SPR EA1N and EA2 PROJECTS

DEADLINE 12 – FLOOD RISK

Interested Party: SASES **PINS Refs:** 20024106 & 20024110

Date: 28 June 2021 **Issue:** 1

INTRODUCTION

1. The Applicants submitted the following document at Deadline 11 on Monday 7 June 2021 which was published on 10 June 2021:

   - Outline Code of Construction Practice – Version 7

2. The Applicants submitted the following documents on 11 June 2021 which were published on Monday 14 June 2021:

   - Outline Operational Drainage Management Plan - Version 5
   - Outline Landscape And Ecological Management Strategy – Version 6
   - Infiltration Test Results (May 2021)

3. The Applicants organised a meeting of the flood and drainage experts of the Applicants, Suffolk County Council and SASES on Wednesday 16 June 2021. The purpose of such meeting for SASES was to see if any common ground could be reached. The Applicants' experts requested that the meeting be "off the record".

4. Clive Carpenter of GWP has reviewed the submissions of the Applicants submitted on or after deadline 11 and has prepared the report attached at Appendix 1.

APPENDIX 1

Report prepared by GWP Consultants

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Michael Mahony
SASES

GWP Report No: 210619

Our ref: mm240621
Your ref:

24 June 2021

Dear Mr Mahony

Flood Risk to Friston Village Comments on Deadline 11 Submissions

This letter constitutes a technical critique of documentation submitted by Scottish Power Renewables (SPR) matters post-dating the Issue Specific Hearings 16 (ISH16) held on Wednesday 26 May 2021, and in advance of Deadline 12. These documents include but are not limited to:

- Additional Infiltration Test Results
- Updated Outline Operational Drainage Management Plan (OODMP);
- Updated Outline Construction Code of Practice (OCoCP); and
- Updated Outline Landscape and Ecological Management Strategy (OLEMS).

Qualifications of Author

This letter has been prepared by Mr Clive Carpenter. Clive has a BSc (Hons) in Geology, an MSc in Hydrogeology and Groundwater Resources, is a Fellow of the Geological Society (FGS), Chartered Geologist (C.Geol), Chartered Member of the Chartered Institute of Water and Environmental Management (C.WEM, CIWEM) and Associate Member of The Academy of Experts (AMAE). Clive has more than 30 years of post-graduate experience in water resources management, water hazard mapping and risk reduction, flood risk assessment, climate change vulnerability assessment, and disaster risk reduction, both in the United Kingdom and overseas.

Instructions

SASES instructed Mr Carpenter in June 2019, to provide expert independent advice and review of the SPR environmental statement and related documentation, with respect to the flood risk impact on Friston Village, and to ascertain whether flood risk has been i) assessed in accordance with policy on site location; ii) adequately investigated; and iii) adequately mitigated.

Infiltration Tests

The Applicant has submitted the results of a second series of infiltration tests undertaken in late May and early June 2021, following preliminary testing in early May, the latter of which did not follow CIRIA and BRE standards.

The Applicant has undertaken 3 No. tests at each proposed basin location and 1 No. between the two proposed basin locations. The 6 No tests at the basin locations were repeated 3 times as per the CIRIA and BRE guidelines, the test between the basin locations was abandoned due to lack of infiltration.

Of the 18 No. completed infiltration tests, 16 No. are reported as not achieving the required water level lowering from 75% to 25% of the pit depth, and consequently all analysis undertaken used extrapolated data, to approximate the times taken for infiltration to occur, and does not meet the CIRIA and BRE guidelines.

Not only is the process of extrapolation not described in the reporting, but it is likely to underestimate the increasing reduction of infiltration rate with time, and therefore overestimate the infiltration rates.

The CIRIA/BRE guidelines are also clear the trial pits should investigate the infiltration characteristics to the same depths as future infiltration basins will be excavated. All pits were dug to 1.0-1.2m depth, whereas the basins are likely to be up to 4m depth in the east to perhaps <0.5m in the west. Drawing SK15 in the OODMP clearly shows

the Hybrid SUDS basin with a basal depth of 14.50m AOD, compared to an upslope surrounding ground level of 18m AOD. The pits have therefore not investigated the properties to the right depths.

We would also point out that large infiltration basins work by water mostly entering the underlying strata through their basal floor, whereas small trial pits infiltrate water through primarily their side walls. This means trial pits measure horizontal permeability whereas infiltration basins are constrained by vertical permeability. In many geological strata, the vertical permeability is an order of magnitude lower than horizontal permeability and therefore we consider the tests have not investigated or replicated the infiltration mechanisms and flow rates in the proposed larger basins.

The Infiltration Report concludes the northern basin is unviable (as an infiltration only basin) and the southern basin is viable (as a hybrid basin) and proposes to use an infiltration rate (40 mm/hr) for design that is smaller than the average (49 mm/hr) of the lowest test results for each trial pit in the southern location, but greater than the minimum calculated (35mm/hr).

Notwithstanding our concerns over the reliability and appropriateness of the tests, taking the same logic as used for the southern basin area, the average of the minimum values for the northern tests is approximately 25mm/hr. We note this is more than double the minimum infiltration value (10mm/hr) considered as viable by SCC in previous discussions with the Applicant, however the option of infiltration has been abandoned.

We conclude the Applicant has excluded the possibility of infiltration being viable in the north because the basin area would need to double in size, impacting landscaping and biodiversity mitigation given land availability constraints at the site, and NOT because of the infiltration rate. We therefore conclude that flood risk has been deprioritised for other matters – in breach of local policy – and the SUDS hierarchy is not being followed as infiltration is not being maximised.

Lastly we note that no attempt has been made by the Applicant to consider the potential for groundwater to be shallow in the Friston area, despite being underlain by a major aquifer and having a low ground elevation 6 km from the coast, and for this to both restrict the performance and viability of infiltration structures as well as to introduce a groundwater flooding risk to Friston Village.
We conclude:

1. the viability and impact of infiltration of project area storm run-off waters still remain entirely unproven; and
2. even if they were, the Applicant has excluded an infiltration option contrary to policy.

Updated Outline Construction Code of Practice (OCoCP)
The Applicant has updated the OCoCP with outline details of water management within the construction footprints of the sub-stations. These are sized for a 1 in 15 Year Return Period, and state they will be discharged at Greenfield Run-Off Rate. Cable route drainage will be sized to 1 in 10 Year Return Periods.

We have the following concerns about the proposed construction phase surface water management:

i) The OCoCP assumes run-off will only be increased from the immediate construction footprint areas of the main infrastructure assets, whereas the Applicant has the potential to de-vegetate and soil strip the entire area within the DCO order limits. The DCO order limits are presumably justified as being the minimum necessary to deliver the project and are required for variety of reasons, including access, construction, landscape mitigation, noise mitigation eta, all of which will require disturbance of the ground, and therefore result in an increase in run-off and generation of turbidity and therefore need water management. The Applicant has failed to demonstrate they understand the requirement for management of run-off water from the entire disturbed site area, and consequently have not demonstrated whether this is actually achievable. The conceptual drawings provided (at Appendix 2 Figures 2 & 3) clearly illustrate the difference between the areas the Applicant considers require construction phase management and the published Works Plans;

ii) The sizing of the water management infrastructure needs to consider an appropriate Return Period storm as well as the known discharge rate. The Applicant states the construction phase water management will be designed for a 1 in 15 Year event for the sub-station footprints and cable end compounds, and a 1 in 10 Year event for the cable routes. We contend these Return Periods are too small given the elevated flood risk to Friston Village and the potential for extended and sequential construction of the different elements of the proposed project. We would expect a construction period of 4+ years to require design against a 1 in 30 Year Return Period as a minimum in any watershed, but with a downstream receptor as vulnerable as Friston Village to flood risk we would expect to see a 1 in 100 Year Return Period to be used. Furthermore, the Applicant has not stated the discharge

rate from the structures – Greenfield Run-off Rate also relates to a return period - and no specific rate has been stated. As such it is unclear whether the Applicant intends to discharge at QBAR or a larger flow rate and hence the risk of both flooding and under-sizing of the water management systems is unknown. It is relevant and comparable that Sizewell C is using 1:100 year return for all construction areas, including park & ride in Wickham Market;

iii) There is no consideration of how the watershed and hillsides upslope of the site (to the east and north and some extent to the west) will be prevented from interacting with the disturbed areas to be managed within the site. Land will route storm run-off onto the DCO area unless there is infrastructure designed and sized to prevent this. At topographic lows – such as that east of the National Grid sub-station – it will be necessary to divert or route storm water across the DCO area. This is abundant ly clear in the public domain surface water flood risk maps (see OODMP Appendix 1 Figure 4) which show a storm flow route through the National Grid substation footprint area. This has not been considered at all. If any upslope water is allowed to enter the on-site drainage schemes the on-site schemes will be under-sized to deal with these additional off-site areas, risking the on-site drainage structures being overwhelmed. Figure 3 for example clearly shows a hillslope north of an example of the cable route which will drain onto the DCO area thus inundating the on-site drainage infrastructure – which is also applicable to the cable routes within the Friston catchment;

iv) The provided drawings appear to show sub-station construction phase ponds connected together. It is not clear if this is to allow transfer of treated or untreated water, and/or whether the storage is to be provided individually or at other locations. This has consequential risks in terms of whether the construction phase drainage is being designed to deal with peak flows or lower treated flows and blockage risks. We note in Figure 2 there is a construction area west of the National Grid sub-station a substantial part of which is at lower elevation than the pond it is meant to drain into. We also observe that the orientation of the southern basin is different from that shown in the OODMP – see comments below.

In conclusion, the Applicant has not demonstrated the viability of delivering a construction phase surface water management scheme to prevent increased flood risk to Friston.

<u>Updated Outline Operational Drainage Management Plan (OODMP)</u>
The Applicant has prepared an updated OODMP, which introduces the results of the infiltration testing into the design process. The Applicant has concluded the northern infiltration basin is unviable, opting instead for an attenuation and discharge option, and designed the southern basin as a hybrid infiltration basin which will infiltrate the 1 in 30 Year storm and discharge any larger events to the local water course. We note that the orientation of the southern basin (as shown in drawing SK14 attached at Appendix 5) has changed but no explanation has been provided for this.

We have the following concerns about the proposed operational phase surface water management:

i) The discharge rates to the local water course are to be restricted to QBAR, however the investigation, characterisation and determination of QBAR and all other return period flows is inadequate and does not follow Environment Agency guidance on small catchments ('Estimating floodpeaks and hydrographs for small catchments: Phase1', EA, 2012). The accurate definition of QBAR is not an academic exercise because this is the Return Period flow rate the LLFA usually requires the Applicant to limit discharge flows to, assuming this will address flood risk from TOTAL flows;

ii) We contend QBAR does not remove flood risk from Friston Village because the village typically floods once every two years and therefore flows of this magnitude do not prevent flooding. Therefore, the LLFA should seek a maximum flow for discharge which demonstrably does not increase flood risk and does not assume QBAR flows will prevent flooding from occurring;

iii) The Applicant's commitment to undertake future hydraulic modelling of the water course does not adequately address the poor baseline understanding of the catchment response to storm events, as there is no rainfall or stream flow monitoring with which to calibrate a hydraulic model;

iv) The Infiltration rates have not followed CIRIA/BRE guidance, but used extrapolation of results which will overestimate infiltration, and have not been dug to similar depths or dimensions to best replicate the proposed infiltration basins;

v) Infiltration rates have not been finalised for design. Wider testing – other than the areas of the current basins - may demonstrate further opportunities for infiltration, which have now been discounted – such as increasing basin area, moving location or changing geometry;

vi) There remains no consideration of groundwater flood risk to Friston from the infiltration basin, nor whether groundwater levels will rise and reduce the performance and efficacy of the infiltration option. The viability of infiltration therefore remains unproven;

vii) The Applicant refers to maximising infiltration where practicable, but is not prioritising flood risk reduction above landscape amenity or biodiversity issues. The northern infiltration basin option has been abandoned by the Applicant due to reportedly low infiltration rates, yet the rates are more than twice the agreed minimum with the LLFA. The observed infiltration rates would require an infiltration basin with twice the area, instead the Applicant ha chosen to discharge this water to the local watercourse. This is clear evidence of not following the SUDS hierarchy and not prioritising flood risk reduction above other site constraints – the flood risk to Friston is being increased to enable amenity and biodiversity objectives to be realised;

viii) The approach to designing the southern infiltration basin – using the average minimum infiltration rate – has not been adopted for the northern basin, despite the infiltration rate being above the minimum requested by the LLFA;

ix) If the northern basin is designed as an attenuation pond only, it must not be lined and must be allowed to infiltrate into the underlying strata, even if this not explicitly allowed for in the design – this is more consistent with the SUDS hierarchy. A ponding depth equivalent to the 1 in 2 Year storm should be allowed for beneath any outflow outlet from the pond;

x) There continues to be no consideration of the management of up-slope storm flows which might enter the development footprint and how these might be managed. We note in drawing SK14 (attached at Appendix 5) there is pipework entering both SUDS basins from the eastern boundary of the sub-stations, one of which is located within an off-site run-off route (as evidenced by the valley geometry crossing the site at this location – and the surface water flood risk map in Appendix 1 Figure 4). If this is capturing off-site flows, the SUDS basins have not been designed to accommodate these flows and this will result in over-topping of the structures and increased flood risk to Friston;

xi) The Applicant caveats the use of a Factor of Safety of 10 in the design process as being for the purposes of the OODMP. This does not give confidence the FoS of 10 is being committed to for the final design;

xii) The Applicant provides no further evaluation of the risk to the discharge pipelines and outfalls from the attenuation pond and the hybrid scheme to the Friston watercourse, from collapse from vehicular traffic on the farm track nor of erosion and exposure of the pipeline from storm flows along the track – the track is a flood flow route. The Applicant has provided drawings of a protected outfall but there are 100s of metres of pipeline to be laid with minimal cover beneath the road. The long term sustainability and therefore viability of the discharge pipelines remains unproven;

xiii) The discharge pipelines are extremely long and of thin diameter. There are no manholes shown to demonstrate the viability of the drainage scheme being able to be adequately maintained. The Friston watercourse receives considerable volumes of field run-off and the is routine deposition of silt and mud in the drainage network, especially at the location of the proposed outfall. There is every likelihood the outfall will pipes will become buried and blocked;

xiv) The OODMP states clearly (see paragraph 130) that "Trees or shrubs will not be planted inside or within 5 m of the footprint of the SUDS basins". This is contradicted by the OLMP general arrangement and the OLMP illustrative plan attached in the latest version of the OLEMS which would appear to show vegetation immediately adjacent to the northern basin. There would appear to be no planting on the bunds of the southern basin, which shows inconsistency on this issue and the Applicants approach to retention bund integrity;

xv) There is a lack of clarity as to whether maintenance of the bunds form part of landscape maintenance or drainage maintenance if the projects are consented. Maintenance of the bunds should form part of maintenance of drainage given their importance. There also needs to be clarity as to who is responsible for what drainage infrastructure given both basins drain into the same watercourse;

xvi) The model output files appear to cover all drainage options – ie none are discounted and the attenuation option for the southern basin is included - and do not clearly relate to the plan text or summary tables. The plan needs to clearly state how this data is being used in the design of the options – and needs to remove those no longer being taken forward to avoid ambiguity;

xvii) There is no comparison of TOTAL flows released pre-development and those post-development. We contend that sufficient infiltration must be used to ensure PEAK and TOTAL flows do not exceed the pre-development situation, in order to demonstrate no increase in flood risk;

In conclusion, the Applicant has not demonstrated the viability of sustained groundwater infiltration, nor outfall discharge to the local water course, over the life of the development.

Updated Outline Landscape and Ecological Management Strategy (OLEMS)
The OLEMS states the measures within it include the National Grid sub-station water management basin and an additional basin.

The OLEMS clearly states wet woodland will no longer be located within the SUDS basins. This is in contradiction with the OODMP which states the opposite. It is critically important the SUDS basins are not vegetated with flora which can block the outfalls or reduce infiltration. The OLMP shows the planting of trees immediately adjacent to the National Grid sub-station basin.

The OLEMS also needs to commit to not vegetating bunds around the basins. There is no mention of the 5m stand-off referred to in paragraph 130 of the OODMP in this document and to ensure any water retention bunds are engineered to appropriately safety standards, consistent with the retention of 1,000's m3 of water immediately uphill of residential housing.

The OLEMS reiterates that the final basin designs and the extent to which infiltration is practicable will be determined in the detailed design process. This is unacceptable and allows for infiltration to be dismissed entirely at a later date.

Whilst the wording of the OLEMS has addressed concerns about vegetated drainage basins, the OLEMS continues to state the drainage schemes and therefore the flood risk to Friston will be determined by other landscaping, and biodiversity needs for the site. This is unacceptable.

The OLEMS is not a suitable document for ensuring robust engineering of floodwater retention structures. Is unclear whether the adequate operation and maintenance of these structures is part of the maintenance required under the OODMP or the OLEMS. These are matters for dedicated water management plan acceptable to the LLFA.

Yours sincerely

Clive Carpenter
Partner and Head of Water Resources