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Whaley Bridge Matters
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GWP Report No: 190635

Our ref: kw27062019
Your ref:

19 July 2019

Dear Sir/Madam

Review and assessment of flood risk impacts as a result of proposed development at Linglongs Road, Whaley Bridge, Derbyshire – Responses to Applicant's June 2019 Responses

1 INTRODUCTION

This Technical Review has been commissioned by Whaley Bridge Matters (WBM). GWP Consultants LLP (GWP) has been tasked with providing an independent review and assessment of the Applicants' responses (Barratt Homes email of 11 June 2019) to address earlier concerns raised by WBM and GWP Consultants on the flood risk impacts as a result of the earlier surface water drainage design submitted by the Applicant as part of the planning application process.

This letter follows on from the technical review letter prepared by GWP on February 2018 (GWP Report No. 180128 – see Appendix 1). This letter specifically relates to Planning Conditions 10, 11 and 13 (see below) and is in response to the Applicant's work and responses to discharge these conditions (see Appendix 2).

2 RELEVANT PLANNING CONDITIONS

Condition 10

Condition 10 states that "the development hereby permitted shall not commence until such time as a scheme to manage the risk of flooding from overland flow of surface water and the drainage of existing flows onto the site, has been submitted to and approved in writing by the Local Planning Authority. The scheme shall be fully implemented and subsequently maintained, in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the Local Planning Authority."

Condition 11

Condition 11 states that "the development hereby permitted shall not commence until a scheme for surface water regulation, based on sustainable drainage principles, has been submitted to and approved in writing by the Local Planning Authority. The scheme shall include details of how the scheme will be maintained and managed after completion. Thereafter the development shall proceed in accordance with the approved details".

Condition 13

Condition 13 states that "the development hereby permitted shall not commence until such time as a scheme to manage the drainage of existing inflows onto the site, has been submitted to and approved in writing by the Local Planning Authority. Thereafter the development shall proceed in accordance with the approved details."

3 REVIEW OF LATEST (JUNE 2019) RESPONSES BY THE APPLICANT TO DISCHARGE PLANNING CONDITIONS

The Applicant has provided a set of qualitative explanations (see Appendix 2) and supporting documentation in an attempt to address the above Planning Conditions.

Having reviewed this further submission, the following points, which were highlighted in the original GWP Report Letter No. 180128, dated February 2018 (see Appendix 1), are considered to still not be adequately addressed and/or the responses contain errors.

3.1 Rainfall onto undeveloped and permeable parts of the site

Applicant's Statement:

The Applicant acknowledges that "rainfall onto undeveloped parts of the site is not considered in the drainage design".

The Applicant also states that this is a "standard accepted industry practice", and that some of the proposed redevelopment features will "severely restrict the site's ability to run off as it did prior to development".

Furthermore, the Applicant has not included developed permeable areas in the drainage design calculations.

Our Response:

Since rainfall onto (developed) permeable areas of the site is not considered in the drainage design calculations, it would be expected these permeable areas are not considered either in the calculation of the site's greenfield run-off rates. However, and as pointed out in the GWP Report No. 180128 (see Appendix 1), this is not the case.

Instead greenfield run-off rates for the site have been estimated by the Applicant based on an area of 4.42ha (*i.e.*, total developed area), however the drainage design calculations are based on an overall area of 2.13ha, which we assume is the total building footprint area.

The Applicant therefore continues to use the greenfield run-off rate for the total area as a maximum acceptable run-off flow rate from the smaller developed site area, ignoring that run-off will continue to occur from the both the undeveloped areas and allegedly permeable parts of the developed site. **The total flows leaving the site will therefore exceed the pre-development situation**. This is NOT standard accepted industry practice.

It would appear the Applicant thinks we are advocating their drainage design should include drainage of these undeveloped areas. This is not our point – we are not advocating they be drained. Our point (as stated above) is that these undeveloped areas will yield run-off and therefore this run-off amount needs to be subtracted from the greenfield run-off rate to arrive at a residual smaller flow rate that the developed areas run-off must be constrained to below.

These erroneous and misleading calculations have not been updated in the latest submission of planning documentation[1]. Failure to address this point will result in **an increase in downstream flood risk**.

Applicant's Statement:

The Applicant points out that: undeveloped parts of the site "will have a much greater time of concentration than the piped drainage network, before it reaches the discharge points" and that a "system of land drains […] will serve to drain any undeveloped areas" (see Appendix 2).

Our response:

These statements are contradictory. Whilst it is likely that rainfall onto undeveloped areas will have a greater time of concentration than the piped drainage network, the provision of a system of land drains in these areas will most likely increase the ease of ground drainage and result in a reduction in the time it takes for these areas to discharge off-site, and **increase in both peak flow rates and total flow rates**.

[1] Drainage Calculations for Linglongs Road, Whaley Bridge - January 2018 (uploaded to the planning portal on the 11th June 2019): http://planning.highpeak.gov.uk/portal/servlets/AttachmentShowServlet?ImageName=435348

Our recommendations:

Based on the above, and in line with Planning Conditions 10 and 11, the Applicant should:

i) Amend the calculation of greenfield run-off rates so that these do not include undeveloped and permeable (developed) parts of the site (i.e., calculate greenfield run-off rates based upon impermeable developed areas only), OR amend the storm water drainage design calculations so that these include undeveloped and permeable (developed) areas within the site; and

ii) Explain how the proposed land drains will be designed so that they do not increase the velocity at which run-off from undeveloped parts of the site is discharged off-site.

Otherwise, it can only be assumed the proposed development will **increase the risk of flooding downstream of the site**.

3.2 Springs, overland flow, and groundwater flow

Applicants' Statement:

The Applicant proposes to install a number of additional land drains to pick up:

i) flow from an on-site spring;

ii) off-site overland flows from the highway embankment; and

iii) any groundwater flows arising from within or outside the site (see Appendix 2).

The Applicant also argues the proposed additional land drains "do not enter the development drainage system and instead connect into the existing ditch, thereby replicating the pre-development scenario".

Our response:

The fact that the additional land drains do not join the development drainage system does not imply that the pre-development scenario will be replicated – in fact, since these (spring, overland, groundwater) flows are not currently conveyed *via* land drains, it can only be assumed the proposed scheme will not replicate the pre-developments scenario.

As pointed out in the GWP Report No. 180128 (see Appendix 1), the proposed method of conveying flows from springs, overland flow, and groundwater – that is, *via* land drains discharging into the eastern drainage ditch – will limit the (existing) opportunity for run-off re-infiltration and evaporation, **thus increasing the peak flow rates and total volumes discharging to the drainage ditch**, which will in turn lead to an increased risk of flooding downstream.

Our recommendations:

The Applicant should provide a quantitative assessment of the impacts the proposed development will have on the conveyance and off-site discharge of spring, overland and groundwater flows, and whether these impacts will increase the current risk of flooding downstream of the site, in order to successfully address Planning Conditions 10 and 13.

3.3 Upstream inflows to the site (Macclesfield Road)

Applicants' Statement:

Regarding surface water run-off from adjoining properties, the Applicant acknowledges the existence of a drain across the site area to transfer upstream flows across the site, and suggests that, once planning is achieved, the drain – its path and outfall location – will be appropriately investigated, and existing flows will be dealt with accordingly.

Our response:

The Applicant has not assessed, neither qualitatively nor quantitatively, the existing run-off flow quantities and regime from the adjoining properties (discharged through the mentioned drain), and thus has not considered whether the potential changes the development will cause on this drain (and flows) could **increase risk of flooding** upstream (due to flow truncation) or downstream (due to increasing conveyance) of the site area.

Therefore, we consider the approach suggested by the Applicant with respect to the above does not meet the requirements laid out in Planning Conditions 10 and 13.

Our recommendations:

The Applicant should determine the flow rates entering the existing upstream flow transfer drain, the condition of the existing transfer drain and its conveyance capacity, and assess the extent to which:

i) the existing transfer drain limits upstream flows crossing the site; and

ii) whether proposed changes to this transfer drain will further constrict upstream flows or whether they will accelerate downstream flows.

3.4 Surface water outfall from adjacent housing estate (Linglongs Avenue)

Applicants' Statement:

The Applicant states the surface water outfall from Linglongs Road is an adopted sewer, which whilst being shown on the sewer records as out-falling into the site has actually been diverted into a below ground pipe extending the full length of the site, ultimately discharging to the watercourse to the east of the site. The Applicant has undertaken a CCTV survey to prove this pipeline exists. The Applicant states the pipeline is to be diverted as part of the development.

Our response:

The CCTV survey results provided by the Applicant extend for a length of 111.30m (from the manhole cover at Linglongs Road), after which the CCTV survey was abandoned. Assuming the culvert follows a straight path, the distance between the manhole cover at Linglongs Road and the watercourse to the east of the site is *c* 350m. A surveyed length of 111.30m is less than one third of the pipe length and therefore is clearly insufficient to prove i) the existence of a culvert extending the full length of the site; and ii) understand the pipeline dimensions, condition and restrictions/limitations *(e.g.*, narrow pipe sections, pipeline collapses, roots, sediment, debris *et al.*) on flows. The CCTV survey results report changes in the direction of the culvert, and this further increases the culvert length required to arrive at the watercourse.

We therefore consider the Applicant has i) failed to demonstrate the length of a culvert system extending the full length of the site; and ii) not characterised the pipeline to determine limitations on its conveyance capacity. The Applicant does not therefore know whether their **proposed changes to the culvert will reduce conveyance and increase upstream flood risk, or increase conveyance and increase downstream flood risk**.

Our recommendations:

It is important the Applicant unequivocally establishes whether the existing flows entering the site from the surface water outfall at Linglongs Road get conveyed across the site *via* a culverted system, or instead get discharged into the central part of the site (as shown in historic maps[2]), as well as the extent to which the current culvert restricts transfer of up-gradient flows across the site.

Unless proven otherwise, the Applicant should assume the flows entering the site *via* the Linglongs Road outfall are discharged to, and attenuated by, the existing greenfield site. Therefore, if the Applicant proposes to re-direct these flows into the watercourse to the east of the site, the Applicant must assess and mitigate the cumulative impact this diversion will have in terms of **increased flood risk downstream of the site,** including whether changes to the existing culvert increase upstream or downstream flood risk.

3.5 Other issues

The Applicant should also address the following issue, which was raised in the GWP Report No. 180128 (see Appendix 1) and has not been considered in their response (see Appendix 2):

i) Increased amount of surface water run-off (from various sources) being discharged from the site into the drainage ditch downstream of the site, in close proximity to the River Goyt, and how this may result in an increased risk of flooding immediately downstream of the site, where river flooding is expected to occur.

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[2] Historic map (1885 OS map) available at:
http://planning.highpeak.gov.uk/portal/servlets/AttachmentShowServlet?ImageName=435929

4 CONCLUSIONS

The additional responses provided by the Applicant do not address the original concerns raised by GWP in our letter report of February 2018.

The Applicant continues to misuse the greenfield run-off rate for the larger site area as an acceptable maximum run-off flow from the developed site, whereas undeveloped and permeable areas of the site will yield run-off. By misunderstanding this issue, the Applicant will be designing a scheme which when combined with the flows leaving the other parts of the site, will exceed the pre-development run-off rate, thereby **increasing flood risk downstream**.

The Applicant clearly states that land drains will intercept shallow groundwater and springs, but fails to understand this will **increase downstream flood risk**.

The Applicant has failed to assess the impact of the development on changes to the drain which conveys the upstream waters (from Macclesfield Road) across the site and therefore has not assessed the potential to decrease drain conveyance and **increase upstream flood risk** or increase drain conveyance and **increase downstream flood risk**.

The Applicant has failed to prove the existence of a culvert from the surface water outfall at Linglongs Road to the watercourse to the east of the site, and determine its conveyance, and therefore cannot identify whether **increased upstream or downstream flood risk** may result from proposed changes to this culvert.

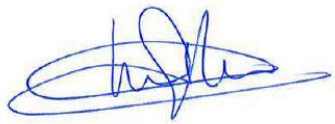
The Applicant needs to provide robust quantitative analyses on these four issues, including: recalculating the greenfield run-off rates and ensuring post development run-off is less than this rate; demonstrating changes to flow size and peak flow timing of shallow groundwater egress and springs will not cause downstream flooding; investigating upstream flows, upstream flow transfer drain conveyance and development impacts on the upstream flow transfer drain; and establishing whether or not the surface water outfall from Linglongs Road is culverted for the entire length of the site, what flow it can convey and whether altering the culvert restricts or increases peak flood flow transfer.

Furthermore, the Applicant should also to address any further (omitted) issues highlighted in the GWP Report No. 180128 (*i.e.*, potential to increase risk of flooding from the River Goyt).

The above is required to ensure the proposed development complies with relevant flood risk management policies – paragraph 163 of the National Planning Policy Framework (NPPF) 2018[3], and Policy EQ11 in the High Peak Local Plan[4].

We trust the above is self-explanatory, but please do not hesitate to contact the undersigned for further assistance.

Yours faithfully,



Marc Girona-Mata
Project Hydrologist

Encs.
Appendix 1 – GWP Report No. 180128 (February 2018)
Appendix 2 – Barratt Homes email of 11 June 2019

[3] National Planning Policy Framework 2018, available at: https://www.gov.uk/government/collections/revised-national-planning-policy-framework

[4] High Peak Local Plan, available at: https://www.highpeak.gov.uk/media/160/The-High-Peak-Local-Plan-Adopted-April-2016/pdf/The_High_Peak_Local_Plan_Adopted_April_2016.pdf

APPENDIX 1

GWP Report No. 180128 (February 2018)

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Whaley Bridge Matters (WBM)
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GWP Report No: 180128

Our ref: kw230118
Your ref:

02 February 2018

Dear Sir/Madam,

Hydrological and Hydrogeological Review and Critique of Proposed Development at Linglongs Road, Whaley Bridge , Derbyshire

This technical review has been commissioned by Whaley Bridge Matters. GWP Consultants LLP (GWP) has been tasked with providing an independent review of the flood risk assessments and the surface water drainage design submitted by the Applicant as part of the planning application process.

1 GENERAL CONSIDERATIONS

The site of interest has Outline Planning Permission. Flood risk and surface water management are Reserved Matters and require discharge of specific Conditions before the development can proceed.

This letter is based upon a brief review of relevant planning documentation that has been made publicly available *via* the High Peak Borough Council online planning portal. However, due to the amount of planning documentation published since the start of the planning process, our efforts have been focussed on reviewing and assessing the most recent documentation, which is considered the most relevant and up to date. Older documentation has only been accessed and reviewed where it has been deemed to provide further relevant information.

This letter focuses on assessing whether or not the proposed development will increase the risk of flooding within and around the site area – an assessment of the different types of flooding is included; and whether or not the site of interest is currently at risk of flooding.

2 FLOOD RISK IMPACT ASSESSMENT

2.1 Upstream inflows to the site

A surface water discharge point exists immediately west of the proposed development application boundary.

Currently, upstream flows discharging from that outfall into the site follow topographical gradients, hence draining to the east across the site. Depending on the magnitude of the storm event, which in turn determines the degree of infiltration and run-off flowing across the site, upstream inflows may be naturally conveyed to either the existing drainage ditch along the eastern part of the site or the existing topographical depression on the north-eastern part of the site; or both.

However, the site of interest in its current status does provide some degree of run-off attenuation, and also allows for evapotranspiration and infiltration to occur. Despite its relatively steep topography, the site has been described as "boggy", with several areas being saturated and/or having ponded water.

The Applicant proposes to convey surface water run-off entering the site area from the west *via* a 225mm diameter culvert. Whilst this might be a valid scheme for conveying upstream inflows off-site, this will lead to an increased risk of on-site and off-site flooding, which has not been considered by the Applicant and is summarised as follows:

1. Routing upstream inflows through a culvert will not allow for infiltration and evapotranspiration to occur, thus upstream inflows will not be attenuated prior to discharging to the eastern drainage ditch. As a result, peak flow rates and total volumes discharging to the eastern ditch will increase, leading to increased risk of flooding downstream of the site;

2. A concrete pipe will transmit flows more quickly than overland flow, resulting in upstream flows arriving downstream of the site more quickly and therefore with greater peak flow than is currently the case, therefore increasing flood risk to the east of the site;

3. The proposed culvert has not been assessed with respect to the required flow capacity as per peak upstream inflows. This may also lead to an increased risk of flooding on-site (if over flow occurs), as well as immediately upstream of the site (as a result of reduced conveyance capacity);

4. The existing downstream drainage ditch has not been assessed with respect to the required capacity to convey upstream inflows together with other flow sources (*i.e.,* storm water drainage network and springs). This may result in an increased risk of flooding within and downstream the site.

2.2 Rainfall run-off

2.2.1 Sustainable Drainage Scheme (SuDS)

The Applicant justifies the use of oversized pipes due to the lack of infiltration potential beneath the site. Whilst this assumption is more than likely to be reasonable given the geology underlying the site area and the presence of shallow groundwater, there might be other SuDS techniques that are equally functional and more beneficial to the site characteristics.

Specifically, the SuDS Manual (CIRIA, 2015) recommends the use of SuDS on the basis of four objectives: peak flow reduction, water quality improvement, amenity and biodiversity. Oversized pipes only achieve one of these objectives, therefore other approaches should be explored rigorously and only discounted where not viable (*e.g.*, infiltration). Other SuDS techniques exist and these have not been considered.

Given the size of the development, its proximity to flood prone areas and its proximity to existing residential developments, further alternatives to infiltration systems could have been explored, in order to achieve a greater attenuation of run-off whilst not increasing the risk of flooding on site.

The highly engineered approach currently being proposed should only be considered once more natural storage and release options have been robustly evaluated.

2.2.2 Storm water drainage network

There is a lack of clarity in the documentation in the most up-to-date storm water drainage calculations (*i.e.* modelling results), dated October 2017 (and uploaded online 23/11/2017). The fact that drainage calculations are not accompanied by any supporting explanatory document hinders GWP's technical review of modelling results.

A number of issues have been identified and are discussed as follows:

1. Storm water drainage calculations are based upon a total contributing area of 2.081 ha, whereas the Surface Water Impermeable Areas Plan (Drawing No. 466/ED/03 dated 23/05/17) shows the total impermeable area to be 2.341 ha; furthermore the Flood Risk Assessment (FRA) 2017 estimates the impermeable area to be 2.21 ha.

2. Existing Greenfield Run-off Rates (GRRs), *i.e.,* pre-development run-off rates, have been calculated by the Applicant's consultants using an estimated total contributing area of 4.42 ha (*i.e.*, two times the estimated impermeable area). Given that no separate drainage strategy has been considered to drain run-off generated within the permeable site areas (*i.e.*, the remaining 2.21 ha, as per the assumptions made in the FRA 2017), it can only be assumed that these areas will also be contributing to the storm water drainage network – permeable areas will generate run-off during intense rainfall events, particularly given the site's steep topography and low infiltration potential.

3. Therefore, either a separate system should be provided for the permeable site areas to be drained or the storm water drainage network should be re-sized to account for the total site run-off (from both impermeable and permeable areas) generated within the site, whilst limiting total off-site run-off rates to below or equal to GRRs for any event up to the 1:100 year (+40% climate change rainfall allowance) design rainfall event. In order to prove this, the Local Lead Flood Authority (LLFA) normally requires proof of compliance with GGRs for the 1:1, 1:30 and 1:100 year (+40% climate change rainfall allowance) design (*i.e.* worst-case scenario) rainfall events.

4. Drainage calculations seem to include duplicated modelling results for some rainfall scenarios; each of them showing completely different, and therefore inconsistent, results. This is the case for the 1:30 year rainfall simulation scenario, where simulations dated 08/11/2017 show the drainage scheme is discharging below GRR; whereas modelling results dated 30/10/2017 show a total off-site discharge rate higher than 300 l/s (*i.e.*, more than 6 times the GGR or maximum allowable off-site discharge). Clarification on this inconsistency should be provided by means of updating drainage calculations and including supporting text.

5. There is also a lack of clarity with the pipeline's and manhole's nomenclature, which further hinders our ability to adequately scrutinise the drainage calculations provided. For instance, nomenclature shown in the Engineering Layout (Drawing No. 466/ED/02 dated 05/05/17) does not coincide with the drainage calculations.

6. Climate change rainfall allowances have not been appropriately applied to all rainfall scenarios (and/or not enough simulation details have been included into the drainage calculations). In this regard, the most significant issues are listed as follows:

    a. No consideration of climate change (*i.e.* allowing for additional flow and/or rainfall) has been included in the 1:30 year rainfall scenario.

    b. Simulation criteria are not specified for the 1:1 year rainfall scenario, thus there is no evidence that climate change potential impacts have been taken into account. Since no consideration of climate change effects has been included in the 1:30 year rainfall scenario, it can only be assumed that the same is true to the 1:1 year rainfall scenario.

    c. Similarly, simulation criteria have not been specified for one of the 1:100 year rainfall scenarios, which leads to the same conclusion as stated above. The drainage calculations include results from 2 different rainfall scenarios, and one of them does include 40% climate change rainfall allowance.

2.3 Sewer drainage network

The Applicant proposes to alter the sewer network that currently exists across the site. The proposed layout incurs an increase in pipe length, which may have negative implications with regards to sewer pipe conveyance. Moreover, the proposed layout may result in an increased risk of blockage, as the pipe gradient will be reduced.

Implications of altering the path of a public sewer network pipeline have not been considered, assessed or mitigated in the Flood Risk Assessment. Aspects such as the current utilisation of the pipeline, as well as quantifying the reduction in pipe conveyance and the increased risk of blockage as a result of the proposed development are important and should be carefully assessed. Consideration of these impacts is deemed relevant as this alteration could potentially result in an increased risk of flooding within and downstream the site.

2.4 Springs and overland flow

It has been proposed to convey flows arising from at least one of the springs located on site (towards the north site boundary) to the eastern drainage ditch *via* a land drain. The proposed land drain will impact the way spring flows are conveyed across the site, thus the following impacts will occur:

1. Routing spring flows through a land drain will not allow for re-infiltration and evapotranspiration occurring. Thus, as a result, peak flow rates and total volumes discharging to the drainage ditch will increase, leading to increased risk of flooding downstream of the site;

2. The proposed land drain (and associated spring capture) may result in a reduction in groundwater flow across the site; this may in turn lead to a reduction in base flow (*i.e.* groundwater fed flow) into the River Goyt and/or the drainage ditch downstream the site during dry periods.

2.5 Groundwater

The Applicant includes a site investigation as part of the documentation. The geology of the site is reported by the British Geological Survey (BGS) to be a glacial till (clay dominated) overlying mudstones of the Pennine Lower Coal Measures. The site investigation involved 13 No. boreholes and 10 No. trial pits, all of which proved a clay soil overlying the Till (sandy gravelly clay), with a further 4 No. rotary holes deep enough to encounter the mudstone, at depths of 4.5m to 17.0m below ground level (bgl). Groundwater was reportedly encountered in 9 No. of 13 No. boreholes, 3 No. of 10 No. trial pits and none of the rotary holes. Of these, the groundwater strikes coincided with sand in 5 No. boreholes, but with clayey strata in the other 4 No. boreholes and 3 No. trial pits. The shallow water strikes (<0.35m bgl) appear to mostly relate to water perched within the soil horizon and weathered clay till, with one exception at WS9 in a sand, whereas the deeper water strikes (3.0 to 4.5m bgl) mostly correlate with sand horizons.

3 No. soakaway tests have also been undertaken. Their location is somewhat coincident with proximity to locations of 'springs and issues' as identified on the Ordnance Survey maps. All 3 No. of the 4 No. soakaway pits (one was not tested) encountered clay dominated strata to 0.65-0.70m bgl, with 2 No. pits then encountering partially saturated (1.1m and 1.5m bgl) gravelly sand, and one pit remaining within gravelly clay. One pit encountered sand to 0.50m bgl then entered clays – the sands were dry. The data for all three soakaway tests shows: i) no repetition of tests – this is not best practise; and ii) no inflow of water into the ground at all, which seems a surprising outcome for the trial pits containing sand.

The ground investigation demonstrates the underlying strata is dominated by clayey strata, which generically will be of low infiltration capacity. Sand units do exist in some places; with the 3 No. soakaway pits, 1 No. other trial pit and 2 No. boreholes encountering sand within 2m of ground surface (note, 2m is the normal maximum depth for soakaways). 24 No. exploratory holes did not encounter sand within 2m of ground surface. The 3 No. soakaway tests have not followed British Standards, although this is likely to be justified by the Applicant's consultants as being due to a complete lack of inflow into the surrounding strata warranting no further testing. By failing to repeat the tests, *i.e.*, pumping out the trial pits, the opportunity to repeat the tests and confirm their accuracy has been lost. 3 No. soakaway test locations is not considered sufficient for a site of this size, and despite the clay dominated strata, the ground investigation did identify other areas that could have been tested (including near WS3 and TP4).

In summary, the ground investigation confirms a shallow perched soil horizon water to exist within 0.5m of ground surface within the eastern half of the site, with deeper groundwater at 1-5mbgl in other specific locations, especially along the northern and north-eastern boundary of the site. Whilst these general ground conditions suggest SuDS infiltration technologies will be largely ineffective, they also suggest shallow groundwater flooding could be a constraint on some properties and that groundwater could be encountered by any substantive deeper drainage infrastructure constructed at depths of 1-4m bgl. The shallow soil waters appear to be recognised by the Applicant, who is proposing to raise house foundation levels. The deeper groundwaters have the potential to create buoyancy problems for any new storm sewers, as well as could be de-watered by permeable materials used for sewer foundations.

In conclusion, SuDS infiltration techniques are unlikely to be effective on the site, although the current site investigation cannot be considered to be rigorous in assessing this issue in detail. Shallow groundwater (flooding) could create buoyancy uplift problems for storm sewers. Alternatively, deeper groundwater could be depressurized by these sewers, depending on construction techniques, resulting in additional minor groundwater flows leaving the site. Groundwater flooding will be a problem in the areas of the site with identified springs and issues and near WS9, where property foundations will interfere with shallow groundwater egress, potentially damaging new properties as well as altering spring flows and locations, if these groundwater flows are intercepted by the Applicant and discharged elsewhere.

2.6 Proximity to river flooding

Finally, in times of heavy rainfall, flooding from the River Goyt is expected immediately downstream of the site.

In this regard, the increased amount of surface water run-off (from various sources, *i.e.*, upstream inflows, springs, storm water drainage, *etc.*) being discharged from the site into the drainage ditch downstream of the site as a result of the proposed development may result in an increase in flood risk immediately downstream of the site, where river flooding is expected to occur.

This fluvial flood risk to the receiving water courses has not been assessed.

3 CONCLUSIONS

In conclusion, the proposed development drainage scheme, through which all flows generated within and upstream the site (including storm water run-off generated within the site, upstream inflows into the site, and on-site springs) will be discharged off-site *via* an existing drainage ditch, will increase the risk of flooding within and around the site area.

Specifically:

i) Upstream flows arriving on and traversing the site will be both routed across the site more quickly and be less attenuated than the current field layout permits;
ii) On-site sizing of the storm water drainage scheme has been for the Greenfield Run-Off Rate, neglecting to include the run-off from the retained greenfield areas, thus when combined together these will exceed the current pre-development run-off rate;
iii) Proposed capture of spring waters will accelerate their run-off from the site;
iv) Shallow groundwater may affect new building foundations and create uplift problems for the proposed new sewer; and
v) The existing sewer re-alignment has not been considered in any detail and could result in loss of flow capacity within it and consequential sewer flooding to the local area.

It is also important to note that, as per the planning response provided by the Derbyshire County Council's (DCC) Flood Risk Management Team (regarding the Planning Ref: HPK/2017/0247 and dated 19/11/2017), Conditions No. 11 and 12 were apparently resolved on the basis that the Applicant had "provided flow rate and volume calculation for the proposed surface water system demonstrating that the site will not increase the discharge rate or volume leaving the site, or result in flooding within the development".

Contrary to the statement by the DCC's Flood Risk Management Team, the volume of surface water run-off leaving the site will increase as a result of the development. The peak flow is also highly likely to increase, given the proposed direct routing of upstream off-site flows across the site and the failure to design the on-site storm drainage scheme for the pre-development rate less the retained green field run-off. Consequently, we consider Conditions No. 11 and 12 should not be discharged.

With respect to the proposed use of oversized pipes and flow inhibitors, whilst this is a legitimate SuDS technique, it does only fulfil one out of the four objectives of SuDS (*i.e.* peak flow attenuation, improved water quality, amenity and biodiversity). Moreover, the proposed SuDS scheme has not been correctly sized (*i.e.* permeable areas of the site have been assumed to generate no run-off). Consequently, we consider Condition 13 should not be discharged.

Whilst a scheme to manage upstream inflows has been proposed, this is expected to result in an increased risk of flooding in and downstream of the site. Since the proposed upstream inflows drainage scheme does not fully mitigate the flood risk impacts associated with the proposed development, we consider Condition 15 should also not be discharged.

We trust the above is self-explanatory, but please do not hesitate to contact the undersigned for further assistance.

Yours faithfully,

Clive Carpenter
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APPENDIX 2

Barratt Homes email of 11 June 2019

Subject: FW: DOC/2017/0071 - Linglongs Road, Whaley Bridge - Conditions 9,10,11 and 13

Existing Watercourse StructuresExisting Watercourse Structures**From:** Furey, Kevin D [mailto:kevin.d.furey@barratthomes.co.uk]
Sent: 11 June 2019 10:59
To: Colley, Jane
Cc: Hilliker, Ian E; Drinkwater, Aleksandra
Subject: DOC/2017/0071 - Linglongs Road, Whaley Bridge - Conditions 9,10,11 and 13

Jane,

Please see comments below regarding our application to discharge planning conditions 9,10,11 and 13.

DOC/2017/0071 - Linglongs Road, Whaley Bridge

Find below my responses/statements (in green) in response to the drainage conditions 9, 10, 11,13. Please note, my response to 11 & 13 just refer to my response from 9 & 10 as the conditions just seems to be the same condition just slightly reworded. In condition 10 I have also split it up into the "other water inputs" listed by WBM. I have spoken to Chris Rogers of DCC LLFA and arranged to meet at 10am on Friday 31st May, where we will discuss the drainage strategy, and what will be needed in order to allow DCC to discharge the conditions.

9- The development hereby permitted shall not commence until such time as a scheme to limit the surface water run-off generated by the proposed development to existing Greenfield rates with attenuation up to a 1 in 100 year event, has been submitted to and approved in writing by the Local Planning Authority. The scheme shall be fully implemented and subsequently maintained, in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the Local Planning Authority.

A flood Risk Assessment was carried out by Cole Easdon (dated May 2017). The FRA states *"It is proposed to discharge surface water at the equivalent greenfield discharge rate for storms up to the 1:100 year event. Runoff from the 1:100 year + 40% climate change event will be restricted to the 1:100 year greenfield rate of 59.4l/s."* The on site drainage design is shown on drawing 466/ED/02R. The drainage is designed to ensure a maximum discharge rate of 59.4L/s is achieved for a 1:100 year event. The drainage design ensures no flooding to properties for all storm events upto and including 1in100 year +40% climate change. An additional 10% allowance is also incorporated into the drainage contributing areas to allow for urban creep (see drawing 466/ED/03E). Microdrainage output files and simulations have been provided. The surface water discharge is restricted to 59.4l/s by means of a series of flow controls and underground attenuation tanks in the form of oversized pipes.

All drainage is to be constructed in phases shown on drawing 466/ED/47A, though given the size of the site, the phases are likely to be consecutive and continuous. All drainage is to be installed and operational prior to first occupation of the connected plots in the relevant phase. This will ensure the discharge rate is controlled prior to any occupations.

The surface water and foul network, including all pipes upto and including the outfall headwalls, is to be put forward for adoption by United Utilities under a S104 agreement. Those sewers are to be maintained under UUs maintenance regime.

All areas of public open space will be transferred to the management company for adoption and maintenance. This includes any SUDS (swales/ponds), sewers (not adopted by UU), and land drains within the open space. The management and maintenance of the POS, ditches and all other land drains will be funded by the purchasers of the development by way of an annual fee levied on the management company. In order to ensure the long term operation of the swales, the maintenance contract will stipulate regular maintenance of the SUDS network. A draft inspection & maintenance schedule for elements of the private drainage infrastructure is already listed in the approved FRA by Cole Easdon. Table 3.3. It essentially reads:

Drainage Element	Maintenance Requirement	Frequency
Catchpits	Inspect. Remove excess silt & debris, Clear Blockage	Inspected every 3 months. Silt & debris removed as necessary.
Surface Water Culvert	Inspect for signs of blockage. CCTV inspection where required.	Annually. Blockages, silt and debris removed and any repairs carried out as necessary.
Ditches/Swales	Inspect. Remove Excess vegetation. Clear Blockages, Silt & Debris.	Inspected every 1 Month, Blockages, silt & debris removed as necessary.

Land drains installed at the base of highway embankments are to be adopted by the Highway Authority, and will be covered under a S38 agreement. These land drains will be maintained under the Maintenance regime of Derbyshire CC Highways. Prior to adoption, they will be maintained by Barratt contractors.

10 - The development hereby permitted shall not commence until such time as a scheme to manage the risk of flooding from overland flow of surface water and the drainage of existing flows onto the site, has been submitted to and approved in writing by the Local Planning Authority. The scheme shall be fully implemented and subsequently maintained, in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the Local Planning Authority.

Drawing 466/ED/02R shows the design for the site wide drainage network, which in conjunction with DDC LLFA, has been designed to manage the risk of flooding for the on site properties, as well as not increasing the risk of flooding to the existing watercourses, or downstream properties. These features, and others raised locally, are discussed below. All drainage design features will be constructed and completed prior to occupation of any plot that is served by that relevant drainage feature.

Rainfall onto undeveloped parts of the site

Rainfall onto undeveloped parts of the site will be onto permeable surfaces (gardens, public open space etc) and therefore will largely infiltrate to ground. As such, rainfall onto permeable surfaces will have a much greater time of concentration than the piped drainage network, before it reaches the discharge points. Furthermore, It is recognised that redevelopment of the site with houses, walls, fences, kerbs, and other features severely restrict the site's ability to run off as it did prior to development. Therefore, rainfall onto undeveloped parts of the site is not considered in the drainage design. This is standard accepted industry practice based upon recognised research and data. Therefore, no additional measures are need to cater for rainfall onto undeveloped parts of the site. Notwithstanding, the system of land drains shown on drg 466/ED/02R will serve to drain any undeveloped areas and ensure no flooding to properties.

Springs (both on-site and off-site),

Drawing 466/ED/02R shows additional land drains which were added to pick up an on-site spring to the rear of plots 101-103 These land drains do not enter the development drainage system and instead connect into the existing ditch running through the site, thereby replicating the pre-development scenario.

Overland flows,

Drawing 466/ED/02R shows a network of additional land drains around the site boundary, and adjacent to all highway embankments which were added at the request of the LLFA to pick up off-site overland flows. These land drains do not enter the development drainage system and instead connect into the existing ditches running through the site, thereby replicating the pre-development scenario.

Groundwater Flows

Drawing 466/ED/02R shows a network of additional land drains around the site boundary, and adjacent to all highway embankments. These land drains would collect any ground water flows arising from within or outside the site. All plots ~~were~~ are at least 150mm above surrounding ground level, and thus any groundwater issues would not

cause flooding to property. Plots 1 to 3 have been provided with at least 300mm above surrounding ground levels as an additional level of protection. The land drains do not enter the development drainage system and instead connect into the existing ditches running through the site, thereby replicating the pre-development scenario.

Surface water run-off from adjoining properties.
It is common that uncharted drains are identified during development, which are usually dealt with at the time of development. Since the uncharted drain is clearly not apparent at the surface, except in the one location at the rear of 130 Manchester Road, the only reliable way to identify its route and prove its eventual outfall, is to trace it by excavation along its length. It is not practicable to make those investigations now, as significant damage to the field will be caused by the investigation. Once planning is achieved and we have a presence on site, with excavators, we can do the necessary investigations, and make amendments to the drainage design that will deal with any existing flows accordingly. We therefore acknowledge the existence of the existing drain, and will ensure that all necessary actions will be taken to maintain these existing flows.

Functional surface water outfall from an adjacent housing estate (Linglongs Avenue)
The surface water outfall from the adjacent Linglongs Avenue estate is in fact an adopted sewer. As such it is shown on the sewer records, and has been since Barratt's involvement in the site. It is shown as out-falling into the site, however that is in fact incorrect. It has, sometime in the past, been diverted into a below ground pipe, which extends the full length of the site, and ultimately discharges to the watercourse to the east of the site. We have identified this pipe by CCTV survey, and shown that this pipe is to be diverted as part of the drainage network proposed through the site. The diversion is shown on drawing 466/ED/02R.

11 - The development hereby permitted shall not commence until a scheme for surface water regulation, based on sustainable drainage principles, has been submitted to and approved in writing by the Local Planning Authority. The scheme shall include details of how the scheme will be maintained and managed after completion. Thereafter the development shall proceed in accordance with the approved details.
See response to Condition 9 as this condition seems to be the same.

13 - The development hereby permitted shall not commence until such time as a scheme to manage the drainage of existing inflows onto the site, has been submitted to and approved in writing by the Local Planning Authority. Thereafter the development shall proceed in accordance with the approved details.
See response to Condition 10 as this condition seems to be the same.

The following information has been submitted to discharge the conditions;

- 466-ED-02 Engineering Layout Rev R
- 466-ED-03 Surface Water Area Plan Rev E
- 466-ED-07 Manhole Details Rev F
- 466-ED-08 Manhole Details Rev F
- 466-ED-09 Manhole Details Rev F
- 466-ED-10 Manhole Details Rev F
- 466-ED-11 Manhole Details Rev E
- 466-ED-12 Engineering Longsections 1 of 3 Rev G
- 466-ED-13 Engineering Longsections 2 of 3 Rev G
- 466-ED-14 Engineering Longsections 3 of 3 Rev H
- 466-ED-15 Detailed Manhole Schedule Rev F
- 466-ED-18 Flood Route Plan Rev F
- 466-ED-30 Flow Control Details Sheet 1 of 2 Rev C
- 466-ED-31 Flow Control Details Sheet 2 of 2 Rev B
- 466-ED-33 Headwall Details Rev A
- 466-ED-35 Plot Drainage Details Sheet 1 of 3 Rev A
- 466-ED-36 Plot Drainage Details Sheet 2 of 3 Rev -
- 466-ED-37 Plot Drainage Details Sheet 3 of 3 Rev A
- 466-ED-46 Proposed Watercourse Structures Rev -

- 466-ED-47 Drainage Phasing Plan Rev A
- 466-ED-53 Proposed Watercourse Structures Rev –
- Drainage Calculations
- FRA Issue 2 Dated May 2017
- Environmental Map

I trust that this is acceptable, however, should you require any further information, please let me know.

Kevin Furey
Technical Manager

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