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NP16 6LN

3 April 2023

Dear Sirs

Expansion of Broiler Rearing Development at Coombe Farm off Cwm Lane at Shirenewton in Monmouthshire
Flood Consequences Assessment

I refer to your request for me to address the flood risk issues, together with their implications, for inclusion in an application for full planning permission for this agricultural development proposal.

The location of the site and the layout and details of the proposed development expansion are shown on the drawings that form part of the submission for full planning permission. Since this flood consequences assessment will also form part of that submission, these drawings are not separately enclosed.

The flood risk issues, together with their implications, relating to the development expansion in question and the resulting land drainage and flood protection and mitigation measures that are required for the development expansion are addressed in the following itemised and TAN 15 referenced flood consequences assessment:

Technical Advice Note 15 (TAN 15)

(1) Guidance to planning authorities in Wales on how to respond on flood risk grounds to development proposals is now given in Planning Policy Wales (PPW) Technical Advice Note 15 (TAN 15) "Development, flooding and coastal erosion" published in December 2021 by the Welsh Government (WG). TAN 15 expects planning authorities to apply a risk-based approach to development planning and management through a sequential procedure of:
   (i) Development location on Flood Map for Planning that indicates zones of differing degree of flood risk (section 5).
   (ii) Type of development and its vulnerability to flooding category (section 6) and its presumed lifetime (section 7).
   (iii) Location justification (section 10).
   (iv) Flood-free and consequences of flooding requirements (section 11).
   (v) Drainage statement (section 8).

   Section 9 of TAN 15 specifically addresses coastal erosion and flooding, which is irrelevant to this development. The relevant main points of the guidance are summarised as follows:

   (a) The Flood Map for Planning referred to in section 5 of TAN 15 is produced by Natural Resources Wales (NRW) from detailed localised flood study modelling or, in the absence of such modelling, which is normally the case, from its national generalised modelling. It divides the land area of Wales into four flood risk zones denoted 1, 2, 3 and TAN 15 defended. Zone 1 has a less than 1 in 1000 (0.1%) annual probability of flooding from the sea, watercourses or surface water. Zone 2 has a less than 1 in 200 (0.5%) annual probability of flooding from the sea and a less than 1 in 100 (1.0%)

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annual probability of flooding from watercourses or surface water but a greater than 1 in 1000 (0.1%) annual probability of flooding from the sea, watercourses or surface water. Zone 3 has a greater than 1 in 200 (0.5%) annual probability of flooding from the sea and a greater than 1 in 100 (1.0%) annual probability of flooding from watercourses or surface water. All of the annual probabilities are inclusive of the predicted impact of 100 years of climate change. The TAN 15 defended zone is where formal flood defence infrastructure that is managed by a recognised risk management authority provides a minimum zone 2 standard of flood protection with an appropriate freeboard.

(b) Section 6 of TAN 15 categorises development according to vulnerability to flooding. There are three categories, which are highly vulnerable development, less vulnerable development and water compatible development. All residential, teaching, medical and emergency services premises are categorised as highly vulnerable development. Commercial, retail and general industrial development are categorised as less vulnerable development. Section 7 of TAN 15 suggests acceptable lifetimes for the impact of climate change of 100 years for highly vulnerable development and 75 years for other types of development.

(c) Section 10 of TAN 15 contains key guidance criteria regarding development location justification. This section states that all types of development are acceptable in principle in zone 1. Development is justified in zone 2 and a TAN 15 defended zone where its location meets the definition of previously developed land and the consequences of flooding can be managed to the standards recommended in section 11. Development in zone 2 must additionally be part of a Development Plan strategy to regenerate an existing settlement or achieve key economic or environmental objectives. New highly vulnerable development must not be permitted in zone 3. Less vulnerable development is only justified in zone 3 in exceptional circumstances and then only if its location meets the definition of previously developed land and the consequences of flooding can be managed to the standards recommended in section 11. Water compatible development is acceptable in principle in all flood risk zones.

(d) Section 11 of TAN 15 specifies flood events in which development must be flood free. Highly vulnerable development, less vulnerable development and built elements of water compatible development occupied by people must be flood free in a 1 in 200 (0.5%) annual probability flood event from the sea and a 1 in 100 (1.0%) annual probability flood event from watercourses, inclusive of the predicted impact of climate change over the lifetime of the development. An exception is emergency services command centres and hubs, which must be flood free in a 1 in 1000 (0.1%) annual probability flood event from the sea or watercourses, again inclusive of the predicted impact of climate change over the lifetime of the development.

(e) Section 11 of TAN 15 also requires the consequences of flooding to be tolerable in an extreme 1 in 1000 (0.1%) annual probability flood event from the sea or watercourses, inclusive of the predicted impact of climate change over the lifetime of the development. The maximum tolerable depth of flooding is 600 mm for highly vulnerable development, less vulnerable development and built elements of water compatible development occupied by people. The maximum tolerable velocity of floodwaters is 0.30 m/s for less vulnerable development and built elements of water compatible development occupied by people. For highly vulnerable development it is 0.15 m/s, with the exception of its associated infrastructure (e.g. car parks, access, paths and roads), which is 0.30 m/s. The depth and velocity of floodwater can, together, be particularly dangerous. Section 11 of TAN 15 therefore provides a flood hazard matrix of this combination to assess the danger to different people.

(f) Section 8 of TAN 15 highlights the need to mitigate for the effect of the increased surface water run-off caused by development, so as not to increase, and if possible decrease, the flood risk elsewhere. This can be achieved by the provision of storage for re-use, infiltration into the underlying subsoil where ground conditions and water table permit, attenuation storage or a combination of these. These sustainable urban drainage systems (SUDS) are normally provided on-site but are, occasionally, located off-site. In 2018 WG published "Statutory standards for sustainable drainage systems".

Climate Change Allowances

(2) The latest allowances for the increase in the peaks of river flow, sea level, rainfall intensity, wind speed and wave height due to climate change over the design life of a development are given in the 2018 UK government publication United Kingdom Climate Projections (UKCP18).

Natural Resources Wales (NRW)

(3) NRW has a duty under the Water Resources Act 1991, the Land Drainage Act 1991, as amended by the Land Drainage Act 1994, and the Flood and Water Management Act 2010 to exercise general supervision over all matters relating to land drainage and flood defence in Wales. Accordingly, it is a statutory consultee in the planning process with regard to land drainage and flood defence. TAN 15 endorses and reinforces this consultee role. In practice, the approval of NRW in respect of matters relating to land drainage and flood protection and mitigation is, invariably, a prerequisite for planning permission.

Development Site

(4) The existing broiler rearing development consists of four identical units each 102 metres long by 24.7 metres wide, with all buildings parallel on their longer sides. A corridor for maintenance and surface water drainage separates each building. A control cabin and feed bins are located between each pair of buildings adjacent to their front gable ends. A 15 metres wide concrete-surfaced access apron extends throughout this frontage.

(5) The proposed expansion is to the south-east end of the existing broiler rearing development and has a national grid reference of ST 46379306 at its approximate centroid. It consists of a further two broiler rearing units each 102.0 metres long by 24.7 metres wide, with both buildings parallel to each other and to the four existing buildings on their longer sides. However, the two new units will protrude approximately a quarter of their length forward of the four existing units. As with the existing units, a corridor for maintenance and surface water drainage separates the two buildings and a control cabin and feed bins are located between them adjacent to their front gable ends. A 25 metres wide concrete-surfaced access apron extends throughout their frontage.

(6) The existing broiler rearing development is built on a cut and fill platform that falls evenly and very gradually from a level of 104.3 m AOD at the rear of the buildings along the north-east edge of the platform to a level of 104.0 m AOD where the front of the buildings abuts the concrete-surfaced access apron along the south-west edge of the platform. The proposed expansion will be similarly built on a cut and fill platform that falls evenly and very gradually from a level of 99.8 m AOD at the rear of the buildings along the north-east edge of the platform to a level of 99.5 m AOD where the front of the buildings abuts the concrete-surfaced access apron along the south-west edge of the platform The spot levels and contours on the topographical survey plan drawing of the proposed expansion site and its immediate

surrounds show the expansion site falling steadily at a relatively even grade from north to south. The approximately rectangular expansion site has existing ground levels of circa 103.8 m AOD at its northern corner, 100.5 m AOD at its eastern corner, 93.5 m AOD at its southern corner and 99.5 m AOD at its western corner.

(7) The bank between the existing and proposed expansion broiler rearing developments formed through cutting will slope at 1:1. However, the bank formed through filling on the other side of the proposed expansion will slope at 1:2. The proposed expansion development platform excluding banks will have an area of some 0.80 hectares. With the banks included the area increases to approximately 0.95 hectares. The impermeable area of the proposed expansion development (i.e. the roofs of the buildings and the concrete-surfaced access apron) will be 0.64 hectares.

(8) The floor level of the broiler rearing units and their control cabins of the proposed expansion development will be at least 0.2 metres above the adjacent platform level at the building perimeter. This will provide protection against flooding from on-site or adjacent drains and culverts surcharging in an exceptionally extreme storm event or in the unlikely event of them becoming blocked, so ensuring the safe management of the residual flood risk.

Flooding from Watercourses

(9) The relevant extract from the Flood Map for Planning on which the existing broiler rearing development, its proposed expansion and the surrounding area are located shows that they are entirely within flood risk zone 1 (reference (1)(a) above). The proposed broiler rearing expansion is categorised as less vulnerable development (reference (1)(b) above). Since the development site and its surrounding area is entirely within flood risk zone 1 it is acceptable in principle irrespective of its vulnerability category (reference (1)(c) above) as it inherently satisfies the flood-free requirements (reference (1)(d) above) and the flooding consequences recommendations (reference (1)(e) above).

Overland Flow

(10) Flooding can occur from sources other than watercourses, one of which is overland flow caused by “sheet run-off” from the land itself. Such run-off can occur from heavy rainfall on ground saturated through prolonged wet weather during the winter or an intense summer thunderstorm. In both cases the rate of rainfall exceeds the rate of infiltration into the ground, resulting, therefore, in “sheet run-off” of the residual.

(11) The topography of the rising agricultural land to the north and north-west of the existing broiler rearing development is such that “sheet run-off” from this land would have resulted in a concentrated overland flow crossing the original development site from north-west to south-east near the front (i.e. south-west side) of the site. Consequently, a cut-off ditch was excavated next to and along the entire length of the south-eastern boundary hedges of the two adjoining fields immediately to the north-west of the original development site to intercept this overland flow.

(12) The flow from the cut-off ditch passes through the existing broiler rearing development site in a 600 mm bore unperforated twin walled high density polyethylene culvert to outfall back on to the established path of the overland flow downstream of the site. This culvert will require diverting and extending at its downstream end in order to accommodate the proposed expansion of the broiler rearing development. The outlet structure to the culvert will be a precast concrete unit, namely the JKH Drainage Units Limited 600 series headwall of 1.10

metre height with sloped grating. However, for erosion protection the outlet structure will be fronted by a 3.0 metres width x 2.0 metres length x 0.3 metres depth gabion mattress made from 75 mm galvanised welded square mesh of minimum 3 mm steel thickness and filled with 150 mm single sized aggregate. The top of this mattress will be flush with the surface of the ground.

Surface Water Drainage

(13) The Soil Survey of England and Wales describes the subsoil underlying the area under consideration as "Well drained fine loamy soils often deep but sometimes over limestone. Very shallow soils in places." Such subsoil is conducive to the infiltration of surface water, especially during the drier months between late spring and early autumn when groundwater levels are significantly lower. However, the possibility of high groundwater levels during particularly wet winter months may compromise the performance of SUDS based solely on infiltration. Therefore, a system that provides both infiltration into the underlying subsoil and attenuation storage is preferred as the SUDS method to mitigate for the effect of the increased surface water run-off caused by development at this location (reference (1)(f) above).

(14) The present infiltration / attenuation storage pond provided for the existing broiler rearing development will be infilled to facilitate the proposed expansion. Consequently, a larger replacement infiltration / attenuation storage pond will be provided that accommodates the surface water run-off from both the existing and proposed expansion broiler rearing development. This infiltration / attenuation storage pond will be located in front of the concrete-surfaced access apron to the two units of the proposed expansion development.

(15) The new infiltration / attenuation storage pond will be unlined and at least 40 metres square with side slopes no steeper than 1:2. Its proposed location is on land that slopes gradually from north-west to south-east. The pond will have a cut depth of 2.0 metres at its south-east (lower) boundary and, in order to provide a level bed throughout, a much deeper cut depth at its north-west (upper) boundary. This will provide a depth of storage of 2.0 metres to the threshold of overtopping along its south-east (lower) boundary. The side slopes of the pond will be seeded with an appropriate grass / wildflower mix. The invert level at the inlet of the outfall drain from the pond will be set 0.5 metres above the bed of the pond so that infiltration takes precedence over attenuation. Although infiltration will occur through the base and sides of the pond, particularly when the groundwater level is lower during the drier months between late spring and early autumn, it will be ignored with regard to the design of the pond's attenuation storage capacity and its integral restriction of outflow. This represents an appreciable factor of safety.

(16) Each longer side of the four units of the existing broiler rearing development has a 150 mm bore perforated twin walled high density polyethylene drain running alongside it to receive the downpipes from the roof gutter. These drains have 20 mm single sized aggregate surround and backfill to ground level as a precaution against groundwater issues. These eight lengths of drain are interconnected at the rear of the units (i.e. their upstream ends) by a single length of drain of identical specification. They discharge at the front of the units (i.e. their downstream ends) to a single length interconnecting 300 mm bore unperforated twin walled high density polyethylene collector drain running beneath the length of the concrete-surfaced access apron. The layout of the surface water drains for the two units of the proposed expansion of the broiler rearing development will be identical to that of the four units of the existing broiler rearing development.

(17) The concrete-surfaced access apron to the four units of the existing broiler rearing development has a slight cross-fall to the front of the units, which directs its surface water run-off to the eight manholes on the 300 mm bore collector drain. These manholes have grating covers to allow this run-off to enter the collector drain. The same arrangement will be provided on the concrete-surfaced access apron to the two units of the proposed expansion of the broiler rearing development, differing only in that there will be four manholes on the 300 mm bore collector drain.

(18) The collector drain of the four units of the existing broiler rearing development has a 375 mm bore unperforated twin walled high density polyethylene outfall drain that discharges to the present infiltration / attenuation storage pond. This drain will require diverting and extending at its downstream end to discharge to the new infiltration / attenuation storage pond. The collector drain of the two units of the proposed expansion of the broiler rearing development will have a 300 mm bore unperforated twin walled high density polyethylene outfall drain that discharges directly to the new infiltration / attenuation storage pond.

(19) The new infiltration / attenuation storage pond will discharge to the 600 mm bore overland flow culvert (reference (12) above) through a 450 mm bore unperforated twin walled high density polyethylene outfall drain. As previously stated, the invert level at the inlet of the outfall drain from the pond will be set 0.5 metres above the bed of the pond so that infiltration takes precedence over attenuation. A discharge control inlet structure will restrict the outflow from the pond to the outfall drain. This inlet structure will also be a JKH Drainage Units Limited 600 series headwall of 1.10 metre height with sloped grating, but it will be fitted with a manually operated rectangular sluice to control the opening through which flow passes to the outfall drain. Detailed hydrological and hydraulic analyses will subsequently be presented to establish the required capacity of the infiltration / attenuation storage pond and the opening setting for the outflow control sluice in accordance with the detailed design criteria below.

(20) The peak rate of surface water run-off from the existing broiler rearing development and its proposed expansion development will be restricted to a peak not greater than that from an assumed completely “greenfield” site by the provision of a new single infiltration / attenuation storage pond with an integral discharge control inlet structure to its outfall drain to the 600 mm bore overland flow culvert. This “greenfield” run-off restriction will be applied up to the 100 years return period with an allowance for 100 years of climate change. The attenuation storage capacity will be established for the 100 year return period storm of critical duration, including an allowance for the increase in peak rainfall intensity due to 100 years of climate change, with the outflow to the outfall drain restricted to the peak “greenfield” run-off rate for the 100 years return period with an allowance for climate change over the design life of the development.

(21) Although the flood peak discharge and critical storm duration and depth increase as the catchment of a watercourse becomes larger, the peak rainfall intensity and flood peak discharge per unit area of catchment (i.e. peak run-off rate) decrease. Accordingly, it is important that the peak “greenfield” run-off rate for a development site is not established from the site itself, or even from the small catchment of the first receiving watercourse downstream of the site, but from the large catchment of a receiving watercourse much further downstream. The peak “greenfield” run-off rate is established from this catchment with all urbanisation excluded.

(22) The discharge from the outlet structure of the 600 mm bore culvert will flow overland for some 150 metres to a ditch alongside Cwm Lane on its north side. This ditch discharges to Castrogi Brook at the bottom of Cwm Lane, which in turn discharges to Nedern Brook

downstream of the A48 at Caerwent. Nedern Brook to its outfall to the Severn Estuary at Caldicot is the most appropriate catchment for establishing peak "greenfield" run-off rates for the development site. The peak "greenfield" run-off rates for the site are obtained by dividing the estimates of return period flood peak discharges in Nedern Brook at its outfall to the Severn Estuary, assuming an entirely rural catchment, by the corresponding catchment area.

(23) The Centre for Ecology and Hydrology (CEH) at Wallingford in Oxfordshire published the Flood Estimation Handbook (FEH) in 1999, which was accompanied by associated software. The following latest versions of this software are based on significant revisions to the original publication. CatchmentUK allows the digital establishment of catchments and their physical parameters. WINFAP 5 enables flood peak flows and flood frequency curves to be estimated for gauged and ungauged catchments. ReFH 2 is a rainfall – run-off modelling package for estimating flood discharge hydrographs and analysing observed events. These latest software versions, which represent the currently accepted methods of hydrological analysis, will be used for this development proposal.

(24) The measures proposed to deal with the surface water run-off from the existing four-unit broiler rearing development and the proposed two-unit broiler rearing expansion development will ensure that there will be no increase in the off-site surface water run-off due to these developments. Consequently, the surface water run-off from these developments will not increase the flood risk elsewhere (reference (1)(f) above).

I believe that the above information, together with the incorporation of the land drainage and flood protection and mitigation measures described therein, demonstrate that the proposed agricultural development safely manages the risk and consequences of flooding.

Yours faithfully

C M Dartnell

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