12. Hydrology, Hydrogeology, Geology and Peat

Non-Technical Summary

12.1. An assessment of the effects on hydrology and peat due to the proposed five turbines up to 149.9 meters (m) and change in turbine model and associated increase in crane hardstanding has been undertaken.

12.2. Chapter 13 of the Environmental Impact Assessment Report 2019 (the EIA Report 2019) assessed that the Proposed Development as having no significant effects on the hydrological environment.

12.3. The increase in the dimensions of turbine and crane hardstanding will increase the potential of effects on the hydrological environment. Due to buffer distances and the implementation of a Construction Environmental Management Plan (CEMP), the potential for all effects remain not significant in terms of the Environmental Impact Assessment (EIA) Regulations[i].

Introduction

12.4. The Applicant received a planning permission for Lochluichart Wind Farm Extension II, a 5-turbine scheme together with associated infrastructure, on 1st July 2020 from THC (the 'Consented Development'). This new application is to increase the tip height of the Consented Development turbines to 149.9m. All the turbines and associated infrastructure will remain in the same locations for this new application (hereafter known as the 'Proposed Development') as they do for the Consented Development.

12.5. The Consented Development application was supported by an Environmental Impact Assessment Report ('EIA Report', 2019) and Supplementary Information ('SI', 2019), as detailed in Chapter 1: Introduction.

12.6. This Chapter address the potential effects the Proposed Development on the Hydrology and Hydrogeology resource and supplements Chapter 13: Hydrology, Hydrogeology, Geology and Peat of the EIA Report 2019. This Chapter should be read in conjunction with the EIA Report 2019 and the 2019 Supplementary Environmental Information Report (the SI 2019).

12.7. Chapter 13 of the EIA Report 2019 assessed that the Consented Development as having no significant effects on the hydrological environment.

12.8. The principles of the EIA Report 2019 and SI 2019 remain valid and appropriate and there

12.9. The principles of the EIA Report 2019 and SI 2019 remain valid and appropriate and therefore, have not been reassessed for this Chapter, unless otherwise stated.

Legislation, Policy and Guidance

12.10. The following changes have been made to legislation, planning policy or guidance with respect to hydrology, hydrogeology, geology or peat since the EIA Report 2019 and SI 2019 were prepared:

- Guidance for Pollution Prevention 1 (GGP1): A General Guide to Preventing Pollution (October 2020)[ii];
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) - Version 8.3 (February 2019)[iii];
- Technical Flood Risk Guidance for Stakeholders – Scottish Environment Protection Agency (SEPA) requirements for undertaking a Flood Risk Assessment - Version 12 (May 2019)[iv];
- Climate change allowances for flood risk assessment in land use planning Land Use Planning System (LUPS-CC1) – SEPA (April 2019)[v]; and
- Nature Scot formerly Scottish Natural Heritage (SNH) (2019) 4th Edition, Good Practice During Wind Farm Construction[vi].

12.11. There have been no substantial changes to legislation, policy and guidance which would alter the conclusions of the EIA Report 2019 and SI 2019.

Assessment Methodology and significance Criteria

12.12. The assessment method and significance criteria are the same as detailed in the EIA Report 2019 and SI 2019.

Responses and Consultation

12.13. Table 12.1 outlines the pertinent consultation responses received in relation to hydrology, hydrogeology and geology.

Table 12.1: Consultation Responses Relating to Hydrology and Hydrogeology

Consultee	Points Raised	Response
SEPA	To avoid delay and potential objection, SEPA consider that the following information must be provided within the EIAR: a) Map and assessment of all engineering activities in or impacting on the water environment including proposed buffers, details of any flood risk assessment and details of any related CAR applications. b) Map and assessment of impacts upon Groundwater Dependent Terrestrial Ecosystems and buffers.	SEPA did not object to the Consented Development, following a number of changes to the scheme promoted in SI 2019, in their response PCS/168732 (17/12/19), so the statement turbine T4 is in deep peat is incorrect. In addition, based on the Consented Development promoted by SI 2019, SEPA were satisfied with floating tracks proposed. The Applicant is not proposing any changes to the location of turbines or related infrastructure (see Chapter 3) from those

Consultee	Points Raised	Response
	c) Map and assessment of impacts upon groundwater abstractions and buffers. d) Peat depth survey and table detailing re-use proposals. e) Map and table detailing forest removal. f) Map and site layout of borrow pits. g) Schedule of mitigation including pollution prevention measures. h) Borrow Pit Site Management Plan of pollution prevention measures. i) Map of proposed waste water drainage layout. j) Map of proposed surface water drainage layout. k) Map of proposed water abstractions including details of the proposed operating regime. l) Decommissioning statement. j) Map of proposed surface water drainage layout. k) Map of proposed water abstractions including details of the proposed operating regime. l) Decommissioning statement. In regard to watercourse crossings, provided	which SEPA did not object to under the Consented Development planning application. The change in turbine model on which the new application is based on for the Proposed Development will mean, outside a larger rotor blade and increased tower height, a larger crane hardstanding; nothing else for the purposes of SEPA's assessment will change. a) A figure showing the layout with earthworks overlying environmental constraints required. b) A figure showing layout with earthworks overlying GWDTEs provided in the EIA Report 2019. c) As outlined in the EIA Report2019, no groundwater abstractions exist within 250 m of Proposed Development infrastructure and no groundwater abstractions are proposed as part of the Proposed Development. d) An Outline Peat Management Plan (oPMP) was submitted as part of the EIA Report 2019 and SI 2019. The land take of crane hardstanding infrastructure accounted for the areas being proposed as part of the 2021 application for the larger rotor and turbine infrastructure.

Consultee	Points Raised	Response
	watercourse crossings are designed to accommodate the 1 in 200-year event and other infrastructure is located well away from watercourses, SEPA do not foresee from current information a need for detailed information on flood risk.	e) oPMP does not include for the forestry removal. f) Borrow pit locations were included in the EIA Report 2019 supported by a Borrow Pit Assessment (BPA) detailing the extents and proposed earthworks associated with the extraction. g) Schedule of Mitigation not included as consistent with the Hydrology chapter in EIA Report 2019. h) Details of borrow pit management plan and pollution prevention are included in the BPA and CEMP submitted as Technical Appendices in the 2019 application. i) Figure illustrating the surface water drainage on site layout, not included. j) Figure illustrating the surface water drainage on site layout, not included. k) As outlined in the EIA Report 2019, no groundwater abstractions exist within 250 m of Proposed Development infrastructure and no groundwater abstractions are proposed as part of the Proposed Development. l) Decommissioning Statement not included as no change from previous application.

Consultee	Points Raised	Response
The Highland Council - Flood Risk Management Team	As before, it is advised that the EIAR needs to address the nature of the hydrology and hydrogeology of the site, and of the potential impacts on water courses, water supplies including private supplies, water quality, water quantity and on aquatic flora and fauna. Impacts on watercourses, lochs, groundwater, other water features and sensitive receptors, such as water supplies, need to be re-assessed. The Council's Flood Risk Management Team had no comments to make at this stage. However, there are a number of watercourses and waterbodies on the site therefore the following applies: • A minimum of a 50m buffer of all watercourses / bodies, except water crossings is required; • Access tracks not acting as preferential pathways for runoff and efforts being made to retain existing natural drainage wherever possible; • Natural flood management techniques should be applied to reduce the rate of runoff where possible; use of SuDS to achieve pre-development runoff rates and to minimise erosion on existing watercourses; • Water crossings in the form of culverts or	A re-assessment of hydrological resources is provided within this Chapter. The 50 m buffer of watercourses used for the EIA Report 2019 / Proposed Development design has been adhered to for the increase in crane hardstanding areas. Sustainable Urban Drainage Systems (SuDS) measures outlined in the CEMP submitted with the EIA Report 2019 will be utilised to ensure surface water is managed across the Proposed Development. All crossings will be designed to the 1:200-year event plus an appropriate uplift for climate change. No land raising will occur within the floodplain.

Consultee	Points Raised	Response
	bridges, or upgrades to existing crossings must be designed to accommodate to 1 in 200-year flood event, plus climate change; • Land rising within any floodplain to be avoided; if ultimately required, compensatory storage must be provided; and • The EIAR should be informed by the Council's Flood Risk and Drainage Impact Assessment SG. The need for, and information on, abstractions of water supplies for concrete works or other operations should also be identified. The EIAR should identify whether a public or private source is to be utilised. If a private source is to be utilised, full details on the source and details of abstraction need to be provided. The Council's Environmental Health Team have advised that there are private water supplies in the vicinity of this development and the applicant has undertaken an assessment of potential impacts from construction etc. The conclusion is that effects are likely to be negligible taking into account the use of best practice to avoid contamination or disruption. The CEPM states that "A surface water and groundwater monitoring programme will be established prior to the	No groundwater abstractions are proposed as part of the Proposed Development.

Consultee	Points Raised	Response
	construction phase of the Development." The previous consent included a condition requiring a surface water and groundwater monitoring program be put in place. This condition is advised to be retained.	
	The EIAR must consider the increased scale of the turbines and associated increase in supporting construction infrastructure with a focus on minimising risks of engineering instability relating to presence to peat on the site. An updated peat slide risk assessment in accordance with the Scottish Government Best Practice Guide for Developers will be expected. Assessment should also address pollution risk and environmental sensitivities of the water environment. It should include a detailed map of peat depth and evidence that the scheme minimises impact on areas of deep peat. The EIAR should include site-specific principles on which construction method statements would be developed for engineering works in peat land areas, including access roads, turbine bases and hard standing areas, and these should include particular reference to drainage impacts, dewatering and disposal of excavated peat.	oPMP in previous application considered a crane hardstand of 1,850m^2 as a conservative approach for peat disturbance in the absence of detailed crane hardstands, therefore no update to impact on peat and associated excavations required in assessment. PSRA update not included in this application but previous PSRA remains valid considering the marginal changes proposed in the crane hardstanding dimensions. CMS not included as no change to previous application.

Consultee	Points Raised	Response
	The EIAR should include a full updated assessment on the impact of the development on peat. The assessment of the impact on peat must include peat probing for all areas where development is proposed. The Council are of the view this should include probing not just at the point of infrastructure as proposed by the scheme but also covering the areas of ground which would be subject to micrositing limits.	
	SEPA have provided several site-specific peat and habitat related comments within their Scoping consultation response. These are summarised below for ease of reference, however, the applicant and their design team should review their response in full, as well as their appended detailed scoping requirements.	
	As stated in the Scoping report (1 of 4), SEPA note that from the previous proposals as compared to the current, that the number of turbines have been reduced to five which reduces the environmental footprint of the proposed development.	Acknowledged
	Looking at the Carbon and Peatland map (2016) on GIS, the new proposed development is mostly on	The information requested is provided in the previous application. With only the crane hardstanding

Consultee	Points Raised	Response
	class 1 peatland with some class 2 and class 5 peatland also present. As first principle SEPA always ask that areas of deep peat is avoided entirely. The applicant must therefore minimise the amount of peat disturbed/excavated and avoid areas of deep peat and it is important to mitigate against any impacts and compensate for the loss where this is the case. The developer should therefore submit; peat depth survey maps; Peat Management Plan and information on mitigation measures to be adopted. For example, the proposed access track between T5 and T4 goes through an area of deeper peat, SEPA therefore advise that the applicant microsites the track into an area of shallower peat. Where this is not achievable, proposals to put in a floating track through this section should be considered. Also, from the information submitted with this application, it appears that T4 is located on deep peat. Again, SEPA ask that the area is micro-sited and T4 is moved into an area of shallower peat.	increased the information previously submitted still remains valid, although it should be noted that the PMP considered the crane hardstanding of 1850m2 in its calculations.

Baseline Conditions

12.14. The Core Study Area is the same as the SI 2019 and all infrastructure proposed is located within this area.

12.15. There have been no changes to land use and no substantial changes to the hydrological regime associated with the Proposed Development.

12.16. It is considered that receptors identified as having high sensitivity in the EIA Report 2019 remain the same and these include:

- Groundwater; and
- Private Water Supplies.

12.17. There are no changes in baseline conditions for the Proposed Development in relation to hydrology, hydrogeology, geology and peat. The published mapping and findings of the peat depth surveys remain unchanged.

Assessment of Potential Effects

12.18. A full description of the Proposed Development layout is provided in Chapter 3 of this EIA-R. The increase in crane hardstanding area from 1,100 m^2 to 1,850 m^2 is of relevance to this assessment.

12.19. All other infrastructure remains the same as the SI 2019, including the re-use of the existing access track and watercourse crossing to access the operational Lochluichart Wind Farm.

12.20. There is no proposed infrastructure in areas of the Core Study Area that has not been previously assessed in terms of hydrology, hydrogeology, geology and peat.

12.21. Given the marginal increase in crane hardstanding areas at the Proposed Development in comparison to the EIA Report 2019, there is increased potential for the following effects compared to the layout presented in the EIA Report 2019:

- Sedimentation;
- Increase in runoff and flood risk
- Effects on PWD; and
- Effects on the hydrological function of wetland habitats.

12.22 The effects on peat are unchanged from the EIA Report 2019 as the footprint assessed in line with excavation and reuse for the oPMP was 1,850 m^2. As such, the oPMP does not require to be updated.

12.23 The increased footprint of the crane hardstanding for each turbine will remain outwith the 50 m buffer of watercourses. As such, potential effects associated with sedimentation and effects on PWS remain the same as the EIA Report 2019 (negligible).

12.24 The measures outlined in the CEMP, such as SuDS, would ensure that the additional surface water run-off rates associated with the increase in hardstanding would be managed and the effects of increase in runoff and flood risk would remain negligible and not significant in terms of the EIA Regulations.

12.25 Potential effects associated with surface water run-off during the operational phase are considered to be marginally increased as a result of the Proposed Development but remain negligible and not significant in terms of the EIA Regulations.

Assessment of Cumulative Effects

12.26 No large-scale construction projects have been identified within the wider 10 km Core Study Area since the submission of the EIA Report 2019 and SI 2019.

12.27 The conclusion of the cumulative assessment presented within the EIA Report 2019 and the SI 2019, which stated that with construction good practice there would be no significant effects, remain valid.

Mitigation Measures and Residual Effects

12.28 No additional mitigation is proposed as a result of the Proposed Development.

12.29 The embedded development design, such as 50 m buffers of watercourses and the measures outlined in the draft CEMP submitted with the EIA Report 2019, such as the use of SuDS to attenuate surface water run-off rates, remains appropriate to limit the potential for hydrological effects.

12.30 Therefore, the conclusions of the EIA Report 2019 and SI 2019, remain valid and there will be no significant residual effects on hydrology, hydrogeology, geology and soils as a result of the Proposed Development.

Summary

12.31 The Proposed Development retains the same amount of new access track and number of watercourse crossings but marginally increases the footprint of the crane hardstanding for each turbine. Good construction practice, such as the use of 50 m buffers from watercourses and suitably sized SuDS will ensure the Proposed Development would not increase the significance of effects assessed in the EIA Report 2019 and SI 2019 in terms of hydrology, hydrogeology, geology and peat.

References

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