SPR EA1N and EA2 PROJECTS

RESPONSE TO LETTERS FROM THE DEPARTMENT OF BUSINESS ENERGY AND INDUSTRIAL STRATEGY DATED 20 DECEMBER 2021

FLOOD RISK COMMENTS

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

Date: 29 January 2022 **Issue:** Final

INTRODUCTION

1. Following the Secretary of State letters of 2nd November 2021 and the responses thereto published on 7th December 2021, the Secretary of State issued further letters dated 20th December 2021 inviting comments and responses on a number of topics including from Interested Parties. This submission is made in response to paragraphs 3, and 8 (Flood Risk) of both letters in respect of the East Anglia ONE North project and the East Anglia TWO project. A separate submission has been made in respect paragraph 7 (Outline Landscape And Ecological Management Strategy) of those letters.

2. **Paragraph 3** - A number of submissions were made in respect of the letters dated 2nd November 2021 from the Department of Business Energy and Industrial Strategy. Comments are made below on the submissions of the following parties insofar as they relate to flood risk:

   i. the Applicants in respect of their submission entitled Applicants' Responses to SoS Questions 2nd November 2021 (Item 3);

   ii. the Environment Agency;

   iii. Suffolk County Council.

3. **Paragraph 8 -** in paragraph 8i the Secretary of State has asked Interested Parties to comment on:

   i. the Applicants' response to the Secretary of State's questions in the 2nd November 2021 Letter regarding surface water and drainage management during construction;

   ii. the updated construction surface water drainage proposals; and

   iii. the proposed amendment to requirement 22 (Code of Construction Practice) in Part 3 of Schedule 1 to the Development Consent Order which was submitted by the Applicants.

   These three requests are addressed below.

4. This submission also includes some observations in respect of the request to the Applicants set out in paragraph 8(ii).

5. This submission has been prepared with the assistance of Mr Clive Carpenter, Partner and Head of Water Resources at GWP Consultants https://gwp.uk.com. In addition a report from Mr Carpenter is attached at Appendix 1 ("GWP Report").

The Applicants Responses to SOS Questions 2 November 2021 (item 3)

6. The Applicants submitted a document, Applicants' Responses to SoS Questions 2nd November 2021 (item 3) (the "Response"), divided into six sections, section 1 being an introduction. This submission sets out comments on each of the sections 2, 3, 4, 5 and 6.

Section 2 - Background

7. The section sets out a highly partial and misleading view on how the Applicants considered flood risk and drainage.

2.1 Site Selection

8. The Applicants seek to explain that surface water (pluvial) flooding as well as fluvial flooding was taken into account in site selection. This is inaccurate for the following reasons.

   i. The RAG assessment (to which the Applicants refer (APP-443)) does not consider surface water flooding at all, it is not included as a criterion in the RAG document.

   ii. The relevant chapter of the ES, Chapter 4 Site Selection And Assessment of Alternatives does not consider surface flood water flood risk in the context of selecting the site.

   iii. In the examinations the Applicants denied that surface water flood risk had to be considered as part of site selection through the application of the sequential test.

   iv. The Applicants lack of concern for surface water flood risk is exemplified by the fact that their DCO applications did not even include an Outline Operational Drainage Management Plan. The first version of this plan only appeared at Deadline 3 (REP3-046).

   v. The Applicants did not conduct any infiltration testing at the site, which is key to determining the feasibility of mitigating surface water flood risk, as part of their site selection process. These are not complex tests. In fact no such testing was carried out at all during the original examination periods. It was only during the extended examination periods that the Applicants conducted those tests and even then they were unable to conduct those tests in accordance with required standards and therefore their results cannot be relied upon (REP12-118).

9. This is despite the fact that the Applicants own Flood Risk Assessment (APP-496) clearly highlighted the high and medium flood risk at the substations site noting at paragraph 125:

> *"The northern and western boundary around the National Grid substation, includes areas at both high risk of surface water flooding i.e. during the one in 30 year event and medium risk of surface water flooding i.e. there is a risk of flooding during the one in 100 year event".*

Yet even this understates the severity of the surface water flood risk as set out in the Environment Agency's interactive surface water flood risk maps

https://check-long-term-flood-risk.service.gov.uk/map?easting=640325&northing=261000&map=RiversOrSea

The legend to these maps indicates that:

- a medium risk of surface water flooding is between a one in 30 year event and a one in 100 year event;

- a high risk of surface water flooding is an event more frequent than a one in 30 year event.

10. Furthermore given the content of the OODMP and OCoCP the Applicants were and remain unaware of the importance of the existing land drainage system which manages surface water from the watershed and hillsides upslope (to the east and north and to some extent from the west). A key component of this is a watercourse (dimensions 1.5m deep and 3m wide (at ground level) identified by Suffolk County Council as an Ordinary Watercourse) which runs from East to West across the proposed location for the National Grid substation an image of which has been submitted by Suffolk County Council[1]. At Appendix 2 is the Applicants' plan entitled Example Construction Surface Water Drainage Scheme, which forms part of the OCoCP, overlaid with the existing land drainage system. SASES has commented on this issue during the examinations including most recently at Deadline 12 (REP12-118 on pages 4 & 5 in respect of the OCoCP) and at Deadline 9 (REP9-080 page 5 in respect of Construction Phase Impacts and management of land drains).

11. This lack of awareness is further demonstrated by the Applicants' comments in the OODMP which refer to a "*natural conveyance route".* In actuality this watercourse is a man made and actively maintained land drainage route. The OODMP also refers to this "*natural conveyance route"* being diverted around the northern perimeter of the National Grid substation. This will not be possible given the constrained nature of the site and also because such a diversion would have to be routed uphill. It should be noted that this substantial land drainage route receives stormwater from many hectares of land from the north and east including from outside of the order limits.

12. The risk to Friston from surface water flood risk was shown in by a flood event in October 2019 resulting in the commissioning by Suffolk County Council of surface water survey by BMT. The BMT report is not as definitive as the Applicants indicate - see section 1 of the GWP Report attached at Appendix 1. Whilst there are surface water flows from a number of sources which combine in Friston, a significant source if not the most significant source is the area covered by the construction site. This of course is no surprise given that part of the construction site is at high and medium risk of surface water flooding.

13. Another source is the agricultural land to the east of Grove Road which is of serious concern during the construction phase because this is the location of the cable route and haul/access road where it approaches, crosses and joins the substations construction site from the east to the west of Grove Road (Work No. 26) - see Works Plan attached at Appendix 4.

14. The Applicants, in separating surface water flood risk from the substations construction site from surface water flood risk from the cable route and haul/access road, did not assess the combination of the flood risk from these two sources of flood risk to Friston. There is attached at Appendix 3 images, taken during the flood event in October 2019, showing the area which is a source of surface water flows from the east of Grove Road and the surface water flooding along Grove Road to Friston. The location and direction in which those images were taken are

[1] The location of this watercourse is shown in this submission made by Suffolk County Council.

https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010078/EN010078-002828-DL1%20-%20Suffolk%20County%20Council%20-%20Location%20of%20Friston%20Infiltration%20Basin%20and%20Watercourses.pdf

shown in the plan attached at Appendix 2. It should be noted the plan in the BMT Report is not complete as it omits this source of surface water flooding.

15. Notwithstanding their own flood risk assessment and the Environment Agency's surface water flood risk maps referred to above, the Applicants seek to dismiss the surface flood risk in paragraphs 8 -11 of their Response.

16. In reality, the Friston has been flooded 16 times in the last 7 years, a frequency so significant that SCC commissioned hydraulic modelling of the flood events – an uncommon action for a small village setting.

17. The Applicant refers to the flood modelling work by BMT on multiple occasions in their response. However, the model itself suffers from the same baseline data inadequacies that have undermined the credibility of the Applicants' submissions - see paragraphs 21 and 22 below. Specifically, the model is unreliable and limited in its accuracy by the complete lack of rainfall and flow monitoring in the Friston watershed, as well as the limitation of the vertical accuracy of the LiDAR generated ground models (+/-25cm). Critically the flood model is not calibrated to quantifiable flood data. The accuracy of any predicted flood flow depths is therefore limited, with reported predicted depths inconsistent and under-estimating residents own observations. The model does establish however the clear link between storm run-off from the Applicant's site and Friston itself – enabling the following conclusion to be drawn: that an increase in storm run-off from the Applicant's site WILL result in an increase in flood risk to Friston Village.

18. Additionally the model was constructed without any knowledge of the condition of the main underground culvert passing through Friston. The Environment Agency have recently released the results of a CCTV survey of this culvert which confirms not only infilling of up to 10% of the culvert width with sediment, but also the existence of a service pipe straddling the 0.8m high culvert, partially covered with entrapped wooden debris, and significantly reducing the flow capacity of the culvert below that modelled.

19. The '4cm of shallow water depth' referred to be the Applicant is therefore not only highly unreliable, but also entirely misleading as it fails to mention the 1.5m deep watercourse, referred to in paragraphs 10 and 11 above, passing through the northern extent of the substations footprint area. Equally misleading is the persistent reference by the Applicant to multiple flood flow paths entering Friston – this has never been disputed and is indeed identified in the BMT model – but crucially, increasing flood flows within the order limits will flow directly into Friston, increasing flood flows in Friston.

20. Further critique of the BMT report is set out in Section 1 of the GWP report.

2.2 Operation of the Projects

21. The Applicants seek to give the impression that they had professionally approached the mitigation of surface water flood risk during operation at the substation sites and in Friston referring to collecting "*extensive baseline data"*. This is not the case. The Applicants:

    i. failed to carry out any infiltration testing prior to the applications being submitted and then only during the extended examination period after the original examination period had expired. They then failed to conduct those tests in accordance with required standards and therefore their results cannot be relied upon (REP12-118).

    ii. did not even include an Outline Operational Drainage Management Plan in the applications;

iii. have no monitoring of watershed rainfall, nor run-off event water levels or flows, essential to estimate baseline Greenfield Run-off Rates for storm Return Periods – a critical input for designing policy compliant drainage systems – as well as to calibrate any hydraulic models;

iv. have no storm water turbidity/suspended solid data to estimate sediment management requirements to prevent blockage risks developing in the off-site drainage routes; and

v. are unaware of the importance of the existing land drainage system as referred to in paragraphs 10 & 11 above.

22. In short the Applicants have failed to gather any watershed specific data on baseline rainfall, run-off, sediment mobilisation and deposition, and drainage network details, resulting in having a poorly defined understanding of flood flow generation into a vulnerable residential area with a clearly highly elevated surface water flood risk. Section 2 of the GWP Report attached at Appendix 1 further sets out the deficiencies in the collection of baseline data by the Applicants.

23. It is unclear on what basis Suffolk County Council as LLFA have agreed *"the key parameters of the outline design presented with the within the OODMP"* not least given:

i. the reliance on QBAR – a storm Return Period of 1 in 2.3 Years – given a) flooding is known to already occur in Friston for events with a frequency of 16 times in 7 years (i.e. < 1 in 0.5 Years), and hence QBAR flows are likely to still cause flooding in Friston; and b) the QBAR flow has not been derived from in catchment monitoring – the preferred method of the EA for small catchments - see further Section 3 of the GWP Report attached Appendix 1;

ii. the defective infiltration testing - not meeting British Standards;

iii. the disregard for the SUDS hierarchy - infiltration could be increased if the basins were made larger, basin size is being constrained by other development factors, resulting in increased flood risk to Friston – biodiversity and landscaping issues are being prioritised before the flood risk reduction to Friston;

iv. the constrained nature of the construction site/order limits;

v. the failure to consider the management of up slope (notably to the east) storm flows which might enter the footprints of the substations, construction compounds and CSEs and how these might be managed. These are currently managed by the existing land drainage system which will be removed by the development see paragraphs 10 & 11 above. If the storm flows are not prevented from entering these footprints, they will overwhelm the proposed drainage schemes, increasing flood risk to Friston – drainage designs currently show up-slope land being drained into these on-site ponds, completely negating the design specifications.

24. More details of the defective nature of the OODMP are set out in GWP's report of 24 June 2021 which forms part of SASES' Deadline 12 submission on Flood Risk (REP12-118 pages 5 & 6)

25. Further given these defects it cannot be said with any degree of certainty that the mitigation measures proposed in the OODMP will be feasible. The proposal that "*the discharge rate will be set at the existing greenfield run-off rate"* highlights this, given that the Applicants state the existing greenfield run-off rate will only be established/agreed post consent, and that they will be relying on an uncalibrated and inaccurate hydraulic model.

26. The inadequacy of the OODMP is then compounded by the Applicants' refusal to carry out a cumulative impact assessment with the other projects which will connect at Friston. These projects will require an expansion of the National Grid substation in an area where there is a high and medium risk of surface water flooding (REP9-080 Deadline 9 – Comments on Deadline 8 Flood Risk Submissions, pages 6 & 7). These projects include NGV's Nautilus and Eurolink projects and NGET's Sealink project. The fact of these connections and the expansion of the National Grid substation/connection hub has been further confirmed by NGVs commencement of consultation in respect of the Nautilus project and NGET's proposal to commence consultation in respect of Sealink project shortly, with meetings currently being arranged with parish councils. SASES highlighted this issue in its submission to the Secretary of State dated 19 October 2021. Since that date both NGV and NGET have recently written to the landowners whose property surrounds the substations site seeking licences to conduct surveys.

27. The Applicants drainage scheme designs rely on unproven Greenfield run-off rates, sub-standard infiltration testing, uncalibrated modelling, unsurveyed drainage networks and are constrained by the available land areas – resulting in an increase in flood risk to Friston.

2.3 Construction of the Projects

28. The risk to Friston from surface water flooding is even more acute during the construction phase due to the far greater areas within the order limits which will either be rendered impermeable and/or stripped of vegetation/disturbed leading to an increase in run-off. The Applicants approach to surface water flood risk during construction has been haphazard. For example the plan which is now attached to the OCoCP was only produced at a very late stage in the examinations during the extended examination period. That plan is defective for the reasons set out in SASES's submission made at Deadline 12 (REP12-118).

29. The very fact that there are no less than 10 separate construction drainage basis with very little detail of how they interact is telling, whilst also remaining unclear as to whether all parts of the disturbed ground will actually flow to these basins. Further the areas of impermeability and/or disturbance include the operational access roads to the substations and cable sealing ends which is not even reflected on the plan. The main operational access road also eliminates a natural drainage basin on the plan. This plan overlaid with the access roads is attached at Appendix 2.

30. A critical consideration of construction phase drainage is the requirement to prevent turbid water leaving the site, and ensure this is treated and clarified before it is discharged from the site. Limitations on treatment capacity are therefore key to basin volume sizing, an issue the Applicants have failed to consider.

31. The Applicants have treated surface water flood risk at the substations construction site and on the cable route separately. As a result they have failed to address the combined effects of surface water flood risk both from the substations construction site and from the cable route where it approaches and connects with the site. This part of the cable route also includes the principal construction access to the site which will remain in use for the entirety of the construction period. The relevant works plan is attached at Appendix 4. As noted in paragraphs 13 & 14 above this is a serious issue as the location of the cable route and haul road/access road is on another significant source of surface water flood risk to Friston.

32. Furthermore there is no consideration of how the watershed and hillsides upslope (to the east and north and to some extent to the west) will be managed given the elimination of the existing land drainage system which will be removed by the development - see paragraphs 11 & 12 above. As stated above if upslope water from impermeable/disturbed areas is allowed onto

the substations, construction compounds and CSEs footprints it will increase erosion and turbidity, and overwhelm the construction phase basins and their treatment units.

Section 3 – Part 3i : National Planning Policy Framework

33. The Applicants' Response in this section indicates that:

    i. they agree that the sequential test should have been applied in relation to the substations site in respect of all sources of flooding but state that they did consider all sources of flooding (paragraphs 21,22 and 23 of the Response);

    ii. they consider that there is an absence of criteria for assessment and application of the sequential test in respect of surface water flood risk in Planning Practice Guidance.

34. With regard to 33(i) this is incorrect and the statement that "*the Applicants considered all sources of flooding"* is misleading. Whilst the Applicants have attempted (albeit inadequately) to address surface water flood risk in terms of mitigation, surface water flood risk was not considered in site selection. In fact in their submissions in the examinations the Applicants consistently denied the need to conduct the sequential test. For example:

    REP8 - Submission of Oral Case: ISH11 paragraph 9 - "*As the onshore substations site is located within a Flood Zone 1 area (which means that there is a low probability of flooding, as classified by the Environment Agency), the site does not require the sequential test to be undertaken. The sequential test simply ensures that developments are planned and built within the lowest area of flood risk possible – Flood Zone 1 – and if that is not possible the sequential test must be undertaken to prove why a higher flood risk area has been chosen. As the substations site has the lowest flood risk probability, the test is not required."*

    REP10 - Applicants' Comments on SASES' Deadline 9 Submissions ID8 page 69 - "*it can be concluded that the sequential test for the Projects is **not** required as the onshore substation and National Grid infrastructure locations are not in flood zones 2 or 3."*

35. With regard to 33(ii) again the statement is misleading. The Applicants do not explain what they mean by absence of any criteria. The fact is Planning Practice Guidance requires all sources of flooding to be considered including in relation to the application of the Sequential Test. Whatever "absence of any criteria" means there is no excuse for not applying the sequential test in accordance with policy. An absence of criteria does not mean the Sequential Test could not and should not be applied to other forms of flooding – most obviously pluvial flooding zones are defined on DEFRA pluvial flood maps according to flood risk, as are depths and velocities of flooding. Any number of criteria could have been used by the Applicant to assess 'relative' pluvial flood risk in the fluvial flood risk Zone 1 areas.

36. In this section the Applicants make other statements which are incorrect and/or misleading for example:

    i. they materially understate the risk of surface water flooding repeatedly referring to it as "low risk" and "very low risk". As explained above this is incorrect. The Applicants focus on only the flood risk to the development, and fail to mention the direct hydraulic flowpath from the site into Friston – which is clearly identified within DEFRA flood maps and BMT modelling - and the increase in flood risk generated by the site during its construction and operational stages – generating larger Total Flows, more frequent higher Peak Flows, increased groundwater flood risk and creating an entirely new reservoir failure inundation risk - to Friston which is clearly already vulnerable to pluvial flood risk;

ii. the reference to the landscape planting reducing the speed of surface water off is misleading. The Applicants omit to mention:

a. that the projects will remove all existing vegetation from the construction site including a number of hedgerows, grassland and prevent the agricultural land from being cultivated;

b. that large areas during construction will be made impermeable or will be disturbed;

c. that the landscape mitigation planting will be immature for many years and that most if not all of this planting will only take place after the completion of construction at the site.

iii. the Applicants have made no assessment of existing surface water run off or the effect of removal the existing land drainage system which manages surface water from northern areas of the site - see paragraphs 10 and 11 above.

iv. Whilst surface water flooding within Friston does result from a number of locations the construction site is a significant contributing source of surface water flooding and it is this site from which the flood risk increases due to the development.

37. The Applicants refer to the greater emphasis being placed by the NPPF on *"… making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management…"*. The proposed OODMP almost entirely ignores natural flood management techniques with infiltration not being maximised contrary to Suffolk County Council's SuDS hierarchy. Operational flood mitigation depends entirely on two semi-engineered very large basins which due to the sloping topography of the site will require substantial bunds up to 3 to 4 metres higher than current ground levels. These SUDS basins will contain very high volumes of water close to the limits which require regulation under the Reservoir Act. The Applicants have given no thought to hard engineering requirements of these basins given the inundation risk to Friston in the event of failure of these bunds with a catastrophic release of large volumes of water adjacent to Friston. The longevity and sustainability of largely passive and unmanaged SUDS schemes is questionable and the long term commitment to adequate maintenance of these structures is unclear and effectively unenforceable.

38. Given the defects of the Applicants approach in terms of site selection, assessment and mitigation, policy requirements have not been met including without limitation the requirement not to increase flood risk elsewhere.

Section 4 - part 3ii - Environment Agency Climate Change Allowances

39. The EA limits its response to a comment about peak river flows, which are not directly of relevance to the pluvial flood risk generated by the site. However consideration would need to be given to these river flows if the Applicant had considered the effect of the increased flows from their site on the flows within the Main River passing through Friston – something the Applicants have not done to date.

40. The EA also notes it is satisfied with measures to protect water quality. Given the complete lack of detail provided by the Applicant on construction phase water management it is incomprehensible the EA arrives at this conclusion – considering that the viability of effective construction phase drainage, including effective turbidity clarification, is challenged by SCC.

Section 6 – Part 3iv – Surface Water and Drainage Management During Construction

41. Before commenting on the updated proposals and the amendment to the Development Consent Order, misleading statements concerning the relevant construction periods need to be addressed.

Comments on Duration of Construction Period

42. The Applicants make a number of comments about the duration of the construction period without stating explicitly what the construction period(s) is(are). The reason is that the overall duration of construction is uncertain. It depends upon whether the projects are built concurrently, or overlap or are built sequentially with the possibility of a gap between completion of one project and commencement of the other. In this context it also needs to be remembered that there are three NSIPs which are the subject of these applications namely EA1N, EA2 and the National Grid connection hub. The Applicants have set out the likely construction periods of each elements of the projects in Chapter 6 of the Environmental Statement section 6.9.

Substations Construction Site

43. In terms of the substations construction site the principal construction periods (not including onshore preparation works) as stated in Chapter 6 of the ES Project Description are as follows:

    i. the National Grid connection hub, 4 years;

    ii. each Applicant's substation, 2½ years.

44. This means that if the projects were constructed sequentially the construction period for the Applicants' substations could be at least 5 years and potentially longer should there be a gap between the completion of one project and the commencement of construction of the other.

45. In addition there needs to be added in some portion of the period of the onshore preparation works whose duration is 15 months. Onshore preparation works include site clearance which will involve vegetation stripping, compaction of the ground at the substations construction site and removal of the existing field drainage network, all of which will increase surface water flood risk. Therefore it is not unreasonable to assume that a worst case construction period could be 7 years or possibly longer before the cumulative impact of other projects.

46. The National Grid connection hub will need to be expanded to permit the connection of NGV's Nautilus and Eurolink projects and NGET's Sealink project - see paragraph 26 above. The works required for this expansion could further extend the construction period to at least 8 years if not longer. Yet further expansion and construction may be necessary given the possible connection of the Five Estuaries and North Falls projects, neither of which has a connection offer and where a number of connection locations on the Suffolk and Essex Coast are currently being considered. The Applicants have not carried out a cumulative impact assessment in respect of any of these projects.

47. Accordingly referring to the storage basins as "temporary" given they will need to be in place for the duration of construction (paragraph 46 of the Response) is misleading.

Onshore Cable Route

48. Similar considerations apply to the cable route both in terms of the sequencing of the projects and the cumulative impact of other projects which will connect at Friston. In the Project

Description it is stated that the construction period of the onshore cable route would be up to 2 years. This means if the projects were constructed sequentially this period would be at least 4 years before taking account of the cumulative impact of other projects[2] which will also require underground cables to be laid between the coast and the National Grid connection hub at Friston.

49. Accordingly the statements by the Applicants that the construction works associated with the onshore cables will be *"temporary and transient in their nature"* and the *"impact associated with flooding are likely to be less than in residential locations"* (paragraph 41 of the Response) are inaccurate and misleading, not least given the proximity of the cable route to residential locations as it approaches the substations construction site.

50. Other examples of the onshore cables being close to residential locations are residential receptors on low lying ground in Flood Zone 2 situated close to Cable Section 3b at Work No.19 east of B1122 Aldeburgh Road often referred to as the Hundred River Crossing.

Return periods

Cable Route

51. The Applicants' position is that the return period for the onshore cable route should be and remain as 1 in 10. However this is based on an inaccurate view on the potential length of the construction period and an assumption that the flood risk is the same along the entirety of the cable route.

52. In determining that a single return period should apply to the entirety of the cable route the Applicants have taken a homogenous approach to flood risk which does not take account of key differences along the route, for example:

    i. where the cable route approaches the substations construction site, it includes the principal construction access road and this will be active for the duration of the construction phase (Work No. 26) - see Appendix 3. Therefore for this part of the cable route the relevant return period should be the same as for the substations construction site.

    ii. the Hundred River Crossing (Work No.19) which is in the vicinity of residences in Aldringham. Figure 05.24 of the Local Planning Authority Strategic Flood Risk Plan[3] confirms this area as containing significant areas designated as Flood Risk 3b, i.e. a Functional Flood Plain and land classified as already having a 5% Annual Exceedance Probability (AEP) and with a 1 in 20 (5%) annual probability of flooding. The application of a 1 in 10 Return Period is inadequate.

53. It needs to be realised that the Return Period not only affects discharge flow rates and flood risk, but also the ability to treat the turbid water to ensure it adheres to an EA discharge consent. Other large scale construction projects in much lower risk pluvial flood areas, are currently designing on-site drainage to a 1 in 30 Year RP for all temporary works to ensure water quality discharge is met.

[2] Since the project description was written the Applicants intend to install the ducts for the second cable route when the first cable route is constructed however cables will still need to be installed in those ducts as part of the construction of the subsequent project.

[3] Suffolk Coastal and Waveney District Councils Level 1 Strategic Flood Risk Assessment April 2018
https://eastsuffolk.inconsult.uk/gf2.ti/f/1006178/53414725.1/PDF/-/D23__Strategic_Flood_Risk_Assessment__Level_1_April_2018_reduced.pdf

Substations Construction Site

54. The Applicants are proposing that (i) a 1 in 30 return period is appropriate and (ii) that this return period can be accommodated at the substations site by *"increasing the depth of the construction drainage basins and reducing the total basin area to allow for additional spoil storage".*

55. This proposal is defective for the following reasons.

i. For 3-5 year large scale linear construction projects in low risk environments, LLFAs have been accepting 1 in 30 year return periods for on-site construction phase drainage schemes including water quality treatment. However the consequences of Return Period exceedance in Friston, a high risk flood area, are much more significant. Given the consequences of drainage scheme failure directly impacts a precautionary approach is justified and as such SASES agrees with the SCC position of using a 1 in 100 return period, which is consistent with SCC position of a 1 in 100 period at Sizewell C.

ii. The Applicants are materially understating the possible duration of the construction works and failing take an account of the cumulative impact of other projects which will require further works at the site

iii. No analysis is provided as to why increasing the depths of the basins and reducing their area will enable surface water flood risk to be mitigated. How deep do these basins need to be? 2m, 3m or deeper? No indication is given as to (a) how these basins will be constructed (b) what the necessary batters are and the geotechnical analysis to confirm slope stability during storm event filling and emptying (c) how depth is constrained by depth to groundwater (d) what the maximum depth is to permit gravity drainage to the surrounding surface water drainage network. In other words the Applicant has not demonstrated the viability of deeper basins.

iv. The Applicants rightly highlight the health and safety risks intrinsic to deep basins but the reassurance that the site will be secure is does not bear examination. The provisions of the Outline Code of Construction Practice in relation to security are extremely thin. Paragraph 66 of the OCoCP merely states that security will be *"adequate"* and "*appropriate*". This is a large site near residential dwellings, public footpaths and adjacent to a village. The site will contain high value equipment. The site will be of significant interest to members of the public who may seek to gain entry to the site outside of working hours. Further there is not a single basin in a single location, but no less than 10 basins spread across the site. A large number of deep basins represents a very significant safety hazard particularly in the hours of darkness. The limited security arrangements do not give any confidence that a serious accident will not occur. No doubt this was the reason the Applicants originally suggested that the ten basins would have depth of no greater than 1m.

56. Further the fact that the Applicants are now proposing to reduce the area of the basins highlights the constrained nature of the site and that the Applicants may not be able to accommodate feasible surface water flood risk mitigation measures within the order limits. It is noted that the Secretary of State has requested details from the Applicants on this issue in paragraph 8ii of the 20 December 2021 letter.

57. For the reasons set out above the Applicants updated construction surface water drainage proposals are wholly unsatisfactory.

Proposed Amendment To Requirement 22 (Code Of Construction Practice) In Part 3 of Schedule 1 to the draft Development Consent Order

58. Without prejudice to the above should the Secretary of State grant the DCOs the following comments are made on the proposed amendment to Requirement 22 paragraph 2(b).

59. This amendment yet further demonstrates the inadequacies of the Applicants' approach to assessment and mitigation of surface water flood risk as the list of works in the amendment omits a substantial number of works which are conducted in the construction site.

60. As well as works nos 30, 31, 34, 38, 41 and 42 the amendment should include references to the following works numbers:

    i. Work no. 26 cable route, haul road and construction access road approaching and at substation site,

    ii. Work no. 32 connection between the Scottish Power substation and National Grid substation

    iii. Work no. 33 landscaping works to which include drainage works, sustainable drainage system ponds, surface water management systems

    iv. Work no. 39 replacement, upgrade and realignment works to the overhead line pylons in the vicinity of work no. 38

    v. Work no. 40 temporary realignment works

    vi. Work no. 43 temporary working areas for the purposes of constructing work number 39 and 40 including access.

61. The omission of these works means no reliance can be placed:

    i. on the feasibility of the surface water flood mitigation proposals given they will have been based on merely a subset of all the works which are to be carried on in the substations construction site:

    ii. on the Applicants response to the request set out in paragraph 8ii of the 20 December 2021 letter as again this response will have been based on merely a subset of all the works which are to be carried on in the substations construction site.

CONCLUSION

62. The Applicants are suffering from a problem of their own making. Without proper consideration and contrary to policy they selected a site with a surface water flood risk which is above and adjacent to a village. They ignored the local community which raised the issue of the elevated flood risk in Friston during consultation in early 2019 including at a meeting with senior management of Scottish Power in July 2019. The Secretary of State will be aware of the application for costs which SASES has made a result of these and other failings by the Applicants.

63. The Applicants are now engaged in a desperate attempt to try and retrofit flood risk mitigation. Their inability to do so is demonstrated by the fact this issue is still being assessed despite a three month extension to the examination periods and now a further extension of three months to the decision periods.

APPENDIX 1

GWP REPORT DATED 28 JANUARY 2022

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Michael Mahony
SASES

GWP Report No: 220125

Our ref: mm280122
Your ref:

28 January 2022

Dear Mr Mahony

Flood Risk Comments on Applicants Response to the Secretary of State Questions

This letter constitutes a technical critique of the documentation submitted by Scottish Power Renewables (SPR) in response to the Secretary of State's questions of November 2021.

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.

1. Observations and Limitations on the BMT Friston Surface Water Study -Technical Report (May 2020)

The development of a hydraulic flood model for a small rural village funded by an LLFA is not common. It is indicative of a persistent and eventually prioritized concern of frequent and unacceptable levels of flooding in a residential area. Friston has been flooded 16 times since 2015, with a particularly severe flood event in October 2019 resulting in the commissioning of the flood modelling work by SCC.
The hydraulic model has been developed by BMT using a combination of different input parameters to attempt to replicate the flood event of 6th October 2019. This model was then used to assess less extreme and more rainfall events to estimate the flood risk in Friston to a wide range of events.
It is noteworthy that the BMT report shows in its very first figure (Fig.1-2 p.10) of the study area 3 storm flow arrows: one east-to-west directly across the sub-station areas, leading to a second arrow north-to-south into Friston Village. Even at the earliest conceptual understanding, BMT recognized the critical hydraulic connection of overland storm flows between the site and Friston.

The basic requirements of any hydraulic flood model are the following:

a) An accurate survey of the land surface in the catchment and detailed surveys of the drainage network ditches, pipes and culverts;
b) Accurate and relevant rainfall data – ideally of different observed flood events;

c) Measured levels and flows of floodwaters in various locations along the drainage network – ideally observing flood levels and flows of flood events, with time – meaning the rising flood levels and the waning flood levels, as well as the flood peak levels.

Despite the impressive visualisations presented in the report, there are significant shortcomings in the availability of these three critical parameters, that have a direct causal impact on the reliability and accuracy of the modelling results and later predictions.

Firstly, the BMT report used rainfall data from outside of the watershed – in fact more than 6km east of the Friston watershed, at a coastal location. No rainfall data was obtained or collected from the watershed itself. No comparison or understanding of the accuracy or relevance of the coastal rainfall data 6km distance to actual rainfall in the Friston watershed was possible. BMT themselves note '*the limitation of not using a gauge within the catchment is that it may not reflect the true rainfall received in Friston'*.

The rarity of the October 2019 flood event has been challenged by SCC, who believe it is more likely to have been a 1 in 5 Year event rather than a 1 in 40 Year event as reported by the Applicant.

Secondly whilst BMT did undertake detailed surveying of the centre of Friston, they relied on characterisation of the rural terrain topography using an Environment Agency LiDAR survey to generate a Digital Terrain Model (DTM). BMT reports they used the 2m EA LiDAR survey – that is to say a topographic survey which has a ground elevation point estimated on a 2m x 2m grid. The generally accepted vertical accuracy of LiDAR is +/- 25cm. Whilst such a level of precision over a watershed sounds impressive, it is clear from this level of accuracy that LiDAR on a 2m grid does not define drainage ditches accurately and all vertical ground elevations influence the areas and depths of flooding to an accuracy of +/-25cm.

Equally obviously, LiDAR cannot measure below ground flow routes such as culverts, pipes, land drains etc – which are so critical to rural storm drainage flow paths – but is also affected by both dense vegetation and areas of murky standing water within existing drainage routes, which both prevent accurate surveying of drainage routes. Given the main flow route through the southern half of Friston is entirely within a culvert – of unknown condition, with unknown debris and utility blockages – the limitations of the accuracy of the model start to become more apparent.

BMT were aware of the limitations of the LiDAR, hence their additional surveying work to define the road curbs etc al in Friston, and some of the main drainage ditches around the Applicants area.

It is important to recognize and appreciate that the BMT flood model uses a 2m grid with a vertical accuracy of +/-25cm, and that the accuracy of flood flow routes and depths are constrained by this. So whilst the locations of flow routes are likely to be accurate (Figure 4-1 shows 2 key flow paths leaving the Applicant site area and haul road alignment) the actual depths and extent and duration of flooding at any specific location cannot be accurately replicated.

A photograph of one of these key flow routes (see Figure 4-2) shows a drainage ditch at least 1m deep and 1m wide at the water level, perhaps 3m wide bank-to-bank, flowing along the northern side of the sub-station footprint - in contrast to the 'shallow surface water flow route' identified by the Applicant.

Thirdly – there was no measured stream or ditch water level data to calibrate the model with. A number of statistical approaches were used instead to estimate the storm run-off flows and this entered into the hydraulic model, however there only reference point for calibration – to demonstrate the accuracy of the flow estimates - was photographs of the flood event taken by residents – anecdotal information with limited accuracy in terms of water depth, location and timing. The local residents strongly dispute the accuracy of the calibration flood depths derived from the flood event photographs by BMT – for example Table 5-2 2nd location (p.48) BMT estimate 7cm of flood water, whereas the resident of the house shown observed more than 25cm.

The lack of rainfall and storm run-off level and flow measurement from within the Friston watershed is inconsistent with Environment Agency best practice on 'Estimating flood peaks and hydrographs for small catchments' (EA, 2012) which identifies the importance of flood flow measurement and the uncertainty in using existing statistical methods.

To conclude, the BMT model is unreliable and limited in its accuracy by the lack of rainfall and flow monitoring in the Friston watershed, as well as the generic limitations of the use of LiDAR generated ground models (+/-25cm). Critically the flood model is not calibrated to quantifiable flood data. The accuracy of any predicted flood flow depths is therefore uncertain but reported depths are inconsistent and under-estimate residents own observations. The model does establish however the clear link between storm run-off from the Applicant's site and Friston itself – enabling the following conclusion to be drawn: that an increase in storm run-off from the Applicant's site WILL result in an increase in flood risk to Friston Village.

The '4cm of shallow water depth' referred to be the Applicant is therefore not only highly unreliable but entirely misleading as it fails to mention the 1.5m deep ditch flow route - defined as an Ordinary Watercourse by the LLFA – passing through the northern extent of the sub-station footprint area. Equally misleading is the persistent reference by the Applicant to multiple flood flowpaths entering Friston – this has never been disputed and is identified in the BMT model – but increasing flood flows on the Applicants site will result in increased flood flows in Friston.

2. Observations and Limitations of the Applicant's Flood-related Baseline Data

The Applicant has referred to 'extensive baseline' data being used to determine the current conditions within and around the site, and to inform the design of on-site drainage schemes to mitigate off-site flood risk. This statement is factually incorrect – the baseline is actually poor, weak and inadequate.

SASES has throughout its contributions criticised the inadequacy of the flood risk baseline. Flood risk baselines need to adequately characterize three components: the Source of flooding; the Receptors at risk of being flooded; and the Pathway from which a flood hazard migrates to arrive at the receptors.

SASES has always stated the definition of the flood source term is poorly defined because there is no rainfall monitoring and no stream or ditch flow level or velocity monitoring. It is not therefore possible to define what rainfall events generate what flows, and hence what intensity and duration of rainfall events cause flooding in Friston.

The relationship between rainfall and run-off is a function of many factors including watershed size, land steepness, existence of depressions, existing drainage networks and land drains, soil types and their distribution, existing infrastructure (notably roads) and so on. There has been no attempt by the Applicant to characterize the watershed nor measure in-catchment rainfall and resulting flows. This is particularly important in Friston given the heterogeneity of the upper watershed and complex interaction of field drains, land hollows and ditch systems.

The lack of adequate definition by neglecting to survey the main storm flow routes means the Pathways are inadequately defined and consequently the hydraulic modelling of the storm events is unreliable and inaccurate.

Lastly the continued refusal of the Applicant to characterize the Receptors: people; residential properties, commercial properties, transport routes etc, means the flood risk to these receptors is not understood: the risk is different to a frail elderly person living on their than it is a young couple. The Applicant is solely focused on attempting to mitigate a poorly defined hazard.

What is clear, from anecdotal flood observations alone by residents and their photographic inventory of flood events, is that Friston has experienced flood events 16 times in 7 years, more than 2 times per year, or on average a 1 in 0.5 Year Return Period.

The inadequacy of the baseline data extends to not only a lack of rainfall, run-off, topographic and drainage data, to a lack of adequate understanding of ground infiltration rates – the Applicant's ground testing campaign did not adhere to British Standards – but a complete lack of groundwater monitoring, which is essential for demonstrating infiltration basin viability and confirming no increase in groundwater flood risk to Friston – the southern half of which has an elevation of <10m AOD and is therefore potentially vulnerable to shallow groundwater level rise.

It is noteworthy that had the Applicant installed rain gauges and flow monitoring stations in the watershed 2 years ago, they would have captured data from 9 flood events.

In summary, the Applicant has not undertaken the most basic characterisation of flood risk to the people of Friston Village. There is no acceptable definition of rainfall, storm run-off, drainage channels nor understanding of the receptors to be impacted by the flood events.

3. Consequences of Poor Baseline on Acceptable Flows and Drainage Design

The inadequate baseline means it is not possible with any confidence for the Applicant to define any storm flow Return Periods – which are the principal benchmark for defining the pre-development flows which must not be exceeded, and ideally need to be bettered, by the flows generated off the development.

The pre-development flows are therefore a fundamental design parameter for any drainage retention structure, as they determine the acceptable flows that can be released to the surrounding environment. These pre-development flows are known as Greenfield Run-off Rates (GRR). They have to be defined before the size of storm water retention ponds can be determined. Without adequately defining the GRR the drainage storage ponds could be undersized, releasing waters above the GRR.

SASES have always stated the consequence of the flood risk baseline being poorly defined is that GRR are poorly understood, and likely to be over-estimated – given the actual run-off from around the site in part gets attenuated in land depressions, at least one of which will be removed. Over-estimation of the GRR allows the drainage basins to be smaller and hence the Applicants scheme be more viable.

The failure to adequately define the GRR has particular significance for Friston, because the default minimum acceptable discharge flow rates for the LLFA are set at a flow rate known as QBAR, the 1 in 2.3 Year Return Period. The larger the GRR, the larger the QBAR and the smaller the drainage ponds.

QBAR as a discharge rate is particularly important in Friston because the observed frequency of flood events in Friston over the last 7 years is 1 in 0.5 Years. Because of the QBAR is not tightly defined and because there is no rainfall and flow monitoring data for the Friston water course, then it is not possible to say whether any of the 16 flood events in the last 7 years were caused by a QBAR flow or even <QBAR flow. However the frequency of flood events alone makes it a strong likelihood that flows less than QBAR are causing flooding, and hence the addition of more total water volume from the Applicant's site at QBAR will in all likelihood increase flood risk in Friston.

SASES has always maintained that QBAR flows could still cause flooding in Friston and therefore are not an acceptable flow rate to discharge storm water from the Applicant's site. Adoption of a lower discharge flow rate would result in the need for larger attenuation ponds and this might not be possible to achieve within the footprint of the site – meaning the development itself is actually not viable.

The Applicant in their own submission states the GRR is currently unknown and this will be determined by a hydraulic model, a model which SASES has demonstrated is uncalibrated, unreliable and inaccurate.

The inadequacy of the definition of reliable GRR has wider consequences on the drainage scheme design, as the storage volumes are not only defined by the outflow rate (QBAR or otherwise) but also the design has to manage specified inflow storm events, be this 1 in 10 Year, 1 in 15 Year, 1 in 30 Year, 1 in 100 Year, and 1 in 100 Year plus % climate change allowances. None of these Return Period

GRRs can be defined if the GRR baseline is unreliable. The Applicant cannot therefore demonstrate the sizing of the storage ponds is consistent with the GRR.

Given the consequences of failure (over-topping) of the basins will be to flood Friston, it is reasonable to be precautionary and to design the surface water management scheme to retain all storm flows up to and including the 1 in 100 Year Return Period plus 40% climate change allowance.

Yours sincerely

Clive Carpenter
Partner and Head of Water Resources

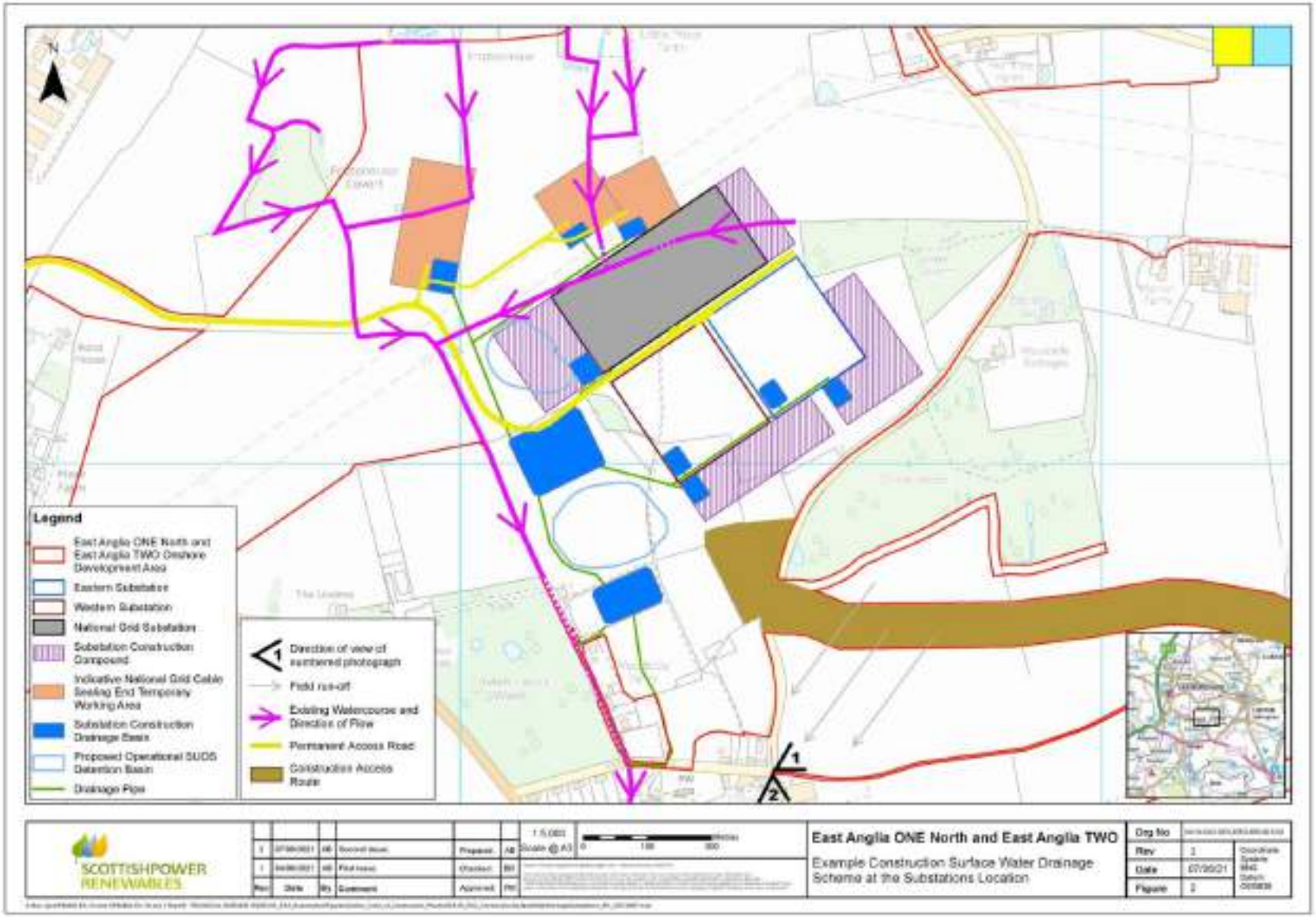
APPENDIX 2

OCOCP PLAN SHOWING

1. LAND DRAINAGE/EXISTING WATERCOURSE OVERLAY

2. OPERATIONAL ACCESS ROADS OVERLAY

3. LOCATIONS FROM WHICH IMAGE 1 AND 2 IN APPENDIX 3 WERE TAKEN


N
Legend
East Anglia ONE North and East Anglia TWO Onshore Development Area
Eastern Substation
Western Substation
National Grid Substation
Substation Construction Compound
Indicative National Grid Cable Sealing End Temporary Working Area
Substation Construction Drainage Basin
Proposed Operational SUDS Detention Basin
Drainage Pipe
Direction of view of numbered photograph
Field run-off
Existing Watercourse and Direction of Flow
Permanent Access Road
Construction Access Route
1
2
SCOTTISHPOWER RENEWABLES
East Anglia ONE North and East Anglia TWO
Example Construction Surface Water Drainage Scheme at the Substations Location
Org No
Rev
Date
Figure

APPENDIX 3

IMAGES OF SURFACE WATER FLOODING FROM THE EAST OF GROVE ROAD - OCTOBER 2019 - IMAGE 1

IMAGE 1

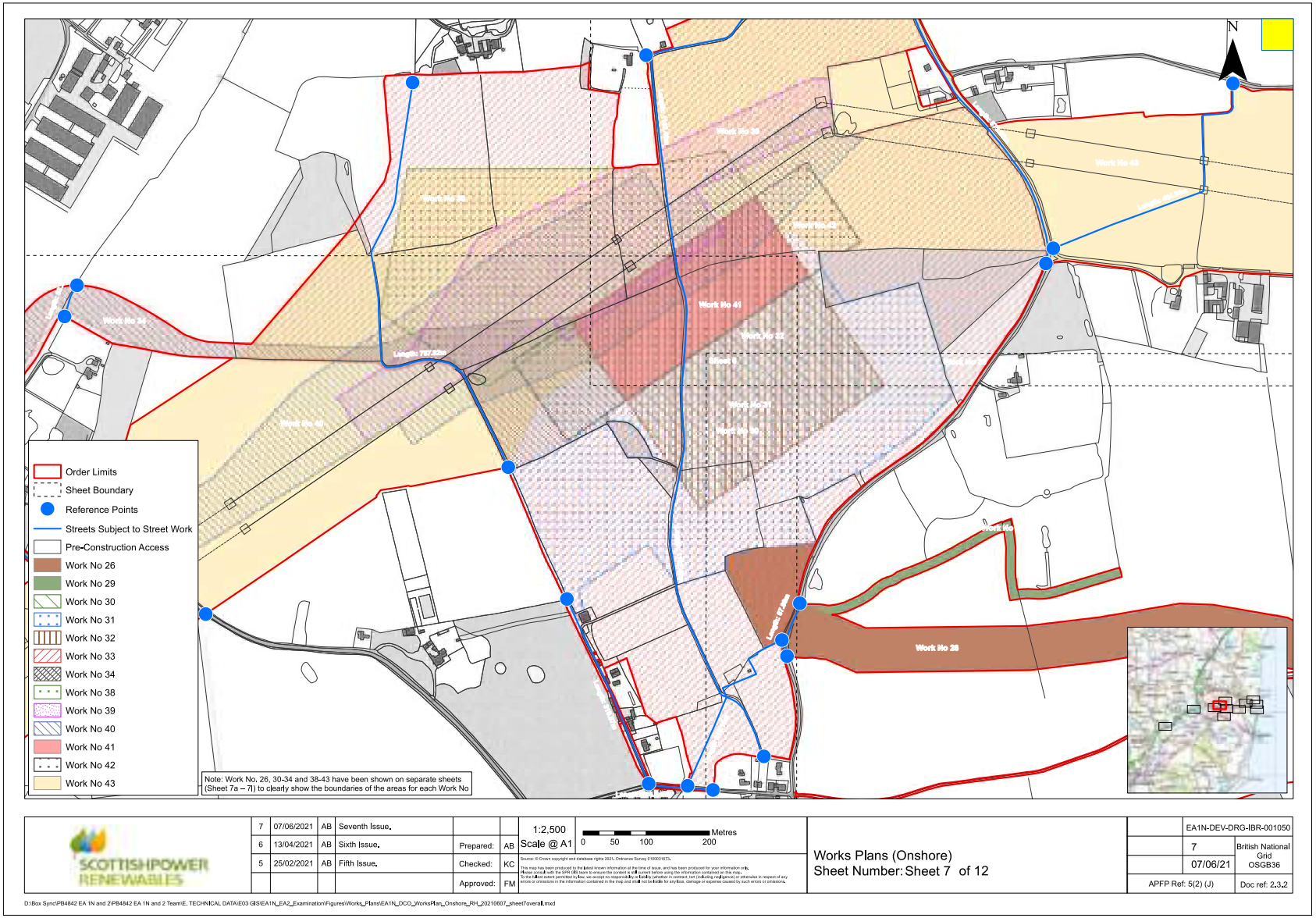
IMAGES OF SURFACE WATER FLOODING FROM THE EAST OF GROVE ROAD

IMAGE 2


06 Oct 2010 11:47

APPENDIX 4

WORKS PLAN FOR SUBSTATIONS CONSTRUCTION SITE SHOWING CABLE ROUTE AND HAUL/ACCESS ROAD (WORK NO.26)



SCOTTISHPOWER RENEWABLES	7	07/06/2021	AB	Seventh Issue.			1:2,500 Scale @ A1
	6	13/04/2021	AB	Sixth Issue.	Prepared:	AB	0 50 100 200 Metres
	5	25/02/2021	AB	Fifth Issue.	Checked:	KC	
					Approved:	FM	

Works Plans (Onshore)
Sheet Number: Sheet 7 of 12

	EA1N-DEV-DRG-IBR-001050	
	7	British National Grid OSGB36
	07/06/21	
APFP Ref: 5(2) (J)		Doc ref: 2.3.2

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