T3-DD-016	Flood EJP Addendum		Applies to Transmission ✓
Revision: 1.00	**Classification:** Confidential	**Issue Date:** August 2025	**Review Date:** August 2025

Scottish & Southern Electricity Networks
TRANSMISSION

T3-DD-016
Transmission

T3-DD-016 Flood Mitigation EJP Addendum

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1 Introduction

This document is an addendum to the EJP for Flood Mitigation (EJP reference number T3BP-EJP-034, Ofgem reference no. SHT20561) and has been produced to address comments supplied in Appendix 1, Table 1 of Ofgem's RIIO-T3 Draft Determinations - SHET Consultation paper. Issues were raised related to:

- Confidence in scope is low as there is no formal town and country planning in place. Ofgem asked for details of arrangements around planning.
- Optioneering was not justified as limited details of optioneering was provided and why the preferred was selected, including why other options were rejected. Further information on sites and locations was requested.

Previous Engineering Supplementary Questions were submitted under reference number SSE086 and we provided responses in February 2025.

We have provided evidence for Ofgem to approve the need, scope and options within the RIIO-T3 Final Determination. We have proposed a PCD set for this scheme for the full [redacted] as set out within the original EJP. We propose an evaluative price control deliverable for these works to provide flexibility to scale the outputs in the RIIO-T3 period and manage any residual uncertainty. We request the supplementary questions process be used if there are any further queries ahead of the decision.

2 Planning and Consents

2.1 Ofgem comments in Draft Determinations

Ofgem's response in Draft Determinations stated that confidence in the scope is low as there is no formal town and country planning in place. Where works are required beyond the existing site boundaries, evidence of town and country planning would be desirable.

2.2 Planning and consents within established SSEN Transmission process

In accordance with our Large Capital Projects (LCP) stage gate process, we secure consents for the proposed works between Gates 2 and 3, when the detailed designs of the selected solutions are finalised. Detailed designs are required prior to progressing the planning and consents process to ensure an accurate project scope and footprint at each site is known, which informs the extent of the planning application needed and which consents to obtain.

The project is currently preparing for Gate 2. Table 1 provides a preliminary outlook on the required actions for planning and consents at each site, based on current preferred solutions and preliminary designs. It should be noted that these requirements may be subject to change as the project progresses through the LCP process and designs develop.

We are confident that any consents necessary to successfully deliver the work will be obtained in accordance with the stage gate timelines, as set out in the project programme in Appendix C of the EJP.

Site	Works inside substation	Works outside substation	Works near SPA/SAC?	Purchase of third-party land required?	Planning/Consent actions required
Bridge of Dun	N/A	Raise Balwyllo Farm access road level and realign bend. Install culverts.	No	No	Planning application and voluntary targeted EA for raising road level. Road Traffic Regulation Order (RTRO) for road closure.
Peterhead	Demountable flood barriers at existing roller doors, grid building and external critical equipment. Replace access doors with flood doors. All cable trenches/ducts entering substation building sealed.	N/A	No	No	Works inside substation to be carried out under The Town and Country Planning (General Permitted Development) (Scotland) Order 1992 "GPDO".
Dallas	N/A	New access route to South by upgrading 2km of existing track.	No	No	Planning application and voluntary targeted EA for new access road. Secure servitude rights with existing landowner for alternative access track.
Tealing	N/A	New access track to North by extending existing track at Seventeen Acres farm by 60m. Install culverts to ensure continuity of established overland flow paths.	No	No	Planning application and voluntary targeted EA for new access road. Secure servitude rights with existing landowner for alternative access track.
Errochty	Augment existing bunds and install barriers around critical equipment. New diesel generator. Cables trenches sealed. New water pumps inside control building.	Flood wall around Control Building with sheet piles. Removal of trees and existing garage buildings. Security fence gate relocated.	No	No	Planning application and voluntary targeted EA for new flood wall and adjustment of security fence line. Works inside substation to be carried out under The Town and Country Planning (General Permitted Development) (Scotland) Order 1992 "GPDO".

Table 1: Site planning and consents considerations

Site	Works inside substation	Works outside substation	Works near SPA/SAC?	Purchase of third-party land required?	Planning/Consent actions required
Luichart	N/A	New 1m high flood wall and security fence installed along 80m of southern perimeter. Improvement works to existing drainage channel and culvert at adjacent access road.	No	No	Planning application and voluntary targeted EA for new flood wall and security fence as height above 3m.
Glenmoriston	N/A	A 240m access track located between two existing OHL towers to join up existing tracks	No	No	Planning application and voluntary targeted EA for new access road. Secure servitude rights with existing landowner for alternative access track.
Coupar Angus	Install of a pumping station and onsite drainage improvement.	Construction of 1.1m high perimeter flood defence, with sheet piling substructure. Existing access road raised by approx. 500mm over a 500m length.	No	Yes	Planning application and voluntary targeted EA for substation perimeter wall and raising access road. Works inside substation to be carried out under The Town and Country Planning (General Permitted Development) (Scotland) Order 1992 "GPDO".
Fort William	N/A	New access from adjacent industrial estate requiring tree clearance and new retaining wall structure. Further 240m access track through adjacent JAHAMA estates land. New culvert crossing at existing drains and watercourses.	No	No	Planning application and voluntary targeted EA for new access road. Secure servitude rights with existing landowner for alternative access track.

Table 1 (cont.): Site planning and consents considerations

3 Project Optioneering

3.1 Ofgem comments in Draft Determinations

Ofgem's position in Draft Determinations stated the needs case for the Flood Mitigation portfolio is justified as it was accepted there are wider global warming trends which will lead to additional flood risks materialising. However, Ofgem stated that the optioneering is not justified because the level of detail provided is not sufficient to understand why the proposed options are appropriate. In addition, it was noted that the optioneering is not robust as only the preferred option is presented for each substation. To justify our optioneering, Ofgem stated that further information is required on the sites and location of interventions.

3.2 Site selection risk scoring framework

To identify the most critical sites for flood mitigation, a risk scoring framework and criteria was developed by internal stakeholders from Asset Management, Project Engineering, Project Delivery, Operations and Environmental teams. This system identified risk areas and a corresponding scale to help quantify risk utilising a weighted scoring system based on a level of consequence to network operation if flooding occurred and the site went offline.

The 31 sites assessed for flood risk as part of the RIIO-T2 Climate Resilience project were further scrutinised by assigning scores for each criterion. The values were totalled to give an overall risk score, which identified the most critical sites in need of intervention. The criteria are described in the sections below and Table 2 provides an example of the scoring matrix applied to each site.

3.3 Site selection risk scoring criteria

3.3.1 Megawatts (MW) supply lost to network

Number of MW capacity lost to the transmission network, either in the form of customer supply (output) or generation (input). Switching stations that are neither entry nor exit points to the network were considered in terms of the impact to downstream substations that depend on their continuing operation.

3.3.2 Customer impact

A measure of the number of customers directly impacted by a substation going offline, either in the form of customer supply (output) or generation (input). Substations acting as entry points for generating facilities scored low in this criterion, as the only customer impacted would be the generator. Switching stations that are neither entry nor exit points for the network were considered in terms of the impact to downstream substations, and customers supplied by them, that depend on their continuing operation.

3.3.3 Resilience guarantee at risk

Level of risk to general resilience of substation operations to ensure access is available for emergency work during a flood event.

3.3.4 Environmental impact (pollution risk)

Risk of oil or other chemical contamination due to failure of existing containment and separation infrastructure, caused by inundation of flood water to the substation.

3.3.5 Platform floods in modelled 1:1000 + CC event

The criteria considered the extent of flooding experienced by a substation compound when a 1:1000 + CC event is modelled. The percentage area of the site flooded in the model outputs was used to assign a score.

3.3.6 Flood access and egress routes

Assessment of the impact to site access during a 1:200 + CC flood event, factoring in any available alternative routes and the length of time the modelling predicted these roads remained affected by flood water.

3.3.7 Environmental impact (Biodiversity)

Impact on any natural capital assets considered to contribute to Biodiversity Net Gain. The spectrum measured ranged from no impact to a small number of habitats damaged but restored within a short time period, multiple habitats requiring long-term restoration or damage done to irreplaceable habitats.

3.3.8 Centre for Protection of National Infrastructure (CPNI) site

Applicable if the substation was a registered CPNI site, whose operation has been identified by the UK government as essential to the function of national infrastructure.

3.3.9 Distance to sensitive sites

This was used as a measure to determine how many critical infrastructure sites lie within the area supplied by the substation and have the greatest need for an uninterrupted power supply. These sites maintain essential services and disruption caused by outage would have significant consequences. Proximity to military installations, healthcare facilities, transportation hubs and others were considered.

3.3.10 Age of platform

Age is a good indicator of the condition of substation compound platforms and their effectiveness as a free-draining medium able to evacuate water off site, which helps to reduce the impact of flooding. Draining performance reduces over time as silt deposits build up due to sustained precipitation and surface run-off experienced by sites as a result of standard weather exposure.

3.3.11 Potential for future development

A criterion that considers other works planned on site within the RIIO-T3 period that would impact the effectiveness or longevity of proposed protection measures. Examples would be new connections or reconfiguration of a substation that requires corresponding alteration of flood mitigations to accommodate.

Weighting	Criteria	*Low Risk*					SCALE					*High Risk*
		0	1	2	3	4	5	6	7	8	9	10
15	Resilience guarantee at risk?	Access available at all times										No access for emergency Works
5	Flooding access and egress routes	Access always available					one route with significant detour					no routes available
14	Environmental impact (Pollution risk)	Low					Medium					High
15	Customer Impact	Low no. of customers <5,000					Customers <50,000					High no. of customers <100,000
10	Platform floods in 1in 1000yr +cc event	no evidence of flooding					partial flooding					platform inundated
20	MW supply lost to network	1			43		86		129			172.0
5	Distance to sensitive sites	67 miles			40		10 miles		7.5			5 mile radius
5	CPNI site	No										Yes
5	Environmental impact (Biodiversity)	no impact					impacted but restored within a year					multiple habitats long term restoration impact or irreplaceable habitats
5	Age of platform	0-10yrs - free draining					10-15yrs risk of silting up					15-20yrs - not free draining
1	Potential for future development	Low Risk					Medium Risk					High Risk

Table 2: Site selection flood risk scoring scale

3.4 Risk scoring matrix results

The list of sites for potential intervention was reduced from 31 to 29 as two substations from the RIIO-T2 list, Port Ann and Clachan, were scheduled to be replaced and decommissioned. Flood mitigation was no longer required at these sites, regardless of flood risk matrix score. The results of the final analysis identified nine sites with high-risk scores and these were selected for intervention.

3.5 Site Solutions Optioneering

The optioneering process relied on collaboration between internal stakeholders and SLR Consulting, the flood risk consultants engaged to assess flood risk and propose mitigation measures for SSEN Transmission to select. The sections below summarise the options considered for sites and the rationale for selecting solutions based on the unique constraints and conditions at each location.

As stated in Section 2.2, the project is currently preparing for Gate 2, therefore current preferred solutions may be subject to change as the detailed design phase advances. For example, when additional site investigation data and refined modelling outputs become available.

3.5.1 Bridge of Dun

The flood risk assessment at this substation concluded that established access routes would be impacted during the specified flood event. As a result, the intervention aimed to provide resilience by considering the following options:

	Option	Cost	Preferred
1	Augment an existing route: raise the level of the road approaching from the west	[redacted]	Y
2	Create a new route through land unaffected by flooding: construct a new track of approx. 600m – 1km. Difficult to identify an alternative route not impacted due to widespread nature of flooding and prohibitively expensive construction cost.	[redacted]	N

Option 1 has been selected as the preferred solution as it requires the least intrusive works to mitigate the issue, minimising both disruption and cost.

3.5.2 Peterhead

The flood risk assessment for this site identified a flood risk to the substation compound, primarily from overland flows from catchment areas to the west. The options considered were:

	Option	Cost	Preferred
1	Construct a 3m high perimeter flood wall barrier to prevent water entering site. Concerns from Security and Operations teams about visibility and access issues caused by a large permanent wall around the security fence. Space constraints limit construction feasibility. The proposed sanitised areas around the substation impact future expansion and pose risks to HV cables and other buried services.	[redacted]	N
2	Construct a large open channel along the northern perimeter of the substation fence, which connects into existing drainage networks. This would provide a flow path to redirect flood water west of site around the site and into existing drainage networks east of site. Presence of HV cables and buried services at the northern perimeter of the site, which would require removal or re-routing to accommodate the channel.	[redacted]	N

3	Construct a large attenuation pond to the west of site to act as upstream storage, capturing flood water. The solution includes new drainage pipes along the northern perimeter to help discharge the attenuated water into existing infrastructure. Potential challenges due to land area and excavation depths necessary to contain the proposed attenuation pond.	[redacted]	Y

Option 3 has been selected as the preferred solution as it minimises both disruption and cost.

3.5.3 Dallas

The flood risk assessment at this substation concluded that the only existing access route to the substation, a crossing over the River Lossie, would be impacted during a flood event. As a result, the emphasis of intervention was to ensure resilience by considering the following options:

	Option	Cost	Preferred
1.	Augment an existing route: raise the ground level along a 200m length of riverbank on both sides of the river, install a new bridge higher level to allow vehicles to cross. Substantial earthworks, disruptive to local landowner and prohibitively expensive.	[redacted]	N
2.	Create a new route through land unaffected by flooding: from higher ground to the south. An existing farmer's track called the Scot's Road provides a potential route from an existing public road to the south up to the substation. This road remained unaffected during the modelled flood event.	[redacted]	Y

Option 2 has been selected as the preferred solution as limited works are required to reprofile and resurface the track to make it suitable for use and therefore represents the best value for money.

3.5.4 Tealing

Output from the flood risk assessment at this substation concluded that the existing access route to the substation would be impacted during a flood event. Because of this, the target of intervention was to ensure resilience by considering the following options:

	Option	Cost	Preferred
1	Augment an existing route: raise 500m of public road level and extensive new drainage systems. Cause significant disruption for nearby property owners and road users.	[redacted]	N
2	Construct alternative access coming from north, using existing track to Balnuith. New track commenced at Seventeen Acres Farm routing south then west parallel to existing fence line, ending at the east side of	[redacted]	Y

	perimeter fence surrounding SVC compound. The new track will link the farm road to the existing substation perimeter track, forming a suitable alternative entry point. New double gate to be installed to allow access. 5no. culverts installed under new track to allow existing overland flows to continue unimpeded.		

Option 2 has been selected as the preferred solution as it presents an opportunity to utilise an established road, not impacted by flooding, and is therefore the least intrusive and lowest cost solution.

3.5.5 Errochty

The flood risk assessment for this site identified a risk of inundation to the substation compound from raised water levels on the River Tummel and surface run-off from the adjacent Craig Kynachan slope to the south. To mitigate, the following options were considered:

	Option	Cost	Preferred
1.	Augment existing bunds and install barriers around critical equipment. New flood wall around Control Building, cable trench entries to building sealed and water pumps situated in basement. Install new diesel generator. Security fence gate relocated.	[redacted]	Y
2.	Construction of a 1.9m high flood defence around the perimeter, with associated sheet piling sub structure. Install of a pumping station and discharge point to River Tummel. Significant impact to neighbouring landowners, flood modelling indicates it could protect the substation compound but result in the loss of a significant flood catchment area and existing flow paths, raising flood levels significantly in adjacent properties. This option is considered feasible from an operability, constructability and maintainability perspective. However, at this time it is not preferred due to the wider environmental impact outwith the operational area.	[redacted]	N

Option 1 has been selected as the preferred option to meet environmental and regulatory approval.

3.5.6 Luichart

The flood risk assessment for this site identified a risk of inundation to the substation compound from both raised water levels on the River Conon and surface run-off from the adjacent hill slope to the east. To mitigate, the following options were considered:

	Option	Cost	Preferred
1	New 1.2m high flood wall and security fence installed along 80m of southern perimeter, built over the previous fence line due to constrained space outside the compound. Additional improvement works to existing drainage channel and culvert at adjacent access road.	[redacted]	Y
2	Raising of existing critical equipment and installing new discrete bunds. Construction of new flood wall around perimeter of control building, and additional pump installed in the control room basement. Cable entry points into the control building to be sealed to prevent water ingress. Localised perimeter bunds or flood barriers around critical equipment and raising equipment levels would make maintenance more challenging, introduce potential new manual handling and working at height risks	[redacted]	N

Option 1 has been selected as the preferred solution as it minimises the impact to substation operation, allowing critical equipment to remain fully open and accessible at current elevations.

3.5.7 Glenmoriston

Output from the flood risk assessment at this substation concluded that the existing access route to the substation along the A887 would be impacted during a flood event. Because of this, the target of intervention was to ensure resilience by considering the following options:

	Option	Cost	Preferred
1	Augment an existing route: raise surface levels and install new drainage over 3km of road. Require numerous localised works at a 3km stretch of busy public road cause long-term disruption for local property owners and road users and be prohibitively expensive.	[redacted]	N
2	A 14.5km route tracking east from the site along the existing Great Glen Way forestry track, which exits north of Fort Augustus. This option would require a new bridge crossing to link existing forestry tracks but potentially offers a route unaffected by the breach extents of any reservoirs in the area.	[redacted]	Y

Option 2 has been selected as the preferred solution as it utilises existing tracks, already in use by SSEN Transmission, to access existing overhead line assets and presents an opportunity to leverage existing servitude rights of access. This creates a suitable alternative entry point to Glenmoriston that would not be impacted by flooding.

3.5.8 Coupar Angus

The flood risk assessment for this site identified a risk of inundation to the substation compound and existing access road during a flood event. To mitigate, the following options were considered:

	Option	Cost	Preferred
1.	Construction of a 1.1m high flood defence around the perimeter, with associated sheet piling substructure. Install of a pumping station and discharge point to Coupar Burn. Improvement of onsite drainage.	[redacted]	Y
2.	Localised raising of existing equipment. Larger pump installed in existing 33kV Control Building. New 132kV Control Building located outside existing substation compound, requiring expansion of compound and extension of security fence line.	[redacted]	N

Option 1 has been selected as the preferred solution as it allows critical equipment to remain fully operational and accessible throughout the duration of the works.

3.5.9 Fort William

Output from the flood risk assessment at this substation concluded that the only existing access route to the substation along the Achintee Road and running parallel to the River Nevis, would be impacted during a flood event. Because of this, the emphasis of intervention was to ensure resilience, and the following options considered:

	Option	Cost	Preferred
1	Augmenting existing route to ensure it function. Substantial new riverbank defences along a 300m length of the north embankment; Cause long-term disruption for adjacent Claggan estate and Achintee Road (property owners and users), expensive to build with low customer value	[redacted]	N
2	Create a new route through land unaffected by flooding, from higher ground to the north, traversed land owned by the JAHAMA Highland Estates. The plan would install approx. 750m of new track, requiring earthworks and culvert crossings at existing drains/ watercourses. Access rights will need to be secured from existing landowners.	[redacted]	Y

Option 2 has been selected as the preferred solution as the new access route would not be impacted during a flooding event.

4 Conclusion

Flood mitigation is essential to safeguard critical transmission assets against increasing climate related flood risks. These measures ensure network resilience, protect customer supply, and minimise environmental and economic impacts during extreme weather events.

This addendum was prepared to address Ofgem's Draft Determination concerns regarding planning consents and our optioneering process. Ofgem highlighted the absence of formal planning evidence and requested greater clarity on option development and selection.

We have addressed these concerns by confirming that consents will be secured at the appropriate design stage, and by providing detailed optioneering analysis. Site selection was based on a weighted risk framework considering factors such as MW supply loss, customer impact, access resilience, environmental risk, and proximity to critical infrastructure.

Options were assessed for feasibility, cost, and impact, with preferred solutions chosen for delivering maximum resilience and value, while alternatives were discounted due to excessive cost, disruption, or impracticality. Rationale for the options progressed has been provided within this paper.

This approach demonstrates a proportionate, evidence-based response to Ofgem's feedback. We therefore encourage Ofgem to approve this programme to enable timely delivery of critical flood resilience measures for the benefit of customers and the wider network. We also welcome the opportunity to continue working with Ofgem on any further questions to ensure the successful delivery of this critical project.

Ofgem should approve the need, scope and options as well as set a PCD for the [redacted] within the originally submitted EJP. We propose an evaluative price control deliverable for these works to provide flexibility to scale the outputs in the RIIO-T3 period and manage any residual uncertainty.