

29th July 2022

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**PITCH DEVELOPMENT, RADCLIFFE MOOR ROAD, LITTLE LEVER (APP. REF. 67658)
RESPONSE TO COMMENTS ON THE HYDROLOGICAL ASSESSMENT BY BURY COUNCIL PARKS AND
COUNTRYSIDE DRAFT 1 (UNDATED – RECEIVED 14.06.2022)**

Comments on the Hydrological Assessment were received from Bury Council's Parks and Countryside department on 14th June 2022. These comments are directly responded to in this letter and where appropriate the updates or amendments have been made to the Hydrological Assessment which is appended to this letter. The Council's original comments are italicised, and our responses follow each of the points raised and are uniquely identified for ease of future reference.

Hydrology

The report proposes that the hydrology post development mimics that of the site as it now stands.

1.1 Correct

I would have expected to see measurements of the flow of water through the reservoir/lodge system over a twelve-month period so that the existing flows rates are established and the drainage scheme designed around these rates so as to accurately mimic the existing.

1.2 This would be a highly inappropriate approach to adopt as to extrapolate extreme storm event data from such a limited dataset would be inaccurate would result in a design that would certainly increase flood risk. Flood Estimation Handbook (FEH) Statistical method and rainfall data has been used to calculate the key greenfield runoff rates for a range of events up to and including the 1% return period storm event (the 1 in 100 year probability of occurrence in any one given year).

As no such measurements have been supplied it is impossible to claim that the proposed scheme will mimic the existing.

1.3 The scheme aims to mimic the statistical rates as outlined in the response to point 1.2, not the flows measured in any one given year which could be unrepresentative of the statistical norms and average flows. It should also be noted that there may be flows other than the springing and surface water runoff from the proposed development site entering the lodge and reservoir systems. We have requested records and drawings showing the layout and operation of the lodge systems

[1]



and these have still not been provided and it is our understanding from the most recent discussions that these do not exist.

It is important to remember that to mimic the existing not only peak and minimum flows need to be replicated but the duration and time of these flows and total volumes.

1.4 The scheme aims to mimic the runoff volumes by controlling the peak rates of discharge and allowing sufficient time for infiltration and other natural losses to occur. The volumes pre and post-development should be very comparable as there is only a limited area of impermeable surface (the clubhouse roof) and this is being slowed by passing through a raingarden then swale; there may be some slight improvement in infiltration due to the depth of the car park construction but whether this emerges from the spring or via the surface water outfall the volume should be comparable. The pitches by virtue of the improved surface drainage will intercept rainfall runoff more quickly but again this is throttled within the systems slowing the discharge and allowing opportunity for infiltration and other natural losses to occur prior to passing through a swale and reedbed.

Similarly, there is no data on water quality over the same period to establish a base line to compare with should the development go ahead.

1.5 If water quality data was obtained from the lodges it would not be clear whether this directly related to the application site or another incoming source of flow to the lodge system. We have requested records and drawings showing the layout and operation of the lodge systems and these have still not been provided and it is our understanding from the most recent discussions that these do not exist. The lack of engagement by Bury Council's technical teams at the early stages of this application preparation process has hampered the ability to discuss these matters in detail. It should be noted that irrespective of the current water quality we would be aiming to provide the highest water quality feasibly achievable from our development proposals; this is reflected in the use of permeable paving, raingardens, dry swale, wet swale and reedbeds.

Drainage System Design

As the site stands some of the rainfall will infiltrate the soil surface and some will run off. Water that infiltrates is then available to recharge the springs and aquafer that serves the reservoir and lodges.

2.1 Correct in part – some rainfall will infiltrate the surface layers into the secondary aquifer (shallower) and will likely emerge via the spring and enter the lodge system. It is less likely that runoff will infiltrate into the deeper aquifer feeding the reservoir.

Installing the drainage system will increase the rate of infiltration and then intercept the water and carry it away without allowing it the opportunity to recharge the aquafer at a sufficient height to feed the reservoir or to feed the springs.

[2]

2.2 If infiltration occurs then this specifically will recharge the secondary aquifer feeding the lodge via the spring. It is our understanding that the deeper primary aquifer feeding the reservoir is fed via artesian groundwater in view of the water level in the reservoir being higher than the development site ground levels at the boundary and there being no other obviously observable inflow.

The drainage system will also reduce the amount of surface run off due to the water entering the drainage system as a result of increased infiltration.

2.3 This is a duplication of point 2.2.

I cannot see any calculations relating to this.

2.4 There are no calculations relating to infiltration as ground conditions mean no results would be obtained from BRE365 testing due to the cohesive nature of the surface strata.

Drainage System Type

There are four drainage options proposed with different capacities and rates of water collection and removal. These variables are needed to calculate the volume of water being intercepted and the on-site storage required and the size of the reed bed required to process the water.

3.1 Regarding the pitch drainage, there are four options for the pitch systems proposed by the Agronomist. The volume of rainfall entering the system is the same irrespective of the selection of any of these four options and selection of one of these options is not required to size and design the stormwater storage requirements.

I cannot see any calculations relating to this.

3.2 There are Microdrainage quick storage estimates within Appendix G of the Hydrological Assessment outlining the mean storage requirements for the extreme storm event of 100yrRP+40%CCA as the system will have to be sized sufficiently to contain the volume generated by this scenario to satisfy the requirements of planning and to manage flood risk.

Which one of the four options will be used? The agronomist has recommended Option 4 with the sand ameliorated topsoil to give maximum pitch availability and playability.

3.3 It is my understanding that the client is minded to select Option 4 but this is a detailed design aspect and requires further discussion with others including Sports England.

[3]

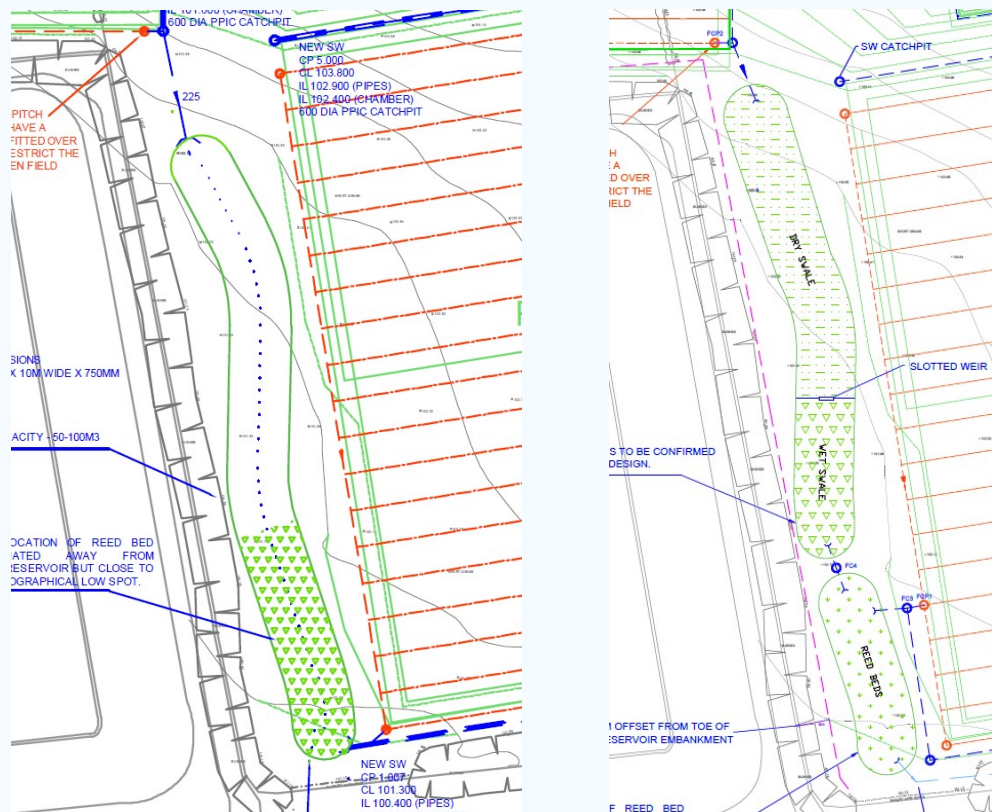
Swail

The design of the combined reed bed/swail is flawed.

4.1 This is not an overly useful statement and one I would disagree with.

It needs to be in two parts.

4.2 The report explains that the swale and reedbed are in two parts. This is shown in the extract below from the Hydrological Assessment drainage strategy plan – both the previous version on the left and the updated plan on the right which shows more detail.



4.3 In fact there are three distinctly different parts as the swale is a 'dry swale' in the upper portion, then becomes a 'wet swale' and then this swale discharges into the reedbed. The detail of the interface between the dry swale, wet swale and reedbed are a matter of detailed design but I would envisage a slotted weir between the dry and wet swale to make landscape maintenance easier and then a spill weir from the wet swale to maintain a permanent water level in the base with a piped connection into the reedbed.

[4]



Firstly, a storage pond to balance incoming flows which tops up the reed bed so that the water level in the reed bed remains constant throughout the year which is necessary to maintain the health of the plants and make the reed bed work efficiently.

4.4 Stormwater storage is proposed to be within the pitch drainage systems, the dry swales and the wet swale; this will result in a more regularised flow into the reed bed so that the water level in the reed bed does not vary significantly to maintain a healthy treatment function of the reedbed.

The reed bed would take at least a couple of years to establish and start working. Until it is established there should be no fertilizer, pesticides or lime applied to the development site.

4.5 Reeds should be fully established in 2 to 3 years but this should be assessed post-construction. A reedbed expert should advise which can be applied and when as other factors need to be considered such as the season and weather. I see no reason why specific requirements cannot be conditioned.

There is no mention of how the existing supply to the lodges would be protected from silt ingress during the construction phase.

4.6 I would have expected a condition relating to a Construction Phase Management Plan which would cover this sort of matter; not just silt but other potential impacts such as environmental impact from spillages and consideration of soil consolidation resulting from heavy plant movements.

Rootzone composition and leaching

It is proposed to increase the pH of the rootzone using lime material. This may alter the pH of the water entering the lodges and be damaging to the established ecology of the reservoir and lodges.

There is no risk assessment associated with this or control measures proposed.

5.1 Regarding the two points above, if there are concerns with the use of lime then small amounts could be added to the topsoil at regular interval over a period of time. The addition could be timed to avoid rainfall and this would reduce the risk of higher than normal pH surface water run-off. The lime could be added after the installation of the drainage system which would further reduce the risk of surface water run-off. Ryegrass used for sport pitches is relatively tolerant of low pH soils and the need to increase soil pH could be reviewed with this in mind.

The existing soil is clay rich with a high cation exchange capacity (CEC) meaning that potassium and phosphorus and similar positively charged ions are bound to the clay particles and are resistant to leaching into the ground water.

[5]

The sand based rootzone that is proposed for the pitch surface and in the drainage system has a lower CEC and so is likely to accelerate the leaching of potassium and phosphorus into the water collected by the drain.

Nitrogen leaching is not affected by the CEC of the soil but will be increased as the rate of water percolation through the soil will be quicker with less time for absorption by roots of the turf.

Consequently the rate at which fertilizer is leached from the soil and into the lodges will be increased compared to present.

The suggestion that the leaching of fertilizers herbicides and other chemicals might be controlled by conditions is unsatisfactory.

It is similar to having an unbudded fuel tank and trying to prevent spillages by having procedures in place rather than a bund. The hierarchy should be to stop the spillages in the first place by engineering means (the bund) and have procedures in place as well.

In this case the contaminated water needs to be treated within the site and best practice observed in the maintenance of the pitches.

5.2 Regarding the seven points above, the risk of nutrient leaching can be reduced using slow and controlled release fertilisers. Organic based feeds also act in a slow-release manner as well as improving the physical condition of the soil. Controlled release fertilisers are especially effective in reducing nitrogen leach in the form of nitrate. Phosphate is very immobile through even sand-based soils and the increased risk of leaching would be more associated with potassium. If required, the cation exchange capacity of the upper sandier topsoil could be increased without compromising drainage potential by adding Zeolite. In addition, there is a product called LeoZeo which is zeolite based, but also contains an organic matter source. Additional details of specific products can be provided if required.

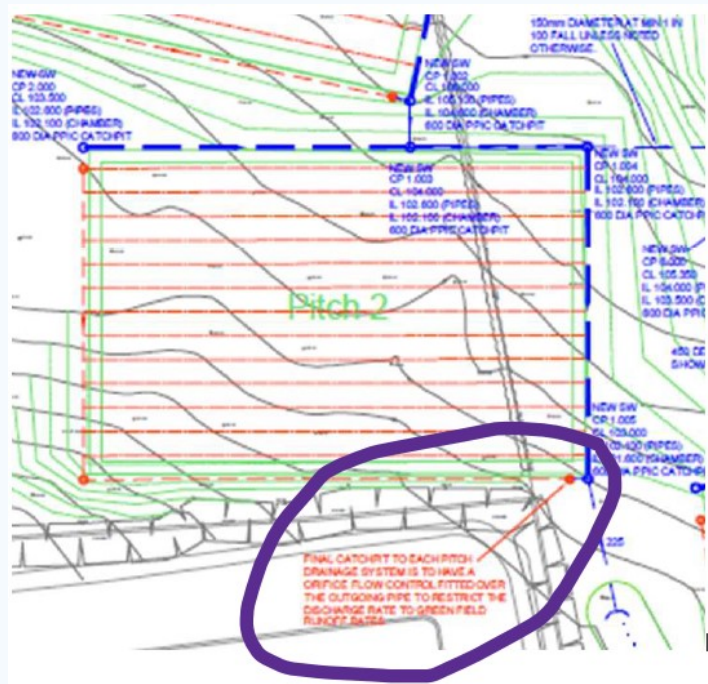
Other measures that can be taken to reduce leaching potential are to ensure balanced nutrient application so that nitrogen uptake by the grass plants is optimised. Undertaking a good aeration regime including verti-draining will help to improve rooting depth which will increase nutrient uptake and reduce nutrient leaching potential. The fact that sand has been added to the topsoil and that there is a drainage system will mean that the risk of surface water run-off will be reduced. It should also be noted that the amount of sand through the soil profile will reduce with depth. It will only be approximately the top 100mm depth of the topsoil profile which will have a higher sand content. Any leached nutrients will be captured by the underlying heavier clay-based topsoil present beneath the shallow sandier upper layer.

Regular pH and nutrient status soil testing will help to monitor the chemical status of the topsoil ensuring that the pitches are not over fertilised and fertiliser applications can then be precise and targeted.

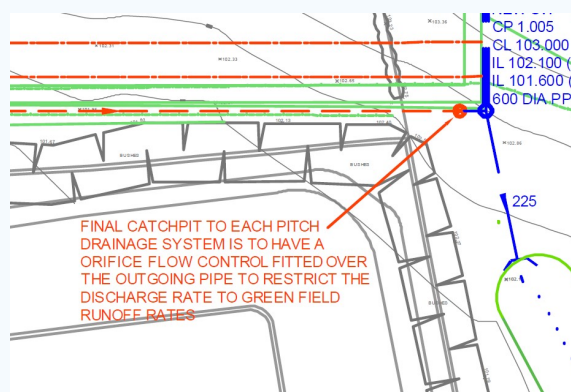
[6]

Flow control

The flow control system will not work as drawn in Figure 9. Constraining the flow at the point indicated without the water having elsewhere to go will cause the manhole to discharge due to the head of water from Pitch 3 and Pitch 4 which are both higher than Pitch 2.



6.1 What is being described in the comment is not what is being proposed. What is being proposed is an orifice flow control to 'each pitch' on the final catchpit. This creates a cascading effect specifically so that one pitch does not hydraulically impact on the subsequent lower pitches. The note encircled specifically states this – see the note below which I have increased in size for clarity.



[7]



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There is no constriction shown on the drain from the car park via pitch 1 to the swail. Connected in this way there is a risk of fuel, oil and grit salt from the surface of the car park entering the ponds as the water does not pass through the swail it merely enters near the exit point without benefitting from the reed bed.

6.2 See comment 6.1, there is a proposed flow constriction on 'each pitch' in the final catchpit from each pitch drainage system. To minimise the risk of contaminates or environmental incidents an amendment has been made to the drainage with the introduction of an additional dry swale length and also the routing of the system means this flow will also pass through the reedbed system fully rather than appear to bypass which it appeared to on the previous drainage strategy drawing.

Car Park

There is insufficient detail on the car park drawing.

7.1 Is this the Drainage Strategy drawing that is being referred to? If so the plan states clearly that the paving is an "area of new porous paving with 320mm thick type 3 sub-base with 30% void ratio". Please clarify what additional specific details you require as further information is usually prepared at detailed design stage.

It appears to be impervious tarmac and concrete paving. How does the water enter the proposed permeable fill forming the sub-base soakaway. What provision is there for silt/oil traps?

7.2 It is not impervious tarmac and concrete paving; I am unsure where this appears? The report and drawing corroborate that the paving will be permeable with a type 3 sub-base. Water enters the permeable sub-base depending on the specific finish proposed which may be a porous asphalt of something similar, either way flow is through voids in the structural make-up. The sub-base should not be described as a 'soakaway' as it is designed for zero infiltration as this is what the ground investigation information tells us. There may be some incidental infiltration occurring but this is not a soakaway. The outfall is throttled and discharge controlled before flow goes into the dry swale and then the reed bed. There is no provision for an oil trap or interceptor as they are not required, filtration (not infiltration) occurs within the sub-base of the car park and as water filters through the road construction there is significant water quality improvement including bacterial digestion of oils. Very little silt should enter the system via the surface but any that does will be captured within the subbase or the catchpit into which this connects where the flow control is located.

Presumably this design is flawed as the subbase will silt up over time and stop acting as a soak away?

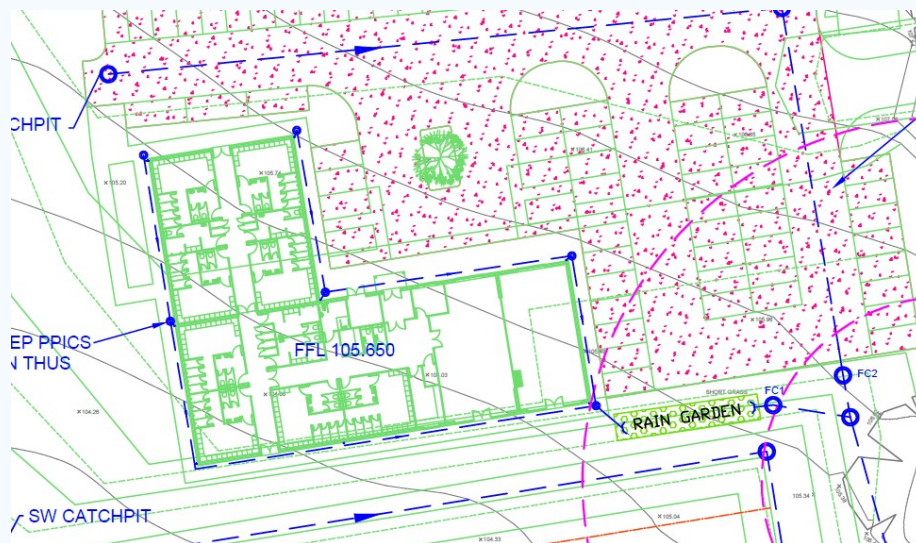
7.3 This presumption is incorrect, principally because the car park is not a soakaway. Some incidental infiltration may occur but this is not the primary purpose of the structure (see 7.2). It should also be noted that in addition to the perforated pipe system within the car park sub-base

[8]

base which has a series of catch pits there is also a catchpit into which this connects where the flow control is located before connecting into the dry swale.

Where are the rain-gardens located?

7.4 At present there is a single rain garden proposed to provide the first treatment stage to the rainfall collected from the club house roof area; this is located to the east of the building adjacent to the car park but not serving the car park (as shown below). Flows from the rain garden will connect into the additional dry-swale then the reed bed.



Connection to the lodges

At 7.1.3 the report states that "There is no positive connection to be made into any pond watercourse, waterbody or pipe"

8.1 This should have read no new proposed positive connection is to be made. However, there may be merit in having further discussion regarding formalising the current 'uncontrolled' flow of water along the southern boundary of the development site into the upper lodge. This was a very wet, water-logged and poorly maintained area on the lodge side of the boundary and there may be benefit in reviewing the levels on the boundary to see if the flows could be encouraged to take a specific route into the upper lodge – this could be discussed during the detailed design stage and might be of benefit to the lodge.

This is incorrect. Photograph 5 in the report shows the existing springs and a wetland area on the boundary of the application site into which the proposed swail will connect.

8.2 See comment 8.1.

[9]



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While on site with the applicant the small stream that leads from the wetland to the lodge was pointed out to them by Council officers.

8.3 Noted.

General observations

The agronomists report states "This is not a design document and does not include detailed design or design information and should not be used for this purpose."

9.1 Noted.

6.4.3 Stillwater Comments

In Point 1 a 5m buffer is advised but the report repeatedly refers to 3m (7.2.7, 7.2.9, 8.2.1)

10.1 Noted, the report has been updated throughout to refer to 5m.

Points 3 and 4 have still not been addressed. No further evidence or information about the springs and their location has not been proved.

10.2 The spring location has been added to the drainage strategy plan for completeness.

No modelling of flow rates within the application site or likely discharge rates. No information on current rates.

10.3 Greenfield runoff calculations using FEH statistical method have been undertaken and are included in the Hydrological Assessment and quick storage estimates using Microdrainage have been undertaken to ascertain the stormwater storage requirements in the most extreme storm events (100yrRP+40%CCA).

No assessment of the downstream impacts, drainage capacity of overall increased flow rates.

10.4 There are no proposals to increase flows; the rates proposed mimic the existing calculated rates.

9.3 Caveats the report with **should** (not will) be no impact on the aquifer based on the ground investigation and the design. No plan for an alternative if it does not.

10.5 Noted.

[10]

9.4 Caveats the report **should** be no adverse impact (not will be no adverse impact) on the spring and surface water. It **aims** to mimic (not will mimic) the rate and volume of existing flow. No plan for an alternative if it does not.

10.6 Noted.

Summary

It is my professional opinion that there should be no adverse impact on the hydrology based on the development proposals which clearly seek to mimic the existing situation.

There is clearly a requirement for detailed drainage design, in terms of pitch drainage and the sustainable drainage systems they connect into. I see no reason why suitable planning conditions cannot be imposed to address any concerns.

I trust you will find the above of assistance, however, if you have any queries or require further information please do not hesitate to contact me.

Yours sincerely,



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Director

BETTS HYDRO

Enc. HYD633-Hydrological Assessment-Rev 2.0

[11]

