Dear David,

The below is the initial LLFA response and we would request the following information:

Attached are:

A Pro-Forma I would like Aecom to complete for all catchments they have identified. It will facilitate the technical assessment of the Calculations files we are likely to receive.

Attached is a LLFA checklist I would like the applicant to complete for each stage/section of the scheme. This will act as both an audit trail and provide evidence the scheme adheres to LLFA Local Standards.

Attached are “high level” observations based on the submitted drainage strategy (HIF1 Drainage Strategy Review).

The LLFA would like the applicant to provide their drawings in GIS format, preferably .shp file so we can overlay onto our flooding and assets data sets.

The applicant should be beginning to consider communicating with S&V as the Land Drainage Consent authority for issues relating to ordinary watercourses.

We are still waiting for comment from the Environment Agency. Without site of any comments they may have it does make it more difficult to give a full assessment.

The applicant should now take account of the points raised, address these and begin to work up detailed design for each section of the HIF1 scheme. Upon receipt of detailed comments and next design iteration the LLFA in partnership with S&V drainage will be able to provide the next level of comment.

What standard are the applicant designing the highways to, e.g. industry best practice, DRMB?

Future maintenance should be beginning to be considered for drainage assets.

Please note the attached HIF 1 Drainage Strategy Review is a high level review and as such needs to be caveated to this effect.

Any queries do let me know.

Kind regards,

Adam.

Flood Risk Engineer (South and Vale)
Environment and Place | Growth and Place
Oxfordshire County Council

County Hall
New Road
Oxford
OX1 1ND

SuDS Flows and Volumes - LLFA Technical Assessment Pro-forma

This form identifies the information required by Oxfordshire County Council LLFA to enable technical assessment of flows and volumes determined as part of drainage I SuDS *calculations.*

*Note : * means delete as appropriate; Numbers in brackets refer to accompanying notes.*

SITE DETAILS

1.1 Planning application reference

1.2 Site name

1.3 Total application site area (1 .....m² ha

1.4 Is the site located in a CDA or LFRZ Y/N

1.5 Is the site located in a SPZ Y/N

VOLUME AND FLOW DESIGN INPUTS

2.1 Site area which is positively drained by SuDS (2 m²

2.2 Impermeable area drained pre development (3 m²

2.3 Impermeable area drained post development (3) m²

2.4 Additional impermeable area (2.3 minus 2.2) m²

2.5 Predevelopment use (4 Greenfield / Brownfield / Mixed*

2.6 Method of discharge (5 Infiltration / waterbody / storm sewer/ combined sewer*

2.7 Infiltration rate (where applicable) .....m/hr

2.8 Influencing factors on infiltration

2.9 Depth to highest known ground water table.....mAOD

2.10 Coefficient of runoff (Cv) (6

2.11 Justification for Cv used

2.12 FEH rainfall data used (Note that FSR is no longer the preferred rainfall calculation method) Y/N

2.13 Will storage be subject to surcharge by elevated water levels in watercourse/ sewer Y/N

2.14 Invert level at outlet (invert level of final flow control) .....mAOD

2.15 Design level used for surcharge water level at point of discharge(14) .....mAOD

SuDS Flows and Volumes - LLFA Technical Assessment Pro-forma

CALCULATION OUTPUTS

Sections 3 and 4 refer to site where storage is provided by attenuation and I or partial infiltration. Where all flows are infiltrated to ground omit Sections 3 -5 and complete Section 6.

3.0 Defining rate of runoff from the site

3.2 Max. discharge for 1 in 1 year rainfall .....l/s/ha, ...l/s for the site

3.2 Max. discharge for Qmed rainfall .....l/s/ha, ...l/s for the site

3.3 Max. discharge for 1 in 30 year rainfall .....l/s/ha, ...l/s for the site

3.4 Max. discharge for 1 in 100 year rainfall .....l/s/ha, ...l/s for the site

3.5 Max. discharge for 1 in 100 year plus 40%CC .....l/s/ha, ...l/s for the site

4.0 Attenuation storage to manage peak runoff rates from the site

4.1 Storage - 1 in 1 year .....m^3 .....m^3/m^2 (of developed impermeable area)

4.2 Storage -1in 30 year (7 .....m^3 .....m^3/m^2

4.3 Storage -1in 100 year (8) .....m^3 .....m3/m2

4.4 Storage - 1 in 100 year plus 40%CC (9) .....m3 .....m3/m2

5.0 Controlling volume of runoff from the site

5.1 Pre development runoff volume(10) ..... m^3 for the site

5.2 Post development runoff volume (unmitigated) (10) ..... m^3 for the site

5.3 Volume to be controlled/does not leave site (5.2-5.1)..... m^3 for the site

5.4 Volume control provided by

Interception losses(11)	.....m3
Rain harvesting(12)	.....m3
Infiltration (even at very low rates)	.....m3
Separate area designated as long term storage(13)	.....m3

5.5 Total volume control (sum of inputs for 5.4) m3 (15)

6.0 Site storage volumes (full infiltration only)

6.1 Storage - 1in 30 year (7 .....m^3 .....m^3/m^2 (of developed impermeable area)

6.2 Storage - 1 in 100 year plus CC (9 .....m3 .....m3/m2

SuDS Flows and Volumes - LLFA Technical Assessment Pro-forma

Notes

1. All area with the proposed application site boundary to be included.
2. The site area which is positively drained includes all green areas which drain to the SuDS system and area of surface SuDS features. It excludes large open green spaces which do not drain to the SuDS system.
3. Impermeable area should be measured pre and post development. Impermeable surfaces includes, roofs, pavements, driveways and paths where runoff is conveyed to the drainage system.
4. Predevelopment use may impact on the allowable discharge rate. The LLFA will seek for reduction in flow rates to GF status in all instances. The design statement and drawings explain/ demonstrate how flows will be managed from the site.
5. Runoff may be discharge via one or a number of means.
6. Sewers for Adoption 6th Edition recommends a Cv of 100% when designing drainage for impermeable area (assumes no loss of runoff from impermeable surfaces) and 0% for permeable areas. Where lower Cv's are used the application should justify the selection of Cv.
7. Storage for the 1 in 30 year must be fully contained within the SuDS components. Note that standing water within SuDS components such as ponds, basins and swales is not classified as flooding. Storage should be calculated for the critical duration rainfall event.
8. Runoff generated from rainfall events up to the 1 in 100 year will not be allowed to leave the site in an uncontrolled way. Temporary flooding of specified areas to shallow depths (150-300mm) may be permitted in agreement with the LLFA.
9. Climate change is specified as 40% increase to rainfall intensity, unless otherwise agreed with the LLFA / EA.
10. To be determined using the 100 year return period 6 hour duration rainfall event.
11. Where Source Control is provided Interception losses will occur. An allowance of 5mm rainfall depth can be subtracted from the net inflow to the storage calculation where interception losses are demonstrated. The Applicant should demonstrate use of subcatchments and source control techniques.
12. Please refer to Rain harvesting BS for guidance on available storage.
13. Flow diverted to Long term storage areas should be infiltrated to the ground, or where this is not possible, discharged to the receiving water at slow flow rates (maximum 2 l/s/ha). LT storage would not be allowed to empty directly back into attenuation storage and would be expected to drain away over 5-10 days. Typically LT storage may be provided on multi-functional open space or sacrificial car parking areas.
14. Careful consideration should be used for calculations where flow control / storage is likely to be influenced by surcharged sewer or peak levels within a watercourse. Storm sewers are designed for pipe full capacity for 1 in 1 to 1 in 5 year return period. Beyond this, the pipe network will usually be in conditions of surcharge. Where information cannot be gathered from Thames Water, engineering judgement should be used to evaluate potential impact (using sensitivity analysis for example).
15. In controlling the volume of runoff the total volume from mitigation measures should be greater than or equal to the additional volume generated.

Design and Credit to: McCloy Consulting Ltd

APPENDIX D: INFORMATION REQUIRED FOR FULL APPLICATIONS

The following information should be provided for every drainage strategy submitted to the LLFA for consideration as part of any **Full application**.

Detail required for Full Applications	Provided?
Non-technical summary Non-technical summary of the proposed drainage strategy.	
Description of the type of development Description of the type of development proposed and where it will be located. Include whether it is new development, an extension to existing development or change of use etc. State the area of the development site itself, how much of the site is currently hard standing, the proposed area to be hard standing post-development, and any proposed areas of public open space. Note that in calculations proposed values of impermeable area should include a 10% allowance for Urban Creep, as taken from CIRIA C753 (version 6) paragraph 24.7.2.	
Location plan Location plan at an appropriate scale should be provided with the application, showing site outline and other adjacent land under the applicant's control.	
Topography plan Topographical survey of the site, including cross-sections of any adjacent watercourses for appropriate distance upstream and downstream of discharge point if appropriate.	
Layout Plan Proposed layout of the development, clearly identifying areas of impermeable surfacing, public open space, natural features such as watercourses, and allocated areas for surface water storage.	
Ground Investigation which should account for: • The presence of constraints that must be considered prior to planning infiltration SuDS; • The drainage potential of the ground; • Potential for ground instability when water is infiltrated; and • Potential for deterioration in groundwater quality as a result of infiltration.	
Assessment of all existing flooding risks to the site An assessment should be made of the risk to the site from all sources of flooding: • **Surface water –** the Environment Agency's Surface Water flood map can be used to assess the level of surface water flood risk to the site. If this map is disputed or considered inaccurate, the developer would need to model the expected flows across the site and use the results to determine the level of risk to the site. • **Groundwater** – typically a geotechnical report is required to cover this. • **Canals** – normally a letter from the Canal and River Trust stating that there is no risk, otherwise modelling of potential overtopping or breach. • **Reservoirs** –the Environment Agency inundation maps can be used to determine local level of risk. If the mapped inundation extent is disputed, the Environment Agency may require further modelling by developer. • **Sewer –** typically a letter or model report from the Water Company. • **Fluvial (main river or ordinary watercourse)** - the Environment Agency have published flood mapping for watercourses with a catchment greater than 3km^2. They can be contacted to obtain models or data associated with this mapping. The Environment Agency will advise	

Detail required for Full Applications	Provided?
on whether flood risk associated with Main River has been assessed appropriately. If only approximate modelling is available for an ordinary watercourse and it is felt to be inaccurate or is disputed, the developer will be required to model such flooding accurately to ensure their development is safe. In some small catchments, the Environment Agency's Surface Water flood map may be considered as a suitable proxy where there is no fluvial floodplain mapping.	
Explanation of how each of these flood risks will be fully mitigated This could require detailed modelling of some sources where significant risk is shown on high level datasets. It might mean applying the sequential approach by avoiding building on one part of the site where there is known flooding. Examples of mitigation measures (note: this list in not exhaustive): • Setting minimum floor levels of the development; • Utilising the sequential approach by locating more sensitive development out of the floodplain that affects the site; • Works to improve/divert infrastructure to eliminate risk; • Proposals to route flood flows through a development so they do not adversely affect the development; • Avoiding the use of below-ground development or basements adjacent to areas of flood risk unless they are designed for flood storage; • Setting residential development 150mm above the adjacent ground level.	
Detailed Drainage Plans Showing the layout of the proposed drainage network, the location of storage within the proposed development and how these relate to submitted calculations, including any chamber, pipe numbers, direction of flow, invert and cover levels, gradients diameters and dimensions that are referenced in Micro Drainage (or similar) reports. The methods of flow control must be detailed, as should non-conventional elements such as ponds, swales, permeable paving etc.	
Full explanation of the forms of SuDS used on the site Including reasons for the use of these features, what flood mitigation, water quality, environmental and social benefits they might achieve. If no SuDS methods are proposed then justification and evidence will need to be provided as to why they are not appropriate for the site. Modelling of the proposed SuDS system for the site, showing the behaviour of the site for the main rainfall events described below ensuring: • Typical operation of the system for low rainfall and first-flush events, with indication of how treatment of surface water will be achieved. • No above ground flooding for any conventional element of the system for the 3.3% (1in30) event. • No flooding from the system to property or critical/sensitive infrastructure for the 1% (1in100) plus climate change event.	
Explanation of how the drainage discharge hierarchy has been followed, providing evidence why any are inappropriate: • Firstly, to infiltration/soakaway • Secondly, to a watercourse or highway ditch (with permission) • Thirdly, to a surface water sewer or highway drain (with permission) • Lastly, to a combined sewer (with permission)	
Evidence that the site has an agreed point of discharge • If a significant portion of surface water is to be infiltrated on site, provide a BRE365 infiltration assessment to prove that this will work effectively.	

Detail required for Full Applications	Provided?
• If discharge is to an ordinary watercourse, evidence will need to be provided to ensure that the system can accept the proposed flows to an acceptable downstream point without increasing risk to others. If the watercourse is not within the boundary of the site, evidence will be required that the developer has a right to cross 3rd party land. The drainage calculations will need to include an analysis of the effects on the drainage system if the outfall is likely to be surcharged during flooding events. • If discharge is to a surface water or combined sewer, or highways ditch or drain, letter of confirmation from the Water Company or responsible body will be required, stating their required discharge maximum rates and confirmation that there is adequate capacity in the existing system. This information is generally provided by going through the relevant water company's "Pre-Planning Service". This is a formal process that all developers are expected to go through to inform their planning applications. There is normally an associated cost for this service and a minimum timescale of 15 working days to obtain a response. The advice is then usually valid for a one year period. This process will provide assurance that there are no capacity issues with third party assets, as we as the LLFA are not able to make this type of assumption on behalf of a Water and Sewerage provider. • Thames Water: https://my.thameswater.co.uk/dynamic/cps/rde/xchg/corp/hs.xsl/18710.htm • Anglian Water: http://www.anglianwater.co.uk/developers/pre-planning-service-.aspx • Severn Trent Water: https://www.stwater.co.uk/developers/application-forms-and-guidance-notes/ (> application forms > Development enquiry application form)	
Calculations of current runoff from site Calculated runoff rates for the existing site for the following rainfall events: QBAR, 3.3% (1in30), 1% (1in100) and, 1% (1in100) plus climate change. A range of rainfall events should be assessed and the critical duration rainfall event selected for each case. For greenfield sites, the methodology in the EA/Defra document "Preliminary Rainfall Runoff Management for Development (W5- 074/A/TR1)" should be used as the basis for calculations. For brownfield sites, clearly state the existing impermeable area and determine the capacity of any existing drainage system.	
Calculations of proposed discharge from site All hydraulic calculations must be produced using approved software and should model the full drainage system. Provide a supporting explanation of methodology. Please note that it is not considered appropriate to use the Modified Rational Method for design calculations other than initial design estimates (i.e. at Outline planning) or for very simple sites (i.e. Minor developments). Clearly state the proposed impermeable area of the development and how this compares to the existing site. In all calculations, proposed values of impermeable area should include a 10% allowance for Urban Creep, as taken from CIRIA C753 (version 6) paragraph 24.7.2. Use the calculation of current runoff to decide discharge rates on the following basis: • Greenfield sites should discharge at a maximum of the equivalent rate so that the site behaves like the original greenfield across the range of events. • Brownfield sites are strongly encouraged to discharge at the greenfield rate wherever possible. As a minimum, brownfield sites should reduce the discharge by 40% to account for the impacts of climate change. • Developers have the option to limit discharge for all events to the QBAR flow rate; or install a complex discharge control which reflects the original discharge or run-off rates from the site across the range of storm events. E.g. QBAR, 3.3% (1in30), 1% (1in100), 1% (1in100) plus climate change and provide Long Term Storage for all runoff volume greater than the greenfield volume (as set out in 'Calculation of Storage Volume' below). Using complex	

Detail required for Full Applications	Provided?
controls is more expensive but reduces the amount of attenuation storage required on the site and is probably worth doing on larger sites. • It is understood that some guidance recommends minimum discharge rates of 5 l/s, to minimise use of small orifice openings that could be at risk of blockages. However, appropriate consideration of filtration features to remove suspended matter and suitable maintenance regimes should minimise this risk and therefore the minimum limit of 5l/s does not apply in Oxfordshire. • Due to the additional datasets that have been added to the Flood Estimation Handbook (FEH) since design rainfall events were developed originally in the Flood Studies Report (FSR) (NERC, 1975), rainfall depths obtained using FEH show significant differences from those obtained from FSR in some parts of the country. Within Oxfordshire, rainfall depths are often greater using more up to date FEH datasets than those using FSR, therefore for various storm events, greater run-off is produced, and additional attenuation is likely to be required. As FEH rainfall data is more up to date, calculations should use FEH data for surface water drainage design, except where the critical storm duration is less than 60 minutes, as it is recognised that FEH data is less robust for short duration storms. If FEH rainfall data is not used as described above, then sensitivity testing to assess the implications of FEH2013 rainfall must be provided. This should demonstrate that the development proposals remain safe and do not increase flood risk to third parties. • Based on the existing and proposed discharge cases calculated as above, the applicant should now have detailed calculations of storage volume required on site for the 1% (1in100) plus climate change case. • When running calculations, the LLFA expect Cv values should be set to 0.95 for roofed areas and 0.9 for paved areas. Default software values should not be used for storage estimate calculations. It is the designer's responsibility to justify why Cv values of less than 0.9 are deemed appropriate	
Calculations of storage volume All hydraulic calculations must be produced using approved software. Calculations of storage volume that will be required on site for the 1% (1in100) plus climate change case, bearing in mind the controlled discharge rate. Where appropriate this should specify the volumes of both attenuation storage and Long-Term storage. See also note above about use of FEH rainfall data. Plans should be provided clearly identifying where this storage will be provided, and the water level within each element for the design storm events. Storage elements should be designed to empty sufficiently within 24 hours to be able to accommodate 80% of the 10% (1in10) storm runoff.	
Infiltration design Where any discharge to ground by infiltration is proposed, details of the infiltration system will be required. Full infiltration testing results are required along with a summary of the infiltration rate taken for each infiltration element. Infiltration elements should be designed to half empty within 24 hours to be able to accommodate further rainfall events.	
Residual Risk As well as the consideration of the modelled events above, there should be a qualitative examination of what would happen if any part of the system fails, demonstrate that flood water will have flow routes through the site without endangering property and where possible maintaining emergency access/egress routes.	
Landscaping Proposals, where relevant, for integrating the drainage system into the landscape or required publicly accessible open space and providing habitat and social enhancement.	

Designing for exceedance For events with a return-period in excess of 3.3% (1in30), surface flooding of open spaces such as landscaped areas or car parks is acceptable for short periods, but the layout and landscaping of the site should aim to route water away from any vulnerable property, and avoid creating hazards to	

Detail required for Full Applications	Provided?
access and egress routes (further guidance in CIRIA publication C635 Designing for exceedance in urban drainage - good practice). No flooding of property should occur as a result of a 1% (1in100) storm event (including an appropriate allowance for climate change). In principle, a well-designed surface water drainage system should ensure that there is little or no residual risk of property flooding occurring during events well in excess of the return-period for which the sewer system itself is designed. This is called designing for exceedance. The CIRIA publication `Designing for exceedance in urban drainage-good practice' can be accessed via the following link: http://www.ciria.com/suds/ciria_publications.htm. If the drainage system has been designed to allow flooding on site is during the 1% (1in100) storm event (including an appropriate allowance for climate change), provide a plan clearly identifying where this flooding will occur. Any flooding of the site should be assessed to ascertain if is safe for the sites users. The depth and rate of flow of the flood water should be compared to Table 4 of "Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose" May 2008 www.sciencesearch.defra.gov.uk/Document.aspx?Document=FD2321_7400_PR.pdf.	
Hydraulic calculations of the full drainage system All hydraulic calculations must be produced using approved software. All elements of the drainage system should be included in the model, with an explanation provided for any assumptions made in the modelling. 'Source control' modelling is not appropriate for a Full planning application. The model results should be provided for critical storm durations of each element of the system and should demonstrate that all the criteria above are met and that there is no surcharging of the system for the QBAR rainfall, no flooding of the surface of the site for the 3.3% (1in30) rainfall, and flooding only in safe areas for the 1% (1in100) plus climate change. See also note above about use of FEH rainfall data.	
Explanation of who will maintain and fund the maintenance of the proposed system over the lifetime of the development and evidence that access will be physically possible to carry out that maintenance, without entering others land. Ideally, SuDS features should be located within public space and a maintenance manual be produced to pass to the future maintainer. Full details will be required at Discharge of Conditions. **SuDS As Built and Maintenance Details** Prior to first occupation, a record of the installed SuDS and site wide drainage scheme shall be submitted to and approved in writing by the Local Planning Authority for deposit with the Lead Local Flood Authority Asset Register. The details shall include: (a) As built plans in both .pdf, CAD and .shp file format; (b) Photographs to document each key stage of the drainage system when installed on site; (c) Photographs to document the completed installation of the drainage structures on site; (d) The name and contact details of any appointed management company information.	

Phasing Explanation of how the site will adequately consider flood risk at all stages of the development. Avoiding interim developed phases that are unprotected. Phases can only progress if adequate flood mitigation measures are in place for that particular phase. This should avoid one small phase of the site being allowed to discharge at the calculated rate for a larger part of the entire development. Adequate flood risk measures for each individual phase should be able to stand alone, (until the entire site is completed), without themselves being at flood risk and without increasing flood risk for other parties.	

The report provides an initial high level basis for development into detailed design. Initial comments are noted in the below against the relevant sections, in *italics*.

4.1 A4130 Widening

4.1.1 The exceedance flows, from the proposed highway, for the A4130 Widening section will be connected into the highway drainage system and will be managed within the highway extents. *Is this overland surface water exceedance flow or highways water exceedance flow - Confirm? Assumed on carriageway highways exceedance. What RP, depth, extent, duration, system capacity to manage?*

4.1.3 In order to reduce the build-up of flood water, south of the existing A4130, a flood relief culvert is proposed south of Meadow Brook under the eastern link road. *Is this to be constructed? To be removed and reinstated if not required. Consents required?*

4.2 Didcot Science Bridge

4.2.1 The exceedance flows, from the proposed highway, for the Section will be connected into the highway drainage system and will be managed within the highway extents. *Is this overland surface water exceedance flow or highways water exceedance flow - Confirm? What RP, depth, extent, duration, system capacity to manage?*

4.3 Didcot to Culham River Crossing

Overview

4.3.1 Exceedance flows from the proposed highway for the Section, will follow the falls on the highway and the associated drainage network toward low points of the highway alignment. Exceedance may be temporarily contained within the highway low point area before connecting back into the highway drainage system. Otherwise, in the case of even more extreme events, overflow will be to the attenuation ponds provided (or existing) and ultimately to the existing ditch systems and directing to the River Thames.

All above – new scheme build – no exceedance flooding to any part of the highway. Further demonstration of exceedance and overflow to receptors required.

Culverts

4.3.3 To maintain the watercourses within the section, a number of culverts have been proposed. These culverts can be seen within the drainage layout drawings within Appendix A.

Are culverts absolutely necessary, can they be replaced with open ditch?

4.4 Clifton Hampden Bypass

Overview

4.4.1 It is important that the overland flow is separated from the highway drainage, where practicable, in the design of the new highway drainage system.
4.4.2 It is proposed to install intercepting drainage parallel to Clifton Hampden Bypass where required to protect the proposed earthworks and carriageway from surface water runoff from adjacent land. At this stage, it is proposed that this intercepting drainage will generally be open ditches.
4.4.3 The flows from the intercepting drainage are generally from permeable areas, usually adjacent lands and will directed to the nearest watercourses via proposed ditches.

Where is the evidence of design, drawings, calcs etc required?

4.4.4 These flows will not be connected into the highway drainage system or the ponds except the locations between chainages CH200 and CH570 to the south of the CHB (see drawing CHB_PD-ACM-HDG-SW_ZZ_ZZ_ZZ-DR-CD-0001) and between chainages CH1300 and CH1700 (see drawing CHB_PD-ACM-HDG-SW_ZZ_ZZ_ZZDR-CD-0002) to the north of the Clifton Hampden Bypass between Farm Access and west of the CSC Secondary Access.

4.4.5 The flow from the natural catchment between chainages CH200 and CH570 will be connected to the highway drainage system due to the ground falling from east to west. There is no feasible solution to separate the overland from the highway drainage as this area is constrained by the existing utilities.
4.4.6 The flow from the natural catchment between chainages CH1300 and CH1700 will be collected in ditches and then will be connected to the highway drainage system due to the ground falling from east to west. There is no feasible solution to separate the overland from the highway drainage as this area is located in close proximity to the Culham Science Centre boundary and therefore it is constrained by the Red Line Boundary.

Cannot have overland surface water flow paths intercepted then directed into highways drainage network – no mixing surface water/highways drainage.

This approach will need agreement, if permissible with OCC HA.

4.4.5 The flow from the natural catchment between chainages CH200 and CH570 will be connected to the highway drainage system due to the ground falling from east to west. There is no feasible solution to separate the overland from the highway drainage as this area is constrained by the existing utilities.

4.4.7 There is another small area of natural catchment on either side of the realigned B4015 which will be also be connected to the highway drainage due to insufficient space to provide separate open ditches to collect the surface water runoff from the natural catchment.

This will need further justification why the natural drainage regime of the catchment cannot be replicated and why there is a need to divert overland surface water flows into a highways drainage network.

5. Highway Drainage Strategy

5.1.2 The highway drainage strategy covers the surface water runoff from the A4130 Widening section. The surface water runoff from the A4130 Widening section will be treated and attenuated prior to discharging into the receiving watercourses.

Where are the drawings, design, calculations, detailed explanation/technical note to support the above statement?

5.2 Overview – Didcot Science Bridge

5.2.1 A surface water drainage network will be required to accommodate the increased impermeable area resulting from the proposals, discharging at Qbar runoff rates to proposed outfalls. Where outfalls discharge into shared third party basins, these have been designed to agreed Qbar rates, so as not to increase the overall discharge rates from all the sections combined.

Have third party agreements been obtained? Where are the drawings, design, calculations, detailed explanation/technical note to support the above statement? Who is responsible for maintenance of the third party basins? (Commuted sums??)

5.2.2 The highway drainage strategy covers the surface water runoff from the Didcot Science Bridge section. The surface water runoff from the section will be treated and attenuated prior to discharging into the receiving watercourse.

Where/how/discharge rate and location?

5.3.2 The highway drainage strategy covers the surface water runoff from the Didcot to Culham section. The surface water runoff from the section will be treated and attenuated prior to discharging into the receiving watercourse.

Where/how/discharge rate and location?

5.4 Overview – Clifton Hampden Bypass

5.4.2 The surface water runoff from the Clifton Hampden Bypass will be treated and attenuated prior to discharging into the receiving watercourse or sewer.

Where/how/discharge rate and location? WaSC agreements in place?

5.5 Methods of Discharge for Surface Water Runoff

5.5.1 As detailed within CIRIA 753 ‘The SuDS Manual’; Section 3.2.3, the destination for offsite surface water runoff that is not collected for use should be prioritised in the following order:

- Firstly, to filter drain infiltration/soakaway
- Secondly, to a watercourse or highway ditch (with permission)
- Thirdly, to a surface water sewer or highway drain (with permission).
- Lastly, to a combined sewer (with permission)

Clear demonstration/justification as to where/why, why not above outlined approaches have been adopted.

5.9 Attenuation of highway runoff – Didcot to Culham River Crossing

5.9.2 The section of proposed highway between the Collett roundabout and Hartwright House runs through the future DTECH development. The carrier swales provided alongside the carriageway at the bottom of the embankment have been sized with a future inflow consideration from the development and also for the amount of land take-up is made. The DTECH developer had expressed concern that the latter should be limited as far as practicable. The carrier swale profile is therefore a compromise between the two interests and maintains a reasonably shallow profile to account for expected ground water levels.

Evidence that this issue has been resolved with DTECH development.

Catchment Comparison for Collet Road Roundabout Catchments A & B

Catchment B will therefore require an area of 504m2 to be attenuated in oversized pipes and the discharge controlled to 2.0l/s by means of hydrobrake.

Oversized pipes are contrary to Local Standards – design should be reviewed and revised.

5.10 Attenuation of Highway Runoff – Clifton Hampden Bypass

5.10.2 Proposed new connections to existing surface water sewers have been attenuated to Q1. Initial contact has been made with CSC regarding this, in principle they are happy for us to connect, but this will be subject to the detailed design satisfying their conditions.

Has further progress been made on this? Why Q1 only? This needs to be resolved to ensure viable discharge.

5.10.3 In accordance with OCC Local Standards and Guidance, surface water attenuation has been designed to accommodate the 1 in 100 year storm event with a 20% allowance for climate change. A sensitivity analysis has been undertaken to understand the flooding implication in a 1 in 100 year storm event with a 40% allowance for climate change.

Has 40% sensitivity analysis been undertaken, what are the outcomes? Justification of 20% required.

5.14.6 A runoff coefficient of 0.45 has been applied to overland catchment areas and embankments where there has been insufficient GI data available. The runoff coefficient has been determined from The Wallingford Procedure Volume 3: Maps; *Winter rain acceptance potential*.

The LLFA would query the use of Cv of 0.45. The applicant must justify why they consider this appropriate and provide a suitable evidence base for the proposed value. The LLFA are unlikely to accept this given the uncertainties mentioned for the catchment.

5.15 Surface Water Drainage

A4130 Widening

5.15.4 Combined kerb drainage units have been proposed where the gully spacing is not economical to construct relative to a combined kerb drainage unit, and where levels do not suit gullies.

As with 5.15.9 and other references to combined kerb drainage.

The LLFA are highly unlikely to accept any form of "beaney block" gully system. LS advocate over the edge drainage or side entry.

5.16 Subsurface Drainage

The LLFA recommend a minimum monitoring of six months in areas identified as having a high ground water table where sub-surface drainage is proposed.

5.16.3 It is noted that road levels in some locations do not allow for the required depth of sub-base drain with available fall left to discharge to a receiving watercourse. In two locations there is a backfall to the sub-base drain effectively providing a reverse effect to what is required. Further design updates are needed to allow the highway and drainage interface to work.
5.16.4 Further design of the subsurface drainage is a task to be carried out in the detailed design, however, checks have been carried out at the highway low points to ensure that an outfall from the subsurface drainage system would be able to connect into the surface water drainage watercourse or basin.

What progress has been made on conceptual design to address the above?

5.18 Grassed Surface Water Channels

5.18.1 Grassed surface water channels have been designed to collect the surface water runoff the mainline carriageway where possible in the Clifton Hampden Bypass section in accordance with CD521. These channels shall be triangular in cross section with maximum depth of 200mm.

Reasoning for triangular design required – erosion potential, bank slippage.

5.18.3 The surface water channels will accommodate a 1 in 1 year storm within channel and checked to ensure the 1 in 5 year storm +20%cc does not encroach into the adjacent lane.

Why only the stated RP's? Has sensitivity testing been undertaken for 40%?

5.19.5 All new drainage outfalls will be subject to discharge consent or environmental permits as required.

What stage is consenting/permitting at?

6.13 Climate Change Assessment

Justification/explanation as to where 30% CC allowance has been derived from. There seems to be a mix and match approach to using 20%, 30% and 40% for pluvial CC allowance. Clarification required.

Any identified flooding, as suggested in the text, relating to the above CC allowances must be validated and full explanation provided.

As per above for:
Didcot Science Bridge section
A4130 Widening Section
Didcot to Culham River Crossing

Other:

Standard methodology needs discussion relating to Qbar/Qmed, in relation to use of FEH data.

E.G. DWG GEN_PD ACM HDG DGT_DRG_ZZ_DZRZ T 0003 Rev P01 *AEC Pond 7, discharge rate 3.8l/s – agreed rates are 2l/s?*

As built plans and details of any management and maintenance company will need to be provided on completion.