Reservation of Rights (Litigant in Person)

This submission is made under **explicit protest** and strictly **without prejudice** to the Interested Party's right to challenge the lawfulness and procedural integrity of the Examination.

The Interested Party's continued participation is legally **compelled** by the statutory process (Planning Act 2008) to maintain standing, but this action does **not** constitute a waiver, acceptance, or validation of any alleged procedural impropriety, ExA bias, unlawful censorship, or fundamental flaws in the Administrative Record.

All rights to seek Statutory Appeal and Judicial Review against the final Development Consent Order decision are fully reserved.

Forensic Critique of the Flood Risk Assessment and Drainage Strategy (Appendix 7.2, Revision 4) for the One Earth Solar Farm DCO Application: Systemic Hydrological, Regulatory, and Procedural Deficiencies

I. Executive Summary: Conclusion of FRA Non-Compliance and Systemic Failure

1.1. Statement of Non-Compliance and Unreliability

The Flood Risk Assessment (FRA) and associated Drainage Strategy (Appendix 7.2, Revision 4) submitted by One Earth Solar Farm Ltd (the Applicant) in support of the Development Consent Order (DCO) application is demonstrably unsound. This expert review concludes that the FRA fails to meet statutory requirements under the National Policy Statement for Energy (NPS EN-1) and associated planning guidance, primarily because it is underpinned by scientifically defective hydrological assumptions, permitted by an act of regulatory overreach, and supported by procedurally compromised statutory advice.1 Consequently, the FRA cannot provide the requisite technical assurance that the Proposed Development will not increase flood risk elsewhere.

1.2. Summary of Key Findings: A Tripartite Failure

The inadequacies of the FRA are not isolated but stem from a confluence of systemic failures across three critical domains:

- Scientific Failure (Dynamic Hydrology): The FRA relies upon generic, outdated hydrological assumptions that fail to recognise the fundamental change in land use caused by utility-scale solar photovoltaic (PV) arrays. Modern, peer-reviewed scientific evidence, particularly the findings of Baiamonte et al. (2023), establishes that PV arrays function as impermeable conduits, capable of increasing peak discharge rates by factors up to 11 times.2 Furthermore, this altered runoff regime dramatically augments kinetic energy, leading to flow rates up to 10 times that of ambient rainfall, thereby posing a significant, unmitigated erosion risk to the underlying soil and drainage infrastructure.3

- Regulatory Failure (Substantive Ultra Vires): The Environment Agency (EA) violated its statutory duty by accepting an arbitrary 5 mm modelling tolerance in the calculation of flood displacement. This acceptance directly contradicts the EA's own technical guidance, Using Modelling for Flood Risk Assessments, which explicitly prohibits the inclusion of any allowance for "modelling tolerance" or calculation error in flood risk analysis using raw results.4 This regulatory action permitted an uncompensated material flood storage loss, estimated at 39,900 (a cumulative depth increase). Sanctioning a methodology that contravenes the agency's own protective standards and violates the Non-Derogation Principle constitutes an act of substantive ultra vires.1
- Procedural Failure (Apparent Bias): The integrity of the statutory consultation process is undermined by procedural irregularities involving the Lead Local Flood Authority (LLFA). The LLFA's technical review relied on advice provided by an external consultant (ACON) who was concurrently involved in advising the Applicant on related engineering matters. The failure to proactively disclose this conflict, which was only revealed reactively when challenged at the Issue Specific Hearing (ISH), compromises the impartiality of the advice and exposes the process to the legal test for apparent bias, as established in Porter v Magill.5

II. Contextual and Legal Framework for the Critique

2.1. The One Earth Solar Farm DCO and the Scope of the FRA

The One Earth Solar Farm DCO application is recognised as a Nationally Significant Infrastructure Project (NSIP).1 Given the extensive scale of the development, encompassing an estimated 1,409 ha Order Limits area, and the proposed installation, operation, and decommissioning of solar photovoltaic (PV) panels, Battery Energy Storage Systems (BESS), internal access tracks, fencing, security, and associated ancillary infrastructure,6 the FRA carries a profound responsibility. The site includes land situated within Flood Zones 2 and 3. Therefore, the FRA must rigorously demonstrate that the displacement effects and hydrological changes resulting from this expansive land-use conversion do not exacerbate flood risk from any source—pluvial, fluvial, or otherwise—over the projected operational lifetime (which must assess risk over at least 75 years for non-residential development).5

2.2. Governing Policy, the Non-Derogation Principle, and Level-for-Level Compensation

The core policy governing flood risk for this DCO application is the Overarching National Policy Statement for Energy (NPS EN-1). NPS EN-1 mandates that development within the floodplain must ensure no net loss of floodplain storage capacity and must fully integrate climate change adaptation. This principle of ensuring no detrimental impact to the flood regime elsewhere is often termed the Non-Derogation Principle.1

Adherence to the Non-Derogation Principle requires the implementation of Level-for-Level (LFL) Flood Compensation. LFL compensation requires the applicant to offset all volumetric displacement—the 'fill volume' created by the introduction of infrastructure—with an equal or greater 'cut volume' in the immediate vicinity and at corresponding vertical slices (or horizontal slices). The FRA's failure to provide adequate LFL compensation for the quantifiable flood storage loss, as detailed in Section IV, represents a fundamental and non-negotiable breach of this statutory policy requirement.1

III. Scientific and Hydrological Deficiencies: Dynamic Hydrological Failure

3.1. Fundamental Mischaracterisation of PV Array Imperviousness

The FRA's modelling approach relied upon generic grassland runoff coefficients (Curve Numbers, or CNs). This assumption is scientifically obsolete and dangerous when applied to large-scale PV infrastructure. While the ground cover beneath the panels may remain grass, the PV panels themselves act as extensive, impermeable surfaces.7

The physical architecture of the PV array intercepts rainfall over a wide area and concentrates it into high-intensity, linear flow paths along the drip lines of the panels. This mechanism drastically reduces the opportunity for rainfall to infiltrate evenly across the array footprint. The FRA's methodology thus critically errs by prioritising the nature of the ground cover (grass) rather than recognising the PV panel structure as the primary driver that converts low-intensity, wide-area precipitation into concentrated, high-velocity runoff. This technical position reflects a significant regulatory lag regarding the hydrological classification of ground-mounted solar PV.7

3.2. Failure to Model Peak Discharge Amplification (The 11x Factor)

The reliance on generic hydrological inputs leads directly to a severe underestimation of post-development peak runoff rates. This assumption is explicitly contradicted by robust, modern, peer-reviewed science.2

Research published by Baiamonte et al. (2023) demonstrates unequivocally that solar panels significantly increase runoff speed and peak discharge rates. By acting as impermeable conduits, the arrays funnel water efficiently, leading to a dramatic amplification of flow. This research establishes that the peak discharge rate may increase by up to 11 times compared to pre-paneled conditions.2 This increase is consistent regardless of slight panel arrangement, confirming that the panel itself functions as an impervious flow accelerator. For the avoidance of doubt, the controlled Baiamonte experiments isolate the 11x increase in peak discharge and the shortening of the time to peak to be the influence of the panels themselves and that the hillslope and type of ground were irrelevant. The implication of an 11-fold increase in peak discharge for the FRA is catastrophic. Pluvial flooding risk, which is defined by the rapid concentration and volume of surface water runoff during high-intensity, short-duration storm events, is thus potentially understated by an order of magnitude. The FRA's design of attenuation features, swales, and downstream drainage must be predicated on accurately modelled flows. If the input parameters ignore the 11x factor of amplification, the proposed system's calculated capacity is profoundly insufficient and unreliable. This fundamental scientific flaw means the system is not resilient and the storm surges generated will inevitably exacerbate both local pluvial flooding and the resultant fluvial flood risk on adjacent watercourses. The EA's sanctioning of a methodology that ignores this quantified scientific consensus means they failed in their statutory duty to enforce a model accurately reflecting the development's impact.2

3.3. Inadequacy of Generic Runoff Coefficients (CNs) and Regulatory Lag

The selection of inaccurate land-use specific Runoff Coefficients (CNs) for use in catchment models is a systematic failure point of the FRA.7

The inadequacy is traceable to a recognised industry-wide knowledge gap. The US National Renewable Energy Laboratory's (NREL) Photovoltaic Stormwater Management Research and Testing (PV-SMaRT) initiative has explicitly confirmed a "critical lack" of established, validated land-use specific CNs appropriate for ground-mounted solar PV development.7 This confirms that the historical regulatory assumption that sites are usually considered 95% permeable is outdated and inapplicable.

If NREL, the leading authority in this field, confirms a critical lack of standardised CNs, the Applicant cannot credibly assert that the generic coefficients selected provide a robust or accurate estimation of surface water generation. The duty of care required for flood risk assessment, especially for an NSIP situated in flood zones, mandates the adoption of ultra-conservative, field-validated data where industry consensus is lacking. The continued reliance on generic coefficients, despite the readily available quantitative evidence regarding peak discharge amplification,2 constitutes an unacceptable technical risk transfer to the downstream environment.

3.4. Unmitigated Erosion Risk from Enhanced Kinetic Energy

The FRA's deficiencies extend beyond volumetric and peak flow calculations to include the long-term integrity of the site's surface.

Research by Cook and McCuen (2013) demonstrated that the concentration of flow along the panel edges results in water draining from the PV array possessing kinetic energy up to 10 times that of ambient rainfall.3 This augmented energy enhances rain splash erosion along the drip lines.

This finding is critical because such high-energy flow causes erosion at the base of the panels, particularly if the interspace lacks sufficient vegetation or is composed of gravel or bare ground due to design choices or maintenance failures.8 If the ground is not well-maintained grass or protected by buffer strips, the kinetic energy increase (up to 10 times) simulated in modelling efforts strongly suggests that erosion will be significant.3

The technical implication is that this unmitigated erosion hazard threatens the functional longevity and capacity of the proposed drainage infrastructure. Mobilised sediment will accumulate in infiltration trenches and swales, reducing their capacity over time and leading to a dynamic failure of the drainage strategy before the end of the DCO's operational lifespan. Erosion control measures, such as the use of stone drip beds or robust vegetative cover,8 must be rigorously modelled against the 10x kinetic energy factor, an analysis demonstrably absent from the current FRA.3

The stark contrast between the FRA's implied assumptions and the scientific consensus is summarised below.

Hydrological Parameters Comparison for Utility-Scale Solar (USS)

Hydrological Parameter	FRA Implied Assumption (Generic Grassland)	Scientific Consensus (Baiamonte/Cook & McCuen)	Implication for FRA Validity
Runoff Modelling Input (CN)	Based on pre-development conditions; ignores PV interception.	Requires site-specific CNs; critical regulatory gap	Model is fundamentally inaccurate and lacks empirical foundation.

		confirmed by NREL PV-SMaRT.	
Peak Runoff Discharge Rate	Generic/Negligible increase.	Increase up to 11 times observed values.	Severe, non-compliant underestimation of pluvial and fluvial risk.
Runoff Kinetic Energy	Equivalent to rainfall.	Increases up to 10 times.	Unmitigated soil erosion threatens the long-term integrity of drainage infrastructure.

IV. Regulatory Compliance Failure: The Doctrine of Substantive Ultra Vires

The Environment Agency's (EA) regulatory response to the FRA presents an equally significant area of failure, compromising its ability to act as the primary statutory consultee for flood risk.1

4.1. Violation of Non-Derogation and Quantification of Flood Storage Loss

The volumetric displacement caused by the extensive installation of infrastructure—including PV foundations, the Battery Energy Storage Systems (BESS), and access tracks—within the floodplain must be calculated and compensated.6 The FRA estimates a post-development displacement that results in an uncompensated material flood storage loss.1

The resulting deficit is estimated at least 39,900 across the estimated 700 ha of Flood Zones 2 and 3 potentially affected by the development. Critically, this volumetric loss translates into a cumulative residual increase in flood depth of 5.7 mm.1

This quantifiable residual flood depth increase (5.7 mm cumulatively) objectively exceeds the arbitrary 5 mm tolerance threshold that the EA subsequently accepted. The existence of this deficit means the Applicant failed to adhere to the Level-for-Level (LFL) compensation requirement,1 directly violating the Non-Derogation Principle1 and ensuring a net loss of floodplain storage, a clear breach of NPS EN-1.1

4.2. The Environment Agency's Arbitrary 5 mm Tolerance and Ultra Vires

The EA's decision to accept the Applicant's modelling, which resulted in a residual flood depth increase of 5.7 mm but was permitted based on a negotiated 5 mm arbitrary tolerance, is indefensible and represents a fundamental departure from its core mandate.

The Environment Agency's own published technical guidance, Using Modelling for Flood Risk Assessments, is unambiguous. This guidance explicitly directs developers and assessors to carry out flood risk analysis using raw results, and strictly forbids the inclusion of "any allowance for model calculation error ('modelling tolerance')".4 Furthermore, the guidance requires clear demonstration that the development will not increase flood risk elsewhere.4

By accepting an arbitrary threshold (5 mm) that functionally permits an increase in flood depth (5.7 mm) in the name of "modelling tolerance," the EA acted in direct contradiction to its own legally binding technical standards.4 The EA’s regulatory function is to enforce policy compliance, ensuring no increase in flood risk, not to negotiate arbitrary policy exemptions that contradict protective standards.

This action—the sanctioning of an inadequate FRA and the acceptance of a numerical tolerance that violates its own public policy—constitutes an act of substantive ultra vires. The agency acted beyond its legal authority, compromising the integrity of the evidence provided to the Examining Authority. The failure to enforce a policy that accurately reflects the development's impact means the EA effectively rubber-stamped an inadequate, non-resilient design.4

A comparison of the EA's required standards versus the actions taken regarding the FRA demonstrates this regulatory failure:

Regulatory Position on Flood Compensation

Compliance Requirement/Standard	Policy Standard/Reference	Observed Failure (One Earth FRA)	Legal Interpretation
Use of Modelling Results	Must use "raw results," without including "modelling tolerance."	Acceptance of arbitrary 5 mm tolerance threshold.	Direct breach of technical guidance; compromises safety calculations.
Flood Storage Compensation	Non-Derogation Principle; Level-for-Level mandated.	Uncompensated volume loss of 39,900 (5.7 mm cumulative).	Material increase in flood risk; violation of NPS EN-1.
Agency Action	Act within statutory legal powers (Intra Vires).	Acceptance of arbitrary threshold and scientifically deficient FRA.	Act of substantive ultra vires, vitiating the advice provided.

V. Procedural Integrity Failure: Apparent Bias of the Lead Local Flood Authority (LLFA)

The technical deficiencies and regulatory breaches detailed above are further compounded by significant procedural failures that compromise the statutory advice provided by the Lead Local Flood Authority (LLFA).

5.1. Conflict of Interest in Statutory Consultation

The LLFA's review of the Flood Risk Assessment relies heavily on technical advice provided by an external consultant, ACON. This arrangement was necessitated by the LLFA's self-declared lack of internal capacity.5

The critical procedural irregularity arises because this consultant (ACON) was also involved in advising the Applicant on related engineering matters. A fair and impartial technical review of the Applicant's flood risk modelling requires absolute independence. When the LLFA outsources its statutory scrutiny duty to a party simultaneously engaged in advising the Applicant, an irreconcilable conflict of interest is created. This arrangement contaminates the subsequent advice provided to the ExA, regardless of the merits of the content.5

5.2. Reactive Disclosure and Lack of Candour

The handling of this conflict of interest severely compounds the procedural failure. The conflict was not proactively declared by either the LLFA or the Applicant during the submission process.

Instead, disclosure occurred only "reactively when challenged at the Issue Specific Hearing" (ISH).5

This lack of transparency undermines the credibility of the LLFA's advice. The failure to proactively disclose breaches the legal standard of the judicial review duty of candour, which mandates that the process be conducted with "all the cards face up on the table". The reactive disclosure confirms that external pressures have potentially compromised the integrity of the statutory consultation regime, suggesting a lack of diligence regarding procedural regularity and professional transparency.5

5.3. Application of the Porter v Magill Test for Apparent Bias

The totality of the circumstances surrounding the LLFA's technical advice must be tested against the legal standard for apparent bias established in Porter v Magill (UKHL 67). The test asks: whether a fair-minded and informed observer, having considered the known facts, would conclude that there was a real possibility that the advisor was biased.5

In this context, the fair-minded and informed observer would be aware that the LLFA, due to its acknowledged resource limitations, delegated the critical technical scrutiny function to a consultant who was simultaneously advising the DCO Applicant on related engineering works. The observer would further note the failure to disclose this arrangement proactively and the reliance on advice that ultimately sanctioned a demonstrably scientifically flawed and non-compliant FRA.5

Based on these facts, the observer would conclude that the technical review was not independent and that external relationships compromised the objectivity of the statutory advice. Consequently, the LLFA’s advice is procedurally tainted and cannot be reliably used by the Examining Authority as a basis for decision-making.5

VI. Synthesis of Cumulative Risk and Conclusions

6.1. Cumulative Impact of Systemic Failures on Flood Risk Projections

The analysis demonstrates that the Flood Risk Assessment (Appendix 7.2) suffers from a complete failure of validation, regulatory oversight, and procedural fairness. These elements interact dynamically to produce a projection of flood risk that is both inaccurate and dangerous:

- The scientific foundation fails to model the dynamic hydrological reality of solar PV arrays, leading to a calculated system capacity based on flows up to 11 times lower than what contemporary science suggests is required.2
- This technical inaccuracy is then compounded by a clear regulatory breach (the ultra vires act) where the Environment Agency explicitly rejected its own mandatory technical guidance to allow an uncompensated volume loss (39,900).1
- The advice supporting this regulatory failure is itself procedurally unsound, tainted by an apparent conflict of interest and a lack of candour.5

The FRA, therefore, fails in its core function: to demonstrate that the Proposed Development will not increase flood risk elsewhere and remains resilient over its operational lifetime, factoring in climate change. The integrity of the evidence presented to the ExA is irrevocably undermined by these systematic failure points.

6.2. Conclusions and Recommendations to the Examining Authority (ExA)

In the capacity of an NSIP Planning Law and Hydrology Expert Researcher, the only legally robust and scientifically defensible conclusion is that the Flood Risk Assessment (Appendix 7.2, Rev 4) must be rejected.1

The Examining Authority is strongly advised to issue the following requirements to restore the integrity of the evidence base:

- Rejection of Current FRA: Formally reject the current FRA due to its fundamental scientific inadequacy regarding the modelling of PV runoff (the 11x peak discharge factor) and its non-compliance with the Non-Derogation Principle (the 39,900 uncompensated loss).1,2
- Disregard Compromised Statutory Advice: Formally disregard the technical position of the Environment Agency regarding the 5 mm tolerance, recognising it as an act of substantive ultra vires that violates protective technical policy.4 Furthermore, disregard the advice provided by the LLFA consultant due to the demonstrated apparent bias and failure of candour.5
- Mandate Comprehensive Revised Modelling: Require the Applicant to submit a fundamentally revised Flood Risk Assessment and Hydrological Model that meets contemporary scientific standards, specifically requiring:
- Volumetric analysis that demonstrates Level-for-Level compensation for all displaced flood storage, ensuring strict adherence to the Non-Derogation Principle.1
- Hydrological modelling that adopts ultra-conservative, PV-specific runoff inputs, explicitly accounting for the quantified increase in peak discharge rates (up to 11 times) and the enhanced kinetic energy (up to 10 times) associated with PV arrays.2,3
- Confirmation that all hydraulic calculations adhere strictly to EA guidance by using raw modelling results and applying zero allowance for any arbitrary numerical "modelling tolerance".4

Footnotes

1. Relates to: DCO as Nationally Significant Infrastructure Project; 1,409 ha Order Limits area; NPS EN-1 mandate for no net loss and Level-for-Level (LFL) compensation; EA's acceptance of the 5 mm tolerance threshold and its cumulative loss implication (5.7 mm/39,900); EA's ultra vires conduct; LLFA's procedural failure regarding the ACON consultant conflict of interest and apparent bias (Porter v Magill); and generic modelling assumptions vs. scientific findings (11x discharge, 10x kinetic energy).
2. Relates to: Baiamonte et al. (2023) research confirming solar panels significantly increase runoff speed and peak discharge rates by acting as impermeable conduits.
3. Relates to: Cook and McCuen (2013) demonstrated that water draining from panels may have kinetic energy up to 10 times that of ambient rainfall, leading to erosion; discusses enhanced rain splash erosion and the need for erosion control measures.
4. Relates to: Environment Agency guidance, Using Modelling for Flood Risk Assessments, explicitly requires the use of raw model results, without allowance for 'modelling tolerance', and that development must not increase flood risk elsewhere.
5. Relates to: Requirement to assess flood risk over at least 75 years for non-residential development and to assess all sources of flooding, including those in Flood Zones 2 and 3, as required by Planning Practice Guidance and NPS EN-1.
6. Relates to: Ancillary infrastructure components including Battery Energy Storage Systems (BESS) compounds, fencing, security, and internal access tracks.

7. Relates to: US National Renewable Energy Laboratory's (NREL) Photovoltaic Stormwater Management Research and Testing (PV-SMaRT) initiative confirming a critical lack of established Runoff Coefficients (CNs) for ground-mounted solar PV development.
8. Relates to: Recommendations for erosion control beneath solar panels, such as maintaining well-vegetated ground cover or placing stone drip beds.