SUBMISSIONS AS TO THE IMPACT OF FLOODING, RAINFALL RUN-OFF AND THE APPLICANT'S FLOOD RISK ASSESSMENT 18.03.2021 (FRA)

Case Officer: Simon McFarlane
Major Projects Officer
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Dorchester
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Dear Simon McFarlane,

Full Planning Application P/FUL/2021/01018

Install ground-mounted solar panel photovoltaic solar arrays, substation, inverter and transformer units, security fencing, gates and CCTV; form vehicular access, internal access track, landscaping and other ancillary infrastructure.

Our Interest

'Save Hardy's Vale' (SHV) is an unincorporated community association[1]. It was formed to protect 190 acres of productive agricultural land in a sensitive and valued landscape, at the heart of the Blackmore Vale, from the significant harm that would result from granting the Application.

The development proposed is for the installation of approximately 150,000[2] metal mounted solar arrays, substation, inverter and transformer units, security fencing, gates and CCTV and the formation of vehicular access and ancillary infrastructure, on a site of 190 acres (77 hectares).

[1] SHV committee members are David Horrell, Catherine Langham, Mark Bentley, Peter Moise and Ian Bryan
[2] Estimates based on the CPRE data range between 150,000 and 200,0000

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In this section of the SHV Letter of Representation, we set out the material planning reasons which support our objections relating to flood risk in an area that is frequently affected by road, land and river flooding. We also set out our contentions as to the Site-specific FRA[3] forming part of the Application.

A. PLANNING POLICY

1. Paragraph 151 (a) and (b) requires that plans should maximise potential for suitable development of sources of renewable energy and that such plans should consider identifying suitable areas for such sources.

2. Paragraph 154 (b) advises that LPAs should approve applications for renewable and low carbon development **if its impacts can be made acceptable**. Once suitable areas for such development are identified in plans applications for commercial scale projects must fulfil the criteria applied for identifying suitable areas.

3. Paragraphs 157 and 158 require a sequential risk-based approach to the location of such development taking into account **current and future impacts** of climate change. The aim of the sequential test is to steer new development to areas with the **lowest risk of flooding** and is to be applied in areas **at risk now or in the future to any form of flooding**

[3] Applicant's Flood Risk Assessment and Drainage Strategy. Doc ref 009

4. Paragraph 163 requires that development should only be allowed in areas at risk of flooding where it can be demonstrated that it **is flood resistant and resilient and incorporates appropriate sustainable drainage systems.**

Local Plan

5. Paragraphs 3.31 and 3.32 requires in general terms that development should be restricted in locations at risk of flooding.

6. Paragraph 4.27 provides that the likelihood of more extreme weather events due to climate change can be increased by increased hard surfacing.

7. Paragraph 4.30 requires that FRAs **must demonstrate the development is not at risk from flooding and that it does not increase flood risk elsewhere. Flood risk mitigation may be required**.

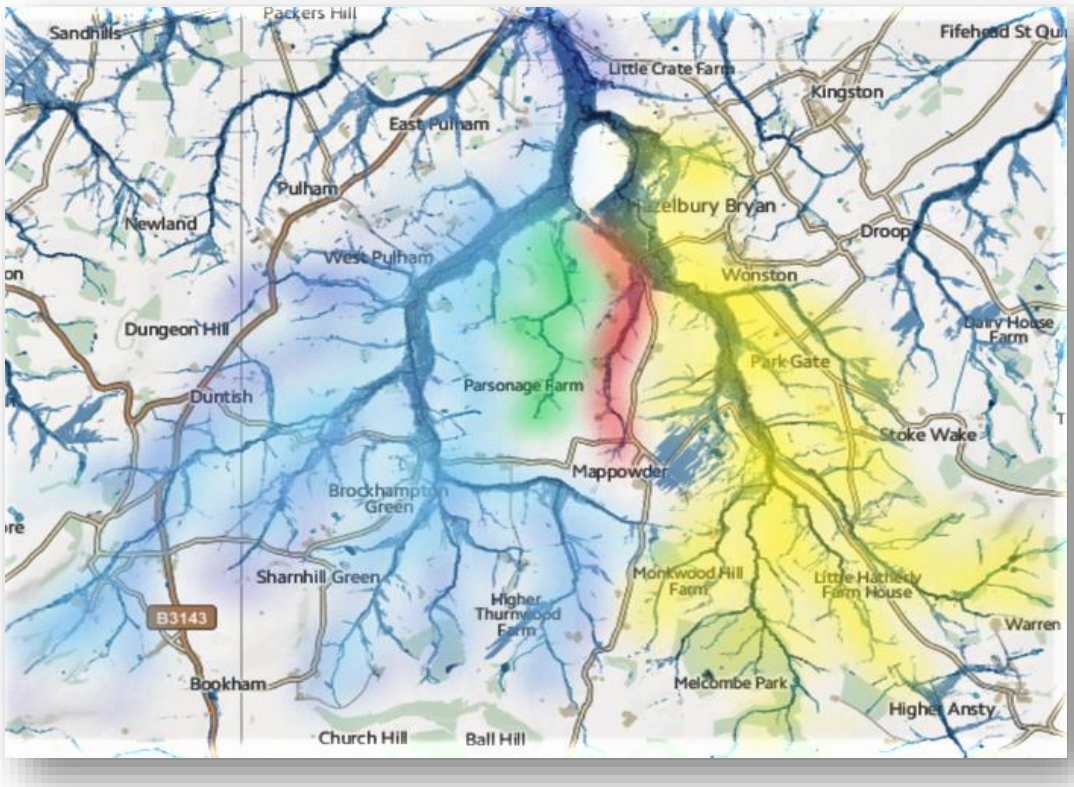
8. Paragraph 4.31 notes that flooding can occur because of heavy rainfall, with the instances of flooding, from surface water, increasing with climate change and with soil erosion impacts. **Sustainable Urban Drainage Systems look to avoid, reduce, delay and manage surface water run-off.**

9. Policy 3 provides that development should minimise the impacts of climate change by avoiding **areas at risk of flooding** from all sources and implement measures to **reduce** flood risk.

North Dairy Farm Solar from above © BNPS

B. CHARACTERISTICS OF AREA

10. The South West River basin district has the highest average annual rainfall in England and the Largest proportion of rainfall in winter months[4]



11. Image 1. above (E.A surface flooding map) The Upper River Lydden and its catchment area in blue (24.463 km$^{2)}$. The Wonston Brook and its catchment in yellow (15.013 km$^{2)}$. The central Short Wood Brook watercourse in green (1.45 km$^{2)}$) and the Parsonage Farm Brook watercourse in red (1.0 km^{2}).

12. There are several 'ordinary watercourses' on and around the Site. They include the Short Wood Brook with a catchment area of 1.45 km^{2} which flows through the centre of the Site, and Parsonage Farm Brook, with a catchment area of approximately 1.0 km^{2} which flows along part of the north-eastern Site boundary.

13. Short Wood Brook rises east of Mappowder, crosses (floods) Taylors Lane 74m west of the Pleck Hill Junction. Its catchment area includes Mappowder Cottages and Hammond Street Farm. It runs about 80 metres east of Parsonage Farm and some 165 metres east of Dairy House Farm. It also passes close to Boywood Cottages, Old Boywood Cottage, Povert Bridge Farmhouse, and Old Boywood Farm.

[4] https://www.gov.uk/government/publications/south-west-river-basin-district-flood-risk-management-plan

14. Parsonage Farm Brook forms the actual north eastern boundary of fields 6. and 7. of the proposed development. It joins Short Wood Brook between fields 4. and 6. (not as indicated in the Applicant's PFA at a point "near the northern Site boundary" and enters the Upper Lydden some 290m (PFA - refers to an incorrect 155 m) north of the Site.

15. The Upper River Lydden is located approximately 90 m to the west of the Site, at its closest point, and flows in a north-easterly direction. The Upper River Lydden has a catchment area of approximately 24.463 km^2 (PFA refers to an incorrect area of 20 km^2).

C. INCIDENCE OF FLOODING

16. Climate change allowances (22 July 2020) set out the allowances for impact of climate change on peak river flows. For development of this category the allowance is 50% for the South West basin over a period of 2040 – 2069 for Flood Zones 2 and 3a. PPG advises that account should be taken of the fact that locations in Zone 1, may well become Zones 2 or 3 in the future. The UK Government Flood Foresight predicts that in general terms climate change is likely to increase river flooding by multiples of between 2 and 4[5]. While the panels on the Site are confined to existing Zone 1, parts of the Site itself will be within the recalculated Climate Change Flood Zone 2 and 3.

17. The FRA acknowledges correctly that for 'essential infrastructure' development within the South West River basin district, climate change could increase river flows by 40% for the upper end allowance and by 50% for the High++ allowance. However, as the UK Government Flood Foresight predicts, it is possible for even higher allowances to be applied.

18. Accordingly, even if the sequential test justifies the selection of the Site for this development (which is denied) provision needs to be made for increased flood risk and rainfall resulting from climate change in the period of the life of the solar generating panels to a far greater extent than is contemplated by the FRA – see Section E below.

[5] 7496 Exec Summary Cover 1st (publishing.service.gov.uk) Page 23.

Sequential Test

19. Paragraph 158 NPPF provides that the aim of the sequential test is to steer new development to areas with the **lowest** risk of flooding. It requires that the sequential approach should be used in areas at risk **now or in the future from any form of flooding.**

Having regard to the fact that the Site is adjoined, and to a material extent comprises Flood Zones 2 and 3, and that the River Lydden and Wonston Brook are in close proximity, and considering the predicted increase in rainfall and river flows, it is submitted that the sequential test must be applied.

The FRA's conclusion (pars 3.33) that the development satisfies the sequential test is not justified. The Applicant has not demonstrated that there are no reasonably available sites appropriate for the proposed development in areas[6] or zones[7] with a lower risk of flooding. The mere proximity to overhead power lines does not render other sites or zones unsuitable without such proximity.

D <u>SATURATION – INFILTRATION - RUN-OFF</u>

Cook and McCuen: Run off rates

20. The applicant's reliance on Cook and McCuen modelling as to run off volumes is misplaced and inappropriate. The model produces a finding that of a total length of 225 m with 30 solar panels, the runoff increased by the introduction of the panel cover was 0.26 m3, a difference of only 0.35%. There is no modelling for very large sites. But the Application relates to a vast extent of solar panels, an area of approximately 312000 square metres of impervious hard surface. This would be the largest solar generating array in North Dorset. Accordingly, the conclusions drawn by the applicant in the FRA as to run off volumes and flow rates are not justified.

21. Cook and McCuen advise that is necessary to understand the design of solar farms and their potential effect on erosion rates and storm run-off, especially the impact on offsite properties and receiving streams. The Applicant acknowledge that it is possible that the velocity of water draining from the edge of the panels is sufficient to cause erosion of the soil below the panels, especially where the maintenance accessways between the arrays are compacted by maintenance vehicles, or are patchy ground.

[6] NPPF para 158
[7] NPPF para 159 first sentence

22. Cook and McCuen also note that "*grass that is not maintained has the potential to become patchy and turn to bare ground. The grass under the panel may not get enough sunlight and die.*". The report further states "*The effect of maintenance on run-off characteristics was modelled for bare ground. In this scenario, spacer cell was changed from grass covered to bare ground. They found that run-off volume increased by 7%.* ***The peak discharge increased by 72%*** *when compared with the grass-covered condition. The run-off for the bare ground condition also resulted in an* ***earlier time to peak by approximately 10 min.***

23. The final condition that Cook and McCuen modelled involved the assumption of healthy grass beneath the panels, and bare ground in the spacer section, which would simulate the condition of unmaintained grass and soil compaction resulting from maintenance vehicles driving over the spacer section. With the spacer section as bare ground, the **peak discharge increased by 100%,** which reflected both the increases in volume and a decrease in timing. Essex Council Solar Array Guidance[8] states that: "Just like any other development, they (solar sites) have the potential to cover large areas, whereby they can interrupt overland flow routes, reduce the amount of rainfall absorbed into the ground and increase the rate and volume of surface water runoff."

E MITIGATION MEASURES

24. NPPF paragraph 164 requires that major developments must incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. Local Plan paras 4.30 and 4.31 require appropriate mitigation including sustainable drainage systems (SuDS). Local Plan para 7.55 requires that, in order to help manage flood risk, there is a need to use sustainable drainage systems

25. The surface water from solar panels flows into the rows with greatly increased kinetic energy, resulting in concentration of surface water and erosion in these areas, and the creation of channelised flows, eroding the soil and increasing the volumes and rates of surface water discharge.

26. Mitigation is required to combat this effect. The minimum would include the following:

    (i) The use of SuDS features to interrupt and slow channelised flows, enhance and promote the infiltration and interception capacity, and to help spread the water over a greater surface area.

    (ii) An enforceable and robust soil, grass, and/or land management plan to keep land in good condition.

[8] Solar Array Development | Essex Design Guide

Sustainable Drainage Systems

27. The SFRA advises that a detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals.

28. Clarkebond Ltd[9] have produced Flood Risk Assessments for the Applicant, British Solar Renewables UK. In consultation with the EA, they developed a procedure to assess a site and identify potential risks factors which could contribute to surface run-off; the procedure involves a high-level decision matrix to determine whether mitigation is required and the scope and scale of mitigation.

No such prudent assessment has been undertaken for the Site.

29. Clarkebond note that on another British Solar Renewables UK site, a SUDS was incorporated to minimise surface water run-off. This included a recommended innovative design of solar panels which comprised horizontal slots across the surface area of each panel to allow intercepted rainfall to drip through to the ground at regular intervals in contrast to conventional designs. The FRA makes no such provision, or for a SuDS.

Maintenance of ground cover

30. The provisions of the FRA and related LEMP as to maintenance of grass of are not sufficiently robust and comprehensive. The impact of very large numbers of solar arrays intensifies the need for such mitigation measures. Grass cannot germinate at under 8 degrees. Accordingly, during the months of peak rainfall, the essential grass cover to ensure adequate infiltration will be most at risk. This is a factor to some extent with all solar generating arrays. But the vast extent and density of the arrays proposed on the Site - or anything approaching such scale - will result in damage to the exposed grass.

31. In a 2014 Appeal dismissal [10] the Inspector accepted that it would be unsound to assume that rain falling on each row of solar panels would flow evenly into the rain-shadow of the row below, so as to mobilise the same percentage of the ground for infiltration as was available before the panels were installed. Rather, because the panels would be set at a downward slope and aligned to follow the contours of the land, rain-water would be likely to fall in a column from the lowest corner of each panel, and could then form rivulets flowing down through the rain-shadows of the rows below without utilising their whole area for infiltration, thus increasing the amount of water run-off from the site.

[9] Hydrology, Flood Management & Planning (clarkebond.com)
[10] Ref: APP/D3315/A/13/2203242

32. Cook and McCuen refer to water run- off energy from the panels exceeding that of the rain falling on the ground area. With a panel angle of 30°and below, the kinetic energy of the rainfall was greater than that coming off the panel, but the area under the panel (i.e., the product of the length, width, and cosine of the panel angle) is greater than the area under the edge of the panel where the water drains from the panel onto the ground. Thus, dividing the kinetic energy by the respective areas gives a more accurate representation of the kinetic energy experienced by the soil. The energy of the water draining from the panel onto the ground can be nearly 10 times greater than the rain itself falling onto the ground area. This would make the soil much more prone to erosion with the panels than without them.

33. BSR's website information publication[11.] describes the management of rivulets cause by run off from the panels by a special system of small channels and mounds of soil which slow the flow of water so it is absorbed into the ground more quickly. But even this modest mitigation appears to have been excluded in relation to the Site.

The following images were selected from British Solar Renewable's Web site: Nanteague - 7.7 MW - British Solar Renewables (britishrenewables.com) 7.7 MW 24.7 acres 2015. The images show bare earth after the developments were completed.

Image 3. Bare earth on the site after construction. Other BSR sites in operation and showing areas of bare ground arround the arrays. In these condidions the Cook and McCuan findings are that run-off could increase by up to 100%.

[11] https://bsrenergy.com/north-dairy-farm/#1596458374584-430c7da5-5179

Image 4. Shows very poor grass cover on the worked-on area. Lower right clearly shows the ground scouring caused by rivulet run-off from the lower edges of the solar panels. The kinetic energy of the water draining from the solar panel could be as much as 10 times greater than that of rainfall. (Cook and McCuan 2013)

Image 5. Bare earth or poor grass regeneration on the working area within the shadow line.

Image 6. BSR site

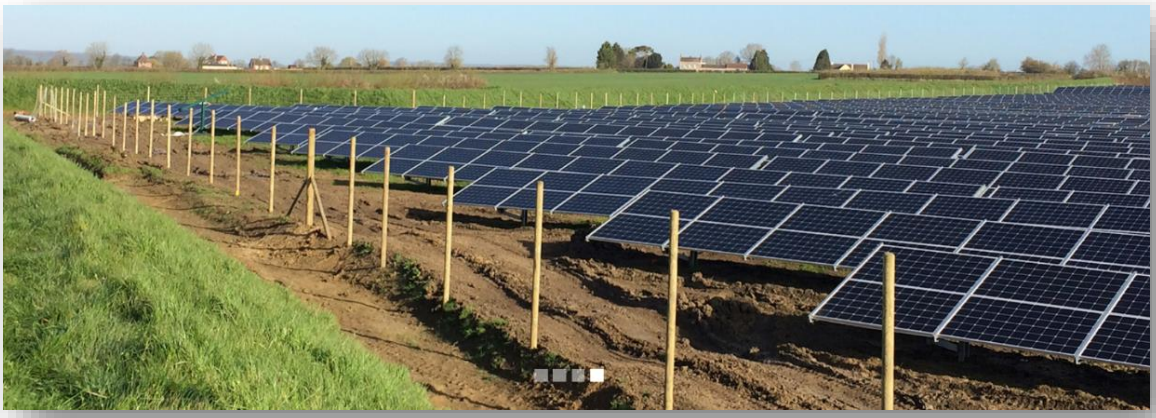


Image 7. BSR site Southfields. Repairing grass cover after construction damage and compaction might not take place until the following spring (as soil temperature would be too low for grass germination) leaving the site particularly vulnerable to flooding and increased runoff during that period.

F. CONCLUSIONS

35. The FRA's estimate of the extent and impact of fluvial flooding is not reliable. JFLOW broadscale modelling is appropriate for particular site- specific areas.

36. The Site is vulnerable to flooding by reason of the immediate proximity of Flood Zones 3. The risk of future flooding is significant due to climate change and the predicted increases in fluvial flows of the River Lydden, Wonston Brook and the watercourses on and in close proximity to the Site.

37. The FRA's conclusion (pars 3.33) that the development satisfies the sequential test is not justified. The Applicant has not demonstrated that there are no reasonably available sites appropriate for the proposed development in areas[12] or zones[13] with a lower risk of flooding.

38. The reliance on the Cook and McCuen modelling of saturation, infiltration and run- off is misplaced and inappropriate and should not be relied on.

39. The FRA does not provide adequate mitigation of flood risk consistent with the vast extent of the surface area of the proposed generating arrays and the susceptibility of the Site to flooding within the foreseeable future.

Ian Bryan

31st May

For and on behalf of the Save Hardy's Vale community group[14]

SHV Web
SHV Facebook

friends@savehardysvale.com

[12] NPPF para 158
[13] NPPF para 159 first sentence
[14] In collaboration with Mark Bentley, Peter Moise and Jeremy Nieboer