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This Technical note has been written to address comments made by Oxfordshire County Council as the Lead Local Flood Authority and should be read in conjunction with the updated Flood Risk Assessment and Drainage Strategy, reference HPH-HYD-XX-XX-RP-D-5001 dated July 2020.

1.1 Infiltration Testing & Groundwater

The current drainage strategy for the development is to attenuate within each parcel via on surface storage features including basins and swales. Green open space has been provided within each parcel to provide these SuDS features to ensure a deliverable surface water management strategy where infiltration is not viable. Previously carried out ground investigation reports have identified various potential sources of contamination and made ground across the site which have a potential for migration via leachate dispersion in to the underlying aquifer. The Environment Agency response from 2018 suggests that a condition relating to infiltration drainage be included and that infiltration drainage should be avoided in areas where contamination has been identified or in areas of historic use where there is potential for contamination to be present in soils. Environment Agency mapping also shows that the development is situated above a major aquifer

In addition to this previously carried out Ground Investigations (Ref: Hydrock report HPW-HYD-MS-ZZ-RP-G-001 & Arup report 120643, Watermans report EED10658-109_R_9.3.1_FA) have identified ground water levels at 1.0mbgl at various locations across the site, as soakaways require 1.0m clearance from the base of the infiltration feature to the upper ground water levels measured, this may also restrict the use of infiltration features.

Due to the various unknowns present in relation to infiltration that have been listed above it was considered a robust and risk reducing approach to utilise non infiltrating techniques at this stage to ensure that a viable method of surface water management was achievable for each parcel, in the event that factors such as contamination, ground water and the presence of a major aquifer were to inhibit the use of soakaways.

On this basis it considered that placing a condition for infiltration testing on the surface water drainage strategy is acceptable due to the number of unknown factors. It should also be noted that Oxfordshire County Council comments originally made in 2018 suggested that infiltration testing could be covered under a condition. As open green space has been provided within each parcel, this will be conducive to providing a strategy based on infiltration where this is turns out to be viable at the detailed design stage. Communal infiltration features in the form of an infiltration basin can be used in the open public spaces in conjunction with on plot private soakaways and porous paving where space and ground conditions allow.

Infiltration testing has been carried out on previously developed parcels across the site. The results of these permeability and infiltration testing can be found in the following reports.

Waterman Preliminary Ground Investigation Ref: EED10658-13.2.1_FA

Hydrock Heyford Park Western Development, Phase 9, 10, 16 & 16A Ref: HPW-HYD-MS-ZZ-RP-G-0001

Hydrock Report Soil Infiltration Testing Phase 7 Ref: HPW-HYD-XX-GI-CO-GE-0004-S2-P1

The test results obtained from the Watermans report were carried out in 2012 and covered the New Settlement Area in the centre of the site. Results obtained from the infiltration testing vary in rate from 8.37×10^{-7} m/s to 3.32×10^{-3} m/s with the average rate being approximately 2.54×10^{-6} m/s. Plan P8219J107 within this report identifies the location of the trial pits in which the tests were carried out.

The Hydrock Report Ref; HPW-HYD-MS-ZZ-RP-G-0001 covered phases 9, 10, 16 & 16A with 3 soakaway tests being carried out on each phase, which achieved mixed results. Table 7.2 in this report shows a summary of the results. The results indicate that soakaways may be possible, however due to the relatively slow infiltration rates soakaways will be dependent on storage capacity available. Rates that were achieved ranged from 5.52×10^{-5} m/s & 1.23×10^{-5} m/s.

Results obtained from the Hydrock report refer purely to the Phase 7 parcel to the west of the Village Centre. 9 infiltration tests were carried out in this area in accordance with BRE 365. The results from this area are in the range of 3.64×10^{-4} m/s to 2.96×10^{-5} m/s. The location of the tests carried out in this area are shown on plan HPW-HYD-P2D-ZZ-DR-GE-1001 within the report.

The results from these reports demonstrate that infiltration varies considerably across the site but also that there is potential that infiltration on each parcel could be a possibility although dependent on the factors mentioned above. Further testing will be carried out before detailed design is carried out on each of the parcels in accordance with BRE365.

1.2 Pre & Post Development Surface Water Management & Whole Catchment Analysis

As the Hydrock Flood Risk Assessment (ref HPH-HYD-XX-XX-RP-D-5001) and previous reports demonstrate flood risk from pluvial sources is considered low risk. The surrounding topography of the area gently falls in a southerly direction towards the adjacent fields. The development is therefore only at risk from pluvial flooding from the site itself. No historical flooding has been recorded at the site so it is assumed that the existing drainage network is of adequate capacity. The Environment Agency surface water flood mapping demonstrates areas that are at risk from surface water flooding. It shows that the entire site is at low risk from and that there are no areas that are shown to have any connectivity. These surface water flooding areas also do not directly affect any of the proposed development parcels.

The development of the proposed parcels will introduce new sustainable drainage systems to manage surface water run-off from these parcels to their point of discharge. The proposed drainage systems for the new parcels will drain independently from the existing network, so will not be reliant on spare capacity within that system.

Areas of the site which are already developed and not part of this planning application will continue to operate through the existing drainage network. As there has been no historic instances of flooding from these systems, they will therefore not pose any flood risk to the proposed development parcels covered under this application.

As it is demonstrated that the existing risk from overland surface water flooding is low for the whole site and that the existing developed areas would continue to operate as existing, there would be very little increase in flood risk from existing areas to the proposed development parcels. In addition to this the new developments are unlikely to increase flood risk to existing areas as surface water run-off from these developments will be managed separately.

Once the individual parcels have been developed, they will be removed from their connection to the existing system, which are currently unrestricted. The redeveloped parcels discharge rates will be reduced to the QBAR run off rate reducing the impact on the downstream network.

1.3 Responses to Initial Information Requirements

- 1.3.1 The proposed discharge rates for each of the residential parcels is to be restricted to the QBAR greenfield run off rate for all return periods up to the 1 in 100 year + 40% allowance for climate change. Table 2 within the Flood Risk assessment (ref: HPH-HYD-XX-XX-RP-D-5001) details each of the parcels covered by this application and includes the gross area covered by the parcel and the proposed impermeable area. The impermeable area has been used to calculate the final QBAR discharge rate for each parcel.
- 1.3.2 Micro Drainage calculations have been updated to use FEH catchment descriptors and a coefficient of discharge (Cv) of 0.9 has now been used. These updated calculations for each parcel can be found in Appendix A of the Flood Risk Assessment. The Micro Drainage calculations in Appendix A have also been carried out for return periods including 1 in 1 year 1 in 30 year and 1 in 100 year, with durations from 30 minutes to 7 days (10080 mins).
- 1.3.3 The surface water discharge locations for each of the parcels is direct to the local watercourse network. None of the watercourses serving the site are listed as main river so discharge consents from the Environment Agency aren't required. The Environment Agency's response from 2018 stated no objection to the development with the suggestion that a condition be placed on the surface water drainage strategy, which is to include infiltration testing. Land Drainage consents for the placement of new structures at the point of connection will be submitted to Cherwell District Council at the detailed design stage.
- 1.3.4 The Flood Risk Assessment describes opportunities for source control within section 5.8.
- 1.3.5 The Flood Risk Assessment demonstrates how and where SuDS features are to be utilised. The green spaces identified in each parcel have been located at the topographical low point to mimic the natural run-off of the area. These areas have been fully utilised to provide at surface storage areas with swales to be provided for conveyance to the storage areas where possible. These could be located within the green strips located adjacent to the parcels, within the open space areas or adjacent to proposed carriageways within the parcel.
- 1.3.6 The majority of the development parcels are residential therefore it is unlikely that blue or green roofs will be feasible, however on parcels 19 & 20 which consists of a care home and medical centre it is possible that blue/green roofs could be utilised, although this would form part of the detailed design for these developments.
- 1.3.7 As all the development parcels are to be connected directly to the local watercourse network there is no reliance on Thames Water public sewers. Therefore, permission to connect to their network is not required.

- 1.3.8 Catchments and discharge locations are detailed within the FRA in section 5.3. This demonstrates which of the local water course each parcel discharges to.
- 1.3.9 Safe ingress/egress information is covered within section 3.6 of the FRA document, which identifies that restriction to access in and out of the development site from flood risk is negligible due to the main access in and out of the development site being elevated well above any fluvial floodplain.
- 1.3.10 Spaces within the proposed green zones can be used for sacrificial areas for the storage of exceedance flow routes. Information relating to exceedance flow routes is located within section 5.5.
- 1.3.11 Section 5.6 within the FRA details information relating to water quality, Biodiversity and Amenity in-line with the SuDS Manual requirements. Water quality and treatment train information has been demonstrated via the use of the pollution hazard indices and the SuDS mitigation tables. This information is shown in Table 4 & Table 5.
- 1.3.12 The internal layout of the residential parcels is not currently known, however the use of permeable surfaces for private drives and suitable internal estate roads where appropriate is possible. The use of permeable surfaces on carriageways adoptable by Oxfordshire County Council Highways will need to be in accordance with their design requirements. Main infrastructure and spine roads used by buses and HGVs will not be able to be constructed from permeable surfaces as they as they will become a long-term maintenance issue. There are also various existing hardstanding areas within the development boundary such as the existing runways. These areas are to remain as existing so will remain impermeable and continue to use the positive drainage network serving these areas.
- 1.3.13 Half drain times have been included for each attenuation basin within the FRA. Table 3 in Section 5.2 shows the total attenuation volume, critical duration and half drain times for each of the proposed storage features. Table 2 shows the break down of the development parcels including the gross area, proposed impermeable area (Assuming a 65% impermeability rate) and also includes an additional 10% of impermeable area to compensate for Urban Creep. This area (impermeable + urban creep) has been used to calculate the attenuation volumes while the QBAR greenfield run of rates have been calculated using the impermeable area only.
- 1.3.14 Fully detailed drainage drawings will be developed for each parcel as the internal layouts are produced, which will include pipe numbers, diameters and gradients. The provision of this information could be conditioned to be submitted as each parcel is brought forward for development.
- 1.3.15 Information relating to exceedance flow routes has been included within section 5.4 and details have been included on the Drainage Strategy drawing reference HPH-HYD-XX-XX-DR-C-2200.
- 1.3.16 A draft management and maintenance plan has been included in section 5.9 of the FRA detailing the maintenance requirements of the proposed SuDS features. A more detailed SuDS management plan will be required for each parcel and will be developed at the detailed design stage.
- 1.3.17 Information relating to phasing and how surface water will be managed during the construction phase will be covered in the Construction Management Plan which should be covered under a condition as this information would not be available at this stage.