

APPENDIX 14.3:

SURFACE WATER MANAGEMENT PLAN

Introduction

1. This draft Surface Water Management Plan (sometimes referred to as a Drainage Management Plan) follows the principles of Sustainable Drainage Systems 'SUDS' in accordance with best practice standards and guidelines. This plan will be refined as the wind farm detailed design is developed and finalised. Final plans will be submitted for consultation and/or approval with other interested bodies as required by agreement or planning condition. Further details on the hydrological regime onsite and the impacts of the wind farm are given in **Chapter 14** of the Environmental Statement and include **Figure 14.3**

Surface Water Management

2. The overall design philosophy for surface water management onsite is to:
 - minimise any change to the hydrology and groundwater conditions within the site. Replicate existing hydrology regimes for the site;
 - minimise sediment loads in the runoff through: diversion of clean upstream water to avoid sediment pick-up; and the use of infiltration and settlement ponds to remove entrained sediments from track runoffs;
 - avoid high flow velocities. Provide multiple outflow structures to avoid the re-suspension of sediment and reduce erosion;
 - reduce erosion potential from current baseline by stabilising and re-vegetating exposed slopes alongside existing tracks which are to be used for the development. Ensure new tracks have stable banks with the vegetation replaced to minimise erosion potential;
 - introduce measures to ensure livestock do not contribute to erosion of track sides and vegetation in ditches through management, fencing and provision of alternative drinking water locations;
 - ensure that any runoff discharged from the site is in compliance with approved standards; and
 - initiate and maintain a programme of water quality monitoring and testing.
3. The water management infrastructure installed during the construction of the project will not only minimise impacts on sensitive water features and other local receptors, but ensures a 'net improvement' in the hydrological regime compared to the current baseline. This improvement will be permanent.

Current Baseline Wind Farm Area

4. Lengths of the existing network of tracks have been cut into the hillsides and in some places have resulted in exposed soil slopes which are susceptible to erosion during heavy rainfall. It is observed that where water pools in trackside ditches, particularly near cattle feeding stations, livestock enter the ditches to drink, trampling the soils and increasing the

rate of erosion. Heavy rainfall then causes further slippage of material from above into the ditches. The process of erosion and trampling is then repeated. This material is then washed across the tracks onto surface vegetation and onwards into watercourses. It is collected in settlement ponds, but in prolonged rainfall the volumes do not allow adequate residence time to allow re-settlement of suspended sediments.

Current Baseline Non Wind Farm Area

5. Site investigations with NRW Officers have highlighted the current potential for discolouration of the River Wye by entrainment of material in the runoffs from the network of tracks and hard stoned areas. Many of the tracks away from the wind farm on the western side of Y Drum have culverts that run directly across the lower car park area and into the River Wye. Currently no measures are in place to reduce erosion at source, or to slow down run off to allow settling out of sediment before entering the river.

Existing Track Upgrade and Side Slope Stabilisation

6. Existing tracks will be regraded and reprofiled to meet the necessary specifications for turbine deliveries. Included in this design will be stabilisation and re-vegetation of the slopes on the sides to control erosion and sediment potential. A variety of geotextile grid materials (capable of stabilising slopes up to 70⁰) will be specified as required to control slope stability and allow vegetation to become established. Removing areas of exposed soils will greatly reduce erosion and sediment entrainment in water runoff. Evidence from existing tracks shows that where the batter of the slope remains shallow, re-vegetation occurs naturally. Mitigation will simply speed up this process.

Track and Crane Pad Drainage

7. The surface water management system indicated in **Figure 14.3** shows the intention to use surface water cut offs to intercept water above construction features (tracks and turbines) and to transfer it around or piped under these features. Natural surface runoff water will be allowed to percolate back into the vegetation below construction areas.
8. Down slope of construction features there will be drainage ditches and swales to capture water and divert it to silt traps or retention/settlement ponds. On steeper slopes roadside swales will incorporate checkdams to reduce flow velocities, discharge will be via vegetated buffer areas / mini-settlement ponds. All of the SUDS features described are indicative and will require further refining during the detailed design stage of the Project.

Construction Compound / Sub-station

9. Water from the hillsides above the compound will be collected in ditches either side of the compound and diverted away from the stoned compound area. The compound is already covered with compacted stone and clean imported stone will be added as required to improve surface conditions. The lower end of the compound will be have a suitable retaining structure such as stone filled gabion baskets to ensure no further compound 'creep' downslope. Water from around the substation compound and construction compound will flow through silt traps / buffer areas to the large existing retention pond south east of Y Drum on Nant Cwm y foel.

10. The exposed slopes where erosion is occurring along the tracks each side of Nant Cwm y Foel will be stabilized and re-vegetated to prevent erosion and hence sediment ingress into the River Wye. These ditches will be built in blind sections and will discharge overland into the Nant Cwm y Foel valley. Although the tracks will be constructed during dry weather (and in advance of the main construction period) water arising during the stabilisation period could, if necessary be treated by mechanical means to remove the sediment before discharge into the Nant Cwm y Foel.
11. The existing retention pond will be increased in capacity and the recently formed new retention pond will also be properly engineered to improve retention capacity and capability.
12. The intended function of these drainage features will be:
 - to control runoff velocity during intense rainfall events, hence mitigating erosion;
 - to reduce erosion rates by re-vegetating trackside slopes and ditches and to keep livestock from causing further damage;
 - to remove entrained sediments from track runoff;
 - to minimise sediment release to receiving watercourses; and
 - to remove any potential for increase in flood risk.
13. The Project will not introduce any direct discharge points to watercourses. Any surface runoff collected by the cut off drainage will be discharged as overland flow via vegetated buffers of appropriate widths. Runoff collected from the construction/hardstanding areas or tracks will pass through the required treatment processes before being discharged as overland flow in a similar manner.

Settlement (retention) Ponds

14. Settlement ponds are also used to entrap silt from existing watercourses during intense rainfall events. A new settlement pond is proposed below turbine 27. The existing settlement ponds at Nant Cwm y Foel will be improved along with the newly constructed settlement pond 250m further downstream. As with other features the settlement ponds will be designed in accordance with SUDS best practice.
15. Final sizing of individual drainage features will take place as part of the detailed design process, which will be informed by a detailed site survey. However, it is noted that the intention is to maintain existing runoff levels and where required due to the introduction of hardstanding. Indicative sub catchments for the track layout have been calculated in response to NRW request to demonstrate how run off rates will be maintained. See **Figure 14.3** and **Chapter 14**.
16. The construction phase is the primary period of concern for the SUDs system. However, these features will remain in perpetuity to ensure that the areas of hardstanding and new tracks associated with the development do not fundamentally change the hydrological regime. In order to ensure long-term efficiency of the drainage system regular checks and

maintenance will be undertaken to remove any blockages and build-up of sediment to make certain that the system is working as planned.

Water Quality Monitoring

17. A regime of water quality monitoring will be established and implemented for any works close to a water course to monitor changes in water quality during operations within the water courses that feed into the River Wye. The purpose of the monitoring will be to establish parameters below which it can be concluded that works are not causing excessive sedimentation and work can continue or should be halted.
18. Before construction begins a monitoring regime will be agreed with NRW and will, amongst other things, establish: typical ranges of turbidity for the water courses on site; levels below which work can take place; and, the maximum increase in nephelometric turbidity units (NTU) caused by the works before the operations should be halted.
19. Monitoring will be carried out using either a turbidity meter, a Secchi disc or transparency tube. The results will be expressed in nephelometric turbidity units (NTU). Monitoring will be carried out by the ECOW. It will be carried out upstream and downstream of any works and will measure the increase in NTU due to the works.

Farming Activities

20. Following discussions about the need to reduce erosion, the Landowners have given a commitment to removing cattle during winter months.

Wind Farm Conclusions

21. The wind farm will use a network of 9.5km of existing tracks and 6.9km of new tracks. All new and upgraded tracks will use a range of SUDS techniques to minimise erosion and control runoff. Stabilisation and re-vegetation of the slopes on the sides of new and upgraded tracks will be incorporated into the engineering design to control erosion and sediment potential. Hydrological regimes will be maintained and sediment control improved. The wind farm construction will deliver a net improvement to the current baseline and will have no detrimental effect on any of the rivers downstream including the River Wye SAC.