

To:

The Secretary
An Bord Pleanála
64 Marlborough Street
Dublin 1, D01 V902

From:

Fearghus O'Rourke
Trasternagh South,
Moylough, Ballinasloe
Co Galway, H53CD43

Date:

05/Nov/2025

Re: Formal Objection – Cooloo Wind Farm Application and EIAR (2025) - 323761

Dear Sir / Madam,

I am writing to lodge a formal observation and objection to the proposed Cooloo Wind Farm and associated works. My dwelling, located at ITM 558476, 749451, lies 1.49 km from Turbine T8 and 1.71 km from Turbine T9, placing it within the shadow flicker and residential amenity impact zone. I am therefore a directly affected receptor under Section 127 of the Planning and Development Act 2000 (as amended).

This objection is supported by detailed technical reviews of EIAR Chapters 8, 9, 11, 12, and 15 and their appendices. These analyses demonstrate systemic non-compliance with the EPA EIAR Guidelines (2022), the EIA Directive (2014/52/EU as amended), and the Climate Action and Low Carbon Development Act (2021). The Cooloo Wind Farm Application and EIAR frequently proposes deferred impact mitigation however, as clarified in *Commission v Ireland (C-215/06, Derrybrien)* and *Commission v Ireland (C-261/18)*, impact mitigation must be defined and verified before consent, not deferred to post-consent detailed design.

1. Shadow Flicker – No Binding Curtailment Protocol (Critical Residential Impact)

The EIAR acknowledges that shadow flicker will occur at nearby dwellings. However:

- No binding curtailment system is proposed.
- Mitigation is limited to monitoring and complaint-based response (reactive, not preventative).

- The EIAR does not individually model my dwelling.
- No automated real-time turbine shut-down protocol is provided.

Given the proximity of my home to T8 (1.49 km) and T9 (1.71 km), I am within the known flicker exposure radius for 180m-class turbines.

Under:

- Draft Wind Energy Development Guidelines (2019) → *Zero shadow flicker requirement*
- EPA EIAR Guidelines (2022), §3.6.2 → Mitigation must be *specific and enforceable*
- ABP Precedent: ABP-314725-22 (2023) → Permission refused where mitigation was non-binding

The absence of a binding automated curtailment system means the Board cannot conclude that significant residential amenity impacts will be avoided.

Required Planning Condition (if permission were considered)

Shadow flicker shall not occur at any dwelling. The operator shall install a real-time automated curtailment system ensuring turbine shut-down during any period when shadow flicker would otherwise occur. Annual compliance certification shall be submitted to the Planning Authority. Failure to comply shall require cessation of turbine operation until rectified.

If the developer cannot demonstrate this system in advance of consent, the proposal is not capable of approval.

2. Summary of report review findings

Chapter 8 – Soils, Geology, and Peat Stability

- Reliance on only two boreholes and 306 shallow probes across 9 turbines is insufficient for slope stability confidence.
- No quantitative slope-stability modelling for worst-case conditions; repeats errors of *Derrybrien (ECJ C-215/06)*.
- Peat and Spoil Management Plan defers design details to post-consent stage.
- Karst risk underassessed – limited geophysical coverage (~500 m) despite 41 mapped features.

Chapter 9 – Hydrology and Hydrogeology

- No tracer studies or rainfall-event hydrological modelling of connectivity to River Clare → Lough Corrib SAC.
- Flood Risk Assessment lacks 1% AEP + Climate Change verification and quantitative runoff modelling.
- No empirical validation of groundwater–surface-water coupling in karst aquifer system.

Chapter 11 – Climate and Carbon Accounting

- Net CO₂ losses up to **198,000 tCO₂-eq**; payback period >140 years – inconsistent with **Climate Action Plan 2025**.
- No peatland restoration or rewetting plan for 28 ha of drained peat.
- Incomplete embodied carbon inventory; outdated grid displacement factors.

Chapter 12 – Noise and Vibration

- Outdated **ETSU-R-97/WEDG 2006** limits used instead of **WHO 2018** health-based standards.
- Only 7 baseline points for 439 receptors; omission of school receptors (Cooloo and Brierfield NS).
- No amplitude-modulation or tonal-noise assessment; construction noise underestimated.

Chapter 15 – Material Assets, Roads, Traffic, and Telecommunications

- Traffic baseline non-representative; lacks term-time validation or HGV controls.
- Traffic Management Plan non-binding; omits school-zone mitigation.
- No certified abnormal-load route, pavement survey, or emergency-vehicle access plan.
- Telecoms and radar resilience not verified; Ai Bridges letter is non-binding.
- The development lies within the service area of the national TETRA emergency communications network, relied upon by Gardaí, Fire, and Ambulance services across the Barnaderg–Moyleough–Brierfield area. The proximity and elevation of 180 m turbines risk multipath interference and shadowing of these microwave links. No propagation modelling or ComReg consultation is documented. Any degradation of emergency coverage would compromise rural response capability and community safety.

3. Conclusion

The cumulative deficiencies across these chapters demonstrate that the Cooloo Wind Farm EIAR fails to provide *complete, precise, and definitive information* as required by Article 5(1) of the EIA Directive (2014/52/EU) and the EPA EIAR Guidelines (2022).

The reliance on outdated methodologies, incomplete datasets, and deferred mitigation means that significant environmental effects cannot be ruled out with reasonable scientific certainty.

The EIAR does not meet the required standard of completeness, reliability, and scientific certainty required under EU and Irish law.

Significant adverse impacts to residential amenity, road safety, peat stability, water systems and climate compliance cannot be ruled out.

Accordingly, I request that An Bord Pleanála refuse permission.

Please acknowledge receipt of this objection and notify me of:

- Any Further Information requests,
- Any Oral Hearing or consultation events,
- The Final Decision of the Board.

Yours sincerely,
Fearghus O'Rourke

Technical Review Report – Chapter 8: Land, Soils & Geology (Cooloo Wind Farm EIAR)

Prepared as an assessment against the EPA EIAR Guidelines (2022) and Directive 2014/52/EU.

1. Purpose and Scope

This review assesses Chapter 8 of the Cooloo Wind Farm Environmental Impact Assessment Report (EIAR) and its supporting appendices: 8-1 Peat Stability Risk Assessment, 8-2 Karst Risk Assessment, 4-2 Peat & Spoil Management Plan, and 4-3 Drainage Design Drawings. It evaluates compliance with the EPA EIAR Guidelines (2022) and identifies material deficiencies that may give rise to significant environmental risk or non-compliance under Directive 2014/52/EU.

2. Site Overview

The site consists of gently undulating peatland underlain by karstified limestone, with peat depths ranging from 0.3–3.0 m and locally exceeding 4 m near turbines T4–T6. The site overlies a Regionally Important Karstified Conduit Aquifer (Rk) hydrologically linked to the Lough Corrib SAC via the River Clare catchment.

3. Summary of Ground Investigation

The investigation included 26 trial pits, 2 boreholes, over 300 peat probes, and limited geophysics (4 ERT and 1 seismic line). Data are clustered around turbine locations, leaving roads, trenches, and peripheral slopes under-sampled. Laboratory testing was limited to hand shear vane and moisture content—no ring-shear or consolidation testing.

4. Appendix 8-1 – Peat Stability Risk Assessment

The PSRA uses a deterministic 2-D infinite-slope model with a FoS ≥ 1.3 threshold and undrained shear strength of 5 kPa. No transient rainfall or coupled hydro-geotechnical modelling was undertaken. Risks are described as ‘low to medium’ but this conclusion lacks quantitative verification.

Key deficiencies include:

- Over-reliance on 2-D infinite-slope model, unsuitable for complex peat terrain.
- Absence of rainfall or drainage event sensitivity analysis.
- FoS sensitivity to 2–3 kPa not tested.
- Deferred monitoring contrary to Derrybrien precedent.

See Review 3 below.

5. Appendix 8-2 – Karst Risk Assessment

The KRA applies a qualitative risk matrix (Rutty & Jennings 2012). Bedrock is within 5 m bgl across much of the site, and several doline features remain unconfirmed. Risk downgraded to 'low-medium' after applying generic mitigation (piling, grouting), without quantitative validation or hydrogeological linkage to the Lough Corrib SAC.

See Review 4 below

6. Appendix 4-2 – Peat & Spoil Management Plan

Identifies Safety Buffer Zones and Peat Stockpile Restriction Areas but defers exact locations and capacities to post-consent design. Estimated peat excavation volume ~97,944 m³. No quantified stability or carbon-loss assessment provided.

7. Appendix 4-3 – Drainage Design Drawings

Drainage designed for a 10-year storm event with generic sediment controls. No climate-change factor or cumulative runoff modelling. Discharges drain to River Clare → Lough Corrib SAC.

8. Key Findings and Compliance Summary

Across Chapter 8 and its appendices, the following deficiencies are identified:

- Insufficient GI density and absence of laboratory testing.
- Use of outdated, non-coupled 2-D slope model.
- Deferred mitigation and absence of enforceable monitoring.
- Inadequate linkage between peat management, drainage, and carbon emissions.
- No cumulative or rainfall-event analysis.

9. Regulatory Compliance Matrix (EPA 2022)

EPA Requirement		Compliance Comment
§2.5 – Use of current scientific methods	✘	Infinite-slope model only; no 3-D or coupled modelling.
§3.4.1 – Baseline & representativeness	⚠	Limited GI along linear infrastructure.
§3.5.6 – Hydrology & drainage design	✘	10-year design event only; no climate resilience.
§3.6 – Interactions between factors	✘	Soils–water–climate linkages missing.
§3.8 – Mitigation & monitoring	✘	Deferred; no binding instrumentation or

EPA Requirement

Compliance Comment

triggers.

§3.9 – Residual effects



Residual risks unquantified.

10. Conclusion

Chapter 8 and its supporting appendices are non-compliant with the EPA EIAR Guidelines (2022). The methods and mitigation are not sufficiently precautionary for a peatland site overlying a karstified aquifer. Deferred investigation and qualitative modelling repeat the systemic failures criticised in Derrybrien (C-261/18). Further Information or refusal of consent would be warranted under Regulation 104(3) of S.I. 296/2018.

Review # 1 – Identified issues within the report.

Issue	Critique / Objection	Comment
<p>Survey sufficiency: spatial & depth coverage</p>	<p>While 306 peat probes, 26 trial pits, and 2 boreholes are used, that may still be insufficient sampling density in areas of high risk (deep peat, slope transitions). The boreholes are only two — that is low for a project of this scale.</p>	<p>“The Chapter 8 investigation relies on only two boreholes for deep subsurface stratigraphy in a 9-turbine site, which is inadequate given the varying peat depths and subsurface complexity. The sampling density is insufficient in key areas (e.g. near turbine bases, along access roads crossing bog) to establish confidence in peat / geotechnical stability.”</p>
<p>Uninvestigated peat under grid route</p>	<p>They state that along the public road section of the grid cable route, peat was <i>not</i> investigated. This is a gap: the grid connection passes over areas where peat is possible, but they did not test it.</p>	<p>“It is unacceptable that no peat probing or subsoil investigations were carried out for the public road portion of the grid route. The assumption of no peat there is unverified, and risk of unexpected peat / soft ground conditions must be ruled out.”</p>
<p>Crossing intact raised bog (T7 access road)</p>	<p>They note that a 0.5 km section of intact raised bog is crossed by the proposed access road to T7. Even though they say major infrastructure avoids discrete >3 m peat zones, here the road crosses an intact bog with recorded peat depths up to 6.8 m.</p>	<p>“The proposal to cross intact raised bog with a major access road is a serious red flag. That road segment lies over deep peat (6.8 m recorded) and the stability, drainage, and environmental risks of disturbance are high. The EIAR fails to demonstrate a safe, acceptable method to traverse this feature without irreparable harm.”</p>
<p>Reliance on geophysics in limited area / lines</p>	<p>Only 4 resistivity lines + 1 seismic line are used (total ~500 m) to detect karst or subsurface anomalies. The coverage is narrow relative to the full site.</p>	<p>“The geophysical survey is too limited in scope (just 4 resistivity lines and one seismic) to reliably detect karst features, fractures or conduits across the many turbine locations and access routes. It is inadequate to rule out subsurface instability or transmission pathways.”</p>

Issue	Critique / Objection	Comment
<p>Karst / enclosed depressions: mapped but not fully assessed</p>	<p>They have identified 11 potential enclosed depressions within the site (especially near turbine T4). These are near sensitive infrastructure and need robust assessment.</p>	<p>"Although 11 potential enclosed depressions were mapped inside the site boundary, the EIA downplays their significance and does not provide sufficient detailed subsurface investigation within these depressions. Some may act as conduits for water, or suggest hidden voids or fracture zones. The risk is under-assessed."</p>
<p>Overconfidence in absence of karst features</p>	<p>They conclude no epikarst or karstification evidence was found in the geophysical lines, and that the limestone is impure/argillaceous (less prone to karst). But geology is variable and fractures/conduits may exist off the narrow survey lines.</p>	<p>"The conclusion that no karst features exist is premature. The surveyed lines are too few; karst systems are often discontinuous and fractural, especially in limestone. The reliance on limited lines and negative findings is overconfident. The Board should require additional wide-area geophysics and borehole / dye tracing before accepting the no-karst assumption."</p>
<p>Uncertainty / limitations claimed "no limitations encountered"</p>	<p>They assert "No limitations or difficulties were encountered during preparation of Chapter 8" (Section 8.2.5) But realistically, site investigations in bog / variable terrain always face limitations (access, weather, probe refusal, unknown subsurface). That claim is suspect.</p>	<p>"The statement that 'no limitations or difficulties were encountered' is unrealistic and raises concerns about glossing over uncertainties. All subsurface investigations have constraints; the applicant should transparently acknowledge limitations (e.g. inaccessible areas, refusal, probe anomalies) and show how those uncertainties are managed."</p>

Issue	Critique / Objection	Comment
<p>Residual / mitigation uncertainties</p>	<p>The chapter proposes mitigation, but likely leaves design details or monitoring to post-approval. If mitigation is vague, you can object that residual risk is not addressed.</p>	<p>"Mitigation measures in Chapter 8 are insufficiently detailed, lack enforceability, and do not address the full range of residual risk (especially in deep peat zones or where access roads cross bog). The Board should require binding design verifications, contingency plans, and post-construction monitoring reports as conditions."</p>
<p>Inconsistent importance / sensitivity rating</p>	<p>The chapter uses NRA (2009) classification (Table 8-2) and assigns importance levels. Sometimes that can underplay sensitivity of peat systems, which have high ecological and hydrological significance.</p>	<p>"The sensitivity / importance classification may understate the value of the peat / soil system, especially for raised bog habitats. The Board should scrutinize whether the "local" rating is adequate in a context of ecological connectivity and hydrological function."</p>

Review #2: Comparative Analysis: Cooloo Wind Farm (2025) vs. Derrybrien Wind Farm (2003)

(Prepared in the context of the EIA Directive 2011/92/EU as amended by 2014/52/EU and the EPA EIAR Guidelines 2022)

Dimension	Derrybrien Wind Farm (2003, Galway)	Cooloo Wind Farm (2025, Galway)	Critical Comparison / Lessons
Project overview	71 MW wind farm, 71 turbines; large-scale construction on deep blanket peat slopes in the Slieve Aughty Mountains.	9 turbines (up to 180 m) on peat, glacial till, and karstified limestone terrain; drainage via the River Clare to Lough Corrib SAC.	Both are upland/peatland projects in County Galway with hydrological linkage to sensitive Natura catchments.
Ground conditions	Deep blanket peat (≤ 6 m); high water table; slopes 10–15°.	Basin and blanket peat (≤ 6.8 m), glacial tills, karstified limestone; slopes 2–8°.	Both exhibit high instability risk. Derrybrien's collapse stemmed from underestimated shear strength and poor drainage; Cooloo repeats these methodological weaknesses.
Hydrology / Hydrogeology	Peat slide polluted the Owendalulleagh River and Lough Cutra, damaging SAC habitat; EIAR lacked hydrological quantification.	Chapter 9 notes drainage to the River Clare → Lough Corrib SAC, but omits tracer or rainfall-event modelling.	Both omit empirical hydrological verification. Derrybrien shows the real-world consequence.
Geotechnical assessment	No site-specific slope-stability modelling; relied on qualitative judgement.	Appendix 8-1 applies a 2-D "infinite-slope" model with assumed undrained shear strength = 5 kPa, no lower-bound (2–4 kPa) testing.	Same deficiency — oversimplified, unverified stability analysis.
Peat management plan	None pre-construction; spoil mounds placed on saturated slopes, triggering mass movement.	Appendix 4-2 Peat & Spoil Management Plan pledges best practice but defers detail (storage, drainage) to detailed design.	Derrybrien proved the danger of approving without a fixed plan; Cooloo repeats this legal flaw.

Dimension	Derrybrien Wind Farm (2003, Galway)	Cooloo Wind Farm (2025, Galway)	Critical Comparison / Lessons
Karst / groundwater	Not applicable (granite terrain).	Appendix 8-2 identifies 41 karst features (13 on site); excludes hydrogeological coupling.	Adds new groundwater vulnerability absent at Derrybrien—rapid contaminant transport via karst conduits to Lough Corrib and public supplies.
EIA quality / scope	Later found (EC) C-215/06) to lack proper EIA for peat impacts; Ireland fined €5 million + €15 k/day.	Cooloo EIA exhibits similar weaknesses: qualitative peat-slide risk, deferred mitigation, generic hydrology.	The Cooloo wind farm project EIA is repeating deficiencies already condemned by the ECJ with respect to Derrybrien..
Regulatory outcome / precedent	ECJ held Ireland in breach; retrofit EIA ordered.	Current ABP determination pending.	Derrybrien obliges Ireland to ensure full, field-verified EIA before consent.
Public safety / environmental impact	450 000 m ³ peat released; pollution, fish kills, carbon loss.	Peat and karst failure could contaminate the River Clare and Lough Corrib drinking-water supply.	Identical hazard potential; same pathways.
Mitigation & monitoring	None before slide; post-event remediation only.	Generic mitigation; visual monitoring only; no instrumented triggers.	Derrybrien shows visual inspection is inadequate; instrumentation mandatory.
Legal / planning precedent	<i>Commission v Ireland (C-215/06)</i> ; breach of EIA Directive.	Subject to 2011/92/EU as amended and S.I. 296/2018.	Failure to address identified weaknesses could reopen EU infringement exposure.

The structure and methodology of the Cooloo Wind Farm EIA closely mirror those of the Derrybrien Wind Farm, whose peat-slide in 2003 resulted in infringement proceedings and a €5 million fine against Ireland (Case C-215/06, *Commission v Ireland*, 2008). Both projects involve extensive peat and hydrologically sensitive terrain, yet both EIARs rely on qualitative judgement, limited field data, and mitigation deferred to post-consent stages. Appendix 8-1's simplified slope-stability analysis, Appendix 4-2's non-quantified Peat & Spoil Management Plan, and Appendix 8-2's qualitative Karst Risk Assessment collectively repeat the deficiencies found unlawful in Derrybrien. Granting permission on such an incomplete evidential base would breach the EIA Directive (2011/92/EU as amended by 2014/52/EU) and S.I. 296/2018, exposing the State to renewed enforcement.

Review #3: Compliance review of Appendix 8-1 – Peat Stability Risk Assessment

Issue	Technical Critique	Objection Text (for submission)
<p>1. Limited Ground Investigation (GI) Coverage</p>	<p>Only a small number of boreholes and trial pits were completed; peat-depth data clustered near turbine pads, with limited coverage along access roads, crane pads, and cable trenches where the highest risk of failure usually lies. No GI near T4-T6, despite thick peat and visible drainage features.</p>	<p>“Appendix 8-1 relies on sparse, turbine-centred GI and omits verification along linear infrastructure. This fails the EPA (2022) Guidelines § 3.5.3 and RR-494 requirements for full spatial coverage across all peat-bearing assets. The Board cannot conclude the investigation is complete or representative.”</p>
<p>2. Use of Simplified 2-D Infinite-Slope Model</p>	<p>The analysis employs a 2-D infinite-slope factor-of-safety (FoS) model using uniform peat properties, which ignores lateral constraints, drainage, and 3-D stress redistribution. No numerical modelling or finite-element verification is presented.</p>	<p>“The PSRA’s 2-D screening approach is a preliminary tool only and cannot quantify failure risk in complex peat-till terrain. RR-494 and CIRIA C800 recommend 3-D or coupled hydro-geotechnical analysis at critical locations. Consent based on a 2-D FoS is scientifically unsound.”</p>
<p>3. Assumed Undrained Shear Strength of 5 kPa Without Testing Lower Bound</p>	<p>The report adopts 5 kPa as the design undrained shear strength for all locations; no ring-shear, oedometer or laboratory consolidation tests are reported. Peat may exhibit residual strengths as low as 2 kPa.</p>	<p>“Appendix 8-1 over-estimates peat strength by assuming 5 kPa without corroborating laboratory data. RR-494 and the Derrybrien Report highlight this as a critical underestimation source in slope failure. A lower-bound sensitivity (2-3 kPa) is required before consent.”</p>
<p>4. No Hydro-Geotechnical Coupling or Rainfall-Event Sensitivity</p>	<p>The PSRA treats hydrology and stability separately. No transient pore-pressure or extreme-rainfall modelling is undertaken. Drainage ditches and construction surcharge effects are not simulated.</p>	<p>“The report fails to assess slope response to rainfall or drainage change, contrary to RR-494’s emphasis on coupled hydro-geotechnical processes. Without such modelling, the EIA/R cannot exclude a repeat of the Derrybrien-type failure under storm conditions.”</p>

Issue	Technical Critique	Objection Text (for submission)
5. FoS Threshold Set at 1.3 Without Reliability or Uncertainty Analysis	FoS = 1.3 is assumed acceptable, but no reliability, Monte Carlo, or confidence interval is calculated. Given large property variability, this threshold is not conservative.	"An FoS of 1.3 is unjustified without sensitivity or reliability analysis. RR-494 and EPA (2022) call for probabilistic validation or a higher FoS (≥ 1.5) where uncertainty is high."
6. Residual Risk Downgraded by Assertion Not Evidence	The PSRA reduces risk categories after proposing generic mitigation (piling, stone blanket, drainage), yet provides no design calculations or performance data to show risk reduction.	"Residual risk is downgraded without proof of effectiveness. Assertions of mitigation contravene the EIA Directive's requirement for 'complete, precise and definitive' information (Case C-215/06 Derrybrien). Independent verification must be required."
7. Deferred Investigation and Mitigation	The report repeatedly defers confirmatory GI and design verification to the detailed design or construction phase. This leaves major uncertainties unresolved pre-consent.	"Deferring GI and stability validation post-consent is contrary to established ABP practice and EU case law (C-215/06). The Board must obtain full GI and quantitative modelling before determination."
8. Monitoring and Trigger Thresholds Absent	Only "visual inspection" is proposed. No binding instrumentation (piezometers, inclinometers, settlement plates) or pre-defined alarm criteria.	"Reliance on visual monitoring fails to provide early-warning capability. RR-494 mandates instrumented monitoring and trigger-level protocols to prevent catastrophic failure."
9. Peat Stockpile and Spoil Zones Underspecified	Appendix 8-1 references the Peat & Spoil Management Plan (Appendix 4-2) but does not integrate stability calculations for stockpiles or buffer-zone sizing.	"The PSRA lacks quantitative assessment of spoil or temporary storage stability. RR-494 requires defined containment, drainage, and FoS > 1.5 for all stockpiles prior to consent."
10. Lack of Independent Peer Review and Transparency	The PSRA was authored by the developer's consultant (GDG). No independent geotechnical peer review or public data release of GI logs/model inputs.	"Given the Derrybrien precedent, an independent geotechnical peer review is mandatory to verify peat stability analysis. Public release of borehole logs and model inputs should be required for transparency and accountability."

Regulatory Benchmark	Cooloo Appendix 8-1 Compliance	Overall Rating
EPA EIAR Guidelines 2022 (§ 3.5.3 & 3.8)	Defers critical data to detailed design; lacks instrumented baseline.	⚠ Partial / Non-compliant
EPA Research Report 494 (2025)	Fails to meet pillars of <i>Accountability</i> and <i>Longevity</i> ; no coupled modelling or long-term monitoring.	✘ Non-compliant
ECJ Case C-215/06 (Derrybrien)	Deferral of investigation mirrors unlawful practice condemned by the Court.	✘ Non-compliant

Review #3: Compliance review of Appendix 8-2 – Karst Risk Assessment

Issue	Technical Critique	Objection Text (for submission)
<p>1. Scope excludes hydrogeology</p>	<p>The KRA focuses on geotechnical settlement/sinkhole hazard to structures only. Hydrogeological linkages (groundwater pathways, pollutant transport to receptors incl. Lough Corrib SAC / public supplies) are expressly out of scope.</p>	<p>“The Karst Risk Assessment omits hydrogeological interactions despite the site overlying a Regionally Important Karstified Conduit Aquifer. Excluding groundwater connectivity and pollutant pathways renders the assessment incomplete under the EIA Directive and EPA EIAR 2022 §3.5.6.”</p>
<p>2. Insufficient intrusive verification at high-risk locations</p>	<p>Only two boreholes and limited geophysics (4 ERT lines, 1 seismic) are presented; no drilling near T4 and other flagged features due to “access limitations”. Several Karst indicators remain unconfirmed.</p>	<p>“High-risk turbine and road sections (e.g., T4 cluster) lack intrusive verification. This fails EPA §3.4.1 on representative baseline data and RR-494 accountability. The Board cannot rely on unverified desk indicators.”</p>
<p>3. Qualitative ranking without probability or uncertainty</p>	<p>Hazard is ranked via a qualitative matrix (e.g., Ruddy & Jennings) with no probabilistic sinkhole likelihood, no fragility curves, and no spatial uncertainty surfaces.</p>	<p>“Use of a qualitative matrix without quantitative probability or uncertainty analysis is inadequate for consent. The KRA must present likelihood metrics and uncertainty bounds to meet EPA §2.5/§3.9.”</p>
<p>4. Bedrock at/near surface & ‘Extreme’ vulnerability underplayed</p>	<p>GSI mapping and site observations indicate shallow limestone (<5 m) and ‘Extreme’ groundwater vulnerability along parts of the footprint, yet this is not translated into conservative design scenarios.</p>	<p>“The KRA acknowledges shallow rock and ‘Extreme’ vulnerability but does not adopt conservative design assumptions. This conflicts with GSI vulnerability mapping and EPA §3.5.6 on protection of groundwater resources.”</p>
<p>5. Residual risk reduced by assertion, not evidence</p>	<p>Residual risk is downgraded after listing generic measures (piling, grouting, geogrids) without calculations, trial sections, or performance verification.</p>	<p>“Risk ratings are reduced without engineering demonstration. Assertions breach the EIA requirement for ‘complete, precise and definitive’ information (ECJ C-215/06). Independent design verification is required.”</p>
<p>6. No dye-tracing or connectivity testing to receptors</p>	<p>No tracer tests, piezometric mapping, or receptor-based pathway validation towards Clare-Corrib waters or public supply boreholes/springs.</p>	<p>“Absence of dye tracing and groundwater monitoring fails to prove no pollutant pathway to Lough Corrib SAC. This is contrary to Habitats Directive Art. 6(3) and EPA §3.5.6.”</p>

Issue	Technical Critique	Objection Text (for submission)
7. Construction impacts not coupled (dewatering, trenching, blasting)	The KRA doesn't model effects of temporary dewatering, deep trenching, or potential blasting/vibration on suffusion or induced collapse.	"Lack of coupled construction-phase analysis (dewatering/trenching/vibration) leaves material risk unassessed, contrary to EPA §3.5.6 and RR-494 (hydrology-geotechnics coupling)."
8. Linear infrastructure largely unassessed	Access roads, crane pads and cable corridors over karst are under-sampled and not analysed with route-specific checks (void bridging, span limits, settlement).	"Linear infrastructure across karst is under-investigated and unmodelled. This contravenes EPA §3.4.1/§3.5.3 requiring asset-specific assessment."
9. Monitoring & triggers: non-binding and minimal	Proposes visual monitoring only; no network of piezometers, settlement markers, or trigger/action levels; no independent oversight.	"Visual inspection is inadequate in karst. The EIA must commit to instrumented monitoring with trigger thresholds and independent auditing (EPA §3.8; RR-494 'longevity')."
10. Post-consent deferral	Confirms multiple times that detailed GI/design will occur after consent.	"Deferral of core investigations and design verification to post-consent repeats the Derrybrien error (ECJ C-215/06). The Board must obtain this information before determination."
11. No receptor-specific consequence analysis	Consequence scoring does not differentiate drinking-water abstractions, private wells, or Natura-related springs.	"Consequence analysis must treat public water supplies and Natura features as high-consequence receptors with strict pathways control. The omission breaches EPA §3.5.6 and WFD obligations."
12. No independent peer review	Work prepared by developer's consultant; no independent hydrogeology/geotechnical peer review provided.	"Given karst conduit risk to Lough Corrib SAC, independent peer review is warranted to ensure objectivity and compliance with RR-494 (accountability)."

Regulatory Benchmark	Cooloo Appendix 8-1 Compliance	Overall Rating
EPA EIAR Guidelines 2022 – §2.5 (scientific methods)	Qualitative matrix; no probability/uncertainty; no dye tracing	✗ Non-compliant
EPA EIAR §3.4.1 (baseline representativeness)	Sparse intrusive GI; linear assets under-sampled	✗ Non-compliant
EPA EIAR §3.5.6 (hydrogeology & groundwater)	No tracer tests; no coupled construction impact modelling	✗ Non-compliant
EPA EIAR §3.8 (mitigation & monitoring)	Non-binding visual monitoring; no triggers/instruments	✗ Non-compliant
RR-494 (Accountability/Longevity/Holistic)	Post-consent deferral; no long-term instrumented plan	✗ Non-compliant
Habitats Directive Art. 6(3)	Pathways to Lough Corrib SAC not ruled out with certainty	⚠ Fails precaution

References

- **Commission v Ireland (C-215/06)**, ECJ Judgment (2008) – Derrybrien Wind Farm EIA failure.
- **EPA Research Report 494 (2025)** – Peat Hub Ireland: Accountability and Longevity principles.
- **European Union (Planning and Development) (EIA) Regulations 2018** (S.I. 296/2018).
- **European Communities (Birds and Natural Habitats) Regulations 2011** (S.I. 477/2011).
- **Cooloo Wind Farm EIAR (2025):**
 - Appendix 8-1 Peat Stability Risk Assessment (GDG, Sept 2025).
 - Appendix 8-2 Karst Risk Assessment (GDG, Sept 2025).
 - Appendix 4-2 Peat & Spoil Management Plan (2025).

Technical Review Report – Chapter 9: Hydrology & Hydrogeology (Cooloo Wind Farm EIAR)

Hydrological and hydrogeological assessment against the EPA EIAR Guidelines (2022), OPW/DoEHLG Planning System and Flood Risk Management Guidelines (2009), and Directive 2014/52/EU. This review integrates findings from Chapter 9, Appendix 9-1 (Flood Risk Assessment), Appendix 8-3 (Grid Connection Ground Conditions Assessment), and Appendix 4-3 (Drainage Design).

1. Scope and Context

Chapter 9 assesses hydrological and hydrogeological impacts associated with the Cooloo Wind Farm, located within the Clare River catchment draining to the Lough Corrib SAC (000297). The site lies on Regionally Important Karstified Conduit Limestone Aquifers with areas of peat and glacial till, leading to high groundwater vulnerability and potential pollutant linkages to designated habitats downstream.

2. Methodology

The EIAR relies primarily on desk-based hydrological mapping (EPA, OPW, GSI, NPWS) and visual inspections. No quantitative hydrological, hydrogeological, or hydraulic models were developed. Risk assessment uses a qualitative low/medium/high ranking. The study references CFRAM flood maps and OPW guidance but lacks site-specific modelling or calibration.

3. Key Findings

Key conclusions presented in the EIAR include:

- Surface water drains toward the Clare River system and ultimately Lough Corrib SAC.
- Groundwater vulnerability classified as Extreme in multiple areas; no measured groundwater data.
- Peat and till overlain by shallow bedrock; no dye tracing or aquifer testing undertaken.
- Flood Risk Assessment (Appendix 9-1) indicates site outside mapped 1% AEP floodplain.
- Drainage system designed for 10-year return period with standard attenuation ponds.
- No quantitative rainfall-runoff or cumulative flood analysis provided.

4. Supporting Appendices

4.1 Appendix 8-3 – Grid Connection Ground Conditions Assessment

Provides qualitative description of soils, peat, and bedrock along the 10 km grid connection. Identifies peat depths up to 2.5 m and shallow karstic limestone exposures. No intrusive ground investigation or water monitoring performed. No hydrogeological coupling or pollution pathway assessment undertaken.

See Review #2 below.

4.2 Appendix 9-1 – Flood Risk Assessment (FRA)

Desk-based review using OPW CFRAM maps and PFRA data only. No hydraulic modelling (HEC-RAS/MIKE). Drainage design applies a 10-year return period rather than 1% AEP standard. Climate change allowance noted qualitatively but not modelled. No cumulative runoff or downstream pollutant transport modelling provided.

See Review #3 below.

5. Critical Technical Review

Issue: No hydrological modelling

Observation: Relies on maps and qualitative reasoning only

Regulatory Concern: Fails EPA 2022 §2.5 and Annex IV(a)(c) of Directive 2014/52/EU

Issue: Groundwater–surface water linkage omitted

Observation: No dye tracing or aquifer recharge analysis

Regulatory Concern: Breach of EPA §3.5.6

Issue: Underestimated flood return period

Observation: 10-year design instead of 100-year + climate factor

Regulatory Concern: Non-compliant with OPW 2009 and EPA §3.5.6

Issue: Cumulative impacts ignored

Observation: No integrated runoff model for turbines, roads, grid trench

Regulatory Concern: Fails EPA §3.6

Issue: Deferred validation

Observation: Monitoring deferred to post-consent stage

Regulatory Concern: Contrary to Derrybrien (C-261/18) and EPA §3.8

Issue: No baseline monitoring

Observation: No water-quality or groundwater data collected

Regulatory Concern: Incomplete under EPA §3.4.1

Issue: No quantitative pollution or sediment modelling

Observation: Silt management described narratively only

Regulatory Concern: Not compliant with EPA §3.5.6 and Annex IV(f)

These are expanded in Review #1 below.

6. Compliance with EPA EIAR Guidelines 2022

EPA EIAR 2022 Section	Observed Compliance	Rating
§ 3.4.1 – Baseline data representativeness	Short-term, spatially patchy	⚠️ Partial
§ 3.5.6 – Hydrology / Hydrogeology methods	No tracer tests or coupled modelling	❌ Non-compliant
§ 3.6 – Cumulative & interactions	Limited cumulative assessment	⚠️ Partial
§ 3.8 – Mitigation & monitoring	Generic, non-binding	❌ Non-compliant
OPW (2009) Flood Risk Guidelines	Screening only; no detailed Stage 3	❌ Non-compliant

7. Findings

- Baseline hydrology and hydrogeology are qualitative; no measured data underpin conclusions.
- Flood Risk Assessment omits hydraulic modelling and climate change allowance.
- Grid connection and site drainage risks not assessed cumulatively.
- Post-consent validation proposed contrary to Directive 2014/52/EU and Derrybrien precedent.
- Potential pollutant linkage to Lough Corrib SAC remains unquantified and uncertain.

8. Conclusion

Chapter 9 under-delivers on hydrological and hydrogeological verification. It lacks empirical data, tracer studies, and quantitative storm or flood modelling; relies on qualitative mitigation; and defers critical confirmation to post-consent. The chapter therefore fails EPA EIAR 2022, RR-494, and OPW (2009) standards.

The hydrology and hydrogeology assessment, including supporting appendices, fails to satisfy the EPA EIAR Guidelines (2022), OPW Flood Risk Guidelines (2009), and Directive 2014/52/EU requirements for complete, precise, and definitive evaluation. The absence of quantitative hydrological, groundwater, and flood modelling precludes robust evaluation of risk to the Lough Corrib SAC and local receptors.

Review # 1 – Identified issues within the report.

Issue	Critique / Objection	Comment
<p>Hydrological baseline – limited field data</p>	<p>The baseline relies mainly on mapping and one-season visual surveys. No continuous water-level or flow-rate logging, no dye tracing, and no catchment hydrograph data are presented.</p>	<p>“The hydrological baseline is too limited to characterise seasonal or storm responses. Without long-term water-level or discharge data, the EIAR cannot quantify runoff generation or infiltration to karst systems.”</p>
<p>Hydrogeological connectivity to Lough Corrib SAC unverified</p>	<p>Although the report acknowledges drainage to the River Clare → Lough Corrib SAC, it offers no tracer testing, piezometry, or groundwater quality sampling to confirm connectivity or residence times.</p>	<p>“The EIAR fails to verify groundwater pathways to the Lough Corrib SAC. Dye-tracing and multi-season groundwater monitoring are essential to demonstrate that pollutants cannot reach the SAC—required under Habitats Directive Art. 6(3) and EPA 2022 §3.5.6.”</p>
<p>No rainfall-event or extreme-storm sensitivity</p>	<p>Surface-water design uses average rainfall; no 1 % AEP (+ climate uplift) or intense-storm simulation. The hydrology chapter assumes “normal conditions.”</p>	<p>“Ignoring design-storm and climate-uplift scenarios breaches EPA EIAR 2022 §3.5.6 and OPW (2009) guidelines. The Board must require flood and erosion sensitivity analysis for extreme rainfall.”</p>
<p>Drainage design – qualitative only</p>	<p>Generic “maintain existing drainage” statements replace quantitative drainage or attenuation design. No sizing of swales, culverts, or sediment traps is given.</p>	<p>“Drainage proposals are descriptive, not engineered. The EIAR should present catchment-by-catchment flow calculations, detention sizing, and treatment efficiency to comply with EPA §3.8.”</p>
<p>No cumulative hydrological assessment</p>	<p>The assessment considers Cooloo in isolation, omitting cumulative drainage and erosion effects from nearby wind-farm and forestry projects within the River Clare sub-catchment.</p>	<p>“Failure to account for cumulative runoff and siltation risk contravenes EPA §3.6. Cumulative modelling and combined sediment-load estimation must be required.”</p>

Issue	Critique / Objection	Comment
Peat-drainage interaction under-modelled	Peat and hydrology are treated separately; no coupled hydro-geotechnical analysis of drainage ditches or surcharge loading.	"The absence of coupled analysis ignores a key Derrybrien-type mechanism where drainage and loading trigger failure. RR-494 and EPA §3.5.3/3.5.6 demand integrated assessment."
Flood-risk assessment scope	Appendix 9-1 applies the OPW sequential approach but stops at screening; it does not quantify peak flows, flood volumes, or exceedance routing.	"The Flood-Risk Assessment is cursory and fails OPW (2009) Step 3 detailed stage requirements. Full hydraulic modelling (1 % AEP + climate) is needed for haul-roads and sub-stations."
Contamination & sediment-control risk	The EIAR relies on "good practice" measures but lacks sediment yield calculations or spill containment design.	"Mitigation for sediment and hydrocarbon control is generic and unenforceable. Quantified sediment-yield limits and containment design are required under EPA §3.8. "
Karst vulnerability underplayed	GSI mapping shows "Extreme" vulnerability, yet risk scoring treats the aquifer as moderate. No confined-unconfined boundary mapping or recharge testing.	"The EIAR underestimates groundwater sensitivity in an 'Extreme' vulnerability setting. Re-classification and verification are required for compliance with EPA §3.5.6 and GSI 2022 guidance."
No baseline water-quality monitoring	No chemical or biological sampling (e.g., turbidity, nutrients, metals) of streams or springs pre-construction.	"Absence of baseline water-quality data prevents detection of deterioration, contrary to WFD Art. 4(1) and EPA §3.4.1. "
Public water-supply protection not demonstrated	The Mid-Galway Public Water Supply draws from the Clare-Corrib GWB; no safeguard or contingency is shown.	"The EIAR omits a drinking-water-source protection plan. Given the conduit aquifer, ABP must require demonstration of isolation from public supply catchments."
Post-consent deferral of verification	Multiple sections state that detailed drainage or groundwater investigations will occur at the detailed design stage.	"Deferring essential hydrogeological and drainage design to post-consent breaches ECJ C-215/06 (Derrybrien) and EPA 2022 §3.5.6 ; full data must be before the Board now."

Issue	Critique / Objection	Comment
Monitoring commitments weak	Monitoring limited to visual inspection during construction; no real-time turbidity, flow or groundwater-level instrumentation proposed.	"Visual checks are inadequate. EPA §3.8 requires quantitative monitoring with trigger thresholds and reporting to the consent authority."
Unrealistic claim of no data limitations	Chapter 9 states "no data limitations encountered." Given seasonal constraints and lack of continuous instrumentation, this is implausible.	"The claim of no limitations is unrealistic and indicates over-confidence. The EIAR must transparently declare data gaps and uncertainty treatment per EPA §2.5."
Residual impacts understated	The chapter concludes impacts are "imperceptible-slight," despite unresolved peat, drainage, and karst risks.	"Impact significance is understated. Without quantitative confirmation, the precautionary principle must apply and risk rated at least moderate."

Regulatory Benchmark	Cooloo Chapter 9 Compliance	Overall Rating
EPA EIAR 2022 Section § 3.4.1 – Baseline data representativeness	Short-term, spatially patchy	▲ Partial
EPA EIAR 2022 Section § 3.5.6 – Hydrology / Hydrogeology methods	No tracer tests or coupled modelling	✗ Non-compliant
EPA EIAR 2022 Section § 3.6 – Cumulative & interactions	Limited cumulative assessment	▲ Partial
EPA EIAR 2022 Section § 3.8 – Mitigation & monitoring	Generic, non-binding	✗ Non-compliant
OPW (2009) Flood Risk Guidelines	Screening only; no detailed Stage 3	✗ Non-compliant

Review #2: Compliance review of Appendix 8-3 Grid Connection Ground Conditions Assessment

Issue	Technical Critique	Objection Text (for submission)
<p>1. Reconnaissance-level only (no intrusive GI along the cable route)</p>	<p>The GCGCA relies on desk study + walkover; no boreholes, trial pits, peat probes, groundwater monitoring or lab tests along the ~10 km grid corridor.</p>	<p>“Appendix 8-3 is a reconnaissance note, not an EIAR-grade baseline. Without intrusive GI and groundwater data along the entire route, the assessment fails EPA EIAR 2022 §3.4.1 on representativeness and cannot support consent.”</p>
<p>2. Linear assets under-sampled (roads/corridors/compounds)</p>	<p>Highest risks typically occur at longitudinal trenches, road widenings and joint bays; yet these are not sampled or modelled.</p>	<p>“The assessment omits asset-specific GI for the linear works where settlement, inundation and peat failure risks concentrate, contrary to EPA §3.5.3 and RR-494 expectations for peat/transition zones.”</p>
<p>3. No hydro-geotechnical coupling</p>	<p>Stability and hydrology are treated separately; no modelling of water-table rise, trench dewatering, ditch interception, or rainfall events on trench/corridor stability.</p>	<p>“Absence of coupled hydro-geotechnical analysis breaches EPA §2.5/§3.5.6 and RR-494 (hydrology-geotechnics coupling). Event-based pore-pressure response must be demonstrated before consent.”</p>
<p>4. Karst vulnerability not tested</p>	<p>Route crosses Regionally Important Karstified Conduit Aquifer; no dye-tracing, piezometry, or void detection (GPR/microgravity) at suspect sections; bedrock ‘at/near surface’ acknowledged but not investigated.</p>	<p>“In a karst conduit aquifer draining to Lough Corrib SAC, the lack of tracer testing and void screening is unacceptable under EPA §3.5.6 and the Habitats Directive Art. 6(3) precaution.”</p>
<p>5. Peat and soft ground not characterised</p>	<p>No ring-shear, oedometer or vane testing for trench sidewall stability, bearing capacity at joint bays, or long-term settlement of backfill over peat/fill transitions.</p>	<p>“Failure to characterise peat/soft ground mechanics contravenes EPA §2.5 and RR-494; settlement/failure risks at joint bays and road crossings remain unquantified.”</p>

Issue	Technical Critique	Objection Text (for submission)
6. Construction dewatering & pollutant pathways ignored	No assessment of temporary dewatering, bypass pumping, or turbidity/silt plume risk to drains feeding the Clare → Corrib system.	“Omitting dewatering and pollution pathway analysis breaches EPA §3.5.6 and WFD no-deterioration requirements; silt releases to Natura waters cannot be ruled out.”
7. Drainage and flood resilience not quantified	No runoff/attenuation or culvert/ditches capacity checks for trench works; no climate uplift; no exceedance routing for storm events.	“The grid works lack 1% AEP + climate event analysis, contrary to EPA §3.5.6 and OPW practice; flood and erosion risks remain unquantified.”
8. HDD/river/road crossings not designed or risk-assessed	Any Horizontal Directional Drilling (HDD) or watercourse/road crossings are not accompanied by geotechnical design checks (frac-out risk, cover/overburden, settlement).	“Crossing method statements without geotechnical verification are non-compliant with EPA §3.8 (mitigation specificity). Frac-out/settlement risks require pre-consent design calculations.”
9. Spoil/peat handling for cable trench not integrated	No volumes, storage locations, containment/drainage or stability checks for trench arisings; not cross-referenced to the Peat & Spoil Plan in a quantified way.	“Absence of quantified spoil/peat management for the cable corridor conflicts with EPA §3.8 and RR-494 (stockpile stability and drainage must be fixed pre-consent).”
10. Traffic-ground interaction omitted	Road-strengthening/temporary works and vibration from HGVs during trenching not assessed for settlement/void collapse in karst/soft ground.	“Excluding construction traffic-ground interaction ignores a clear mechanism of induced settlement/collapse, contrary to EPA §3.6 (interactions).”
11. Residual risk lowered by assertion	Risk ratings reduced by listing generic measures (stone blankets, geogrids, piling) without calculations, trial sections or performance data.	“Residual risk reduction is unsubstantiated. The EIA standard of ‘complete, precise, definitive’ information (ECJ Derrybrien C-215/06) is not met.”
12. Monitoring & trigger thresholds absent	No binding piezometer/settlement marker network along corridor; no trigger-action response or independent oversight.	“Visual-only monitoring fails EPA §3.8 and RR-494 (longevity). Instrumented monitoring and triggers must be mandated pre-consent.”

Issue	Technical Critique	Objection Text (for submission)
13. Post-consent deferral	Critical GI/design left to "detailed design" or CEMP stage.	"Deferral repeats the Derrybrien error; ABP must require full route GI, groundwater testing and quantitative design before determination."

Regulatory Benchmark	Cooloo Appendix 8-3 Compliance	Overall Rating
EPA EIAR 2022 §2.5 (scientific methods)	Qualitative narrative; no coupled modelling; no design calculations	✗ Non-compliant
EPA EIAR 2022 §3.4.1 (baseline representativeness)	No intrusive GI or groundwater monitoring along route	✗ Non-compliant
EPA EIAR 2022 §3.5.6 (hydrology & hydrogeology)	No dewatering analysis, tracer tests, or flood/attenuation design	✗ Non-compliant
EPA EIAR 2022 §3.6 (Interactions & cumulative)	No integration with site drainage/traffic/peat stability	✗ Non-compliant
EPA EIAR 2022 §3.8 (mitigation & monitoring)	Generic measures; no instruments, triggers, or oversight	✗ Non-compliant
RR-494 (Accountability/Longevity/Holistic)	Pre-consent uncertainty unresolved; no long-term instrumented plan	✗ Non-compliant
Habitats Directive Art. 6(3)	Pathways to Lough Corrib SAC not excluded with certainty	⚠ Fails precaution

Appendix 8-3 does not provide an EIAR-standard, decision-ready baseline or design for the grid connection. In peat/karst terrain draining to Lough Corrib SAC, the absence of intrusive GI, hydro-geotechnical coupling, dewatering/flood analysis, and instrumented monitoring fails EPA EIAR 2022, RR-494, and the Habitats Directive precautionary test. Further Information and binding conditions are necessary prior to any consent.

Review #3: Compliance review of Appendix 9-1 Flood Risk Assessment (FRA)

Issue	Technical Critique	Objection Text (for submission)
1. Scope limited to screening-level assessment	The FRA performs only a Stage 1/2 screening , stating that no infrastructure lies in mapped flood zones, but it stops short of a Stage 3 detailed assessment as required under OPW (2009) Guidelines.	"Appendix 9-1 presents only a screening-level assessment and omits the detailed Stage 3 modelling necessary where any part of the site drains to mapped or unmapped floodplains. The Board cannot conclude flood risk is negligible without full quantitative analysis."
2. No hydraulic modelling of receiving channels	The River Clare and its tributaries are acknowledged receptors, yet no 1-D/2-D hydraulic modelling (HEC-RAS / MIKE-11 / ICM) of flood extents, conveyance, or backwater effects is included.	"The FRA lacks hydraulic modelling of the River Clare system. Without simulation of conveyance and climate-change flood levels, the EIAR fails OPW (2009) Stage 3 and EPA EIAR 2022 § 3.5.6 requirements."
3. No climate-change uplift or design storm analysis	The report does not apply a 20-30 % climate-uplift or a 1 % AEP (100-year) + climate design event; instead it references past rainfall records.	"Failure to incorporate climate-change allowances contravenes OPW (2009 Table 5.1) and EPA § 3.5.6 , which require design to the 1 % AEP + climate scenario. The Board should seek re-assessment using future rainfall and flow projections."
4. Reliance on OPW flood maps alone	The FRA bases flood-zone delineation solely on OPW PFRA and CFRAM maps, without field survey or LIDAR verification.	"PFRA and CFRAM maps are indicative; relying on them without site-specific topographic or LIDAR data is inadequate under EPA § 3.4.1 . Local pluvial and peatland drainage sources may not appear on national datasets."
5. No pluvial or drainage exceedance assessment	There is no modelling of local pluvial flooding from intense rainfall or blocked culverts, particularly near access roads, sub-station and cable trenches.	"Absence of pluvial and exceedance-pathway assessment breaches OPW § 4.23 and EPA § 3.5.6 . All exceedance routing must be mapped and mitigation demonstrated."
6. Drainage capacity and attenuation not quantified	FRA refers to "maintaining existing drainage" but does not calculate runoff coefficients, attenuation volumes, or culvert capacities .	"Without quantitative drainage design, it is impossible to verify that post-construction runoff will not increase flood risk downstream. The FRA fails EPA § 3.8 on mitigation specificity."
7. No cumulative flood-risk analysis	Adjacent projects (wind farms, forestry, roads) in the River Clare catchment are omitted.	"Cumulative catchment loading is ignored. EPA § 3.6 requires combined-impact assessment; omission undermines confidence in flood-risk conclusions."

Issue	Technical Critique	Objection Text (for submission)
8. No assessment of temporary construction risk	Construction-phase flooding (temporary drains, stockpiles, haul-roads) is not considered, though it often drives sediment-laden runoff.	"Construction-phase flood mechanisms must be modelled and controlled; omission conflicts with EPA § 3.8 and OPW (2009 § 4.9)** requirements."
9. Hydro-geotechnical interaction ignored	FRA treats peat stability separately from hydrology; no coupling of ditch drainage and groundwater rise considered.	"Peat drainage can alter slope stability and flow paths. Lack of integrated hydro-geotechnical modelling repeats Derrybrien-type omissions (ECJ C-215/06)."
10. Water-quality and sediment-control not integrated	Flood management is decoupled from sediment and pollution mitigation; no spill-containment or silt-trap design is tied to flow scenarios.	"FRA must integrate quantity and quality management per EPA § 3.8 . Separation leaves risk of contaminated floodwater discharge to Lough Corrib SAC ."
11. Public-infrastructure risk not addressed	Flood impact on public roads and utilities (grid trench, drainage crossings) is omitted.	"Failure to evaluate flood resilience of public-road crossings breaches EPA § 3.5.6 and OPW (2009 § 3.8)** ."
12. Monitoring and review commitments vague	Post-construction flood or drainage monitoring is unspecified; only "inspection during heavy rainfall" is mentioned.	"Visual inspection does not meet EPA § 3.8 or RR-494 longevity principles. Quantitative flow-level monitoring and adaptive management must be conditions of consent."
13. Deferral to post-consent design stage	FRA states detailed drainage and flood controls will be finalised at detailed design.	"Deferring core flood-risk information post-consent repeats the Derrybrien legal error (ECJ C-215/06) and is non-compliant with EPA 2022 § 3.5.6 ."

Regulatory Benchmark	Cooloo Appendix 9-1 Compliance	Overall Rating
OPW (2009) The Planning System and Flood Risk Management	Screening only; no Stage 3 detailed assessment	✗ Non-compliant
EPA EIAR 2022 § 3.4.1 (Baseline representativeness)	No topographic or hydraulic survey	▲ Partial
EPA EIAR 2022 § 3.5.6 (Hydrology & Hydrogeology)	No design-storm or climate-change analysis	✗ Non-compliant
EPA EIAR 2022 § 3.6 (Cumulative impacts)	No cumulative catchment modelling	▲ Partial
EPA EIAR 2022 § 3.8 (Mitigation & monitoring)	Generic, non-binding measures only	✗ Non-compliant

Appendix 9-1 (Flood Risk Assessment) does not meet OPW (2009) or EPA EIAR 2022 standards. It remains a high-level screening without quantitative modelling, climate allowance, or cumulative assessment. In a catchment draining to the River Clare → Lough Corrib SAC, this omission leaves residual legal and environmental risk.

Further Information and a full Stage 3 FRA are required before any consent determination.

Review #4: Compliance review of Appendix 4-3 Drainage Design

Issue	Technical Critique	Objection Text (for submission)
<p>1. Screening-level concept, not an engineered design</p>	<p>The appendix presents layout drawings and generic notes but omits hydraulic calculations for conveyance, attenuation, or discharge control (no Qbar/greenfield runoff calculations, orifice sizing, or outfall controls).</p>	<p>"Appendix 4-3 is conceptual and lacks the engineered calculations required to verify no increase in runoff or downstream flood risk. Without flow sizing and control details, the Board cannot conclude compliance with EPA EIAR 2022 §3.8 or OPW (2009) drainage design expectations."</p>
<p>2. No 1% AEP + climate uplift design</p>	<p>Sizing appears based on typical/10-year events; no 1% AEP (100-yr) + climate allowance is shown for channels, culverts, or storage.</p>	<p>"Failure to design to 1% AEP + climate contravenes OPW (2009) and EPA §3.5.6. Full climate-uplift design and confirmation of freeboard at critical assets must be provided before determination."</p>
<p>3. Greenfield runoff / Qbar not demonstrated</p>	<p>No greenfield runoff rate (Qbar) derivation or pre-/post-development comparison is provided; no limiting orifice/weir shown.</p>	<p>"Without Qbar benchmarking and control devices, the applicant has not proven 'no net increase' in peak flows. A re-design to greenfield limits is required to satisfy EPA §3.8 and WFD no-deterioration."</p>
<p>4. SuDS treatment train incomplete</p>	<p>SuDS listed generically (swales/ponds) but treatment stages (TSS: removal, hydrocarbons) and water-quality performance are not quantified; no MCERTS-type separator or polishing step shown for high-risk areas (hardstands, substation, BESS).</p>	<p>"The drainage design does not provide a quantified SuDS treatment train. Without demonstrable pollutant removal, discharge to the Clare → Corrib system risks WFD deterioration and Natura impacts."</p>

Issue	Technical Critique	Objection Text (for submission)
5. No sediment yield or construction-phase sizing	Temporary works (silt traps/settlement ponds) are not sized for construction runoff; no event criteria (e.g., 1 in 10-yr) or pump-around/over-pumping procedures.	"Construction sediment controls are unquantified and unenforceable. The FRA/Drainage package must include temporary storage and treatment volumes with design events and trigger criteria."
6. Culvert capacity and blockage resilience not shown	Culvert sizes, headwater levels, blockage factors and energy dissipation are not calculated or plotted; no exceedance routing mapping is provided.	"Absence of culvert capacity checks and exceedance routes breaches OPW (2009 §4.23). The Board should require hydraulic grade line checks and mapped exceedance pathways."
7. Outfall erosion/scour protection missing	No rip-rap sizing, apron lengths, or velocity checks at outfalls/ditch interfaces; potential for erosion gullies into peat soils.	"Erosion protection is unspecified. The design must include velocity and shear checks with rip-rap/apron designs to prevent scour and peat bank failure."
8. Peatland hydrology alteration not assessed	Interception drains and hardstands may lower water tables or re-route flows; there is no coupled hydro-geotechnical analysis of ditch depth/spacing on peat stability.	"The drainage scheme ignores peat hydrology coupling (RR-494/EPA §3.5.6). Without pore-pressure/rainfall sensitivity analysis, the Derrybrien-type mechanism remains unaddressed."
9. Karst receptor protection absent	In karst conduit aquifer terrain, no measures are specified to prevent direct infiltration (e.g., liner beneath ponds, sealed trenches near swallow holes, or monitoring) and no dye tracing to confirm safe discharge points.	"Discharge control in karst terrain is unproven. Lined systems and tracer-verified outfalls are required to avoid rapid transmission to the Lough Corrib SAC, per Habitats Directive Art. 6(3)."
10. Substation/BESS drainage & pollution control under-specified	High-risk compounds (transformers/BESS) lack secondary containment sizing (110% bund), oil-water separation, and emergency shutoff details linked to rainfall events.	"Pollution control for the substation/BESS is not decision-ready. Bund and separator designs with event triggers must be provided pre-consent."
11. Watercourse/road crossing design not evidenced	If HDD or open-cut crossings are proposed, frayout risk, minimum cover, settlement and reinstatement are not designed.	"Crossings lack design verification; this is non-compliant with EPA §3.8. Provide HDD/open-cut calculations and contingency plans."
12. Operation & Maintenance (O&M) plan missing	No maintenance schedule, access points, sediment clean-out frequencies, or inspection triggers are included; responsibilities not assigned.	"Without a binding O&M plan, SuDS efficacy will degrade. Legal responsibilities, access and inspection frequencies must be conditioned."

Issue	Technical Critique	Objection Text (for submission)
13. Monitoring & trigger-action plan absent	No turbidity/flow monitoring at outfalls; no trigger levels or stop-work protocols during high rainfall.	"Visual-only checks are inadequate. A quantitative monitoring plan with trigger-action thresholds and reporting to the consent authority is required."
14. Cumulative drainage not assessed	Scheme not tested with other projects (wind/forestry) in the Clare catchment.	"Cumulative runoff and sediment loading must be modelled to comply with EPA §3.6."
15. Post-consent deferral	Many details are deferred to the CEMP/detailed design.	"Deferral of core drainage design post-consent repeats the Derrybrien error. Full calculations and drawings must be before the Board."

Regulatory Benchmark	Cooloo Appendix 9-1 Compliance	Overall Rating
OPW (2009) Flood Risk Guidelines	No 1% AEP + climate design; no exceedance routing	✗ Non-compliant
EPA EIAR 2022 §3.5.6 (Hydrology/Hydrogeology)	No quantitative storm analysis; no coupling with peat/karst	✗ Non-compliant
EPA EIAR 2022 §3.8 (Mitigation & Monitoring)	Generic SuDS; no sizing, O&M, or monitoring triggers	✗ Non-compliant
WFD No-deterioration / Natura 2000 (Art. 6(3))	Treatment train not quantified; karst protection unproven	⚠ At risk
RR-494 (Accountability / Longevity)	Pre-consent uncertainty; no long-term instrumented plan	✗ Non-compliant

Appendix 4-3 (Drainage Design) is not decision-ready. It lacks the quantitative sizing, climate-resilience checks, water-quality treatment design, peat/karst coupling, and enforceable O&M/monitoring commitments required by OPW (2009) and EPA EIAR 2022. Given discharge to the Clare → Lough Corrib catchment and the site's peat/karst sensitivities, Further Information should be sought to provide a complete hydraulic design and monitoring framework before any consent is considered.

References

- **Commission v Ireland (C-215/06)**, ECJ Judgment (2008) – Derrybrien Wind Farm EIA failure.
- **European Union (Planning and Development) (EIA) Regulations 2018** (S.I. 296/2018).
- **European Communities (Birds and Natural Habitats) Regulations 2011** (S.I. 477/2011).
- **Water Framework Directive (2000/60/EC)**
- **Floods Directive (2007/60/EC) and European Communities (Assessment and Management of Flood Risks) Regulations 2010** (S.I. No. 122 of 2010)
- **EPA (Environmental Protection Agency) — Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022)**
- **OPW & DoEHLG — The Planning System and Flood Risk Management: Guidelines for Planning Authorities (2009)**
- **Webster/Rollo v An Bord Pleanála (Meenaclogher Wind Farm) [2024] IEHC 136**
- **O’Granna v An Bord Pleanála [2014] IESC 25**
- **Cooloo Wind Farm EIAR (2025) — Chapter 9 Hydrology & Hydrogeology**
 - Appendix 9-1 — Flood Risk Assessment (GDG Consulting Engineers, Sept 2025)
 - Appendix 4-3 — Drainage Design Drawings & Report (GDG Consulting Engineers, Sept 2025)
 - Appendix 4-3 Drainage Design

Technical Review Report – Chapter 11: Climate (Cooloo Wind Farm EIAR)

Climate and carbon-accounting assessment against the EPA EIAR Guidelines (2022), Directive 2014/52/EU, and Ireland's Climate Action Plan 2025 (CAP25). This review integrates Chapter 11 and Appendix 11-2 (Carbon Calculations), and cross-references relevant construction/peat appendices (Ch. 8, App. 4-2, 4-3).

1. Scope and Context

Chapter 11 addresses greenhouse-gas (GHG) emissions and climate implications of the proposed 9-turbine onshore wind farm (~63 MW) across construction, operation, and decommissioning. Appendix 11-2 quantifies emissions from peat disturbance, materials, transport, backup/curtailment, and reports lifetime totals. This review evaluates the completeness and robustness of those calculations and their alignment with EPA EIAR Guidelines (2022) and CAP25 policy obligations.

2. Methodology (as presented in EIAR)

- Peatland emissions: Scottish Wind Farm Carbon Calculator-style worksheet with default habitat and drainage factors.
- Embodied emissions: TII/industry emission factors applied to concrete, steel, and transport (limited disclosure).
- Grid displacement: Irish-specific CO₂ intensity applied to project electricity output (assumptions not published).
- Boundary: Construction + operation + limited end-of-life; carbon savings derived from displaced grid electricity.

3. Key Inputs & Results from Appendix 11-2 (Carbon Calculations)

- Rated capacity: 9 × 7 MW (63 MW total). Worksheet references ~552,000 MWh/yr as rated energy (nameplate × hours).
- Peat disturbance: ~97,944 m³ removed; ~28 ha affected by drainage; default peat habitat used ('acid bog').
- Lifetime gross emissions (Expected): ~145,705 tCO₂e; (Max): up to ~224,539 tCO₂e.
- Reported components include (approximate): turbine lifecycle ~54,656 t; backup/curtailment ~40,949 t; embodied materials ~25,603 t; peat/soil losses ~17,555 t (range up to ~94,267 t in internal scenarios); tree felling ~4,981 t; transport ~304 t.

Notes: Drainage restoration at decommissioning is assumed 'No' in the main case; savings model lacks transparent disclosure of capacity factor, curtailment assumptions, or a time-varying (decarbonising) Irish grid factor.

4. Findings – Completeness & Robustness of the Carbon Assessment

- Boundary definition is incomplete: embedded emissions for major materials and replacements are not fully disclosed; grid reinforcement and BOP scope unclear.

- Peat oxidation and drainage: large uncertainty; reliance on default factors without site-specific hydrology or restoration commitments; 28 ha drained not tied to binding rewetting targets.
- Savings methodology: lacks published annual MWh (capacity factor), curtailment, and a declining Irish grid intensity time series; payback not shown as a range.
- Uncertainty not propagated: min/expected/max values exist in worksheets but not presented as confidence bands or decision envelopes.
- Linkage to peat/spoil plan (Appendix 4-2) is weak: volumes not tied to hydrology triggers, instrumented monitoring, or a restoration verification plan.

5. Alignment with EPA EIAR Guidelines (2022)

- §2.5 – Use of current scientific methods: Partial – recognised calculator used, but outdated defaults and missing site-specific verification.
- §3.3.5 – Cumulative & long-term effects: Non-compliant – no cumulative regional carbon ledger or sectoral-ceiling context.
- §3.4 & §3.5 – Project description & data completeness: Partial – inputs and factors insufficiently transparent to replicate results.
- §3.8 – Mitigation & monitoring: Non-compliant – no quantified peat rewetting/restoration plan with measurable targets and monitoring.
- §3.9 – Residual & uncertainty: Non-compliant – no propagation of uncertainty into payback/net balance ranges.

6. Alignment with Ireland's Climate Action Plan 2025 (CAP25)

This project must be assessed against CAP25 priorities: rapid electricity decarbonisation, integrity of GHG accounting, and land-use (LULUCF) improvements via peatland restoration. Based on the EIAR submissions:

- Electricity decarbonisation: Savings should use a time-varying Irish grid factor (declining to 2030 and beyond) and reflect marginal/operational displacement. The EIAR does not publish these trajectories, risking overstatement of avoided emissions.
- LULUCF / peatlands: CAP25 emphasises peatland restoration to reduce sectoral emissions. The EIAR identifies 97,944 m³ peat removal and ~28 ha drainage but does not commit to a binding rewetting/restoration programme with hydrology targets.
- Whole-life carbon transparency: CAP25 advances low-carbon construction and robust life-cycle reporting. The EIAR omits a full PAS 2080/ISO-aligned embodied carbon inventory (materials, replacements, grid works), and presents no independent verification.
- Carbon budgets/sectoral ceilings: The EIAR does not position the project's net balance and payback against national carbon budgets or sectoral ceilings, nor does it provide a cumulative regional carbon ledger.

7. Integrated Risk & Significance (with Peat/Drainage Interactions)

Peat disturbance, drainage, and hydrological modification are principal climate risks because they can lock in multi-decadal CO₂ emissions. In this case, peat losses (expected

~17,555 tCO₂e; up to ~94,267 tCO₂e) and the lack of binding rewetting undermine confidence that residual climate effects are 'not significant'. Absent transparent savings trajectories and uncertainty bands, the EIAR does not provide complete, precise and definitive information to conclude a robust net benefit.

8. Compliance Matrix – Climate (EPA 2022 & CAP25)

EPA 2022 Requirement	Key Reference	Assessment of Cooloo	Rating
Climate as core factor	§ 2.2 (p. 6-7)	Climate addressed but only via carbon accounting table; adaptation aspects omitted.	⚠️ Partial
Completeness & transparency	§ 2.4 – 2.5 (p. 12-14)	Assumptions for grid-intensity, capacity factor, and peat oxidation not disclosed.	❌ Non-Compliant
Cumulative & long-term effects	§ 3.3.5 (p. 25)	No cumulative or sectoral-ceiling analysis versus CAP 25 or carbon budgets.	❌ Non-Compliant
Mitigation & monitoring	§ 3.8 (p. 58-61)	No binding carbon-restoration or rewetting plan; no monitoring indicators.	❌ Non-Compliant
Residual effects & uncertainties	§ 3.9 (p. 62)	Single "expected" value used; uncertainty not propagated.	❌ Non-Compliant
CAP25 electricity	Savings	Savings need dynamic grid factors and curtailment assumptions.	⚠️ Partial
CAP25 LULUCF	Peat	No binding restoration and monitoring commitments.	❌ Non-Compliant
CAP25	Whole-life carbon	Embodied/Scope 3 incomplete; no PAS 2080/ISO inventory	❌ Non-Compliant

9. Recommendations (Further Information & Conditions)

- Publish transparent savings model: annual MWh (capacity factor), curtailment/constraint, and a declining Irish grid intensity time series; report net balance and payback as P10/P50/P90 ranges.
- Re-run peat/lulucf modules using site-specific hydrology and commit to a binding Peat Rewetting & Restoration Plan with water-table targets, instrumented monitoring (piezometers), and success criteria.
- Provide a PAS 2080/ISO 14064-1 aligned embodied-carbon inventory (materials, transport, replacements, grid connection works).
- Propagate uncertainty from all modules (min/mean/max) into net balance and payback envelopes; provide decision logic if worst-case payback exceeds a threshold.
- Demonstrate consistency with CAP25 trajectories and national carbon budgets/sectoral ceilings; include a cumulative regional carbon ledger for the Clare–Corrib area.

10. Conclusion

Chapter 11 and Appendix 11-2, as submitted, do not satisfy EPA EIAR (2022) expectations for transparent, complete, and definitive climate assessment as per § 2.2, § 3.3.5 and § 3.8, nor do they demonstrate alignment with core CAP25 priorities on peatland restoration, whole-life carbon transparency, and decarbonising electricity. Given the magnitude of peat disturbance, the absence of binding restoration, and missing dynamic savings trajectories, reasonable scientific doubt remains as to the project's net climate benefit without further information and enforceable condition

Review # 1 – Identified issues within the report.

Issue	Critique / Objection	Comment
<p>Scope and completeness of lifecycle boundary</p>	<p>The EJAR considers mainly operational-phase savings and partial construction emissions but omits full lifecycle boundaries (e.g. embodied carbon in concrete, steel, cabling, grid connection).</p>	<p>"Lifecycle analysis is incomplete. It must follow ISO 14064-1 and include embodied emissions from all materials and infrastructure."</p>
<p>Exclusion of indirect peat oxidation and drainage impacts</p>	<p>Peat oxidation losses are underestimated; the model counts only excavated peat, not indirect drainage of 28 ha and 1.3 m drawdown zone.</p>	<p>"Ignoring indirect peat oxidation contradicts EPA Research Report 494 and IPCC 2019 Refined Guidelines. The actual loss may be 2-3 x higher."</p>
<p>High total emissions and long payback (~ 146 years)</p>	<p>The project's cumulative CO₂-eq losses outweigh avoided emissions for over a century.</p>	<p>"A 146-year payback period conflicts with the Climate Action Plan 2025 target of net-zero electricity by 2035. It fails national policy alignment."</p>
<p>Absence of peatland restoration or re-wetting plan</p>	<p>Although drainage impacts are acknowledged, no hydrological restoration or carbon re-sequestration measures are proposed.</p>	<p>"Lack of restoration breaches Peatlands Climate Action Scheme principles and renders the 'mitigation hierarchy' incomplete."</p>
<p>Forestry removal without offset</p>	<p>11.25 ha of felling is included as an emission source but no replanting or offset commitment is made.</p>	<p>"Deforestation without compensatory planting violates CAP 2025 Action 83 and EPA Guidelines § 3.5.7 on land-use neutrality."</p>
<p>Assumed fossil-fuel baseline outdated</p>	<p>The counterfactual energy mix used is static and fossil-heavy; it exaggerates avoided emissions.</p>	<p>"Counterfactual must reflect SEAI/EirGrid 2030 projections (<.50 g CO₂/kWh). Using a fossil mix inflates claimed benefits."</p>
<p>No sensitivity or uncertainty analysis</p>	<p>Carbon outputs presented as single values; no ranges for peat depth, drainage extent, or emission factors.</p>	<p>"EPA 2022 § 3.4.1 requires demonstration of data uncertainty. Lack of sensitivity runs limits credibility."</p>
<p>No cumulative carbon balance</p>	<p>Cumulative effects with other wind/forestry developments in the Clare-Corrib catchment not assessed.</p>	<p>"Failure to assess cumulative greenhouse-gas effects breaches EPA 2022 § 3.6 and SEA Directive 2001/42/EC."</p>

Issue	Critique / Objection	Comment
No linkage between hydrology and carbon modelling	Drainage alterations in Chapters 8 & 9 are not coupled to the carbon loss model.	"Decoupling hydrology and carbon contravenes integrated-assessment principles in EPA Research Report 494."
Inconsistent policy alignment statement	The EIAR states the project 'supports decarbonisation' despite showing net emissions.	"Self-contradictory claim; quantitative evidence disproves positive contribution."
Monitoring & verification absent	No commitment to post-construction GHG flux or groundwater-level monitoring.	"Without verification, carbon balance remains speculative; EPA § 3.8 demands measurable indicators."
Independent peer review lacking	All carbon calculations were developer-prepared with no third-party audit.	"Independent verification is necessary to ensure credibility; recommended as ABP condition."
Cumulative land-use change (peat + forest)	Combined peat excavation and felling produce large net land-use emissions unmitigated by restoration.	"Combined land-use emissions may exceed regional sequestration capacity—contrary to CAP 2025 Target 4.2."
Failure to reference Climate Act 2021 budgets	No comparison to Ireland's legally binding carbon-budget ceilings for 2021-2025 and 2026-2030.	"Assessment omits context of national carbon budgets required under Climate Act § 6A."
Repetition of Derrybrien-type EIA flaws	As in Derrybrien (ECJ C-215/06), mitigation and monitoring are deferred post-consent.	"Deferral breaches the EIA Directive's requirement for full assessment prior to decision; exposes ABP to legal risk."

Regulatory Benchmark	Chapter 11 / Appendix 11-2 Compliance	Overall Rating
EPA EIAR 2022 § 3.5.7 (Climate Factors)	Quantified but non-compliant with near-term policy targets; incomplete lifecycle boundary	⚠ Partial / Insufficient
EPA EIAR 2022 § 3.6 (Cumulative Effects)	No cumulative carbon assessment	✗ Non-compliant
EPA EIAR 2022 § 3.8 (Mitigation & Monitoring)	No re-wetting, monitoring, or adaptive management	✗ Non-compliant
Climate Action & Low Carbon Development (Amendment) Act 2021	Fails to contribute to national carbon budgets	✗ Non-compliant
Climate Action Plan 2025	Payback > 100 years; negative near-term impact	✗ Non-compliant
RR-494 (Peatland Carbon & Hydrology Integration)	No coupled modelling or peer review	✗ Non-compliant

Chapter 11 (Climate) and Appendix 11-2 (Carbon Calculations) fail to demonstrate that the Cooloo Wind Farm delivers a net carbon benefit within any relevant planning or policy timeframe.

The 146-year payback period, omission of restoration measures, and lack of lifecycle completeness render the EIAR non-compliant with EPA 2022 Guidelines, the Climate Action and Low Carbon Development Act 2021, and Climate Action Plan 2025.

The Board should require a revised, fully quantified and independently audited carbon assessment — incorporating re-wetting, offsetting, and cumulative analysis — before any consent is granted.

Technical Review Report – Chapter 12: Noise & Vibration (Cooloo Wind Farm EIAR)

Acoustic and environmental assessment against the EPA EIAR Guidelines (2022), WHO Environmental Noise Guidelines (2018), and relevant Irish case law including O’Granna v An Bord Pleanála [2014] IESC 25 and Webster v Meenaclogher [2024] IEHC 136. This review integrates Chapter 12 and its associated appendices (12-1 Construction Noise Report, 12-2 Operational Noise Report, 12-3 Battery Storage Noise Assessment).

1. Scope and Context

Chapter 12 evaluates construction and operational noise and vibration impacts associated with the Cooloo Wind Farm, including turbines, substation, access roads, and battery energy storage system. The assessment applies ETSU-R-97 and WEDG (2006) guidance for operational noise, and BS 5228-1:2009+A1:2014 for construction noise.

2. Methodology

Baseline sound monitoring was conducted at seven locations over 2–4 weeks between 2021 and 2022. Background noise levels were expressed in LA90 (10 min) and averaged by wind speed. Proxy data were used for unmonitored receptors. Operational noise was modelled using ISO 9613-2 propagation within CadnaA and WindFarmer software, applying 40–45 dB LA90 limits from WEDG (2006). Construction noise modelling followed BS 5228 with assumed day-time working hours (07:00–19:00). Battery storage equipment was assessed separately as steady-state broadband noise.

3. Key Findings

- Predicted operational noise levels reach 43.2 dB LA90 at several receptors under 10 m/s wind.
- Construction-phase noise peaks at 66–69 dB LAeq but omits school-specific receptors.
- Cumulative noise includes only Clonberne (11 turbines) and Cloonlusk (2 turbines).
- No amplitude modulation (AM) correction or penalty applied.
- Low-frequency and tonal noise dismissed as non-significant without measurement.
- Vibration considered negligible without quantitative analysis.
- Battery storage predicted 34–36 dB LA90 at 50 m with no tonal modelling.

4. Supporting Appendices

4.1 Appendix 12-1 – Construction Noise Report

Uses BS 5228 reference data and assumed equipment usage but excludes Cooloo and Brierfield National Schools located within approximately 1 km of haul routes. No prediction of short-term noise peaks from concrete pours or HGV movements. Temporal variation during sensitive hours is not assessed.

4.2 Appendix 12-2 – Operational Noise Report

Presents receptor contour maps and noise tables for 10 m/s wind. Maximum LA90 predicted at 43.2 dB; uncertainty ± 3 dB noted but not propagated. WHO 2018 thresholds (≤ 40 dB Lnight) not considered. Cumulative analysis restricted to two nearby wind farms.

4.3 Appendix 12-3 – Battery Storage Noise Assessment

Assesses inverters and transformers enclosed within containerised housings. Predicts 34–36 dB LA90 at 50 m. No octave-band analysis or tonal adjustment undertaken. Tonality and low-frequency effects not modelled quantitatively.

5. Critical Technical Review

Issue: Outdated Criteria

Observation: Relies on ETSU-R-97/WEDG 2006 (40–45 dB LA90) rather than WHO 2018 (≤ 40 dB Lnight).

Regulatory Concern: Non-compliant with EPA §2.5 and Webster v Meenanogher (2024 IEHC 136).

Issue: Limited Baseline Coverage

Observation: Seven monitoring points for 439 receptors; proxy data used.

Regulatory Concern: Fails EPA §3.4.1 (representativeness).

Issue: Amplitude Modulation Ignored

Observation: No AM penalty (+3–6 dB) or modulation modelling applied.

Regulatory Concern: Non-compliant with EPA §3.5.4 (nuisance evaluation).

Issue: Cumulative Analysis Incomplete

Observation: Only two other wind farms considered.

Regulatory Concern: Fails EPA §3.6 (cumulative impact).

Issue: Construction Noise Deficient

Observation: No assessment of noise near schools or for short-term events.

Regulatory Concern: Fails EPA §3.8 (sensitive receptor analysis).

Issue: Uncertainty Unquantified

Observation: ± 3 dB uncertainty declared but not applied to compliance.

Regulatory Concern: Contrary to EPA §3.9 (residual uncertainty).

Issue: Post-Consent Validation

Observation: Monitoring proposed only if required by condition.

Regulatory Concern: Contrary to Derrybrien (C-261/18) and Directive 2014/52/EU Article

5(1).

6. Quantitative Comparison – Standards vs EIAR

Night-time (L_{night}): 43.2 dB (Standard: ≤40 dB (WHO 2018)) – ❌ Non-compliant

Daytime (L_{day}): 43.2 dB (Standard: ≤45 dB (EPA 2022)) – ⚠️ Marginal

Construction limit: 69 dB (Standard: ≤65–70 dB (BS 5228)) – ⚠️ Within limit but excludes schools

AM penalty: 0 dB (Standard: +3–6 dB (ABP precedent)) – ❌ Non-compliant

Cumulative inclusion: 2 included (Standard: All nearby projects) – ❌ Incomplete

7. Compliance with EPA EIAR Guidelines (2022)

Area	EPA 2022 Compliance	Key Deficiency
Legislative Framework	❌	Outdated WEDG 2006 / ETSU-R-97 reliance
Baseline Data	⚠️ Partial	Sparse spatial coverage, limited duration
Methodology	❌	No AM penalty / uncertainty propagation
Significance & Health	❌	Ignores WHO 2018 and Irish health jurisprudence
Cumulative Effects	❌	Narrative only, not quantified
Mitigation & Monitoring	❌	Generic, complaint-based
Residual Effects	❌	No quantified uncertainty

8. Findings

- Noise limits applied are inconsistent with WHO 2018 and EPA 2022 guidance.
- Baseline monitoring coverage inadequate to represent all receptors.
- Operational model ignores amplitude modulation and low-frequency risk.
- Construction noise impacts near schools are unassessed.

- Battery storage tonal noise and verification absent.
- Post-consent validation proposed contrary to legal precedent.

9. Conclusion

The Cooloo Wind Farm noise and vibration assessment fails to meet EPA EIAR Guidelines (2022) and WHO (2018) health-based thresholds. Outdated standards, insufficient baseline monitoring, omission of amplitude modulation, and limited cumulative analysis prevent a definitive evaluation of community and health impacts. The assessment defers key verification steps to the post-consent phase, contrary to Derrybrien (C-261/18) and Directive 2014/52/EU requirements for pre-consent impact certainty.

It is recommended that An Bord Pleanála request Further Information to include:

- Revised operational model using WHO/EPA thresholds.
- Inclusion of AM penalty scenarios (+3–6 dB) and uncertainty propagation.
- Construction-phase noise modelling for Cooloo and Brierfield National Schools.
- Binding post-construction monitoring and compliance criteria.
- Independent peer review of noise modelling and baseline adequacy.

Review # 1 – Identified issues within the report.

Issue	Critique / Objection	Comment
1. Outdated noise limits and methodology	The EJAR relies on WEDG (2006) and ETSU-R-97 (UK) criteria — outdated and inconsistent with WHO (2018) limits (≤ 40 dB L _{night}).	“WEDG/ETSU thresholds are obsolete. Current health-based guidance demands compliance with WHO 2018 levels, particularly at night.”
2. Inadequate baseline monitoring density	Only 7 monitoring locations represent ~439 receptors within 2.5 km. Sparse sampling fails to capture microclimate and directional variability.	“EPA 2022 § 3.4.1 requires representative sampling. 7 points are inadequate for this receptor population.”
3. Use of LA90 metric only (excludes LAeq, Lmax)	EJAR relies solely on LA90, 10min without analysis of peak or average noise levels (LAeq, Lmax).	“Excluding LAeq/Lmax underestimates exposure during high wind speeds and amplitude-modulation peaks.”
4. Amplitude modulation (AM) not modelled	The report acknowledges AM (“whoosh-whoosh”) but applies no penalty (+3–6 dB).	“AM is a recognised nuisance. ABP consents since 2021 impose AM penalties. Failure to model AM is non-compliant.”
5. Tonality and low-frequency noise ignored	No tonal correction or infrasound (<100 Hz) analysis included.	“Contrary to WHO 2018 and EPA draft guidance (2024), which require evaluation of low-frequency annoyance and tonal audibility.”
6. Construction-phase noise omitted for schools	Appendix 12-1 excludes Cooloo NS and Brierfield NS from the construction-phase noise model.	“Exclusion of sensitive educational receptors violates EPA 2022 § 3.5.4 on human-health impact assessment.”
7. Traffic noise excluded	Construction traffic noise deferred to Ch.15 without numerical assessment.	“Double-counting gap: EPA § 3.5.3 requires cumulative construction noise including traffic.”
8. Operational-phase averaging masks worst case	Appendix 12-2 uses average wind-speed distribution and directional weighting.	“Averaging conceals worst-case downwind/stable conditions. EPA (2022) § 8.5 requires worst-case modelling.”
9. Uncertainty not propagated into compliance check	Noise-model uncertainty (± 3 dB) acknowledged but not included in compliance analysis.	“ ± 3 dB uncertainty could place multiple receptors above WHO limits; omission underestimates exceedance risk”

Issue	Critique / Objection	Comment
10. Cumulative noise with other wind farms incomplete	Only Clonberne and Cloonlusk considered; other planned wind farms within 10 km omitted.	"Cumulative exposure underestimated, contrary to EPA 2022 § 3.6."
11. Schools and community receptors omitted from receptor table	No receptors assigned to Cooloo NS, Brierfield NS, or local community facilities.	"Sensitive receptor omission breaches EIA Directive Annex IV(f) (human health and amenity)."
12. Health impact statement superficial	Declares "no direct health effects" without referencing WHO 2018 or peer-reviewed health literature.	"Contradicts O'Grannia v ABP [2014] IESC 25, which requires specific health assessment."
13. No vibration or construction blast analysis	No vibration risk assessment for piling, rock breaking, or road construction.	"Non-compliant with BS 5228-2:2009+A1:2014 and EPA § 3.5.4; need quantitative vibration assessment."
14. No post-construction verification plan	Monitoring "if required by condition"; no fixed locations, metrics, or triggers defined.	"Deferral breaches Derrybrien precedent — EIA must provide measurable post-consent verification framework."
15. Battery storage noise underestimated (Appendix 12-3)	Uses fixed 60 dB(A) sound power and assumes limited duty cycle; omits cooling fans and nighttime standby.	"Noise from battery cooling underestimated; need specific manufacturer data and 24-hour operational scenarios."
16. Lack of independent peer review	All assessments prepared by same consultant (AWN); no independent verification.	"Independent validation required where sensitive health impacts possible (EPA § 3.8)."
17. No tonal analysis at receptor locations	Frequency spectra not provided for modelled receptors.	"Absence of spectral data prevents verification of compliance with tonal penalties under ISO 1996-2."
18. Incorrect background noise correlation	Background correlation curve assumes same slope for all locations.	"Invalidates receptor-specific threshold determination; should be re-run per IEC 61400-11 guidance."
19. Lack of construction scheduling and mitigation detail	Generic measures like "avoid high-noise works at night" stated; no hour-by-hour noise schedule provided.	"Mitigation vague; needs enforceable Noise Management Plan with working-hour constraints."

Issue	Critique / Objection	Comment
20. Deferred cumulative and long-term verification	Suggests "noise monitoring may be conducted post commissioning."	"Deferred mitigation repeats Derrybrien's procedural flaw — EIA must confirm pre-consent adequacy."

Review #2: Compliance review of 12-1 – Construction Noise Assessment

Issue	Technical Critique	Objection Text (for submission)
1. Baseline coverage inadequate	Only seven baseline points used; Cooloo NS and Brierfield NS excluded despite proximity to haul route and works compounds.	"Baseline monitoring fails to include the two national schools most exposed to construction traffic and piling. EPA 2022 §3.4.1 requires representative data at all sensitive receptors. A revised baseline campaign is required."
2. Construction-phase noise unmodelled for haulage	Haul traffic omitted; noise limited to on-site plant.	"Appendix 12-1 omits HGV construction traffic noise despite school-route proximity. This underestimates cumulative exposure and breaches EPA §3.5.3."
3. Use of outdated thresholds	Applies BS 5228 guidance and WEDG criteria, not WHO 2018 or EPA draft thresholds for daytime ≤ 55 dB LAeq, 16 hr and ≤ 40 dB Lnight.	"Assessment relies on obsolete WEDG/BS 5228 criteria. WHO 2018 health-based limits must replace generic construction thresholds."
4. No hour-by-hour modelling or phasing	Noise predictions use daily averages; high-noise tasks (concrete pours, rock breaking) not time-resolved.	"Absence of phased modelling hides peak exposure during school hours. Hourly modelling required to determine compliance with WHO Lnight ≤ 40 dB."
5. No vibration assessment	Rock breaking, piling, or compaction not analysed.	"No vibration study provided. BS 5228-2 requires quantitative vibration checks for piling, blasting and compaction."
6. No receptor façade corrections	Results given as free-field values only.	"Without façade corrections, compliance at dwellings cannot be verified. Provide façade-adjusted predictions."
7. Uncertainty not considered	Model uncertainty (± 3 dB) omitted from compliance.	"Ignoring ± 3 dB uncertainty may conceal exceedances. Apply uncertainty propagation and identify at-risk receptors."

Issue	Technical Critique	Objection Text (for submission)
8. Mitigation generic and deferred	States "noisy works avoided at night" but no enforceable schedule or trigger.	"Generic mitigation is unenforceable. A binding Construction Noise Management Plan (with hours, triggers, complaint protocol) must be provided pre-consent."
9. No cumulative construction impacts	Overlaps with grid-route or road-upgrade noise not assessed.	"Cumulative construction noise untested; contravenes EPA § 3.6."
10. Post-consent verification deferred	Monitoring "if required by condition."	"Noise verification cannot be deferred. The Board must require pre-defined monitoring locations, timing, and limits."

Review #3: Compliance review of 12-2 – Operational Noise Assessment

Issue	Technical Critique	Objection Text (for submission)
1. Outdated ETSU-R-97 / WEDG 2006 thresholds	40-45 dB LA90 limits applied; WHO 2018 Lnight ≤ 40 dB ignored.	"Outdated ETSU/WEDG criteria underestimate health risk. WHO 2018 thresholds must apply for night-time noise."
2. Limited receptor coverage	7 representative receptors for > 400 dwellings; schools excluded.	"Sparse receptor set violates EPA § 3.4.1. Both national schools and community facilities must be modelled."
3. Amplitude Modulation (AM) not modelled or penalised	AM discussed qualitatively but no +3-6 dB penalty applied.	"Ignoring AM breaches current ABP conditioning practice. Compliance must include AM penalty scenarios."
4. Tonality and low-frequency noise omitted	No tonal or spectral analysis; infrasound dismissed generically.	"Absence of tonal correction and LF spectra conflicts with ISO 1996-2 and WHO 2018 guidance."
5. Averaging conceals worst-case conditions	Uses average wind-speed and direction weighting; no directional worst-case.	"Average-case approach masks exceedances under downwind or stable conditions. Worst-case directional modelling required."
6. Model uncertainty unaccounted	± 3 dB not added to compliance margins.	"Uncertainty must be propagated per ISO 9613-2; otherwise borderline receptors may exceed limits."

Issue	Technical Critique	Objection Text (for submission)
7. Cumulative noise incomplete	Only Clonberne & Cloonlusk included; others omitted.	"Cumulative modelling fails EPA § 3.6. All consented/likely projects within 10 km must be included."
8. Health impact section superficial	Declares "no health effect" without evidence.	"Absence of quantitative health analysis contravenes <i>O'Grannia v ABP (2014)</i> . WHO 2018 evidence must be addressed."
9. Post-consent verification left open	Monitoring "may" occur; no method.	"Deferral of verification repeats Derrybrien procedural flaw. Monitoring must be defined pre-consent."
10. Construction traffic noise excluded	Delegated to Ch. 15; not numerically assessed.	"Separation of traffic and turbine noise prevents cumulative evaluation; EPA § 3.5.3 non-compliant."
11. AM/tonal detection method not defined	No reference to IEC 61400-11 or Ofgem methodology.	"Compliance cannot be verified without an AM detection standard; require methodology adoption."
12. No independent peer review	All modelling by same consultant; no validation.	"Independent verification is required under EPA § 3.8 for sensitive receptors."

Review #4: Compliance review of 12-3 – Battery Storage Noise Assessment

Issue	Technical Critique	Objection Text (for submission)
1. Generic source data	Uses a generic 60 dB(A) sound power for all BESS units; no manufacturer data or octave-band spectra.	"Appendix 12-3 lacks real SWL data. Compliance cannot be established without manufacturer-verified spectra."
2. No night-time worst-case scenario	Models daytime charge/discharge only; cooling fans assumed inactive at night.	"Night-time standby and cooling cycles omitted; this underestimates exposure and breaches WHO Lnight ≤ 40 dB."
3. Tonal & AM characteristics ignored	No tonal or modulation penalties applied though inverter/transformer noise is tonal.	"Failure to include tonal penalties violates BS 4142 § 9 and ISO 1996-2; the Board should require penalty application."
4. Receptors too few	Only one proxy receptor modelled near compound; others omitted.	"A single receptor cannot represent full noise field; all nearby dwellings and schools require assessment."

Issue	Technical Critique	Objection Text (for submission)
5. Cumulative with turbines omitted	Combined turbine + BESS noise not modelled.	"Combined operational noise must be modelled to verify total LAeq compliance."
6. Uncertainty and verification deferred	± 3 dB not applied; monitoring "if required."	"Uncertainty propagation and binding verification plan required per EPA § 3.8."
7. Mitigation measures not specified	No enclosures, barriers, or fan-speed controls described.	"Without defined mitigation, the BESS assessment is theoretical. Specify acoustic enclosure design and low-noise fan settings."
8. No tonal testing method	No reference to BS 4142 or IEC 61260 for tonal analysis.	"Measurement methodology unspecified; compliance cannot be verified without BS 4142 protocol."
9. No link to climate / energy chapter	Operational emissions and noise-energy trade-off not discussed.	"Lack of cross-reference with carbon lifecycle undermines integrated assessment under EPA § 3.5.7."
10. Post-consent deferral	Verification and mitigation left to CEMP.	"Deferral contravenes EIA Directive Art. 5(3); all details must be fixed pre-consent."

Summary of Compliance for all appendices

Standard / Regulation	Compliance Status	Key Non-Compliant Aspects
EPA EIAR 2022 §§3.4-3.8	Partial / ✗ Non-compliant	Insufficient baseline density; omitted receptors; deferred mitigation; incomplete cumulative analysis.
WHO Environmental Noise Guidelines (2018)	✗ Non-compliant	Exceeds Lnight ≤ 40 dB; outdated WEDG/ETSU limits.
BS 5228-1/-2, BS 4142, ISO 9613-2, ISO 1996-2	Partial	Lacks vibration, tonal, and uncertainty integration.
EIA Directive 2014/52/EU (Annex IV (f))	✗ Non-compliant	Human-health assessment incomplete; sensitive receptors omitted.

Across all three appendices, the Noise and Vibration chapter does not demonstrate compliance with current Irish and EU environmental-noise standards. The reliance on outdated ETSU/WEDG limits, minimal receptor coverage, absence of AM/tonal penalties, and post-consent deferral of verification mean the results cannot provide the “complete, precise and definitive” information required by the EIA Directive and EPA EIAR Guidelines (2022).

Before any determination, the Board should require updated modelling using WHO 2018 thresholds, AM-penalised scenarios, full construction-phase (incl. HGV) analysis for both national schools, and a legally binding Noise Management & Verification Plan covering turbines and BESS.

References

- **Environmental Protection Agency (EPA) (2022).**
 - Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EIAR).
 - §§ 3.4–3.8 (Baseline, Human Health, Cumulative, Mitigation, Monitoring).
- **European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 — S.I. No. 296 of 2018.**
 - Transposing Directive 2014/52/EU amending Directive 2011/92/EU (EIA Directive).
 - Annex IV(f): “Human health, population and amenity impacts”.
- **World Health Organization (WHO) (2018):** Environmental Noise Guidelines for the European Region.
 - Night-time target ≤ 40 dB L_{night} (external), daytime ≤ 45 dB L_{day}.
 - Health-based evidence on sleep disturbance and cardiovascular risk.
- **European Commission (2014).**
 - Guidance on EIA – Screening, Scoping and Environmental Factors (Noise, Human Health, Climate).
- **Climate Action and Low Carbon Development (Amendment) Act 2021.**
 - Section 4: integration of mitigation in project-level EIAs.
 - (Cross-reference relevant for BESS and operational noise-energy balance.)
- **Wind Energy Development Guidelines (WEDG) (Department of the Environment, Heritage and Local Government, 2006).**
 - Outdated but still referenced in some EIARs; uses 40–45 dB LA90 limits.
- **Draft Revised Wind Energy Development Guidelines (WEDG 2019).**
 - Proposes alignment with WHO thresholds and AM penalties.

- **O’Grianna & Ors v An Bord Pleanála [2014] IESC 25.**
 - Supreme Court: health and amenity impacts must be specifically and cumulatively assessed under EIA.
- **Webster & Rollo v Meenaclogher Windfarm Ltd & An Bord Pleanála [2024] IEHC 136.**
 - High Court recognition that decision-makers must consider up-to-date health evidence (WHO 2018).
- **Commission v Ireland (C-215/06) – Derrybrien Wind Farm Judgment (ECJ 2008).**
 - EIA must be prospective, complete and precise; deferral of assessment (post-consent verification) unlawful.
- **Commission v Ireland (C-261/18) – Article 260 TFEU enforcement (2020).**
 - Ireland fined for failure to rectify Derrybrien EIA breach.
- **An Bord Pleanála Inspector’s Report ABP-319216-24 (Galway Wind Farm, 2024).**
 - Required omission of turbine within priority habitat and enforced AM penalties (+4–6 dB).
- **An Bord Pleanála Decision ABP-309889-21 (Galway / Mayo).**
 - Set precedent for applying AM correction factors and requiring WHO-aligned thresholds.
- **Cooloo Wind Farm EIA (2025) — Chapter 12 Chapter 12 (Noise & Vibration)**
 - Appendix 12-1 — Construction Noise Assessment
 - Appendix 12-2 — Operational Noise Assessment
 - Appendix 12-3 – Battery Storage Noise Assessment

Technical Review Report – Chapter 5 (Material Assets) Construction Traffic Impacts and Telecoms and Links (Cooloo Wind Farm EIAR)

Transport and environmental assessment against the EPA EIAR Guidelines (2022), TII Standards (GE-STY-01024), DMURS (2020), and RSA Construction Traffic Guidance (2018). This report integrates Chapter 15 (Material Assets) and Appendix 15-1 (Traffinomics Traffic Count Data, July 2025) with Appendix 15-2 (Traffic Management Plan). This report also considers the impact of Appendix 15-5 — Ai Bridges Letter of Reliance (Telecoms & Links).

1. Scope and Context

The Cooloo Wind Farm proposes nine turbines, substation, access roads, and grid connection. Construction will involve approximately 8,000–10,000 HGV movements over 18–24 months, including large turbine component deliveries. The principal access route follows M6 → N63 → R364 → L7408 via Moylough, Brierfield, and Cooloo. Two national schools—Brierfield NS (within 50 m of haul route) and Cooloo NS (≈300 m away)—lie on or adjacent to the designated haul corridor.

2. Methodology as Presented in EIAR

The EIAR and Traffic Management Plan (TMP) estimate daily HGV flows and discuss mitigation narratively. Baseline data are derived from single-day manual counts and supplemented by Traffinomics survey results (July 2025). No quantitative capacity or safety modelling was undertaken. The TMP proposes standard signage, flagmen, and driver induction, with no time-based restrictions for school hours or commuter peaks.

3. Baseline Traffic Conditions – Traffinomics (July 2025)

- Counts undertaken 8 July 2025 at two junctions: R347/N63 at Moylough and L2302/R332/N63 near Brierfield/Cooloo.
- Peak hour (07:00–09:00) flows ≈ 1,000–1,100 PCU/h; PM peak (16:00–18:00) ≈ 900–1,000 PCU/h.
- HGV share: 4–6% of total flows; LGVs significant due to commuter and service traffic.
- Local roads L7408/L7409 carry <200 PCU/h but have width <5 m, poor visibility, and no pedestrian facilities.
- Baseline Level-of-Service (LOS): D–E during AM peaks on N63/R347 corridor, already near capacity.

Conclusion: the baseline confirms that the Galway-bound commuter corridor operates under high stress. Even 60–80 additional HGV trips/day could trigger LOS E–F conditions and queuing at key junctions.

4. Sensitive Receptors – National Schools

4.1 Brierfield National School

Located directly on the L7408 haul route within 50 m of carriageway. School drop-off/pick-up coincides with commuter peaks (08:50–09:10, 14:30–15:00). Traffic counts show ~40–45 vehicles/15 min during these periods. Introducing HGV convoys would double heavy-vehicle exposure. No exclusion window or marshal control specified in TMP.

4.2 Cooloo National School

Situated ≈300 m north of haul route junction. Indirect exposure through dust, vibration, and passing traffic noise. No pedestrian crossings or dedicated footpaths provided; no protective barriers proposed. TMP lacks any specific mitigation for this receptor.

5. Regional Commuter Impacts – N63 Corridor (Moyleigh → Galway)

The N63 forms part of the key commuter route into Galway via Mountbellew, Moyleigh, Abbeyknockmoy, and Athenry. Baseline westbound flows exceed 500 PCU/h at Moyleigh during the morning peak. Construction-phase deliveries (up to 80–100 HGVs/day) will likely overlap with this peak (07:00–09:00), potentially increasing average junction delays by 40–70 seconds per vehicle based on TII GE-STY-01024 default saturation parameters.

6. Technical and Regulatory Deficiencies

Issue 1: Lack of traffic modelling

Observation: No SIDRA/VISSIM or quantitative capacity analysis for junctions or school corridors.

Regulatory Reference: EPA §2.5; TII GE-STY-01024.

Issue 2: No school-hour exclusion

Observation: TMP lacks time-based curfews or escort policies for HGVs near schools.

Regulatory Reference: RSA 2018; DMURS §4.3.2.

Issue 3: Inadequate baseline

Observation: Single-day July count not representative of term-time or seasonal peaks.

Regulatory Reference: EPA §3.4.1.

Issue 4: Commuter overlap ignored

Observation: No temporal or cumulative traffic modelling for N63 corridor.

Regulatory Reference: EPA §3.6.

Issue 5: Dust/vibration ignored

Observation: No quantitative nuisance analysis for school receptors.

Regulatory Reference: EPA §3.5.4.

Issue 6: Deferred mitigation

Observation: TMP to be finalised post-consent, with no enforceable conditions.

Regulatory Reference: Derrybrien (C-261/18).

6.1 Emergency Communications Resilience (TETRA Network)

The development lies within the operational footprint of the National Digital Radio Service (TETRA), used by Garda Síochána, National Ambulance Service, and Fire Services throughout the Barnaderg–Cooloo–Moylough–Brierfield area. This network relies on line-of-sight microwave backhaul links and low-angle propagation paths that are sensitive to physical obstruction and multipath scattering from tall structures.

The proposed turbines, at 180 m tip height, form dominant moving reflective surfaces. No radio-frequency propagation modeling, no Fresnel zone clearance analysis, and no consultation with ComReg, NDRS operators, or emergency services is documented in Chapter 15 or Appendix 15-5.

This is a material omission because:

- TETRA operates in the 380–400 MHz band where wind turbine blades can induce Doppler shift, signal scattering, and destructive interference.
- The area has limited alternative coverage, meaning any degradation cannot be automatically rerouted.
- Emergency response times in rural Galway rely on stable radio coverage due to low mobile network redundancy.

Failure to assess turbine interference with TETRA constitutes non-compliance with:

- EPA EIAR Guidelines 2022 – §3.5.3 (Human Health & Safety)
- Planning & Development Regulations (S.I. 296/2018) – Schedule 6(4)(f)
- ComReg Radio Spectrum Licence Conditions & EN 303 345 (Electromagnetic Compatibility)

7. Compliance with EPA EIAR Guidelines (2022)

EPA Guideline Clause	Requirement	Compliance (Observed from Appendix 15-1 Data)	Comment
§2.5 – Scientific method	Quantitative baseline and capacity analysis	⚠ Partial	Counts provided, but no SIDRA/VISSIM modelling of junctions or school corridors.
§3.4.1 – Representative baseline	Multi-day, term-time data	✘	Only one Tuesday in July 2025; not representative of school term.
§3.5.4 – Human environment	Explicit assessment of schools, pedestrians	✘	No receptor-specific analysis.
§3.6 – Cumulative/temporal	Include commuter overlap	✘	No temporal modelling or mitigation windows.
§3.8 – Mitigation & monitoring	Enforceable, data-driven TMP	✘	Mitigation deferred post-consent.

8. Findings

- Traffinomics data confirm commuter congestion near capacity at N63/R347 junctions.
- Haul routes pass directly by two national schools without time restrictions.
- No quantitative modelling of junction performance or queueing.
- TMP omits enforceable curfews, liaison mechanisms, or post-consent compliance tracking.
- Potential dust, vibration, and safety risks to children and commuters remain unquantified.

9. Recommendations

- Develop a quantitative traffic model (SIDRA/VISSIM) for critical junctions (R347/N63, L2302/R332).
- Implement school-hour exclusion zones (no HGV movements 08:15–09:30, 14:15–15:30).
- Restrict HGV movements during 07:00–09:00 and 16:30–18:00 commuter peaks.

- Provide temporary pedestrian protection (barriers, signage, marshals) at Brierfield NS.
- Introduce GPS-based HGV tracking and compliance logs for all turbine deliveries.
- Establish Community Liaison and Road Safety Committee with schools and Galway County Council.
- Conduct Stage 1 & 2 independent Road Safety Audits prior to construction commencement.

10. Conclusion

The review of Chapter 15 and its supporting appendices demonstrates significant procedural and technical non-compliance with the EPA EIAR Guidelines (2022), DMURS (2019), TII DN-GL-01060, and associated Department of Transport and OPW standards. Baseline traffic data in Appendix 15-1 (Traffinomics Count Report) are temporally and spatially insufficient, relying on short off-peak surveys that omit school-term conditions and daily variability. Consequently, the EIAR fails to present a representative picture of existing traffic volumes or sensitive receptor exposure, contrary to EPA §3.4.1. The Traffic Management Plan (Appendix 15-2) provides only indicative mitigation and lacks enforceable time windows, quantitative HGV limits, or safety design for Cooloo NS and Brierfield NS, breaching DMURS §4.4 and EPA §3.5.3 on community health and safety. No certified abnormal-load route, pre-works pavement survey, or reinstatement bond is supplied, contrary to TII DN-GL-01060, and cumulative construction traffic with nearby projects is not modelled, violating EPA §3.6.

Emergency-vehicle resilience, diversion mapping and blue-light coordination are absent, while the separation of construction noise (Chapter 12) from traffic impacts prevents proper cumulative appraisal. The Ai Bridges “Letter of Reliance” (Appendix 15-5) provides only non-binding assurance on telecoms and omits a quantified assessment of mobile, broadband or emergency (TETRA) coverage for local communities and schools. No operator agreements or post-construction verification commitments are included. In aggregate, the material assets assessment remains conceptual rather than operational, defers multiple decisions to post-consent stages, and fails to guarantee public safety, communications resilience, or compliance with national transport standards.

From a regulatory perspective, these deficiencies mirror the type of incomplete assessment criticised in previous ABP and ECJ findings (e.g. Derrybrien precedent) where reliance on deferred mitigation rendered consent legally vulnerable. To achieve compliance, the Board should require a revised and independently audited Traffic and Communications Impact Package encompassing (i) term-time baseline surveys, (ii) quantitative school-zone safety design, (iii) binding HGV scheduling with KPIs, (iv) pre-works pavement and bridge certification, and (v) signed telecom operator agreements guaranteeing continuity for emergency and educational users. Without these, Chapter 15 cannot be regarded as compliant with the EPA EIAR (2022) framework or with Ireland’s statutory duties under the EIA Directive 2014/52/EU.

In addition, the omission of an Emergency Communications Resilience Assessment for the TETRA network represents a significant public-safety failure. Until resilience testing, operator certification and enforceable contingency protocols are secured, the project cannot be considered compliant with EPA EIA 2022 §3.5.3 or with the State's obligations to safeguard emergency services in rural communities.

Review # 1 – Identified issues within the report.

Issue	Critique / Objection	Comment
1. Baseline traffic data out-of-date / limited temporal coverage	The Traffinomics count data were collected during a short snapshot period (2024) and may not reflect current peak conditions or school-hour traffic.	Baseline traffic counts must represent pre-construction peak and school-hour flows per TH GE-STY-01002 and EPA 2022 § 3.4.1 . Multi-day data are required.
2. School proximity and safety not assessed quantitatively	The TMP acknowledges Cooloo NS and Brierfield NS but provides no swept-path, visibility, or queue-length modelling for HGVs passing during drop-off/pick-up.	Failure to model conflicts at school frontages breaches DMURS 2019 § 4.4 and EPA 2022 § 3.5.4 on human-health protection. A School Traffic Safety Audit is required.
3. Route capacity & junction modelling	Junction capacity modelling omits regional roads R328 , R360 , and N63 , which carry commuter flows toward Galway.	No SIDRA/LINSIG outputs provided; junction performance under wind-farm traffic remains untested.
4. Construction traffic peak underestimated	The TMP assumes 10–20 HGVs/day; peak turbine-blade and concrete phases could exceed 80 HGVs/day.	Under-prediction of peaks risks congestion and unsafe school-hour conflicts. Require revised Construction Traffic Impact Assessment with worst-case scenario.
5. Haul-route condition & structural assessment absent	No pavement-condition or load-bearing survey presented for local L-roads identified as haul routes.	Contradicts TH DN-GL-01060 (2019) ; pre-works condition survey and reinstatement bond are required.
6. Communication & emergency-access resilience	The TMP lacks contingency for blocked routes or emergency-vehicle priority during convoys.	No Emergency Access Plan or communications protocol specified; contrary to EPA § 3.8 mitigation requirements.
7. Cumulative traffic with concurrent developments	Cumulative impacts with nearby wind, quarry, and N63 projects are omitted.	Non-compliant with EPA § 3.6 ; requires combined scenario modelling.
8. TMP lacks enforceable scheduling & community liaison	“Deliveries to avoid school hours” stated, but no fixed time window or enforcement mechanism included.	A binding TMP condition should specify no HGV 07:30–09:30 / 14:30–16:00 and appoint a Community Liaison Officer .

Issue	Critique / Objection	Comment
9. Noise & vibration from traffic deferred to Ch. 12	Traffic-related noise was excluded from the operational and construction noise model.	Cross-reference insufficient; combined impacts must be re-modelled under EPA § 3.5.3 / 3.5.4.
10. Telecommunications resilience (Appendix 15-5)	The Ai Bridges letter only covers turbine radar interference, not risks to fibre or mobile networks from road works.	A Communications Continuity Plan is required for community broadband, mobile coverage, and emergency comms.
11. Utilities / water / drainage crossings	The TMP mentions culvert crossings but lacks sediment and pollution control measures.	Potential siltation/flooding breaches OPW 2009 Flood Guidelines § 3.2 ; detailed method statements required.
12. Reinstatement & road bond detail deferred	Commitments to reinstate roads are generic; no bond value or accountable party identified.	Must be supported by a reinstatement bond under Reg. 13 of the Planning & Development Regulations 2001 .
13. Climate & material-assets linkage	Transport emissions omitted from Chapter 11 (Carbon Balance).	Non-compliant with EPA § 3.5.7 (Climate Factors); haulage GHGs must be quantified.
14. Signage & abnormal-load escort planning	No certified route plan or Garda Síochána approval provided for abnormal loads.	Missing documentation required under DoT 'Abnormal Loads 2020' Code of Practice .
15. Public consultation on TMP	No evidence that the draft TMP was presented for community comment.	EPA 2022 § 2.3 requires early stakeholder engagement; TMP must be re-issued after consultation.

Standard / Regulation	Key Expectation	Observed Status in EIA/R	Compliance Rating	Summary Comment
EPA §3.4.1 – Baseline Representativeness	Traffic counts should capture realistic peaks, seasonal variation, and school terms.	Short-duration counts; no term-time validation.	⚠ Partial	Require 7-day ATC and school-term counts.
EPA §3.5.3 – Human Health	Must analyse community safety and school risk.	Schools qualitatively mentioned only.	✘ Non-compliant	Conduct quantitative school safety & noise analysis.

Standard / Regulation	Key Expectation	Observed Status in EIA/R	Compliance Rating	Summary Comment
EPA §3.6 – Cumulative Impacts	Consider other regional construction and wind schemes.	Not addressed.	✗	Add cumulative HGV and noise modelling.
EPA §3.8 – Mitigation Specificity	Mitigation must be binding and measurable.	Generic and deferred to TMP.	⚠	Needs enforceable windows, KPIs, and monitoring plan.
DMURS §4.4 – School / Pedestrian Safety	Design school-zone protection.	None.	✗	Condition School-Zone Safety Audit and design drawings.
TII DN-GL-01060 – Pavement Reinstatement	Survey, bond, and reinstatement commitment required.	None included.	✗	Require pre-works survey and reinstatement bond.
DoT Abnormal Loads Guidance	Route clearance, swept paths, Garda approval.	Not demonstrated.	⚠	Submit certified abnormal-load route survey.
OPW (2009)	Drainage design to avoid runoff/flooding on haul routes.	No hydraulic justification.	⚠	Add drainage cross-sections and runoff controls.

Review # 2 – Chapter 15 — Material Assets, Roads & Traffic

Issue	Critique / Objection	Comment
Baseline traffic is temporally thin	Counts are short-duration snapshots; do not represent peak commuter periods, school terms, or seasonal variation.	“Chapter 15 relies on short snapshot counts that are not representative of peak commuter/school conditions. This fails EPA EIA/R 2022 §3.4.1 on representative baselines; 7-day ATC datasets during term-time are required.”

Issue	Critique / Objection	Comment
Schools not quantitatively assessed	No swept-path, queue, visibility or conflict modelling at Cooloo NS/Brierfield NS during drop-off/pick-up.	"Absence of quantitative school-frontage analysis breaches DMURS §4.4 and EPA §3.5.4 (human health/safety). Require a School Traffic Safety Audit and time-restricted HGV windows."
Junction & route capacity under-modelled	No SIDRA/LINSIG for key R-road/N-road nodes (R328/R360/N63); peak concrete/blade convoys not tested.	"Lack of capacity modelling prevents evaluation of Galway-bound commuter effects. The Board should require full junction models including construction peaks."
Construction peak underestimated	Averages (10-20 HGV/day) omit peak pour/convoy days (>80 HGV).	"Underestimation of peaks understates risk to safety and network performance. A revised CTIA using worst-case peaks is required."
Haul-route structural integrity untested	No pavement condition survey, axle load assessment or bridge/culvert clearance check.	"Non-compliant with TII DN-GL-01060. Require pre-works survey, strengthening plan and a reinstatement bond prior to commencement."
Emergency access & resilience absent	No detour plans, blue-light priority or incident clearance protocols during convoys.	"Missing Emergency Access Plan contravenes EPA §3.8 (mitigation). Condition a blue-light priority and diversion protocol."
Cumulative traffic omitted	Overlap with other permitted/regional works not modelled.	"Breaches EPA §3.6 on cumulative effects; combined scenarios must be assessed."
TMP unenforceable	Vague promise to avoid school hours; no fixed windows, KPIs, or governance.	"TMP lacks enforceability. Condition binding windows (e.g, no HGV 07:30-09:30 / 14:30-16:00), monitoring KPIs, and a Community Liaison Officer."
Traffic noise/vibration split to Ch.12	No integrated construction road-noise/vibration assessment.	"Separation frustrates cumulative assessment; re-run with integrated road noise and BS 5228-2 vibration checks."

Issue	Critique / Objection	Comment
Utilities/Drainage crossing risks	Method statements for culverts/ditches absent; no silt control sizing.	"Potential WFD/OPW non-compliance. Require OPW-compliant method statements and sediment control sizing."
Reinstatement & bond unspecified	No bond value, scope or responsibility stated.	"Reinstatement must be backed by a quantified bond (P&D Regs). Condition before commencement."
Public consultation lacking	No evidence of community consultation on TMP.	"EPA 2022 §2.3 requires early engagement; TMP should be republished after consultation."

Standard / Regulation	Key Expectation	Observed Status in EIAR	Compliance Rating	Summary Comment
EPA §3.4.1 - Baseline Representativeness	Traffic counts should capture realistic peaks, seasonal variation, and school terms.	Short-duration counts; no term-time validation.	⚠ Partial	Require 7-day ATC and school-term counts.
EPA §3.5.3 - Human Health	Must analyse community safety and school risk.	Schools qualitatively mentioned only.	✗ Non-compliant	Conduct quantitative school safety & noise analysis.
EPA §3.6 - Cumulative Impacts	Consider other regional construction and wind schemes.	Not addressed.	✗	Add cumulative HGV and noise modelling.
EPA §3.8 - Mitigation Specificity	Mitigation must be binding and measurable.	Generic and deferred to TMP.	⚠	Needs enforceable windows, KPIs, and monitoring plan.
DMURS §4.4 - School / Pedestrian Safety	Design school-zone protection.	None.	✗	Condition School-Zone Safety Audit and design drawings.

Standard / Regulation	Key Expectation	Observed Status in EIAR	Compliance Rating	Summary Comment
TII DN-GL-01060 - Pavement Reinstatement	Survey, bond, and reinstatement commitment required.	None included.	✘	Require pre-works survey and reinstatement bond.
DoT Abnormal Loads Guidance	Route clearance, swept paths, Garda approval.	Not demonstrated.	⚠	Submit certified abnormal-load route survey.
OPW (2009)	Drainage design to avoid runoff/flooding on haul routes.	No hydraulic justification.	⚠	Add drainage cross-sections and runoff controls.

Review # 3 – Appendix 15-1 – Traffinomics Traffic Count Data

Issue	Critique / Objection	Comment
Snapshot duration too short	Manual/short ATC windows; not 7-day continuous; unclear if term-time.	"Appendix 15-1 lacks representative 7-day ATC datasets in school term. Replace with term-time, multi-week counts per EPA §3.4.1."
Classification & calibration unclear	HGV/Abnormal Load classification and ATC calibration not evidenced.	"Vehicle classification/calibration evidence absent; heavy flows may be miscounted. Provide calibration certificates and class matrices."
No turning & queue surveys	Junction turning counts/queue length surveys not provided for critical nodes.	"Without turning/queue data, junction models are speculative. Require peak-hour TMCs and queue surveys."
Growth factors & seasonality	No use of TII growth factors; seasonality not adjusted.	"Traffic growth/seasonality untreated → underestimates 2025–2030 flows. Apply TII growth and seasonal adjustment."
Abnormal loads not reflected	Data do not include blade/tower convoys or escort effects.	"Baseline omits abnormal load dynamics; separate convoy impact study is required."
Data transparency	Raw CSVs/time series not appended; only summaries.	"Full raw datasets are necessary for independent audit. Publish raw ATC/TMC files."

Standard / Regulation	Key Expectation	Observed Status in EIAR	Compliance Rating	Summary Comment
EPA §3.4.1	Statistically representative traffic baseline.	Short, off-peak samples.	▲	Extend to 7-day ATC dataset.
EPA §3.5.4	Include vulnerable road users.	Not recorded.	✘	Add pedestrian/cyclist counts.

Standard / Regulation	Key Expectation	Observed Status in EIAR	Compliance Rating	Summary Comment
TII DN-GL-01060	Use calibrated devices.	Calibration not shown.	▲	Provide ATC calibration certificates.
DMURS	Reflect local access hierarchy.	Only regional counts.	▲	Expand to local roads serving schools.

Review # 4 – Appendix 15-2 (Traffic Management Plan)

Issue	Critique / Objection	Comment
Non-binding scheduling	"Avoid school hours" stated but no fixed windows or curtailment rules.	"TMP must specify binding delivery windows (e.g. no HGV 07:30–09:30 / 14:30–16:00) and enforcement procedures."
Lack of abnormal-load route proof	No certified route survey, swept paths, bridge/overhead clearance check, or Garda approval appended.	"Non-compliant with DoT Abnormal Loads guidance. Provide certified route survey and approval letters."
Road condition & bond missing	No pre-works survey/spec or bond quantum.	"Contrary to TII DN-GL-01060. Condition a pre-works survey and reinstatement bond before mobilisation."
Emergency access & comms plan absent	No blue-light coordination, diversion maps, or live comms protocol.	"Fails EPA §3.8 mitigation. Require an Emergency Access & Communications Plan with contact points and escalation."
School-zone safety not designed	No RSAs, crossing protection, marshal plans or parking controls at schools.	"DMURS §4.4 requires school-zone safety design. Condition Stage 1/2 Road Safety Audit and measures."
Monitoring KPIs & governance	No KPI dashboard (HGV counts, complaints, breaches) or governance chart.	"TMP must include KPIs, thresholds, reporting cadence, and a named Community Liaison Officer."
Cumulative scheduling	Overlap with other schemes not planned; convoy conflicts possible.	"Breaches EPA §3.6; provide cumulative schedule and conflict-avoidance protocol."

Issue	Critique / Objection	Comment
Noise/vibration integration	No BS 5228-2 vibration checks for roadworks/crane pads; noise left to Ch.12.	"Include integrated construction noise/vibration controls and triggers in TMP."
Pedestrian/cyclist protection	No temporary traffic management drawings (TTM) showing footpaths, shuttles or TMAs.	"Provide Chapter 8 TM drawings per Traffic Signs Manual, including pedestrian/cyclist arrangements."
Complaints & incident management	No formal complaints log/SLA; no incident response timelines.	"Condition a complaints protocol with response SLA and ABP/EPA reporting."

Standard / Regulation	Key Expectation	Observed Status in EIAR	Compliance Rating	Summary Comment
EPA §3.8	Specific mitigation and monitoring triggers.	Generic measures only.	▲	Define fixed windows, KPIs, triggers.
DMURS §4.4	Protect pedestrians/schools during works.	Not addressed.	✗	Include school-zone safety and marshal plans.
TH DN-GL-01060	Pre-works survey, bond, reinstatement.	Missing.	✗	Must be conditioned pre-commencement.
DoT Abnormal Loads	Certified route and Garda approval.	Absent.	▲	Require route certification.
EPA §3.6	Cumulative scheduling.	Ignored.	✗	Add combined works schedule.
EPA §3.5.3	Emergency-vehicle resilience.	Absent.	✗	Condition Emergency Access Plan.

Review # 5 – Appendix 15-5 – Ai Bridges Letter of Reliance (Telecoms & Links)

Issue	Critique / Objection	Comment
Reliance on non-binding letter	"Letter of reliance" summarises feasibility but is not a binding operator agreement.	"Mitigations must be underpinned by signed agreements with ESB/Three/2rn confirming clearances and reroutes before construction."
Incomplete operator coverage	Several operators non-responsive (WISP/alt-nets); no field validation of coverage.	"Operator gaps mean risks remain. Require pre/post coverage surveys (DTT/LTE/5G/WISP) and written confirmations."
Fresnel clearance not guaranteed	ESB/Three microwave links: proposals for micrositing/relocation but no final clearance design or 0.6F1 proof.	"Provide Fresnel clearance calculations and route-specific drawings, or binding relocation MoUs with programme and costs."
Schools & emergency comms not addressed	No resilience plan for Cooloo NS/Brierfield NS, or TETRA coverage checks.	"Condition a School & Emergency Comms Resilience Plan: baseline tests, rapid remediation SLA, and TETRA post-install test with contingency."
Construction-phase outages	No plan to maintain broadband/mobile during trenching/roadworks on haul routes.	"Require a Communications Continuity Plan (temporary repeaters, alternative routing, outage notices) prior to grid/road works."
2rn protocol lacks SLA	Protocol referenced but no fix-times or interim measures for affected premises.	"Mandate a time-bound SLA with interim solutions (repeaters/deflectors) funded by the developer."
Evidence of radar/aviation interface	Letter doesn't replace quantitative radar/clutter study for Ch.16.	"Clarify that telecom reliance letter is not an aviation clearance; require IAA/DoD written acceptance separately."

Standard / Regulation	Key Expectation	Observed Status in EIAR	Compliance Rating	Summary Comment
EPA §3.5.3	Address community communication resilience.	Schools/emergency comms omitted.	✗	Add Comms Resilience Plan and TETRA test.
EPA §3.8	Mitigation must be binding, not indicative.	Non-binding letter only.	⚠	Secure signed operator agreements.
EPA §3.6	Cumulative infrastructure effects (telecoms, radar).	Not discussed.	⚠	Integrate telecoms with aviation analysis.
DoT/IAA Protocols	Written acceptance from IAA/DoD.	Not appended.	✗	Provide IAA/DoD letters before determination.
DMURS	Maintain broadband/mobile access along public routes.	No continuity plan.	⚠	Condition Communications Continuity Plan.

References

- **European Parliament and Council (2014)** — *Directive 2014/52/EU amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment* (EIA Directive).
- **European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018** — *S.I. No. 296 of 2018*, transposing the 2014 Directive into Irish law.
- **Planning and Development Regulations 2001–2024** — including provisions for reinstatement bonds and construction traffic management under Part 10.
- **European Communities (Birds and Natural Habitats) Regulations 2011** — *S.I. No. 477 of 2011* (as amended), relevant for hydrological and cumulative impact pathways.
- **Climate Action and Low Carbon Development (Amendment) Act 2021** — contextual policy for cumulative emissions and transport sustainability.
- **Environmental Protection Agency (EPA) (2022)** — *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*.
 - Section 3.4.1 — Baseline Data and Representativeness.
 - Section 3.5.3–3.5.4 — Human Health and Safety.
 - Section 3.6 — Cumulative Effects.
 - Section 3.8 — Mitigation and Monitoring.
- **Department of Housing, Local Government and Heritage (DHLGH) (2022)** — *Wind Energy Development Guidelines (Draft, 2022)* — transport, construction, and amenity considerations.
- **Office of Public Works (OPW) (2009)** — *The Planning System and Flood Risk Management – Guidelines for Planning Authorities* (drainage and runoff design).
- **Design Manual for Urban Roads and Streets (DMURS)** — *Version 2.0, 2019* — National guidance for urban and rural road user safety, including school-zone and vulnerable road user design (§4.4).
- **Transport Infrastructure Ireland (TII)**:
 - *DN-GL-01060 (2020)* — *Guidelines for Managing Road Construction Works and Pavement Reinstatement*.
 - *GE-STY-01024 (2020)* — *Abnormal Loads Approval and Swept Path Requirements*.
 - *Publication PE-PAV-02009* — *Pavement Assessment and Strengthening Manual*.
- **Department of Transport (2015)** — *Abnormal Load Permit Application and Guidance Notes*.

- **Traffic Signs Manual (TSM), Chapter 8 (2019 Update)** — *Temporary Traffic Management at Road Works.*
- **THI (2017)** — *Project Appraisal Guidelines for National Roads Unit 16.1 – Construction Traffic Impacts.*
- **Commission for Communications Regulation (ComReg)** — *National Radio Spectrum Policy Statements (2019-2024)* and *Telecommunications Infrastructure Guidelines (2021).*
- **Department of the Environment, Climate and Communications (DECC) (2023)** — *National Digital Strategy 2023-2028 – Harnessing Digital for Ireland's Future.*
- **Irish Aviation Authority (IAA) (2021)** — *Guidance on Wind Turbine Developments and Aviation Safety / Radar Interference.*
- **Bridges Limited (2025)** — *Letter of Reliance on Microwave and Telecom Path Clearances for Cooloo Wind Farm (Appendix 15-5).*
- **European Aviation Safety Agency (EASA) (2019)** — *Study on Wind Turbines and Radar Clutter Effects.*
- **Cooloo Wind Farm EIAR (2025)** — *Chapter 15: Material Assets, Roads & Traffic.*
 - **Appendix 15-1** — *Traffic Count Data (2025.09.26).*
 - **Appendix 15-2** — *Traffic Management Plan (2025.09.26)*
 - **Appendix 15-5** — *Ai Bridges Telecommunications and Link Clearance Letter (2025.09.26).*
 - **Chapter 12 Cross-Reference** — *Noise and Vibration (Construction Traffic).*