APPENDIX 12

SCHEDULE OF MITIGATION AND MONITORING

Planning and Environmental Consultants

Appropriate Assessment Screening Report and Natura Impact Statement – Appendix 12

Proposed Ballydermot Wind Farm, Co. Offaly and Co. Kildare

Appendix 12 – Mitigation and Monitoring

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1. SCHEDULE OF MITIGATION & MONITORING PROPOSALS

All mitigation and monitoring measures relating to the pre-commencement, construction, operational and decommissioning phases of the Proposed Project are set out in the NIS and associated appendices.

All mitigation which will be implemented during the various phases of the Proposed Project to protect the European Sites and their Qualifying Interests are presented in Table 1-1 below.

All monitoring measures which will be implemented during the pre-commencement, construction, operational and decommissioning phases of the Proposed Project are outlined in Table 1-2. All monitoring measures were set out in the NIS and associated appendices. The monitoring proposals are presented in terms of the monitoring requirement, frequency of monitoring and the mechanism for reporting results where applicable. By presenting the monitoring proposals in the below format, it is intended to provide a monitoring schedule that can be reviewed and tracked during all phases of the Proposed Project to ensure all the required monitoring is completed as required.

It is intended that the CEMP will be updated where required prior to the commencement of construction to include all mitigation and monitoring measures, planning conditions and or alterations to the EIAR and application documents should they emerge during the course of the planning process and would be submitted to the Planning Authority for written approval prior to the commencement of development. Similarly, the decommissioning plan will be updated and agreed with the local authority prior to the commencement of any decommissioning works.

1.1 NIS Mitigation Measures

Table 1-1 Schedule of Mitigation Measures

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Pre-Construction		
MM1	Potential for Indirect Effects on European Sites - Otter	Section 6.2.1 of the AASR/NIS	Prior to the commencement of construction works associated with the installation of watercourse crossings within the Project Site, a pre-commencement otter survey will be undertaken to ensure that no otter holts/breeding sites have been established since the original surveys were undertaken (TII, 2008a). This will be undertaken by a suitably qualified ecologist in accordance with standard best practice guidance.		
MM2	Potential for Indirect Effects on European Sites – Aquatic Fauna	Section 6.3.1 of the AASR/NIS	Prior to the commencement of works, Section 14 Authorisation from the Inland Fisheries Division of the Department of Environment, Climate and Communications will be obtained. Prior to the pumping out of water from the enclosure, electrofishing will be carried out within the dammed area and any recovered aquatic individuals will be relocated by the ECoW to suitable similar river habitat downstream of the works location, under licence. Only after electrofishing is complete and any fish species are removed, if present, may the water from within the dammed area begin to be pumped out from within this temporary works area.		
			Construction		
MM3	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Suspended Solids Entrainment in Surface Waters)	Section 6.1.1.1 of the AASR/NIS	**Proposed Mitigation by Avoidance** The key mitigation measure during the construction phase is the avoidance of sensitive hydrological features where possible, by application of suitable buffer zones (i.e. 50m to main watercourses, and 10m to main drains). The majority of the Proposed Project development areas are located significantly away from the delineated 50m watercourse buffer zones with the exception of new and proposed watercourse crossings, sections of access roads to the south of Proposed Turbine 37 (930m of access road) and in the south of Lodge Bog (130m		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			access road), crane hardstands associated with Proposed Turbines 36 and 38 and a small drain to the southwest of the Proposed Offsite Substation. Additional mitigation measures, which are outlined further on in this section, will be implemented at these locations within the hydrological buffer zone. The large setback distance from sensitive hydrological features means that adequate room is maintained for the proposed drainage mitigation measures (discussed below) to be properly installed and operate effectively. The proposed buffer zone will: › Avoid physical damage (river/stream banks and river/stream beds) to watercourses and associated release of sediment; › Avoid excavations within close proximity to surface watercourses; › Avoid the entry of suspended sediment from earthworks into watercourses; and, › Avoid the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone. In addition, the drainage systems for the Proposed Wind Farm and Proposed Onsite Substation will connect into the existing bog drainage network. Runoff will be conveyed through the existing field drains and main drains to the existing large IPC licenced settlement ponds[JL193.1][CM193.2], where it will undergo further settlement and attenuation prior to discharge from the bog. The nearest IPC licenced settlement pond is located approximately 160m from the nearest Proposed Turbine. As such, there is significant distance for wind farm related surface water to travel before it actually reaches the edge of the bogs and joins any receiving waters outside of the overall bog boundaries. **Proposed Mitigation by Design** There is an extensive network of drains already existing at the Proposed Wind Farm site. The existing drainage infrastructure is operating in accordance with IPC licence requirements, with environmental monitoring and silt control measures being implemented. The existing drainage system at the Proposed Wind Farm site will be maintained and expanded locally as		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			required for use within the Proposed Project drainage system. The key elements are the upgrading and improvements to water treatment elements, such as in-line controls and treatment systems, including wind farm related silt traps and settlement ponds. The elements of interaction with existing drains will be as follows: › Interceptor drains will convey clean runoff water around works areas to the existing downstream drainage system (field drains and main drains). Where required, interceptor drains will be installed in advance of any construction works commencing. This will ensure that clean water is kept clean by diverting surface water flow around excavations, construction areas and temporary storage areas. Where possible (depending on orientation), existing field drains can be used as interceptors drains; › Collector drains will be used to intercept and collect runoff from construction areas (from turbine base/hardstand areas, construction compounds, and the substation). During the construction phase temporary settlement ponds will be used to attenuate and treat runoff from the construction areas (from turbine base/hardstand areas, construction compounds, and the Proposed Onsite Substation) and treated water will then discharge into existing field drains and main drains. Temporary settlement ponds will be removed at the end of the construction phase (end of high risk period), and operating wind farm runoff will discharge into existing field drains and main drains; › During the construction phase, temporary silt traps (silt fences) will be used as an additional water protection measure around the existing bog drainage network, particularly where works are proposed within 50m of a natural watercourse. The silt fences will be placed in the existing drains downstream of construction works, and the associated construction area run-off water will be diverted into proposed interceptor drains, or culverted under/across the works area; › During the construction phase, dewatering silt bags will also be used as required. They can be used downgradient of turbine bases, where temporary pumping is required. Discharge from dewatering silt bags will flow into settlement ponds and treated water from settlement ponds will outfall to existing field drains and main drains;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› With regards to the proposed floating roads, and depending on intermediate topography, a collector drain (dirty water system as described above) may be used during construction stage, or over the edge (OTE) drainage will occur. OTE drainage allows runoff from access tracks to flow into local field drains and be managed via the existing site drainage system. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations (at least 150m from bog outfall locations. Silt traps and check dams will be installed in field drains downstream of OTE drainage areas, and these will provide attenuation and treatment of dirty water; and, › Culverts will be required where site roads and proposed hardstands cross the main bog drainage networks. These will be installed with a minimum gradient to reduce the entrainment of suspended solids. All culverts will be inspected regularly and maintained where appropriate. Culverts will remain in-situ during the operational phase of the Proposed Project. **Water Treatment Train** During the construction phase field testing (visual, supplemented with pH, electrical conductivity, temperature, dissolved oxygen and turbidity monitoring), sampling and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs (Environmental Quality Standards) will be undertaken by the ECoW (Environmental Clerk of Works) for each primary watercourse, and specifically following heavy rainfall events (i.e. weekly, monthly and event-based). If the discharge water from construction areas fails to be of a high quality, then a filtration treatment system (such as a 'Siltbuster®' or similar equivalent treatment train (sequence of water treatment processes)) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This will apply for all of the construction phase **Silt Fences:**		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to the existing drainage network of sand and gravel-sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin and entrained in surface water runoff. Regular inspection of these structures will be undertaken by the ECoW and regular maintenance will be completed by the contractor during construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. **Silt Bags:** Silt bags will be used where small to medium volumes of water need to be pumped from excavations (e.g. the proposed underpass locations). As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through. **Pre-emptive Site Drainage Management:** The works programme for the construction stage of the development will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of peat/subsoil or peat stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast. The following forecasting systems are available and will be used on a daily/weekly basis, as required, to allow site staff to direct proposed and planned construction activities: › General Forecasts: Available on a national, regional and county level from the Met Éireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates; › MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events; › Rainfall Radar Images: Images covering the entire country are freely available from the Met Éireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and, › Consultancy Service: Met Éireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest. Using the safe threshold rainfall values will allow planned works to be safely executed (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event. Earthworks will be suspended if forecasting suggests any of the following is likely to occur: › >10 mm/hr (i.e. high intensity local rainfall events); › >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or, › >half monthly average rainfall in any 7 days. Prior to earthworks being suspended the following control measures will be completed: › Secure all open peat/spoil excavations; › Provide temporary or emergency drainage to prevent back-up of surface runoff; and, › Avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded. **Management of Runoff from Peat and Spoil Areas** All excavated peat and overburden will be placed/spread alongside the excavations for the infrastructure elements. Excavated peat and spoil will be transported immediately on excavation to designated peat and spoil areas alongside the hardstands and access roads or		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			used for landscaping. During the initial placement of peat and spoil, silt fences, straw bales and biodegradable geogrids will be used to control surface water runoff from the storage areas as required. Interceptor and collector drains will be used at storage areas. 'Siltbuster' treatment trains will be employed if previous treatment is not to a high quality. **Timing of Site Construction Works:** Construction of the site drainage system will only be carried out during periods of low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and operational for all subsequent construction works. **Proposed Drainage and Water Quality Monitoring:** An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works and will be included in the Construction and Environmental Management Plan (CEMP; Appendix 9). Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Any excess build-up of silt levels at dams, the settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. During the construction phase field testing (visual, supplemented with pH, electrical conductivity, temperature, dissolved oxygen and turbidity monitoring), sampling and		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			laboratory analysis of a range of parameters[1] with relevant regulatory limits and EQSs will be undertaken for each primary watercourse, and specifically following heavy rainfall events (i.e. weekly, monthly and event-based). The data will be processed and analysed and works will cease if elevated turbidity concentrations are recorded. In this event, all upstream silt traps and drainage routes will be inspected by the ECoW or the Site Manager to identify the cause of the elevated turbidity levels. Works will not recommence until any issues have been resolved and the turbidity concentrations have returned to background concentrations. **Works within the 50m Hydrological Buffer Zones:** The following additional mitigation measures will also be implemented at those locations identified above where works are within the 50m hydrological buffer zone: › Double or triple silt fences will be placed downgradient of all work locations within the hydrological buffer zones; › All works will be completed during the dry weather periods and works will be postponed in the event of rainfall; and, › The hedgerow separating the small drain to the southwest of the Proposed Offsite Substation will be retained. This drain is not shown on the EPA databases but was recorded during site surveys. The drain was described as being heavily vegetated and with a low flow. Retaining the hedgerow will act as an additional protection measure to this drain.		
MM4	Potential for Indirect Effects on European Sites – Deterioration of Water Quality	Section 6.1.1.2	Management of excavation seepages and subsequent treatment prior to discharge into the drainage network will be undertaken for excavation works across the Project Site, as follows: › Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place;		

[1] *example suite: pH (field measured), Electrical Conductivity (field measured), temperature (field measured), Dissolved Oxygen (field measured), Turbidity (NTU) (sonde measured), Flow (m/s), Total Suspended Solids (mg/l), Ammonia, Nitrite (NO_2) (mg/l), Ortho-Phosphate (P) (mg/l), Nitrate (NO_3) (mg/l), Phosphorus (unfiltered) (mg/l), Chloride (mg/l), and BOD (mg/l).*

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
	(Excavation Dewatering)		› If required, pumping of excavation inflows will prevent the build-up of groundwater in the excavation; › The interceptor drainage will be discharged to the existing drainage system or onto natural vegetated bog surfaces within the Project Site and not directly to any natural watercourse; › The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a "Siltbuster®" unit; › There will be no direct discharge to the existing drainage network and therefore no risk of hydraulic loading or contamination will occur; and, › Daily monitoring of excavations and the water treatment system by a suitably qualified person (ECoW) will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped, and a geotechnical assessment will be undertaken.		
MM5	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Leaks or Spills of Hydrocarbons)	Section 6.1.1.3 of the NIS	› Refuelling and maintenance of construction vehicles and plant will, where practicable, be undertaken off-site at controlled, designated fuelling facilities. Where refuelling or maintenance is required on-site, it will be undertaken at designated areas in accordance with the CEMP and appropriate pollution prevention procedures; › On-site re-fuelling will be undertaken using a double skinned bowser or a refuelling truck with spill kits kept onboard; › Only designated trained operatives will be authorised to refuel plant on-site; › Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system; › All fuel storage areas will be bunded appropriately for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area; › Fuel and oil stores including tanks and drums will be regularly inspected by the appointed EnvCoW for leaks and signs of damage;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› The Proposed Onsite Substation and the Proposed Offsite Substation will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor; › The plant used during construction will be regularly inspected for leaks and fitness for purpose; and, › An emergency response plan for the construction phase to deal with accidental spillages is contained within the CEMP (which is contained in Appendix 9).		
MM6	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Release of Cement-Based Products)	Section 6.1.1.4 of the AASR/NIS	› No batching of wet-cement products will occur on site. Ready-mixed concrete will be delivered to site and, where possible, pre-cast elements will be used; › Where possible pre-cast elements for culverts and concrete works will be used; › No washing out of any plant used in concrete transport or concreting operations will be allowed on-site; › Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be isolated in temporary lined wash-out pits located near proposed site compounds. These temporary lined wash-out pits will be removed from the site at the end of the construction phase; › Any washing out of concrete pumping plant will also be into the temporary lined wash-out pits; › Will use weather forecasting to plan dry days for pouring concrete; and, › Will ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event.		
MM7	Potential for Indirect Effects on European Sites – Deterioration of Water Quality	Section 6.1.1.5 of the AASR/NIS	› There are a total of 10 no. proposed construction compounds associated with the Proposed Project (the locations are detailed in Table 2-2 of this AASR and NIS); › During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used at each of the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
	(Wastewater Disposal)		› Water supply for the site office and other sanitation will be brought to the Project Site and removed after use from the site to be discharged at a suitable off-site treatment location; and, › No water or wastewater will be sourced on the Project Site, nor discharged to the Project Site		
MM8	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Piled Foundations)	Section 6.1.1.6 of the AASR/NIS	The proposed mitigation measures designed for the protection of downstream surface water quality and groundwater quality will be implemented at all construction work areas, including piling works associated with the foundations. › Mitigation measures for sediment control are detailed in Section 6.1.1.1, and 6.1.1.2 › Mitigation measures for the control of hydrocarbons during construction works are detailed in Section 6.1.1.3 › Mitigation measures for the control of cement-based products during construction works are detailed in Section 6.1.1.4 › Mitigation measures in relation to wastewater are detailed in Section 6.1.1.5 Proposed mitigation measures relative to piling works will comprise: › Where driven piles are used, they will have a cross section without re-entrant angles; › Strict QA/QC procedures for piling works will be followed; › Piles will be kept vertical during piling works; and, › Where required, a bentonite seal will be used to prevent upward/downward movement of surface water/groundwater.		
MM9	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Crossing of Watercourses at the	Section 6.1.1.7 of the AASR/NIS	The Proposed Wind Farm design has been optimised to utilise the existing infrastructure and existing watercourse crossings where practicable. Of the 15 no. watercourse crossing locations, a number are existing crossings which reduces the nature of the works required. The crossings comprise of proposed new crossings, upgrade to existing crossing and the replacement of existing crossings. The proposed crossing types include clear-span bridges, bottomless culverts and appropriately sized culverts as outlined in Section 2.3.1.11.1. Mitigation measures for the proposed watercourse crossings are detailed below:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
	Proposed Wind Farm)		› Clear-span bridge crossings will be designed to span the watercourse without disturbance to the watercourse bed and with abutments located outside the channel where practicable. No in-stream excavation works will be required for the clear-span crossings; › Where bottomless culverts are proposed, the natural watercourse bed will be retained through the crossing where practicable. Construction will be undertaken from outside the watercourse channel and appropriate measures will be implemented to prevent the mobilisation of sediment into the watercourse; › Where box culverts or pipes are proposed, the crossing will be suitably sized for the expected peak flows and designed to maintain hydraulic conveyance. Any works required within or immediately adjacent to the watercourse will be undertaken in accordance with the relevant OPW and IFI requirements and appropriate sediment and pollution control measures will be implemented. Works at these locations will be undertaken in the dry; › Existing crossings requiring upgrading or replacement will be constructed in a manner that minimises disturbance to the existing watercourse and its banks. Where existing structures are to be removed, works will be undertaken in accordance with the approved construction methodology and appropriate measures will be implemented to prevent sediment mobilisation; › All proposed new and upgraded crossings will be designed to maintain existing watercourse flow conveyance and to avoid creating a restriction to flow or increasing flood risk upstream or downstream of the crossing; › All guidance / mitigation measures required by the OPW and/or the Inland Fisheries Ireland (IFI)[2] is incorporated into the design of the proposed crossings; › All drainage measures will be installed in advance of the works; › Plant and equipment will not be permitted to track across the watercourse; › Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of a temporary pre-cast concrete or metal bridge;		

[2] *Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› As a further precaution, near stream construction work, will only be carried out during the period permitted by IFI for in-stream works according to the IFI (2016) guidance document "Guidelines on protection of fisheries during construction works in and adjacent to waters", i.e., July to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI); › Where works are necessary inside the 50m buffer of watercourses double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase; › All new river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent; The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material. Confirmatory inspections of the proposed new watercourse crossing location will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing. All new proposed culverts and proposed culvert upgrades at field drain crossings required for the Proposed Wind Farm will be suitably sized for the expected peak flows in the watercourse. All culverts will be inspected regularly by the ECoW, Site Manager and/or contractor to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM10	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Crossing of Watercourses along the Proposed Grid Connection)	Section 6.1.1.8	Prior to the commencement of cable trenching or watercourse crossing works the following key temporary drainage measures will be installed: › A double silt fence perimeter will be placed along the road verge on the down-slope side of works areas that are located inside the watercourse 50m buffer zone; › The following mitigation measures are proposed for the Proposed Grid Connection crossing works: ○ No stockpiling of construction materials will take place along the grid route; ○ No refuelling of machinery or overnight parking of machinery is permitted in this area; ○ No concrete truck chute cleaning is permitted in this area; ○ Works will not take place at periods of high rainfall, and will be scaled back or suspended if heavy rain is forecast; ○ Local road drainage, culverts and manholes will be temporarily blocked during the works; ○ Machinery deliveries will be arranged using existing structures along the public road; ○ All machinery operations will take place away from the stream and ditch banks, apart from where crossings occur. Although no instream works are proposed or will occur; ○ Any excess construction material will be immediately removed from the area and sent to a licenced waste facility; ○ Spill kits will be available in each item of plant required to complete the works; and, ○ Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.		
MM11	Potential for Indirect Effects on European Sites – Deterioration of	Section 6.1.1.9 of the AASR/NIS	Measures employed to prevent overdosing and potential chemical carryover: › The siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding reagents, so overdosing cannot occur;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
	Water Quality (Use of Siltbuster)		› Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated, suitably qualified staff, means the correct amount of chemical is added by the dosing system; › Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment; › Final effluent not meeting the discharge criteria will be recycled and retreated, which has a secondary positive effect of reducing carryover; and, › The use of biodegradable chemical agents will be implemented at very sensitive sites (i.e. adjacent to SACs).		
MM12	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Tree Felling and Vegetation Removal)	Section 6.1.1.10 of the AASR/NIS	Tree felling operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents, including the specific guidelines listed below, to ensure that felling, planting and other forestry operations result in minimal potential negative effects to the receiving environment. › Forestry Standards Manual (Forest Service, 2015) › Forest Protection Guidelines (Forest Service, 2002) › Forest Operations and Water Protection Guidelines (Coillte, 2013) › Forestry and Water Quality Guidelines (Forest Service, 2000b) › Forestry and the Landscape Guidelines (Forest Service, 2000c) › Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018) › Coillte Planting Guideline SOP › Code of Best Forest Practice (Forest Service, 2000) **Proposed Mitigation by Avoidance** There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines" are shown in Table 6-1.		

<table>
<tr><th>Ref. No.</th><th>Reference Heading</th><th>Reference Location</th><th>Mitigation Measure</th><th>Audit Result</th><th>Action Required</th></tr>
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The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively. The buffer/setback zone will:

› Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment;
› Avoid soil disturbance and compaction within close proximity to surface watercourses;
› Avoid the entry of suspended sediment from works into watercourses; and,
› Avoid the entry of suspended sediment from the drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

Minimum Buffer Zone Widths (Forest Service, 2000)
<table>
<tr><th colspan="2">Average slope leading to the aquatic zone</th><th>Buffer zone width on either side of the aquatic zone</th><th>Buffer zone width for highly erodible soils</th></tr>
<tr><td>Moderate</td><td>(0 – 15%)</td><td>10 m</td><td>15 m</td></tr>
<tr><td>Steep</td><td>(15 – 30%)</td><td>15 m</td><td>20 m</td></tr>
<tr><td>Very steep</td><td>(>30%)</td><td>20 m</td><td>25 m</td></tr>
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In addition to the application of buffer/setback zones, the following supplementary mitigation measures will be employed during felling works:
Proposed Mitigation by Design:

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:
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</table>

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance; › All machinery will be operated by suitably qualified personnel; › Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works; › Machines will traverse the Project Site along specified off-road routes (referred to as racks); › The location of racks will be chosen to avoid wet and potentially sensitive areas; › Brash mats will be placed on the racks to support the vehicles on soft ground, reducing mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when mats become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall; › Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement for runoff from work areas and will prevent sediment from entering downstream watercourses. Accumulated sediment will be carefully disposed of at pre-selected peat and spoil areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground; › In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed on Site during construction; › Double silt fencing will also be put down slope of felling areas which are located in close proximity to streams and/or relevant watercourses; › Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Timber will be stacked in dry areas, and outside watercourse buffer zones. Check dams and silt traps will be emplaced on the down gradient side of timber storage/processing sites; › Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff; › Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone or within 20m of any other hydrological feature. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and, › Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors. **Silt Traps:** Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner. **Timing of Proposed Project Felling Works:** Felling will only be carried out during periods of no or low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. **Drain Inspection and Maintenance** The following items will be carried out during pre-felling inspections and after: › Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines; › Inspection of all areas reported as having unusual ground conditions;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Inspection of main drainage ditches and outfalls. During pre-felling inspections the main drainage ditches will be identified. Ideally the pre-felling inspection will be carried out during rainfall; › Following tree felling all main drains will be inspected to ensure that they are functioning; › Extraction tracks within 10m of drains will be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground; › Culverts on drains exiting Project Site, if impeded by silt or debris, will be unblocked; and, › All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall. **Surface Water Quality Monitoring** Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity by the appointed ECoW. The 'before' sampling will be conducted within 4 weeks of the felling activity commencing, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e. where an impact has been shown). Criteria for the selection of water sampling points include the following: › Avoid man-made ditches and drains, or watercourses that do not have year round flows, i.e. avoid ephemeral ditches, drains or watercourses; › Select sampling points upstream and downstream of the forestry activities; › It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Downstream locations will be selected: one immediately below the forestry activity, the second at exit from the forest, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location); and, › The above sampling strategy will be undertaken for all on-site sub-catchments streams where tree felling is proposed. Daily surface water monitoring forms (for visual inspections and field chemistry measurements) will also be utilised at every works site near any watercourse (to be completed by the ECoW). These will be taken daily and kept on site for record and inspection.		
MM13	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Fluvial Flooding)	Section 6.1.1.11 of the AASR/NIS	Despite the low likelihood of a fluvial flood event occurring during the construction of the Proposed Wind Farm, weather/rainfall events of those magnitudes likely to generate significant rainfall which would in turn cause fluvial flooding would be forecastable. An emergency response system has been developed for the construction phase of the Proposed Project to respond to high rainfall events which may result in fluvial flooding. A potential high intensity rainfall event would likely to be identified 3-5 days in advance, with more accurate forecasts of severity within 24-48 hours of occurrence. Preparations for a flood event would begin from the initial indications that there may be a high rainfall event. This would allow time for the preparation and the implementation of additional emergency mitigation measures as outlined below. As above, the first point of mitigation is ongoing monitoring of weather forecasts and weather warning. The project EM (Environmental Manager) or the site ECoW will be responsible for monitoring weather forecasts during the construction phase. There will be a 24-hour advance meteorological forecasting (Met Eireann download) linked to a trigger-response system. When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			rainfall event longer than 4 hour duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken. Cessation of all construction works until the storm event, including the storm runoff has passed. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the Project Site will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc. Exposed soils/peat (exposed temporary stockpiles) will be covered with plastic sheeting during all relatively heavy rainfall events and during periods where works have temporarily ceased before completion at a particular area (e.g., overnight and weekends). With regards to the fluvial flood zones at the Proposed Wind Farm site, a managed retreat from the fluvial flood zones will be implemented in the event of a high intensity rainfall event and/or weather warning related to rainfall. This will include the following: › Any areas where soil/subsoil is exposed at the surface will be compacted firmly with a digger bucket of a suitably sized excavator. › Open trenches will be backfilled and compacted. › Existing sediment control measures will be removed, as these may be washed away and deposited elsewhere by the floodwaters. › Site access tracks will be scraps and any excess soft material will be removed from the flood zones. › All plant, machinery and equipment will be removed from the flood zones. With regards to the flood zones mapped along the Proposed Grid Connection underground cabling route, works in the vicinity of these watercourse crossings will be postponed in the event of flood or high flows in the river.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM14	Potential for Indirect Effects on European Sites – Otter	Section 6.2.1 of the AASR/NIS	In the unlikely event that an otter holt is identified within 150m of the proposed works during the pre-construction surveys, consultation will be undertaken with the NPWS and a derogation licence applied for, in line with TII (2008b) *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes*. › All conditions of a derogation licence will be implemented in full. › No works will be undertaken within 150m of any holts at which breeding females or cubs are present. › No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under licence › All of the above works will be undertaken or supervised by an appropriately qualified ecologist.		
MM15	Potential for Indirect Effects on European Sites – Aquatic Fauna	Section 6.3.1 of the AASR/NIS	In addition to the measures outlined in Section 6.1.1 above relating to protection of water quality, the following mitigation measures will be strictly adhered to during proposed in-stream works: › All in-stream works will be undertaken in line with IFI (2016) *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* and OPW (2019) *Environmental Guidance: Drainage Maintenance and Construction*[3]. › All guidance / mitigation measures required by the OPW and/or the IFI is incorporated into the design of the proposed crossings; › All in-stream works will be supervised by an ECoW, who will have the power to halt works if non-compliance is observed; › All drainage measures will be installed in advance of the works; › All operatives will be trained in how to address the environmental risks and best practice measures;		

3 Brew, T., Gilligan, N., 2019, Environmental Guidance: Drainage Maintenance and Construction. Series of Ecological Assessments on Arterial Drainage Maintenance No 13. Environment Section, Office of Public Works, Trim, Co. Meath, Ireland.

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› In accordance with OPW (2019), in order to accommodate lamprey spawning and berried white-clawed crayfish (i.e. carrying eggs), no works may be carried out from end March to mid-July; › In order to minimise causing direct physical damage and mortality of species living in the riverbed, the temporary dam will be constructed using sand bags and these will be placed at an extremely slow pace, such that any animals within the vicinity of the footprint will have a chance to leave for alternative suitable areas before potentially harmful effects; › Machinery, construction equipment and construction materials will not enter the water; the works will only occur after the dry working area is created; › Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of a temporary pre-cast concrete or metal bridge; › Once the foundations have been completed at both sides of the watercourse, the pre-cast concrete box culvert will be installed using a crane and there will be no contact with the watercourse; › Where the box culvert is installed in sections, the joint will be sealed to prevent granular material entering the watercourse; › All machinery, PPE and equipment used within the watercourse will be thoroughly cleaned prior to entering the watercourse. All machinery will be visually inspected by the ECoW and any vegetation or debris removed. All machinery, PPE and equipment will then be disinfected using a broad-spectrum cleaner (e.g. 1% solution of Virkon Aquatic or another proprietary disinfection product) prior to entering the watercourse and after removal from the watercourse to ensure biosecurity is upheld and limit the spread of invasive species and infectious waterborne diseases. This will occur within a designated wash-down area, which will be underlain by a washable membrane or hard surface; › As a further precaution, near stream construction work, will only be carried out during the period permitted by IFI for in-stream works according to the IFI (2016) guidance document '*Guidelines on protection of fisheries during construction works in and*		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			adjacent to waters[4]', i.e., July to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI).		
			Operation		
MM16	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Progressive Replacement of Natural Surface with Lower Permeability Surfaces)	Section 6.1.2.1 of the AASR/NIS	**Mitigation by Design** As the part of the Proposed Project drainage design, it is proposed that runoff from the proposed infrastructure will be collected locally in new proposed silt traps/settlement ponds and vegetated buffer areas prior to release into the existing drainage network. The new proposed drainage measures will then create significant additional attenuation to what is already present. The operational phase drainage system will include the following: › Interceptor drains (for collecting and redistributing clean water) will be installed up-gradient of all proposed infrastructure to intercept clean surface runoff and minimise the volume of runoff entering construction areas where suspended sediment could become entrained. Intercepted clean water will be directed around the works and redistributed to downstream field drains. Where practicable, existing field drains will be utilised for this purpose; otherwise, new interceptor drains will be installed › Collectors drains will be installed downstream of works areas to collect runoff from access roads, turbine hardstands and other construction areas where suspended sediment may become entrained. This runoff will be conveyed to local settlement ponds for treatment and settlement of suspended sediment prior to discharge to the nearest downstream field drain or main drain;		

[4] *IFI (2016) Guidelines on the Protection of Fisheries During Construction Works and Adjacent to Waters. Inland Fisheries Ireland.*

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› On steeper sections of access road, transverse drains ('grips') will be installed, where appropriate, within the road surface layer of the road to intercept runoff and divert it to adjacent roadside collector drains; › Check dams will be used along sections of access road collector drains, where appropriate, to reduce flow velocities and promote the settlement of suspended sediment. Check dams will be constructed using 4/40mm non-friable crushed rock and will be installed at 25m or 50m intervals, depending on the local gradient; › Settlement ponds, emplaced downstream of access road sections and at Proposed Turbine locations, will buffer volumes of runoff discharging from the existing drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to existing downstream field/main drains; and › All surface water runoff from the Proposed Project will have to pass through the existing IPC licence settlement ponds at the existing bog outfall locations prior to onward flow to surrounding streams and rivers.		
MM17	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Suspended Solids Entrainment)	Section 6.1.2.2 of the AASR/NIS	Mitigation measures for sediment control are the same as those outlined in Section 6.1.1.1. Mitigation measures for control of hydrocarbons during maintenance works are similar to those outlined in Section 6.1.1.3.		
MM18	Potential for Indirect Effects on European Sites – Deterioration of Water Quality (Release of Wastewater)	Section 6.1.2.3 of the AASR/NIS	It is proposed to install sealed underground holding tanks for effluent (wastewater) at the control buildings. The tanks will be routinely emptied by a licensed contractor. A level sensor will be installed in the tanks which will be linked to the on-site SCADA system. If the level of the tank contents rise to a predetermined 'high' level a warning will appear on the overall SCADA system for the site and automatic notification will be sent to the facility manager. A formal service agreement will be entered into with a suitably permitted waste contractor, in relation to the servicing and de-sludging of the wastewater holding tank on-site. There will be		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			no discharge of wastewater to ground at the Project Site, and therefore there is no potential to impact groundwater or surface water quality.		
			Decommissioning		
MM19	Potential for Indirect Effects on European Sites – Deterioration of Water Quality	Section 6.1.3 of the AASR/NIS	Mitigation measures will be implemented as per the construction phase mitigation measures outlined in Section 6.1.1.		
MM20	Potential for Indirect Effects on European Sites – Otter	Section 6.2.2 of the AASR/NIS	The same mitigation to prevent adverse effects on otter as a result of disturbance during construction will be implemented during the decommissioning phase.		
MM21	Potential for Indirect Effects on European Sites – Aquatic Fauna	Section 6.3.2 of the AASR/NIS	As outlined in Section 6.1.3 in relation to deterioration of water quality, the potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works. It is considered that Project Site roadways could be in use for purposes other than the operation of the Proposed Project by the time the decommissioning of the Proposed Wind Farm is to be considered, and therefore it may be more appropriate to leave the Project Site roads in-situ for future use. It is envisaged that the roads will be widely utilised for amenity purposes by the local community.		

1.2 NIS Monitoring Measures

Table 1-2 - Schedule on Monitoring Measures

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
Construction Phase						
MX1	Surface Water Quality Monitoring	Section 6.1.1.1 of the AASR/NIS	› During the construction phase field testing (visual, supplemented with pH, electrical conductivity, temperature, dissolved oxygen and turbidity monitoring), sampling and laboratory analysis of a range of parameters[5] with relevant regulatory limits and EQSs will be undertaken for each primary watercourse, and specifically following heavy rainfall events (i.e. weekly, monthly and event-based). The data will be processed and analysed and works will cease if elevated turbidity concentrations are recorded. In this event, all upstream silt traps and drainage routes will be inspected by the ECoW or the Site Manager to identify the cause of the elevated turbidity levels. Works will not recommence until any issues have been resolved and the turbidity concentrations have returned to background concentrations. › Daily surface water monitoring forms (for visual inspections and field chemistry measurements) will also be utilised at every works site near any watercourse (to be completed by the ECoW). These will be taken daily and kept on site for record and inspection	Daily	As Required	ECoW
MX2	Water Treatment System Monitoring	Section 6.1.1.2 of	› Daily monitoring of excavations and the water treatment system by a suitably qualified person (ECoW) will occur during the	Daily	As Required	ECoW

[5] example suite: pH (field measured), Electrical Conductivity (field measured), temperature (field measured), Dissolved Oxygen (field measured), Turbidity (NTU) (sonde measured), Flow (m/s), Total Suspended Solids (mg/l), Ammonia, Nitrite (NO_2) (mg/l), Ortho-Phosphate (P) (mg/l), Nitrate (NO_3) (mg/l), Phosphorus (unfiltered) (mg/l), Chloride (mg/l), and BOD (mg/l).

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		the AASR/NIS	construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped, and a geotechnical assessment will be undertaken. › Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated, suitably qualified staff, means the correct amount of chemical is added by the dosing system			
MX3	Weather Monitoring	Section 6.1.1.11 of the AASR/NIS	› The project EM (Environmental Manager) or the site ECoW will be responsible for monitoring weather forecasts during the construction phase. There will be a 24-hour advance meteorological forecasting (Met Eireann download) linked to a trigger-response system. When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen rainfall event longer than 4 hour duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken. › Cessation of all construction works until the storm event, including the storm runoff has passed. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the Project Site will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc.	As Required	As Required	EM/ECoW
Operational Phase						
MX4	Environmental Monitoring	Section 3.6.1 of the AASR/NIS	The continuation of the environmental monitoring as per the IPC licence, combined with the monitoring, aftercare and maintenance programme set out within the Draft Rehabilitation Plans will verify			

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			the effectiveness of the measures with the future management of existing silt ponds to be reviewed as rehabilitation progresses.			
Decommissioning Phase						
MX5	Potential for Indirect Effects on European Sites – Deterioration of Water Quality	Section 6.1.3 of the AASR/NIS	All monitoring will be implemented as per the construction phase.			