	O K
2880 min Winter	1.000	0.000	0.0	44.3	44.3	0.0	O K
4320 min Winter	1.000	0.000	0.0	31.8	31.8	0.0	O K
5760 min Winter	1.000	0.000	0.0	25.2	25.2	0.0	O K
7200 min Winter	1.000	0.000	0.0	21.0	21.0	0.0	O K
8640 min Winter	1.000	0.000	0.0	18.1	18.1	0.0	O K
10080 min Winter	1.000	0.000	0.0	15.9	15.9	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	84.226	0.0	1029.8	28
60 min Winter	52.662	0.0	1298.7	46
120 min Winter	31.800	0.0	1569.0	84
180 min Winter	23.353	0.0	1718.9	118
240 min Winter	18.644	0.0	1828.4	150
360 min Winter	13.543	0.0	1991.7	210
480 min Winter	10.792	0.0	2118.4	258
600 min Winter	9.043	0.0	2218.0	0
720 min Winter	7.823	0.0	2302.5	0
960 min Winter	6.219	0.0	2440.5	0
1440 min Winter	4.493	0.0	2645.1	0
2160 min Winter	3.241	0.0	2862.0	0
2880 min Winter	2.568	0.0	3023.5	0
4320 min Winter	1.847	0.0	3262.3	0
5760 min Winter	1.461	0.0	3439.7	0
7200 min Winter	1.217	0.0	3582.0	0
8640 min Winter	1.048	0.0	3701.2	0
10080 min Winter	0.923	0.0	3804.2	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 2.920

Time (mins) From:	To:	Area (ha)
0	4	2.920

Model Details

Storage is Offline Dividing Weir Level (m) 1.000
Cover Level (m) 3.000

Cellular Storage Structure

Invert Level (m) 1.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	720.0	720.0	1.100	0.0	832.0
1.000	720.0	832.0			

Pipe Outflow Control

Diameter (m) 0.300 Entry Loss Coefficient 0.500
Slope (1:X) 23.1 Coefficient of Contraction 0.600
Length (m) 9.690 Upstream Invert Level (m) 0.000
Roughness k (mm) 0.600

APPENDIX F: Indicative Surface Water Strategy

A2 ORIGINAL

KEY

SURFACE WATER DRAINAGE NETWORKS

POSSIBLE PARMEABLE PAVING OF CAR PARKING AND MEWS AREAS

Dogkennel Wood

CROWHURST ROAD

WISHING TREE LANE

DARWELL CLOSE

HARLEY SHUTE ROAD

NEWTS WAY

THE SPALDING

Off-line attenuation tank beneath MUGA

Existing pond to remain as is

Possible on-line attenuation culverts/oversized pipes

Flow control manhole. Outlet restricted to 303 l/s.

Existing lined ditch to be made good and retained

1:1000 0 20 40 60 80 100 m

1:1 0 10 20 30 40 50 60 70 80 90 100 mm

PRELIMINARY
NOT FOR CONSTRUCTION

rev.	amendment	checked	date

mayer brown

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Telephone 01483 750 508 Fax 01483 750 437
wokingoffice@mayerbrown.co.uk www.mayerbrown.co.uk

client
EAST SUSSEX COUNTY COUNCIL

project
THE GROVE SCHOOL
ST LEONARDS-ON-SEA

scale	drawn by	checked by
1:1000 @ A2	JRH	TPM

date	cad file
FEBRUARY 2015	01.DWG

title
INDICATIVE SURFACE WATER DRAINAGE STRATEGY

drawing number	rev.
ESCC-HASTINGS.2/01	