LT521 Bingally 400kV Substation

Drainage Strategy Report: Substation Platform

BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0001

Scottish & Southern Electricity Networks
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1.0 INTRODUCTION

1.1 General

1.1.1 Fairhurst have been appointed by BAM Nuttall to prepare a Drainage Strategy Report to inform the drainage design proposals at the Bingally 400kV Substation in the Scottish Highlands. The site is part of Scottish and Southern Electricity Networks (SSEN) £7bn upgrade of their onshore electricity transmission infrastructure.

1.1.2 The development forms part of a proposed 400kV upgrade from the existing 275kV network between Beauly and Denny. The proposed substation at Bingally forms part of this network route.

1.1.3 This report has been compiled to outline the drainage strategy for the substation platform to support the planning application for the proposed electrical substation at Bingally. An addendum to this report will be provided at a later date which will include the drainage strategy for the access track to the substation platform.

1.2 Site Location

1.2.1 The proposed Bingally substation site is situated approximately 2.5km South of the village of Tomich. The site access is via a proposed 9.5 km long access track off the A831, 1.5km east of the town of Cannich within the Highland Council Area. A plan of the location of the proposed development in relation to the local area is provided in **Figure 1**.

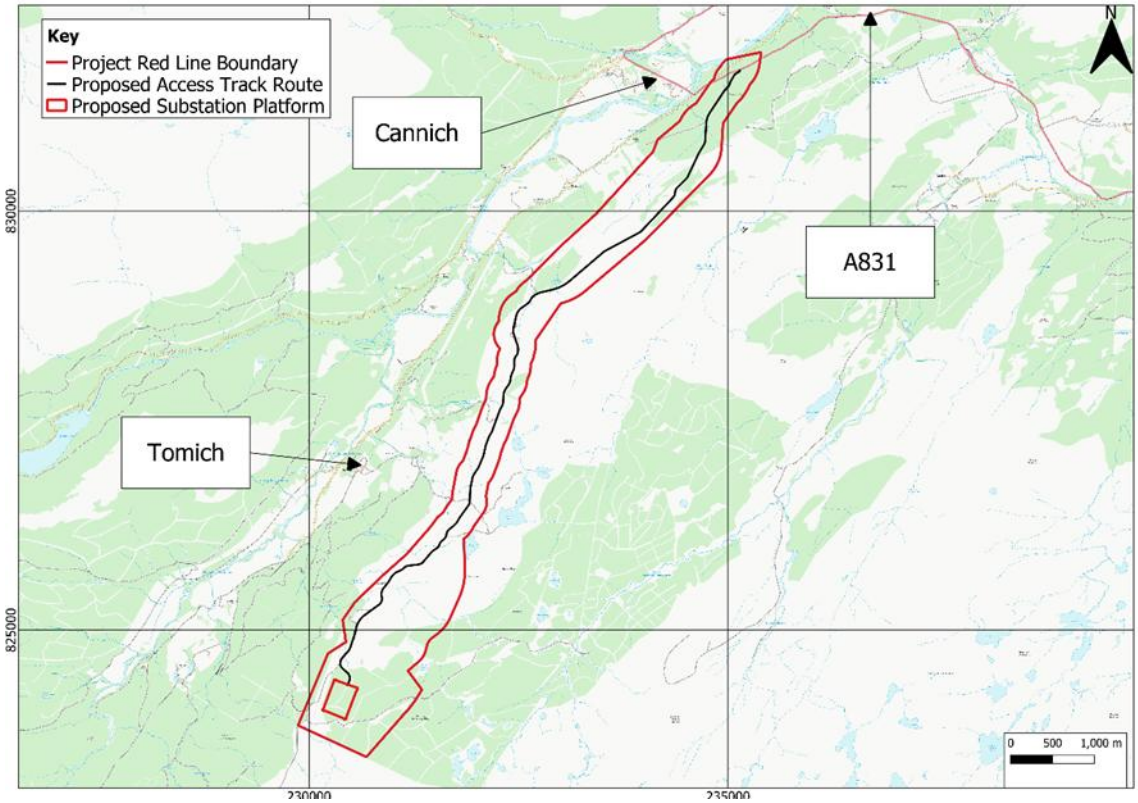


Figure 1 - Indicative Site Location

1.2.2 The site area within the red line boundary is approximately 619 Ha. The proposed substation platform covers an area of approximately 11.5 Ha, excluding earthworks and associated peat cell storage. The remainder of the site is allocated to material storage and a new forestry access track. Refer to proposed site layout drawings in **Appendix 1** for details of the proposed platform and surrounding site arrangements.

1.3 Design Considerations

1.3.1 The Drainage Strategy has been prepared to define the scheme for the site with regards to the proposed drainage channel realignments, surface water and foul water drainage. The report will consider the overall drainage strategy for the proposed substation platform.

1.3.2 Please refer to **Section 5** for the design strategy, philosophy and required specifications and requirements in which the proposed drainage strategy follows.

1.4 Drainage assumptions within the Substation

1.4.1 The drainage design within the Bingally substation fence line has been carried out by Patterson Reeves & Partners (PRP). Assumptions have been made during the drainage design to allow for the proposed SuDS design for the site, whilst coordinating with the internal drainage design. Assumed details include:

- All oily water or water requiring specific treatment due to operations within the substation platform fenceline shall be treated sufficiently inside the fenceline as part of the PRP drainage design. The run-off shall then connect to the proposed Fairhurst designed SuDS drainage outside of the substation platform fenceline for attenuation purposes;
- All surface water run-off from hard standing surfaces within the substation platform fenceline will discharge to the SuDS drainage outside of the fenceline, and tie-in points shall be coordinated between PRP and Fairhurst;
- All surface water run-off from the unbound areas within the substation platform shall percolate through the substation filter material, and leave the platform via filter drains. The dimensions, details and flow rates leaving the filter drains are provided by PRP and will be incorporated into the drainage design outside of the substation fenceline. It is assumed that the filter material is providing sufficient treatment to the run-off before leaving the substation boundary, as per the PRP design, and can discharge directly to a nearby water feature should the discharge flow rates remain below the equivalent greenfield rate.
- PRP will discharge to the north fenceline of the substation platform, and coordinate with the proposed external drainage design.

2.0 EXISTING SITE DESCRIPTION

2.1 Existing Site Description

2.1.1 The current site is located in an area of moor and woodland with areas of boggy land and peat. In June 2023 a wildfire burned through an estimated 80km² of the surrounding area. This resulted in a large section of woodland being burned down or the charred remains being felled. The remnants of the fire can still be seen on site as scorched earth and burnt wooden embers.

2.1.2 The existing access to the proposed substation area is via forestry tracks originating from the village of Tomich. Several tracks lead to either the north or the south side of the proposed substation area.

2.1.3 Multiple unbound access tracks are situated throughout the red line boundary of the overall site, extending in numerous different directions. However, currently there are no uninterrupted access provisions to the proposed substation site from the A831.

2.1.4 There are no existing residential dwellings or farm buildings within the site boundary.

2.1.5 An existing site layout plan can be seen in drawing BING4-LT521-SEBAM-DRAI-ZZ-D-C-0158 in **Appendix 2**.

2.2 Site Topography

2.2.1 The topography around the substation within the redline boundary varies in direction and gradient. The existing ground levels range from approximately 333mAOD to the east of the site to approximately 264mAOD at the north west of the platform/layout areas. There is an area to the south of the proposed substation platform that falls to approximately 306mAOD.

2.3 Ground Conditions

2.3.1 Ground investigation information has been taken from the *Fairhurst – Geo-environmental Desk Study Report (Doc no. BING4-LT521-SEBAM-ZZ-ZZ-RPT-G-0001).* The present site is a mixture of woodland area, boggy land, numerous watercourses, peat, and rock.

Peat

2.3.2 Peat can be found over a large percentage of the proposed site. Recent ground investigations have shown that the peat reaches thicknesses of up to 7m at the north west area of the site. Further investigation is required but, it is likely that the peat areas will require some removal and replacement with suitable fill below structures.

2.3.3 Areas where peat does not require removal should be left in-tact. Due to the possibility of removal leading to the release of carbon into the atmosphere, peat should only be removed if there are no suitable alternatives.

Groundwater

2.3.4 Groundwater is present at shallow levels on site. Borehole investigation show groundwater levels ranging from 0.10mbgl to 3.20mbgl. The groundwater is also usually encountered below areas of peat. Due to the shallow depths of the groundwater, careful management

will be required during the construction phase (particularly with any excavations) with long term management plans required for the post-construction phase.

2.4 Flood Risk

2.4.1 A review of SEPA Flood Maps shows no fluvial flood risk within the location of the proposed substation development. The Flood Maps also show some discreet areas likely to experience minor surface water (pluvial) flooding.

2.4.2 A Flood Risk Assessment (FRA) and Drainage Impact Assessment (DIA) shall be undertaken for the scheme, which shall provide full details of the flood risk across the site, and the corresponding impact.

2.5 Utilities

2.5.1 There are no private water supplies or foul water systems located at the proposed substation site, within the proposed substation platform boundary. It is also assumed that any underground cables associated with the transmission line will run in parallel with the transmission overhead structures.

2.5.2 A proposed electrical and fibre optic cable will be buried below the proposed access track from Fasnakyle Electricity Distribution Station. Construction of this utility will be managed by the project manager and construction manager. **Figure 2** below shows the pathway of the transmission overhead line and its location within the proposed platform area.

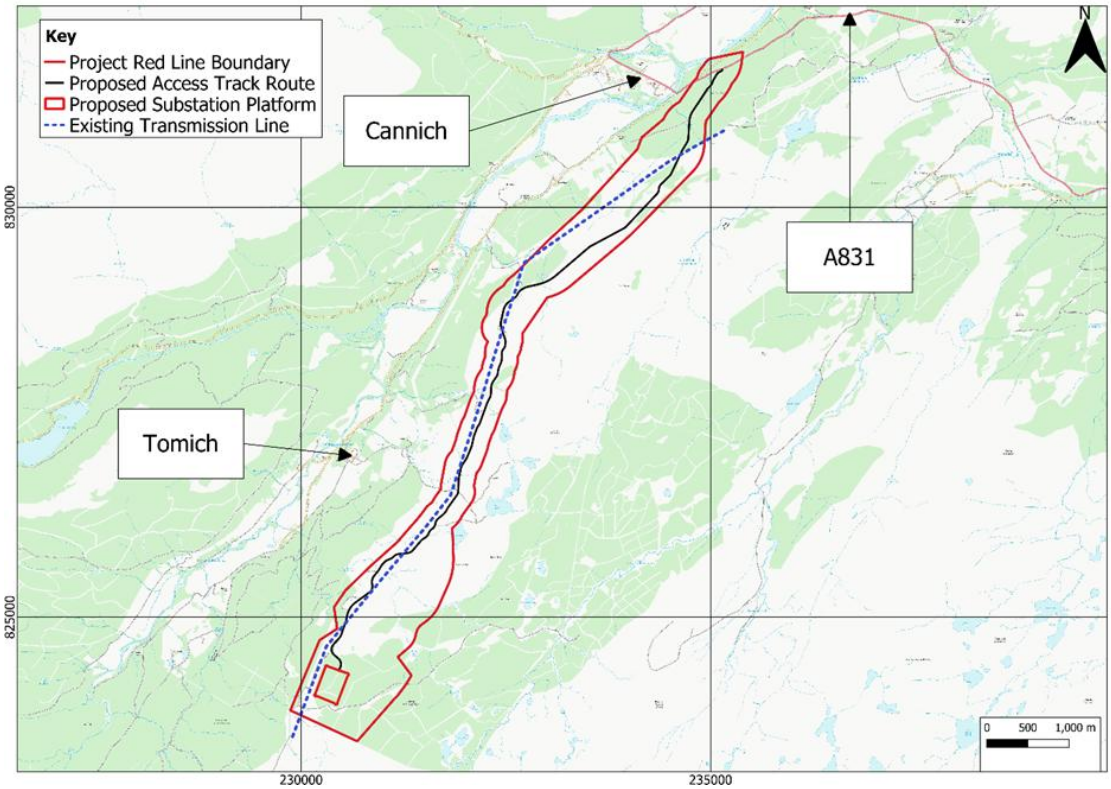


Figure 2: Plan of existing transmission line

2.5.3 During both the planning and construction phases, the proximity of the overhead lines to the platform must be taken into consideration. *Health and Safety Executive guidance note G56: Avoiding danger from overhead power lines* must be followed during the planning and construction phases.

3.0 EXISTING WATERCOURSES AND DRAINAGE FEATURES

3.1 Watercourses

3.1.1 Although there are several watercourses and small tributary channels present within the entire site boundary, no channels are directly affected by the proposed substation platform layout and require realignments or diversions. A tributary of the Allt an Rathain is located adjacent to the substation, on the south west side, but will only accommodate drainage outfalls. Similarly, a tributary of the Allt a' Bhuachaille is located to the north of the substation, and is proposed to accommodate drainage outfalls.

3.1.2 Refer to **Appendix 2** for details on existing tributaries near the proposed substation platform.

3.1.3 Due to the extensive area and numerous informal surface water drainage channels in the region, there may be further drainage paths within the platform area which have not been identified using OS maps or visual inspection (It should be noted that a range of tributaries are not visible on the 1:50,000 scale OS maps). A detailed investigation of the site is required prior to detailed design.

3.1.4 Several existing watercourses and tributaries are impacted by the substation access track, but are discussed in *BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0004 Drainage Strategy: Access Track*.

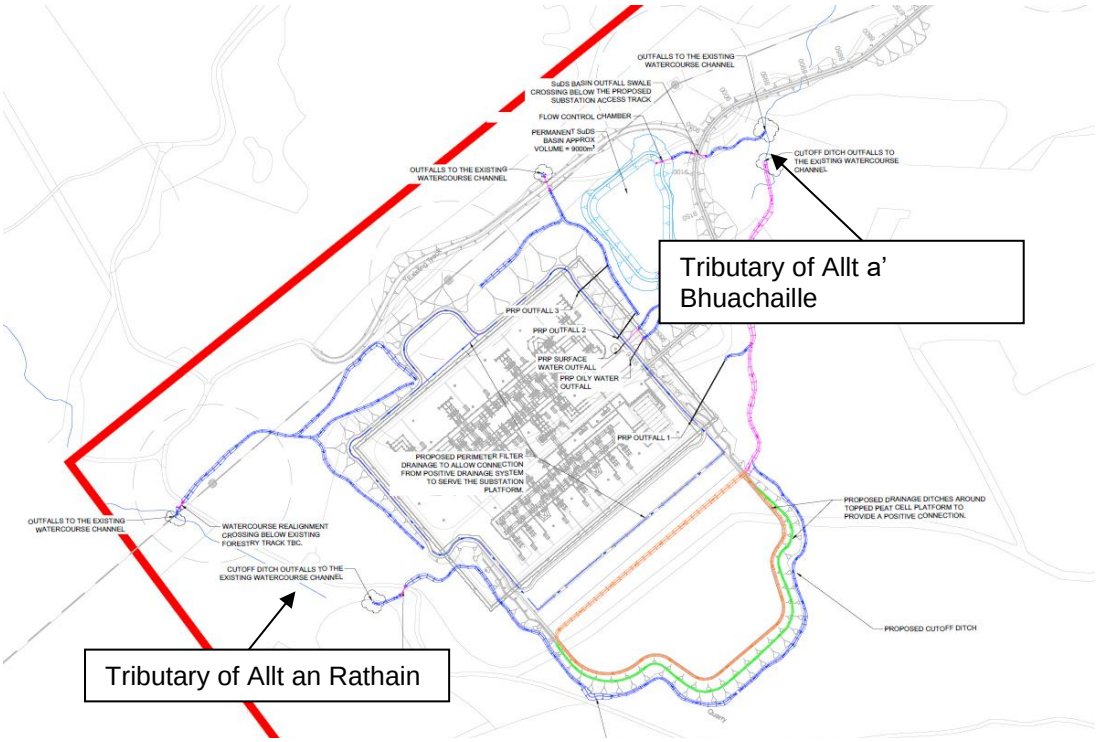


Figure 3: Location of tributary of Allt an Rathain and Allt a' Bhuachaille

3.2 Drainage Features

3.2.1 Multiple land ditches can be seen throughout site, and are in mainly rectangular form. Outfalls from these ditches could not be located whilst on site.

3.2.2 Due to the extensiveness of the site, further investigation would be required to confirm the location and details of all culverts on site prior to detailed design.

4.0 PROPOSED DEVELOPMENT

4.1 Proposed Substation Platform

4.1.1 To upgrade the existing Beauly to Denny overhead line from 275kV to 400kV, additional substations are required for the line to be able to connect to the upgraded circuit.

4.1.2 The proposed Bingally 400kV substation development consists of a platform of approximately 11.5ha area which will sit at a formation level of 323mAOD with a finished platform level of 324mAOD. The 11.5ha area does not include engineered slopes or adjacent access track.

4.1.3 The proposed arrangement at Bingally (including proposed permanent drainage) is shown below in **Figure 4**. A full proposed general arrangement layout can be found in **Appendix 1** for the proposed site. Proposed drainage shall be discussed in further detail in Sections 5-10, with proposed substation platform drainage drawings in **Appendix 4**.

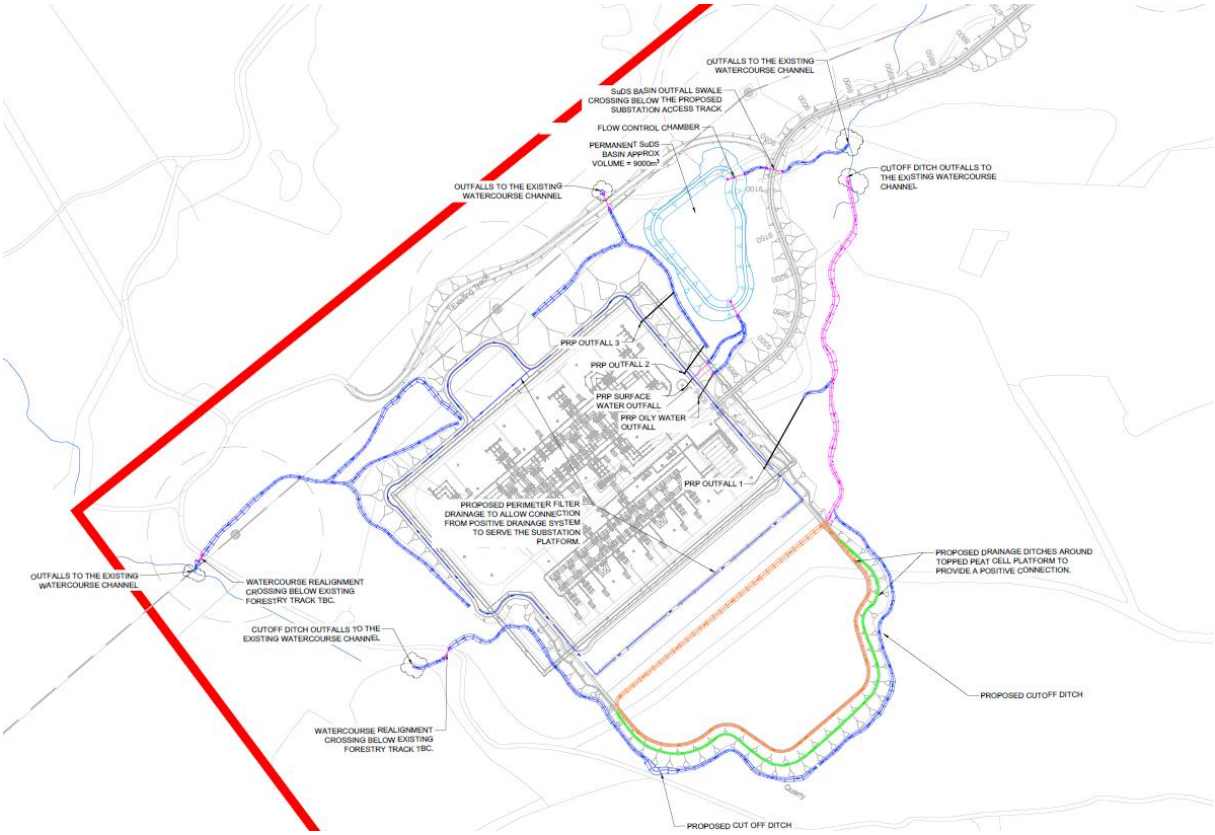


Figure 4: Bingally 400kV Proposed Substation Layout

4.1.4 The proposed substation platform shall be formed of a build-up of a minimum of 1m crushed rock and will be predominantly free draining material. This makes up part of the PRP drainage philosophy, who are the designers of the drainage inside the fenceline of the substation platform. The substation will contain of several buildings and hardstanding areas

which will be impermeable. It is assumed that the PRP substation platform drainage design includes remediation measures for any oil that may contaminate run-off.

4.1.5 The drainage for the internal fenced area of the substation platform will be designed by Patterson Reeves & Partners (PRP). See Figure 5 for PRP drainage layout. This can be found, along with their associated drainage philosophy, in **Appendix 3**.

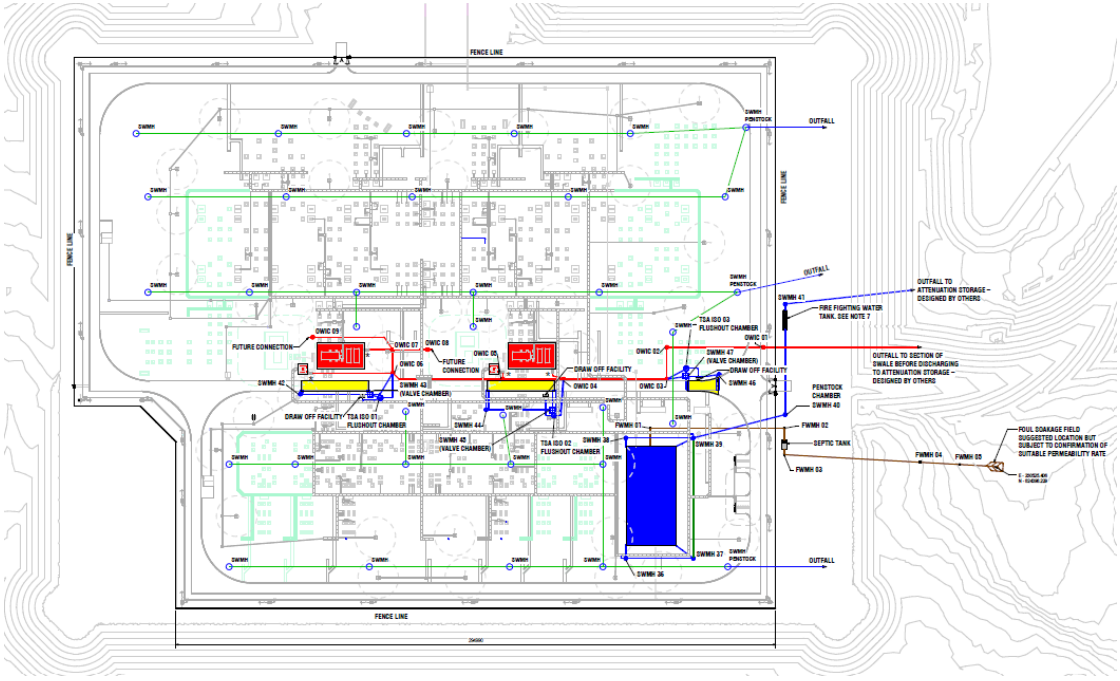


Figure 5: PRP Proposed Substation Layout - BING-LT521-SEBAM-DRAI-XX-LAY-0001

4.2 Proposed Access Tracks

4.2.1 The substation will be accessed from the A831 prior to the village of Cannich. The main substation access track will be approximately 9500m in length to the substation. Details for the access track and drainage strategy will be addressed in a supplementary Drainage Strategy at a later date.

4.2.2 Access tracks within the proposed substation layout will be provided for maintenance of proposed SuDS basins and other SuDS features.

4.2.3 It is assumed that access tracks where the gradient exceeds 8% will have a sealed surface, in accordance with SSEN Specification. Gradients < 8% will have an unsealed surface. SSEN specifications state that unbound material type 2 sub-base is used. This will be confirmed by the contractor.

4.2.4 Proposed access tracks are to be predominantly adopted by Forestry and Land Scotland (FLS).

4.2.5 SuDS access tracks will be unsealed unless stated otherwise by the contractor.

5.0 PROPOSED DRAINAGE

5.1 Drainage Strategy

5.1.1 The principles of the drainage strategy for the new 400kV substation at Bingally in the Highlands will be to replicate the existing quality and quantities of run-off presently at the site wherever it is reasonable and practical to do so. All post development run-off shall also be dispersed in accordance with local authority guidelines (The Highland Council), SEPA guidelines, and SSEN Specifications (SSEN Drainage Specifications: Document SP-NET-CIV-502).

5.2 Drainage Strategy Contents

5.2.1 The drainage strategy will cover the following:

- Natural run-off collection and diversion (where required);
- Platform surface water run-off drainage collection and routing; and
- SuDS basins, cut-off drains & ditches for treatment and attenuation.

5.2.2 For the permanent drainage design, drainage from the substation platform has been designed to assume the run-off will percolate through the granular fill of the substation platform and connect into the external SuDS network. Full details of the substation platform is being designed by others (PRP) and has not been received in full. Fairhurst have received instruction from SSEN to assume the substation platform as 100% impermeable, for the purposes of the drainage design. Surface water and oily water run-off from the hard standing roofs, roads and bunded areas within the substation fence line are to discharge into the proposed drainage swales following suitable treatment, which is included in the PRP drainage design. Full details of the Drainage and SuDS Strategy can be found in **Section 7**.

5.2.3 Drainage from temporary buildings, layout areas and temporary access roads is also considered. Further details of the temporary drainage strategy can be found in **Section 8**.

5.3 Design Philosophy

5.3.1 In addition to SSEN drainage specification and Local Authority guidelines, the proposed surface water design has been designed to follow the philosophy detailed in CIRIA: The SuDS Manual C753 wherever possible. The manual states:

- Wherever possible, run-off should be managed at source (i.e. close to where the rain falls) with residual flows then conveyed downstream to further storage or treatment components where required.
- The passage of water between individual components should be through the use of above ground conveyance systems (e.g. swales and rills).
- Pipework may be a more suitable option depending on the specific scheme, especially where space is limited.
- Pre-treatment (the removal of litter and sediment) and maintenance are vital to ensure the long-term and sustained effectiveness of all SuDS components.
- Overland flow routes may also be required to convey and control floodwater safely during extreme events.

5.4 Design Specifications and Requirements

5.4.1 The design shall adhere to the relevant SSEN specifications to meet the client's requirements. These specifications are listed below:

- SP-NET-CIV-502 – Drainage Specification
- SP-NET-CIV-503 – Pavements and Roadways

5.4.2 The following publications has also been considered in design decisions in accordance to SSEN SP-NET-CIV-005 – Drainage Specification:

- The SuDS Manual: CIRIA C753
- The Highland Council: Flood Risk & Drainage Impact, Supplementary Guidance
- SEPA: Scottish Flood Hazard and Risk Information
- SUDSWP: Water Assessment and Drainage Assessment Guide

5.4.3 The SSEN Drainage Specification, document number SP-NET-CIV-502 states the following with regards to design requirements:

5.4.4 "The strategy shall identify the levels of flood protection for the site. As a minimum these shall include:

- *1 in 200 year rainfall period protection for operational areas*
- *1 in 1000 year rainfall return period protection for critical equipment*
- *1 in 200 year rainfall return period for off-site flooding"*

5.4.5 SSEN specifications state that both the platform and access road should be considered operational areas.

5.4.6 Highland Council flood risk guidance states that "in line with SPP, all new developments need to be free from unacceptable flood risk for all flood events up to the 1 in 200-year return period (including an allowance for climate change). And that the post-development run-off rates do not exceed the pre-development run-off rate and volume for a previously undeveloped site."

5.4.7 The Highland Council flood risk and drainage guidance states that "formal on-site storage should be provided up to the 1 in 30-year return period event and attenuation measures should be designed such that SuDS features will not surcharge during a 30-year return period rainfall event." However, the drainage design has accommodated on-site storage of up to and including the 1 in 200-year return period storm with a discharge rate equivalent to the 1 in 2-year return period, to accommodate SSEN Specifications.

5.4.8 Climate change allowances have been added when considering the proposed surface water drainage design within the development site. The *SEPA climate change allowances for flood risk assessment in land use planning, version 4, Table 2* recommends a 42% uplift for rainfall data at Bingally, which falls within the North Highland basin region. This climate change allowance shall be considered during surface water drainage design as required by SEPA guidelines.

5.5 Outfall Options

5.5.1 The options available for discharging surface water are recommended by *CIRIA: The SuDS Manual C753* hierarchy. The hierarchy with relevant site considerations are summarised in **Table 3** below:

Table 1: CIRIA: The SuDS Manual C753 Outfall Heirarchy

Outfall Method	Suitability	Comments
Infiltrate run-off back into the ground.	Suitability is not known at this time as no infiltration test have been completed.	Conclusive infiltration tests are required prior to confirming if this option is available at the Bingally development site.
Discharge run-off to watercourse	There are a number of watercourses located across the site. Based on the proposed surface water design and development levels, outfalls can be achieved to nearby watercourses following suitable approvals.	A number of outfalls may be required to allow for this option, along with confirmation of levels detailed design stages.
Discharge run-off to surface or combined sewers.	There are no known Scottish Water sewers at the site location so there could be no discharge to a sewer network.	Not feasible.
Discharge run-off into existing water features such as ponds.	Further investigations and agreements would be required to consider this outfall option.	Not feasible.

6.0 DRAINAGE STRATEGY: PLATFORM

6.1.1 The drainage of the substation platform has been designed by Patterson Reeves and Partners (PRP). Information provided in the PRP drainage philosophy shows the platform to be constructed with a 1m free-draining granular material to provide infiltration through the platform, acting as a drainage blanket. It has been assumed this will be positively drained to the proposed surface water drainage design outside of the substation fenceline.

6.1.2 Flows from the run-off from proposed building roofs and pumped flows from the bunds and tanker standing areas are positively drained into pipework which are sized to prevent any surface flooding during a 1 in 1000-year return period storm. The philosophy of the surface water drainage strategy is to replicate the green equivalent field run-off rates.

6.1.3 Foul drains associated with oily water within the substation platform have positive drainage to a Klargester treatment plant to be fitted with a remote monitoring early fault detection system. Oily water will discharge in to the external drainage network once fully treated.

6.1.4 Further information can be found on the drainage drawing provided by PRP, and can be referred to in **Appendix 3**.

6.1.5 Calculations have been carried out by Fairhurst to estimate the attenuated volume of surface water run-off from the platform to the maximum allowable discharge rate. This has been coordinated with flow information provided by PRP for the platform area. Following completion of geotechnical assessment across the site, the final volumes will be determined during the detailed design stage.

7.0 DRAINAGE STRATEGY: SuDS

7.1 Specifications

7.1.1 *The SuDS and attenuation system on site had been designed in accordance with:*

- SSEN Drainage Specification document SP-NET-CIV-502.
- CIRIA, The SuDS Manual (C753)
- Highlands & Argyll Local Flood Risk Management Plan

7.2 Simple Index Analysis (SIA) Tool

7.2.1 All proposed SuDS schemes are designed in compliance with CIRIA C753, The SuDS Manual (2015). The Simple Index Analysis (SIA) Tool has been developed by SEPA to assess the suitability of proposed SuDS components at a development and to minimise any risks to the water quality of any receiving waterbodies.

7.2.2 Outputs from the SIA study for each area are detailed below for the substation platform.

7.2.3 It is assumed that PRP are dealing with all required treatment of the substation platform site operations, including for any required specialist treatments. For example, oily water treatment shall be designed and contained within the substation platform by others (PRP). Therefore, it is assumed Fairhurst will provide suitable treatment for both low trafficked roads, and simple industrial roofing.

7.2.4 As detailed in Section 6, Information provided by PRP drainage philosophy shows the platform is to be constructed with a 1m free-draining granular material to provide infiltration through the platform and will act as a drainage blanket. This has been included to the SIA tool as a filter drain for design purposes.

Table 2: SIA Tool Summary Table - Platform (Roads)

Run-off area land-use description	**Platform: Roads**			
Pollution hazard indices:	Hazard Level	Suspended Solids	Metals	Hydrocarbons
	Medium	0.7	0.6	0.7
Pollution mitigation indices (Swale):		0.5	0.6	0.6
Pollution mitigation indices (SuDS Basin):		0.4	0.4	0.4
Total mitigation Index:		0.9	0.9	1.0
Sufficiency:		Sufficient	Sufficient	Sufficient

Table 3: SIA Tool Summary Table - Platform (Roofs)

Run-off area land-use description	Platform: Commercial / Industrial Roofing (High Potential for Metal Leaching Assumed)			
Pollution hazard indices:	Hazard Level	Suspended Solids	Metals	Hydrocarbons
	Low	0.3	0.8	0.05
Pollution mitigation indices (SuDS basin):		0.5	0.5	0.6
Pollution mitigation indices (Filter drain):		0.4	0.4	0.4
Total mitigation Index:		0.9	0.9	1.0
Sufficiency:		Sufficient	Sufficient	Sufficient

7.2.5 Both Table 1 and Table 2 above show that sufficient treatment has been proposed for the substation platform based on the assumptions stated in paragraph 7.2.4.

7.3 Attenuation

7.3.1 Overland flow and excess surface water flow from the platform will be collected by perimeter drainage around the extent of the substation platform, and discharged to the proposed SuDS basins, before being attenuated to nearby existing water channels at the required discharge rate. It should be noted that prior to this, it is expected that surface water run-off shall percolate the proposed minimum 1m drainage blanket across the site before reaching the substation platform perimeter drainage.

7.3.2 In accordance with the guidelines, SuDS basins have been designed to store surface water run-off for up to a 1:200-year return period with the inclusion of an additional 42% climate change allowance in line with SEPA recommendations.

7.3.3 Due to the scale of the site, a proposed SuDS basins is located to the north of the platform. Calculations have shown that a storage volume of approximately 8000m³ is required at the SuDS basin.

7.3.4 See **Appendix 4** for the Proposed Drainage Layout.

7.4 Discharge Rates

7.4.1 Discharge rates from the SuDS basins has been calculated as 59.8 l/s. This is the equivalent pre-development Greenfield run-off rate from the platform area for the 1 in 2-year flood event, based on the existing catchment falling towards the outfall location on the tributary of the Allt a' Bhuachaille.

7.5 Basin Design

7.5.1 The SuDS basin has been designed following guidance from CIRIA, The SuDS Manual (C753). Basins have been designed to a 2m depth. This includes a minimum 0.3m freeboard allowance and will provide 1.7m water depth for storage.

8.0 DRAINAGE STRATEGY: TEMPORARY DRAINAGE

8.1 Temporary Platform Drainage

8.1.1 Temporary drainage at the platform area has been designed to collect and control surface water run-off during the construction phase of works.

8.1.2 The temporary drainage network consists of:

- Conveyance ditches around the temporary laydown areas. These have been designed to collect any run-off from the laydown areas. Run-off will then disperse to settlement lagoons (locations to be determined) prior to discharging to the existing watercourse.
- Temporary piped crossings under access tracks.
- Temporary settlement lagoons (locations to be determined) to remove silts and suspended solids prior to discharge to the receiving watercourses.

8.1.3 The location of the proposed settlement lagoons will be determined during detailed design prior to the commencement of works. These will be designed in accordance with *CIRIA C648 & C649 – Control of water pollution from linear construction projects*, to provide the required settlement volume and discharge rate for the construction works suspended solid run-off for up to the 1 in 20-year return period, with checks for a 1 in 30-year return period.

8.1.4 It is anticipated to clean and reuse one temporary settlement lagoon to the north-east of the platform as the permanent SuDS basin, whilst ensuring the suitable storage volume is achieved.

9.0 DRAINAGE STRATEGY: GROUND WATER

9.1.1 SEPA flood maps indicate areas where groundwater could influence the duration and extent of flooding from other sources. The proposed site is situated out with groundwater influenced flood extent shown on these maps apart from at the northern end of the proposed track where it approaches the A831.

9.1.2 The 1:50,000 British Geological Society (BGS) digital mapping shows that the substation site is underlain by sedimentary bedrock, comprising the Tarvie Psammite Formation. The BGS 1:625,000 hydrogeology map classifies this as a low productivity aquifer with small amounts of flow occurring predominantly through near surface fractures and discontinuities.

9.1.3 The BGS identifies that superficial deposits across the site, where present, are predominantly Glacial Till. Glacial Till is more prevalent in the southern half of the site. Overlying both bedrock and Glacial Till are pockets and areas of Peat.

9.1.4 Please refer to Geo-Environmental Report No. BING4-LT521-SEBAM-ZZ-ZZ-RPT-G-0001 for details on potential for groundwater flooding.

9.1.5 Considerations for groundwater as part of the surface water drainage design are to be finalised upon completion of ground investigations on site. An indicative groundwater seepage rate has been incorporated into the drainage model to consider potential seepage from the cut slope at the platform, but will be finalised at detailed design.

9.2 Design Considerations

9.2.1 Groundwater has been observed to be shallow at the proposed substation site and throughout the site. Due to the shallow groundwater depths, careful management will be required to ensure excavation stability during construction and also in the long-term e.g., culvert operation, slope stability and any groundwater changes which may cause flooding or dewatering of localised peat.

9.2.2 Please refer to Geo-Environmental Report No. BING4-LT521-SEBAM-ZZ-ZZ-RPT-G-0001 for further recommendations on dealing with groundwater.

10.0 DRAINAGE STRATEGY: FOUL WATER MANAGEMENT

10.1.1 Foul water drainage management within the substation platform has been designed by Patterson Reeves & Partners (PRP). Refer to drawing BING4-LT521-SEBAM-DRAI-XX-LAY-C-0001 in **Appendix 3**. PRP design philosophy references the foul design shall comply with *Sewers for Scotland*. However, it should be noted that the foul drainage within the site does not connect to multiple dwellings and will not be adopted by Scottish Water. The PRP drainage philosophy also states that foul drains are to be 100mm diameter and will drain by gravity to a KLARGESTER BA BIODISC 750 package treatment plant.

10.1.2 During construction, the office and welfare facilities will be connected to a septic tank to contain the foul water from the facilities. Full design details are to be determined once the contractor has provided details for the temporary design arrangements.

11.0 MAINTENANCE SCHEDULE

All surface water drainage features will require regular maintenance to ensure the features can maintain their drainage capabilities. The frequency of a maintenance schedule varies depending on the feature and can become less regular over time again, depending on the feature type. The SuDS Manual (C753) provides recommended maintenance requirements, which is summarised below.

11.1 Swales/Ditches

Table 4: Maintenance Schedule, Swales/ Ditches, The SuDS Manual (C753)

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect inlets/outlets and overflows for blockages and clear if required	Monthly
	Litter and debris removal	Monthly/as required
	Grass cutting – to retain grass height within specified design range.	Monthly (during growing season) or as required
	Manage other vegetation and remove nuisance plants	Monthly at start then as required
	Inspect infiltration surfaces for ponding, compaction & silt accumulation. Record areas where ponding occurs for >48 hours.	Monthly/as required
	Inspect vegetation coverage	Monthly for 6 months then quarterly for 2 years then half yearly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Bi-annually
Occasional Maintenance	Reseed areas of poor vegetation growth and alter plant types to better suit conditions if required	As required of if bare soil is exposed over 10% or more of swale treatment area.
Remedial Maintenance	Repair erosion or other damage by re-turfing or re-seeding.	As required
	Re-level uneven surfaces and reinstate design levels.	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required
	Remove and dispose of oil or petrol residues using safe standard practices	As required

11.2 SuDS Basins

Table 5: Maintenance Schedule, SuDS Basins, The SuDS Manual (C753)

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect inlets/outlets and overflows for blockages and clear if required.	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly for first year then annually or as required
	Inspect banksides, structures and pipework for evidence of physical damage	Monthly
	Litter and debris removal	Monthly
	Grass cutting (spillways and access routes).	Monthly (during growing season) or as required.
	Grass cutting (meadow grass in and around basin).	Bi-annually (Spring, before nesting season then again in Autumn)
	Manage other vegetation and remove nuisance plants.	Monthly, at start then as required
	Check any penstocks and other mechanical devices.	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets/outlets and forebay	Annually or as required
	Manage wetland plants in outlet pool – where provided	Annually
Occasional Maintenance	Re-seed areas of poor vegetation growth.	As required
	Prune and trim any trees and remove cuttings	Every 2 years or as required.
	Remove sediment from inlets/outlets, forebays and main basin when required	Every 5 years or as required (likely to be minimal requirements where effective upstream source control is provided).
Remedial Maintenance	Repair erosion or other damage by re-seeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

12.0 CONCLUSION

12.1.1 This drainage strategy report shows the proposed drainage infrastructure and the methodology behind the designs. Design parameters have also been included in this report and appropriate guidelines have been observed in order to influence the design process.

12.1.2 Fairhurst are responsible for all surface water drainage proposals outside of the substation platform boundary fence. All drainage inside the fenceline is designed by others (Patterson Reeves and Partners (PRP)).

12.1.3 The proposed permanent surface water drainage has been designed in accordance with The Highland Council, SEPA and SSEN guidance. Greenfield run-off rates and attenuation volumes to be stored up to and including the 1 in 200-year return event storm. This has contributed to the SuDS design throughout the scheme allowing for the sizing of the attenuation basin of up to 8,000m^3 storage capacity. Swales / ditches shall convey surface water, and discharge treated surface water run-off into the existing channels / drainage ditches across the site in 2 no. locations.

12.1.4 The temporary surface water design has also been considered. This consists of conveyance ditches around the temporary construction 'laydown area' platforms, which then discharge to settlement lagoons. The settlement lagoons have been designed to allow the settlement of suspended solids prior to discharge to the natural environment, for up to the 1 in 20-year storm event, with a check also for the 1 in 30-year event.

12.1.5 Foul water drainage has been designed by PRP within the substation platform. Further details can be found in the design philosophy provided by PRP in drawing BING4-LT521-SEBAM-DRAI-XX-LAY-C-0001, in **Appendix 3**.

13.0 REFERENCE DOCUMENTS

Table 6: Reference Documents

Document Name	Reference	Publisher	Date of Publication
Drainage Specification	SP-NET-CIV-502	SSEN	July 2023
Climate Change Allowances for Flood Risk Assessment in Land Use Planning	Version 3	SEPA	April 2023
The SuDS Manual	C753	CIRIA	2019
The Highland Council: Flood Risk & Drainage Impact Assessment: Supplementary Guidance	N/A	The Highland Council	2023
Highlands & Argyll: Flood Risk Management Plan	/A	SEPA	December 2021
Water Assessment and Drainage Assessment Guide		Sustainable Urban Drainage Scottish Working Party (SUDSWP)	N/A
Avoiding danger from overhead power lines.	Guidance Note G56 (Fourth Edition)	Health and Safety Executive	2013

Appendix 1 Proposed Site Boundary and Layout

DRAWING STATUS:
ISSUED FOR ACCEPTANCE
S5

REVISION:	P01	P03	P04	P05	P06	P07	P07
DRAWN:	RG 26/01/2024	RG 28/03/2024	RG 14/05/2024	RG 14/02/2025	JM 15/09/2025	JM 01/10/2025	JM 17/10/2025
CHECKED:	GI 26/01/2024	GI 28/03/2024	GI 14/05/2024	GI 14/02/2025	SC 15/09/2025	SC 01/10/2025	SC 17/10/2025
APPROVED:	CG 26/01/2024	CG 28/03/2024	CG 14/05/2024	CG 14/02/2025	CG 15/09/2025	CG 01/10/2025	CG 17/10/2025
PROJECT REF.	BING4-LT521	BING4-LT521	BING4-LT521	BING4-LT521	BING4-LT521	BING4-LT521	BING4-LT521
	FIRST ISSUE	DRAWING RENUMBERED	PHASE 2C	PHASE 2C	NOTES UPDATED	LAYOUT UPDATED	UPDATED WITH LATEST DESIGN

UPDATED WITH LATEST DESIGN

NOTES
1. THE PROPOSALS SHOWN ON THIS DRAWING HAVE BEEN DETERMINED FROM TOPOGRAPHICAL SURVEY INFORMATION PROVIDED BY OTHERS
2. DESIGN PROPOSALS SHOWN ARE PRELIMINARY AND SUBJECT TO DETAILED DESIGN.
3. SITE CONSTRAINTS FROM UNDERGROUND HV CABLES OVERHEAD AND ACCESS TO OHL TO BE CONFIRMED
4. TEMPORARY LAYDOWN AREAS TO BE REINSTATED, WHERE APPROPRIATE, WITH PEAT FROM ADJACENT TEMPORARY STORAGE AREAS.
5. PERMANENT PEAT STORAGE AREAS FOR SURPLUS PEAT GENERATED FROM CONSTRUCTION OF THE ACCESS ROAD TO BE CONFIRMED.
6. DEVELOPMENT OF BOTH TEMPORARY AND PERMANENT PEAT STORAGE AREAS WILL BE DETERMINED ON THE BASIS OF GEOTECHNICAL SITE INVESTIGATION.

Customer
Scottish & Southern Electricity Networks
TRANSMISSION

Project
LT521-BINGALLY 400kv SUBSTATION

Contractor
SIEMENS ENERGY + bam
Joint Venture
Substation Delivery
Framework

Title
TEMPORARY SITE LAYOUT

Subcon. Drawing No. FAIRHURST
BING4-LT521-SEBAM-ZZ-ZZ-D-C-0103

Contractor Drawing No.
BING4-LT521-SEBAM-ZZ-ZZ-D-C-0103

Customer Drawing No.
BING4-LT521-SEBAM-ZZ-ZZ-D-C-0103

Designed	Drawn	Checked	Approved	Date	Scale	Size	Sheet	Revision
RG	AC	GI	CG	08/01/2024	1:2500	A1	1 of 1	P07

Red Line Boundary
Compound & Access Track
Scale - 1:100,000

Permanent Site Layout
Site Compound
Scale - 1:2,500

KEY					
PROPOSED RED LINE BOUNDARY	🟥	DRAINAGE	―	DRAINAGE	―
		SUDS FEATURE	🟦	PROPOSED BORROW PIT	▨
EARTHWORK SLOPES	🟩	OVERHEAD LINES	— —	VERGE	🟩
ACCESS TRACK	▬	WATERCOURSES	―	EXISTING TRACK	▬

NOTES
1. THE PROPOSALS SHOWN ON THIS DRAWING HAVE BEEN DETERMINED FROM TOPOGRAPHICAL SURVEY INFORMATION PROVIDED BY OTHERS
2. DESIGN PROPOSALS SHOWN ARE PRELIMINARY AND SUBJECT TO DETAILED DESIGN.
3. SITE CONSTRAINTS FROM UNDERGROUND HV CABLES OVERHEAD AND ACCESS TO OHL TO BE CONFIRMED
4. PERMANENT PEAT STORAGE AREAS FOR SURPLUS PEAT GENERATED FROM CONSTRUCTION OF THE ACCESS ROAD TO BE CONFIRMED.
5. DEVELOPMENT OF BOTH TEMPORARY AND PERMANENT PEAT STORAGE AREAS WILL BE DETERMINED ON THE BASIS OF GEOTECHNICAL SITE INVESTIGATION.

DRAWING STATUS:
ISSUED FOR ACCEPTANCE
S5

REVISION:	P02	P03	P04	P05	P06	P07	P07
DRAWN:	RG 23/02/2024	RG 28/03/2024	RG 14/05/2024	RG 16/05/2024	RG 14/02/2025	JM 26/09/2025	JM 17/10/2025
CHECKED:	GI 23/02/2024	GI 28/03/2024	GI 14/05/2024	GI 16/05/2024	GI 14/02/2025	SC 26/09/2025	SC 17/10/2025
APPROVED:	CG 23/02/2024	CG 28/03/2024	CG 14/05/2024	CG 16/05/2024	CG 14/02/2025	CG 26/09/2025	CG 17/10/2025
PROJECT REF.	BING4-LT521	BING4-LT521	BING4-LT521	BING4-LT521	BING4-LT521	BING4-LT521	BING4-LT521
	FIRST ISSUE	DRAWING RENUMBERED	PHASE 2C	VIEWPORT CHANGES	NOTES UPDATED	UPDATED WITH LATEST DESIGN	UPDATED WITH LATEST DESIGN

Customer
Scottish & Southern Electricity Networks
TRANSMISSION

Contractor
SIEMENS energy + bam
Joint Venture
Substation Delivery
Framework

Subcon. Drawing No.
FAIRHURST
SHEET 1 OF 1

Project
LT521-BINGALLY 400kv SUBSTATION

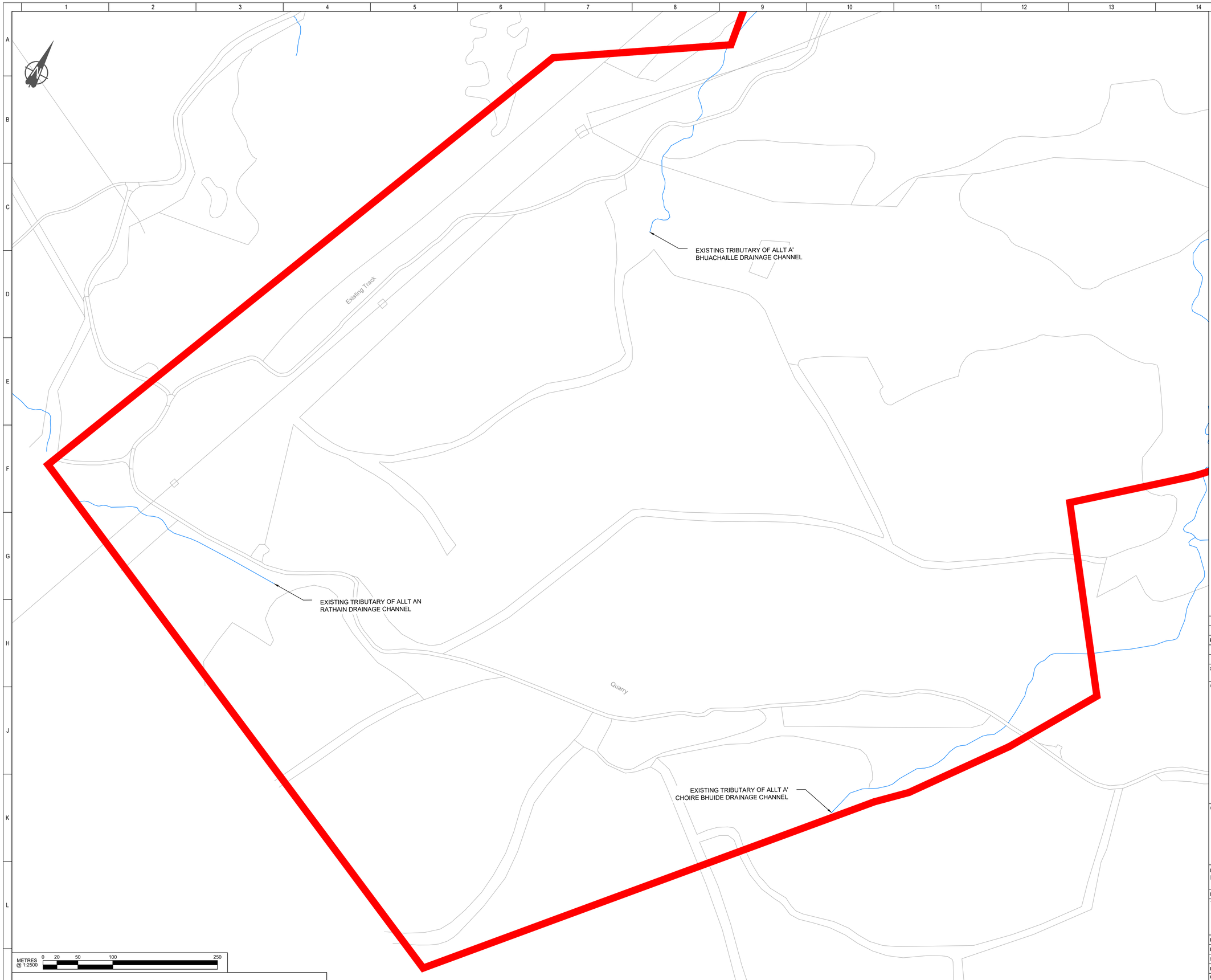
Title
PERMANENT SITE LAYOUT
SHEET 1 OF 1

Contractor Drawing No.
BING4-LT521-SEBAM-ZZ-ZZ-D-C-0109

Customer Drawing No.
BING4-LT521-SEBAM-ZZ-ZZ-D-C-0109

Designed	Drawn	Checked	Approved	Date	Scale	Size	Sheet	Revision
RG	RG	GI	CG	26/01/2024	AS SHOWN	A1	1 of 1	P07

Appendix 2 Existing Drainage Layout



METRES @ 1:2500 0 20 50 100 250

NOTES:

1. The proposals shown on this drawing have been determined from topographical survey information provided by others
2. Site layout based on drawing Fasnakyle - Site D alternative Siemens BAM layout
3. Substation layout based on S345-SEL-V00-XX-M3-C-5001.rvt.
4. Design proposals shown are preliminary and subject to detailed design.
5. All dimensions in mm unless stated otherwise.
6. Refer to design decision log for assumptions associated with proposed design.
7. Tie-in locations to existing watercourse channels to be confirmed.
8. The contractor shall check all dimensions on site and report any difference to the designer.
9. All levels are in metres (m) above ordnance datum unless stated otherwise.
10. Services to be confirmed to allow for co-ordination.
11. Existing drainage unknown and to be confirmed.
12. Site constraints from underground HV cables and access to OHL to be confirmed
13. Refer to drawings - BING4-LT521-SEBAM-DRAI-ZZ-D-C-0151, BING4-LT521-SEBAM-DRAI-ZZ-D-C-0152 & BING4-LT521-SEBAM-DRAI-ZZ-D-C-0153 for access track drainage design
14. Refer to drawing - BING4-LT521-SEBAM-DRAI-ZZ-D-C-0190 for proposed permanent drainage design.

LEGEND:

Existing watercourse

Red line site boundary

REV:	DATE:	DRWN:	CHKD:	APPVD:	DESCRIPTION:
P02.01	04/02/25	CMcL	RD	RJM	SECOND ISSUE
P01	20/06/24	CMcL	RD	RJM	FIRST ISSUE

STATUS: S4 ISSUED FOR REVIEW

CONTRACTOR: SIEMENS energy + bam

Joint Venture Substation Delivery Framework

CLIENT: Scottish & Southern Electricity Networks TRANSMISSION

PROJECT: LT521 - BINGALLY 400kV SUBSTATION

PROJECT NUMBER: BING4-LT521 | LOCATION: BINGALLY

TITLE: EXISTING DRAINAGE LAYOUT - SUBSTATION

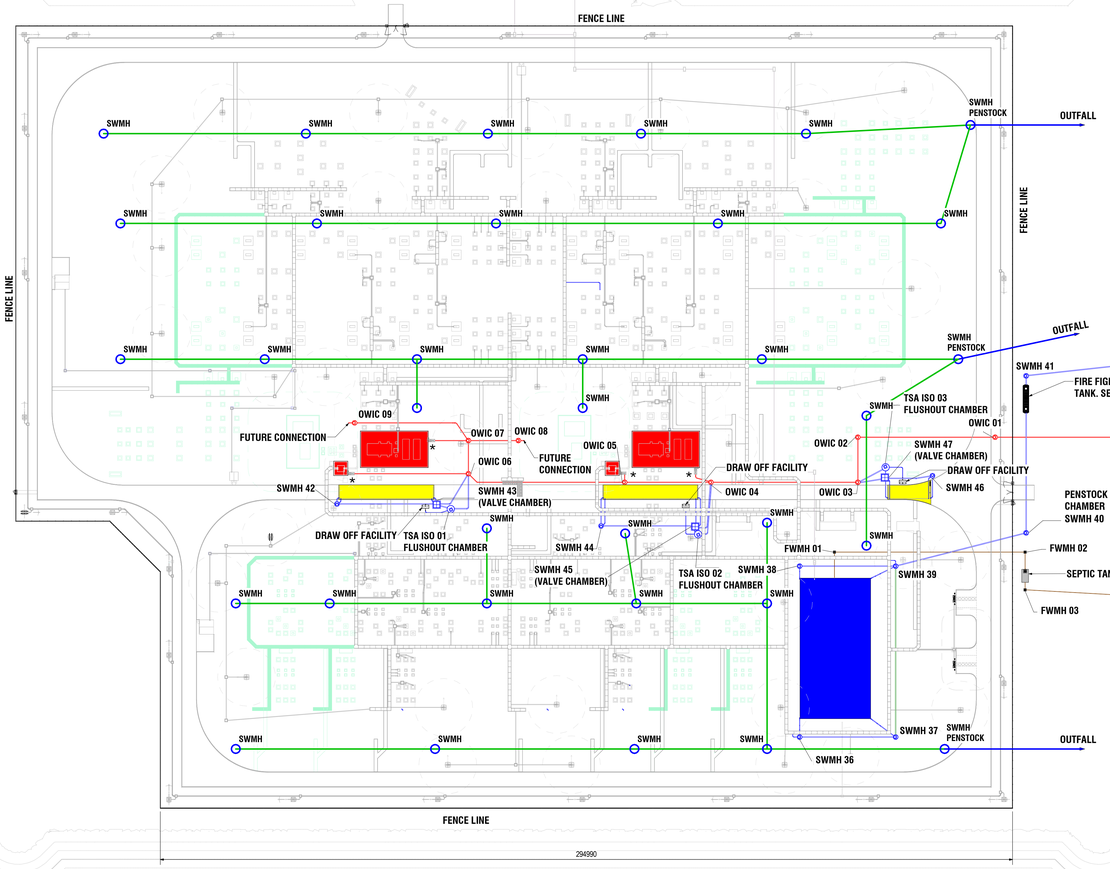
DRAWN: C.McLaughlin	ENG CHECK: R.Duncan
DESIGNER: A.Peters	COORDINATION: R.Duncan
SCALE : 1:2500	APPROVED: R.Minto
DATE OF FIRST ISSUE: 20/06/2025	SECURITY:

ORIGINATOR DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0158 | SHEET No: 1 of 1

CLIENT DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0158 | REV. No: P02.01

Appendix 3 Proposed PRP Layout Drawing

WORK IN PROGRESS



DRAINAGE OVERVIEW AND PHILOSPHY
(1 : 750)

1. DO NOT SCALE, WORK TO DIMENSIONS SHOWN. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE LOCATION OF ALL EXISTING SERVICES WITHIN THE WORKS AREA AND FOR THE STRUCTURAL STABILITY THROUGHOUT THE WORKS.

3. CONTRACTORS ARE TO BE AWARE OF THEIR RESPONSIBILITIES UNDER THE CDM REGULATIONS & COMPLY WITH THEM AT ALL TIMES. NOTE THAT ANY HAZARDS IDENTIFIED ON THE DRAWINGS ARE ONLY THOSE WHICH MAY NOT BE OBVIOUS TO COMPETENT PERSONS OR ARE UNUSUAL OR WHICH MIGHT BE DIFFICULT TO MANAGE.

4. WORKING AREAS AND METHODS TO BE AGREED BEFORE WORK COMMENCES.

5. THE TERM 'CONTRACTOR' REFERS TO THE CONTRACTOR RESPONSIBLE FOR THE INDIVIDUAL ELEMENT OF THE WORKS.

6. UNLESS NOTED OTHERWISE THE SPECIFICATION FOR THE WORKS IS :-
- SP-NET-CIV-501_SPECIFICATION FOR EARTHWORKS - Rev 2.00 February 2023.
- SP-NET-CIV-502_DRAINAGE SPECIFICATION - Rev 1.01 July 2020.
- WHERE PROPRIETARY ITEMS HAVE BEEN SPECIFIED, SIMILAR APPROVED PRODUCTS WILL BE ACCEPTABLE BUT
- ONLY WHERE AGREED WITH PATTERSON REEVES & PARTNERS.

7. MINIMUM 120,000 LITRE BURIED FIRE FIGHTING WATER STORAGE TANK. HYDRANTS WILL NOT BE PROVIDED. WATER STORAGE TANK SHALL BE ACCESSIBLE FROM OUTSIDE THE SUBSTATION. FIRE FIGHTING AUTHORITY WILL NEED TO USE THEIR OWN SUCTION DEVICE TO GAIN ACCESS TO FIRE FIGHTING WATER.

DRAINAGE LEGEND

- CARRIER DRAIN - 300 DIA. TYPICAL U.N.O
- FILTER DRAIN - 300 DIA. TYPICAL U.N.O
- OILY WATER DRAIN - 150 DIA. TYPICAL
- FOUL WATER DRAIN - 100 DIA. TYPICAL
- SURFACE WATER CHAMBER - 600 DIA
- OILY WATER CHAMBER - 600 DIA
- FOUL WATER CHAMBER - 450 DIA
- BUND
- BUILDING
- TANKER STAND AREA
- ABOVE GROUND OIL SEPERATOR

ALL CHAMBER COVERS WITHIN 2m OF FENCELINE SHALL BE GRP

DRAINAGE PHILOSOPHY

NORMAL SITE OPERATION

SURFACE WATER

APART FROM BUILDINGS, IMPERMEABLE ROADS AND BUNDS, THE SITE WILL GENERALLY BE SURFACED IN A LAYER OF STONE CHIPPINGS ON TOP OF A POROUS SUB-BASE LAYER THAT WILL ACT AS A DRAINAGE BLANKET. THE SSE SPECIFICATION CALLS FOR A 725MM SUB-BASE TO HAVE AN ASSORBENCY OF $3x10^{-1}$ /M/S. RAINFALL WILL INFILTRATE INTO THE BLANKET. DUE TO THE SIGNIFICANT CUT AND FILL WORKS, THERE WILL BE A DEPTH OF GRANULAR MATERIAL OVER A LARGE PORTION OF THE SITE I.E. THE FILLED SECTION. THE UNDERLYING ROCK WILL BE CUT AS REQUIRED AND PROCESSED ON-SITE TO BE USED AS ENGINEERED FILL. THE DEPTH OF UNDERLYING PROCESSED FILL WILL BE SEVERAL METRES THICK IN PLACES. AT THIS STAGE IT IS ASSUMED THAT THIS UNDERLYING ENGINEERED STRATA WILL BE IMPERVIOUS.

THE PHILOSOPHY OF THE SURFACE WATER DRAINAGE STRATEGY IS IN PRINCIPLE TO MIMIC THE QUALITY AND QUANTITY OF THE RUNOFF FROM THE SITE IN ITS 'GREENRIELD' STATE. IN SO FAR AS IT IS REASONABLE AND PRACTICABLE, WHERE APPROPRIATE ADDITIONAL POST-DEVELOPMENT RUNOFF SHALL BE DISPERSED IN ACCORDANCE WITH LOCAL AUTHORITY, SEPA AND SEWERS FOR SCOTLAND.

DESIGN EVENT RAIN-FALL SHALL BE BASED ON THE USE OF THE MOST RECENT VERSION OF THE 'FLOOD ESTIMATION HANDBOOK' SPECIFIC TO THE LOCATION OF THE DEVELOPMENT. AN ALLOWANCE FOR CLIMATE CHANGE SHALL BE APPLIED IN ACCORDANCE WITH SEPA CLIMATE CHANGE (CC) ALLOWANCES FOR FLOOD RISK ASSESSMENTS IN LAND USE PLANNING, VERSION 6.

EXCLUDING TANKER STANDING AREAS, OTHER PAVED AREAS WILL DRAIN DIRECTLY INTO THE UPPER PLATFORM DRAINAGE BLANKET. SURFACE WATER FLOWS WILL BE GIVEN INITIAL TREATMENT AS IT PASSES THROUGH THE STONE BLANKET LAYER. IN ORDER TO DRAIN THE UPPER DRAINAGE BLANKET A SERIES OF FILTER DRAINS ARE PROPOSED. THE NEED FOR THESE FILTER DRAINS WILL BE REVIEWED FOLLOWING TESTING OF THE UNDERLYING ENGINEERED STRATA TO DETERMINE THE POROSITY. EVEN IF THE UNDERLYING FORMATION IS IMPERVIOUS, AN ANALYSIS OF THE FLOW OF SURFACE WATER THROUGH THE DRAINAGE BLANKET TOWARDS FILTER DRAINS INDICATES THAT THE OUTFLOW IS CONSIDERABLY LESS THAN THE GREENFIELD RUNOFF RATE FOR ANY PARTICULAR RETURN PERIOD STORM. THEREFORE, WITH REGARDS TO RAINFALL ONTO THE PERMEABLE AREAS, THERE IS NO NEED FOR ANY ADDITIONAL ATTENUATION.

FLOWS FROM THE RUNOFF FROM BUILDING ROOFS, TANKER STANDING AREAS AND PUMPED FLOWS FROM BUNDS WILL BE POSITIVELY DRAINED INTO PIPEWORK WHICH WILL BE SIZED TO PREVENT ANY SURFACE FLOODING DURING A 1 IN 200 YEAR RETURN PERIOD STORM, PLUS CLIMATE CHANGE.

IT IS ANTICIPATED THAT FLOWS TO DOWNSTREAM WATERCOURSES WILL BE RESTRICTED TO THE GREEN FIELD RUNOFF RATE WHEN CONSIDERING THE TOTAL IMPERMEABLE AREAS, WHICH IN THIS CASE IS 0.269 HA. THE GREENFIELD RUNOFF RATE FOR A 1 IN 2 YEAR RETURN PERIOD STORM IS 3.2L/S. FLOWS TO DOWNSTREAM WATERCOURSE WILL THEREFORE BE RESTRICTED TO THIS RATE. INFODRAINAGE ANALYSIS HAS DETERMINED THAT AN ATTENUATION VOLUME OF **225.7m³ WILL** BE REQUIRED DURING A 1 IN 200 YEAR RETURN PERIOD STORM.

AS A MINIMUM, THE SURFACE WATER DRAINAGE SYSTEM WILL FULLY MANAGE SURFACE WATER FLOWS RESULTING FROM THE DEVELOPED SITE UP TO THE 1 IN 1000-YEAR + CC RAIN FALL RETURN PERIOD PROTECTION FOR 'CRITICAL EQUIPMENT'. ANY ON SITE FLOODING WHICH RESULTS FROM A 1 IN 1000 YEAR RETURN PERIOD STORM WILL BE EASILY ABSORBED INTO THE DRAINAGE STONE PLATFORM. IN ADDITION, A MINIMUM OF 1 IN 200-YEAR + CC RAIN-FALL RETURN PERIOD PROTECTION WILL BE PROVIDED FOR BOTH ON AND OFF SITE FLOODING. THE DETAIL OF THE ATTENUATION AND ADDITIONAL SuDS TREATMENT OUTSIDE THE SECURITY FENCE LINE WILL BE DESIGNED BY OTHERS

EQUIPMENT CONTAINING OIL WILL BE SITUATED IN IMPERMEABLE BUNDS. BECAUSE THERE MAY BE OIL PRESENT WITHIN WATER WITHIN THESE BUNDS, INTELLIGENT PUMPING SYSTEMS WHICH WILL DETECT THE PRESENCE OF OIL WILL BE USED. THESE WILL CEASE OPERATION IF OIL IS DETECTED. IN ADDITION, FLOWS FROM THESE LOCATIONS WILL PASS THROUGH ABOVE-GROUND OIL SEPARATORS, BEFORE PASSING DOWNSTREAM. IN ACCORDANCE WITH SSE SPECIFICATION FLOWS FROM OIL CONTAINMENT AREAS, INCLUDING TANKER STANDING AREAS, WILL DISCHARGE THROUGH A SEPARATE OUTFALL AND INTO A SWALE SO THAT ANY SIGNS OF OIL CAN BE EASILY IDENTIFIED. DURING ANY OPERATION INVOLVING OIL TANKERS OR TREATMENT, FLOWS FROM THE TANKER STANDING AREAS WILL BE TEMPORARILY DIRECTED TO AN UNDERGROUND STORAGE CONTAINER SO THAT ANY SPILLAGES WILL NOT PASS DOWNSTREAM TO WATERCOURSES.

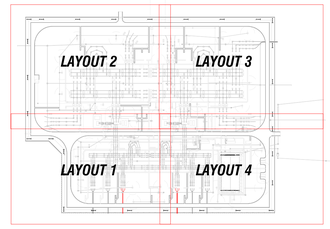
IN ADDITION, COOLING PLANT CONTAINING GLYCOL WILL ALSO BE HOUSED IN BUNDS. RAINWATER ENTERING THESE BUNDS WILL ALSO BE PUMPED OUT INTO THE SURFACE WATER SYSTEM. IF A PRESSURE DROP IS INDICATED IN THE GLYCOL PIPEWORK, THE SURFACE WATER PUMPS WILL SWITCH OFF ENSURING CONTAMINATED WATER IS RETAINED WITHIN THE COOLER BUND.

WHERE OILY WATER AND SURFACE WATER CARRIER DRAINS ARE USED WITHIN THE SUBSTATION, THE CHAMBERS SHALL BE CONSIDERED AS 'MANHOLES', IN ACCORDANCE WITH SP-NET-CIV-502 THESE CHAMBERS SHALL HAVE 1200mm INTERNAL DIAMETER AND SHALL ALL BE BENCHED. CATCHPITS SHALL NOT BE USED WITHIN THE SUBSTATION.

FOUL WATER

SEWERS FOR SCOTLAND V4.0 STIPULATES THAT ALL GRAVITY SEWER PIPES SHALL BE 150mm INTERNAL DIAMETER AND SHALL BE UPVC, HOWEVER, THE FOUL DRAINAGE HERE DOESN'T CONNECT MULTIPLE PROPERTIES AND THEREFORE NOT CONSIDERED TO BE A 'SEWER'. WHERE GRAVITY DRAINS ARE PROVIDED THESE WILL BE 100mm INTERNAL DIAMETER. THE FOUL DRAIN FROM THE BUILDING SHALL DRAIN DIRECTLY INTO A FOUL PUMPING STATION (DUTY/STANDBY). THE PUMPING MAIN SHALL BE 50 DIA. (1200 DEEP TO CROWN) AND SHALL BE PUMPED TO A MANHOLE OUTSIDE THE SUBSTATION SECURITY FENCE. FROM THERE FOUL WATER SHALL DRAIN VIA GRAVITY INTO A SEPTIC TANK (ALSO LOCATED OUTSIDE THE SUBSTATION FENCELINE) LOCATED AS CLOSE AS PRACTICALLY POSSIBLE TO THE ENTRANCE FOR EASE OF ACCESS FOR MAINTENANCE.

THE OUTFALL FROM THE SEPTIC TANK SHALL DRAIN INTO A SUITABLY SIZED DRAINAGE FIELD. IF IT IS NOT POSSIBLE TO DRAIN BY GRAVITY THEN THE EFFLUENT WILL NEED TO BE PUMPED TO A FOUL SOAKAGE FIELD. THE SOAKAGE FIELD SHALL BE LOCATED IN AN AREA WHERE THERE ARE SUITABLE DRAINAGE CHARACTERISTICS. ALSO WHERE THE LEVELS PERMIT THE SOAKAGE FIELD TO BE NO GREATER THAN 700mm TO CROWN OF PIPE. ALL IN ACCORDANCE WITH BS 6297 WHICH COVERS 'DEALING WITH DIFFICULT SITES AND GROUND CONDITIONS', THIS MUST BE REFERRED TO WHEN DETERMINING THE CORRECT LOCATION. REFER TO FIGURE 6 OF BS 6297.



OVERALL KEY PLAN
(1 : 3000)

FINISHED SUBSTATION LEVEL
(+247 AOD)

SCALE 1:750

CDM REGULATIONS :

SIGNIFICANT OR UNUSUAL RESIDUAL HAZARDS HIGHLIGHTED BELOW:

THERE ARE NO RISKS UNFAMILIAR TO A COMPETENT CONTRACTOR

SAFE METHODS OF WORK ARE THE RESPONSIBILITY OF THE CONTRACTOR AND ARE TO BE IDENTIFIED IN THE HEALTH AND SAFETY PLAN.

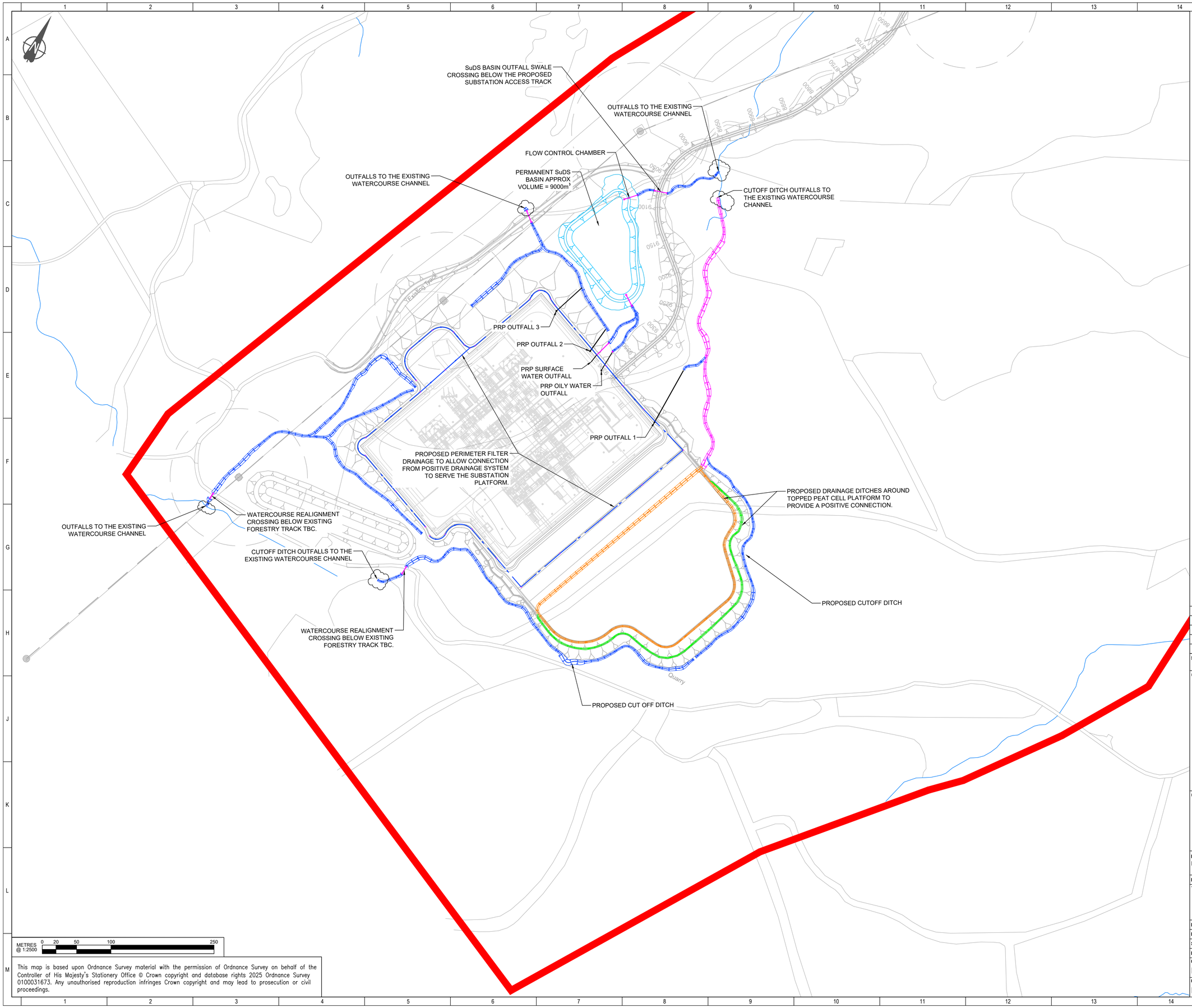
Subcontractor

Patterson Reeves & Partners
Westleigh House, E1 - 85 Leigh Road, Eastleigh, Hampshire SO50 9DQ

REVISION:	P01		P02	
DRAWN:	D.Wheatland	15.05.2025	D.Wheatland	NYI
CHECKED:	G.Hooper	15.05.2025	G.Hooper	NYI
APPROVED:	N.Patterson	15.05.2025	N.Patterson	NYI
	FOR INFORMATION		FOR INFORMATION	
	PROJECT REF: LTS21		PROJECT REF: LTS21	
	FIRST ISSUE		FIRST ISSUE	

Project Reference	BINGALLY 400kV SUBSTATION
Contractor	IEMENS ENERGY + bam
Client	Scottish & Southern Electricity Networks TRANSMISSION
Project Title	BINGALLY 400kV SUBSTATION
Drawing Title	OVERVIEW AND PHILOSOPHY DRAINAGE
Site	BINGALLY 400kV SUBSTATION
Contractor Drawing Number	
Client Drawing Number	BING-LT521-PRP-DRAI-XX-LAY-C-0001
Sheet of	01 of 01
Suitability Code	S2
Purpose of Issue	FOR INFORMATION
Scale	1:750
Size	A0
Revision	P01

Appendix 4 Proposed Drainage Drawings



NOTES:
1. The proposals shown on this drawing have been determined from topographical survey information provided by others
2. Site layout based on drawing Fasnakyle - Site D alternative Siemens BAM layout
3. Substation layout based on S345-SEL-V00-XX-M3-C-5001.rvt.
4. Design proposals shown are preliminary and subject to detailed design.
5. All dimensions in mm unless stated otherwise.
6. Refer to design decision log for assumptions associated with proposed design.
7. Tie-in locations to existing watercourse channels to be confirmed.
8. The contractor shall check all dimensions on site and report any difference to the designer.
9. All levels are in metres (m) above ordnance datum unless stated otherwise.
10. Services to be confirmed to allow for co-ordination.
11. Existing drainage unknown and to be confirmed.
12. Site constraints from underground HV cables and access to OHL to be confirmed
13. Refer to drawings - BING4-LT521-SEBAM-DRAI-ZZ-D-C-0151, BING4-LT521-SEBAM-DRAI-ZZ-D-C-0152 & BING4-LT521-SEBAM-DRAI-ZZ-D-C-0153 for access track drainage design
14. Temporary drainage not shown for clarity. Please refer to drawing - BING4-LT521-SEBAM-DRAI-ZZ-D-C-0195

LEGEND:

- Proposed Ditch - Type A
- Proposed Ditch - Type B
- Proposed Swale - Type C (700x700 min)
- Proposed Swale Type D (500x500 min)
- Filter Drain
- Pipe/Culvert
- Suds Basin
- Chamber
- Headwall
- Existing ditch / watercourse

METRES @ 1:2500 0 20 50 100 250

REV:	DATE:	DRWN:	CHKD:	APPVD:	DESCRIPTION:
P02	28/10/25	CMcL	RD	RJM	ISSUED FOR PLANNING
P01	23/10/25	CMcL	RD	RJM	ISSUED FOR PLANNING

STATUS: S5 ISSUED FOR FINAL REVIEW

CONTRACTOR: SIEMENS energy + bam

Joint Venture Substation Delivery Framework

CLIENT: Scottish & Southern Electricity Networks TRANSMISSION

PROJECT: LT521 - BINGALLY 400kV SUBSTATION

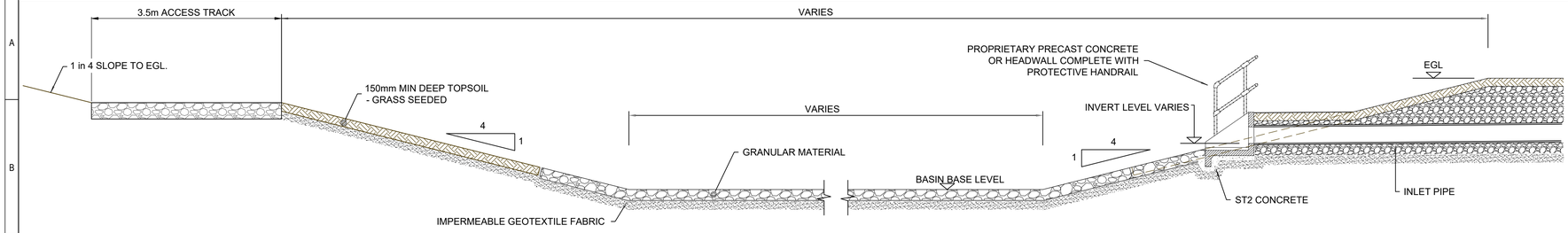
PROJECT NUMBER: BING4-LT521 | LOCATION: BINGALLY

TITLE: PROPOSED PERMANENT DRAINAGE LAYOUT - SUBSTATION

DRAWN:	C.McLaughlin	ENG CHECK:	R.Duncan
DESIGNER:	A.Peters	COORDINATION:	R.Duncan
SCALE :	1:2500	APPROVED:	R.Minto
DATE OF FIRST ISSUE:	04/02/2025	SECURITY:	

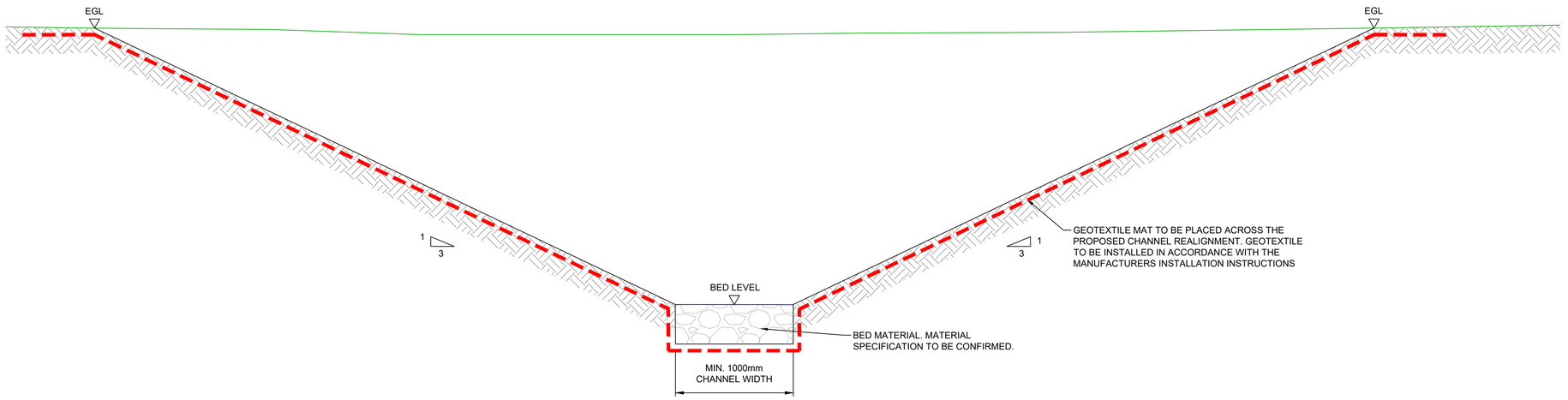
ORIGINATOR DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0190 | SHEET No: 1 of 1

CLIENT DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0190 | REV. No: P02



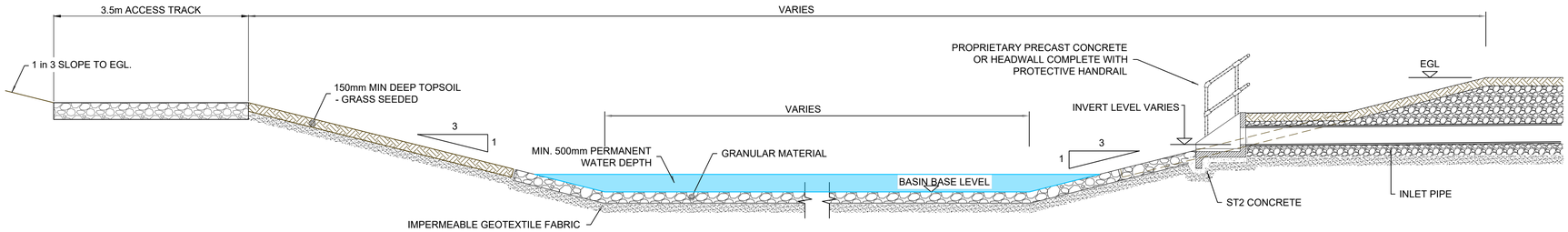
TYPICAL CROSS-SECTION THROUGH SUDS BASIN

SCALE 1:50



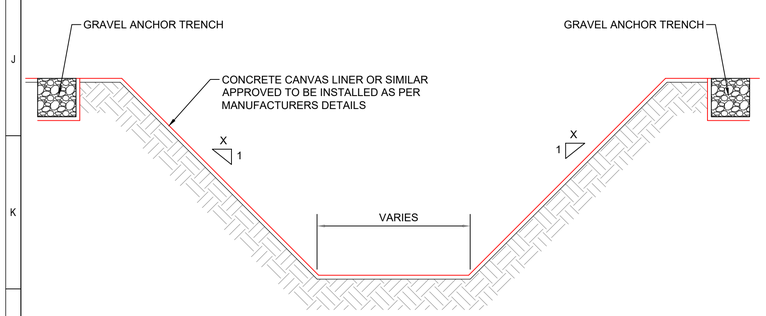
TYPICAL SECTION THROUGH WATERCOURSE REALIGNMENT CHANNEL

SCALE 1:20



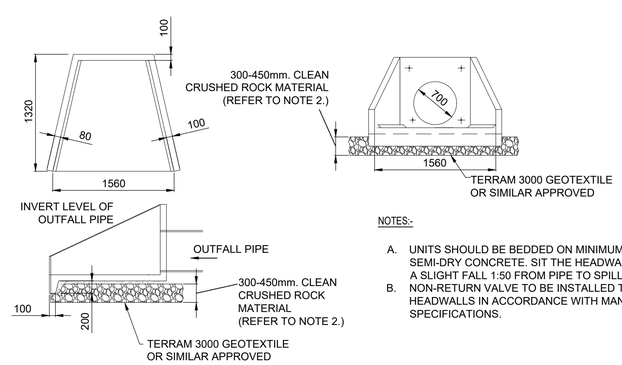
TYPICAL CROSS-SECTION THROUGH SETTLEMENT LAGOONS

SCALE 1:50



DITCH

SCALE 1:20

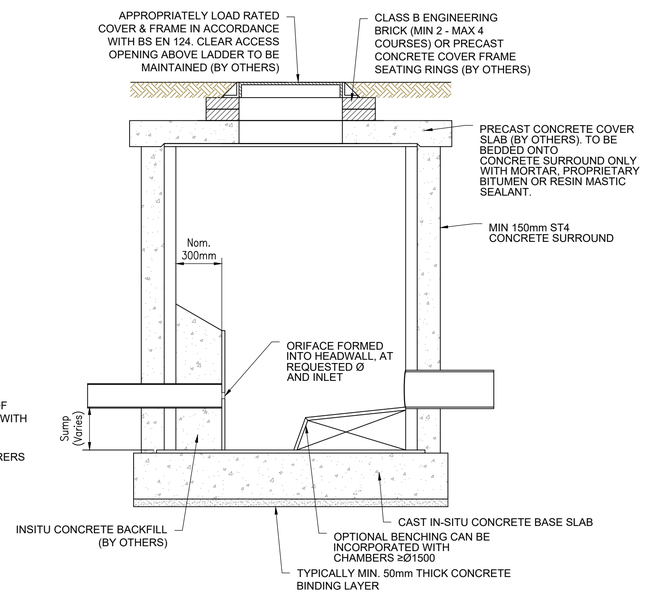


NOTES:-

A. UNITS SHOULD BE BEDDED ON MINIMUM 100mm OF SEMI-DRY CONCRETE. SIT THE HEADWALL LEVEL WITH A SLIGHT FALL 1:50 FROM PIPE TO SPILL MOUTH.
B. NON-RETURN VALVE TO BE INSTALLED TO ALL HEADWALLS IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.

TYPICAL PRECAST HEADWALL / OUTFALL DETAIL-ALTHON (OR SIMILAR APPROVED)

(SCALE 1:50)



TYPICAL ORIFACE FLOW CONTROL CHAMBER

(SCALE 1:20)

METRES @ 1:50 0 0.5 1 2 5

METRES @ 1:20 0 0.2 0.5 1 2

NOTES

1. The proposals shown on this drawing have been determined from topographical survey information provided by others
2. Site layout based on drawing Fasnakyle - Site D alternative Siemens BAM layout
3. Substation layout based on S345-SEL-V00-XX-M3-C-5001.rvt
4. Design proposals shown are preliminary and subject to detailed design.
5. All dimensions in mm unless stated otherwise.
6. Refer to design decision log for assumptions associated with proposed design.
7. Tie-in locations to existing watercourse to be confirmed.
8. The contractor shall check all dimensions on site and report any difference to the designer.
9. All levels are in metres (m) above ordnance datum unless stated otherwise.
10. Services to be confirmed to allow for coordination.
11. Existing drainage unknown and to be confirmed.
12. Site constraints from underground HV cables and access to OHL to be confirmed.
13. For permanent drainage layout drawing refer to BING4-LT521-SEBAM-DRAI-ZZ-D-C-0150.
14. Suds features may require to be lined if contamination identified by ground investigations.
15. Details are indicative only.
16. Proposed layout is for estimated costing purposes only. All drainage elements will be finalised and sized at detailed design.
17. All ditches are assumed to be lined for the purposes of the interim costing estimate drawings. Final details to be confirmed at detailed design stage.

REV:	DATE:	DRWN:	CHKD:	APPVD:	DESCRIPTION:
P01	23/10/25	CMcL	RD	RJM	ISSUED FOR PLANNING

STATUS: S5 ISSUED FOR FINAL REVIEW

CONTRACTOR: SIEMENS energy + bam

Joint Venture
Substation Delivery
Framework

CLIENT: Scottish & Southern Electricity Networks TRANSMISSION

PROJECT: LT521 - BINGALLY 400kV SUBSTATION

PROJECT NUMBER: BING4-LT521 | LOCATION: BINGALLY

TITLE: PROPOSED DRAINAGE DETAILS

DRAWN:	C.McLaughlin	ENG CHECK:	R.Duncan
DESIGNER:	A.Peters	COORDINATION:	R.Duncan
SCALE :	1:2500	APPROVED:	R.Minto
DATE OF FIRST ISSUE:	06/02/2025	SECURITY:	

ORIGINATOR DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0194 — SHEET No: 1 of 1

CLIENT DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0194 — REV. No: P01

PROPOSED SETTLEMENT LAGOON. SIZING AND LOCATION TBC.

PROPOSED TEMPORARY FLOW CONTROL CHAMBER.

OUTFALL TO EXISTING WATERCOURSE

PROPOSED SETTLEMENT LAGOON. SIZING AND LOCATION TBC.

PROPOSED TEMPORARY FLOW CONTROL CHAMBER.

PROPOSED TEMPORARY FLOW CONTROL CHAMBER.

OUTFALL FROM PROPOSED TEMPORARY SETTLEMENT LAGOON TO EXISTING WATERCOURSE TBC.

PROPOSED SETTLEMENT LAGOON. SIZING AND LOCATION TBC.

PROPOSED TEMPORARY FLOW CONTROL CHAMBER.

OUTFALL FROM PROPOSED TEMPORARY SETTLEMENT LAGOON TO EXISTING WATERCOURSE TBC.

SEPTIC TANK LOCATION

PROPOSED CULVERT BELOW EXISTING FORESTRY TRACK

OUTFALL FROM PROPOSED CUTOFF DITCH TO EXISTING WATERCOURSE TBC.

TEMPORARY DRAINAGE DITCHES TO REMOVE SURFACE WATER RUNOFF FROM THE PEAT CELL AREA

NOTES:

1. The proposals shown on this drawing have been determined from topographical survey information provided by others
2. Site layout based on drawing Fasnakyle - Site D alternative Siemens BAM layout
3. Substation layout based on S345-SEL-V00-XX-M3-C-5001.rvt.
4. Design proposals shown are preliminary and subject to detailed design.
5. All dimensions in mm unless stated otherwise.
6. Refer to design decision log for assumptions associated with proposed design.
7. Tie-in locations to existing watercourse channels to be confirmed.
8. The contractor shall check all dimensions on site and report any difference to the designer.
9. All levels are in metres (m) above ordnance datum unless stated otherwise.
10. Services to be confirmed to allow for co-ordination.
11. Existing drainage unknown and to be confirmed.
12. Site constraints from underground HV cables and access to OHL to be confirmed
13. Refer to drawings - BING4-LT521-SEBAM-DRAI-ZZ-D-C-0151, BING4-LT521-SEBAM-DRAI-ZZ-D-C-0152 & BING4-LT521-SEBAM-DRAI-ZZ-D-C-0153 for access track drainage design
14. Permanent drainage not shown for clarity. Please refer to drawing - BING4-LT521-SEBAM-DRAI-ZZ-D-C-0190
15. Proposed layout is for estimated costing purposes only. All drainage elements will be finalised and sized at detailed design.
16. All ditches are assumed to be lined for the purposes of the interim costing estimate drawings. Final details to be confirmed at detailed design stage.

LEGEND:

- Proposed Cut off ditch
- Proposed ditch - Type A
- Proposed ditch - Type B
- Proposed ditch - Type C
- Drainage culvert
- Temporary settlement lagoons
- Flow control
- Headwall
- Existing ditch / watercourse

METRES @ 1:2500 0 20 50 100 250

REV:	DATE:	DRWN:	CHKD:	APPVD:	DESCRIPTION:
P02	28/10/25	CMcL	RD	RJM	ISSUED FOR PLANNING
P01	23/10/25	CMcL	RD	RJM	ISSUED FOR PLANNING

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CONTRACTOR: SIEMENS energy + bam

Joint Venture Substation Delivery Framework

CLIENT: Scottish & Southern Electricity Networks TRANSMISSION

PROJECT: LT521 - BINGALLY 400kV SUBSTATION

PROJECT NUMBER: BING4-LT521 | LOCATION: BINGALLY

TITLE: PROPOSED TEMPORARY DRAINAGE LAYOUT - SUBSTATION

DRAWN:	C.McLaughlin	ENG CHECK:	R.Duncan
DESIGNER:	A.Peters	COORDINATION:	R.Duncan
SCALE :	1:2500	APPROVED:	R.Minto
DATE OF FIRST ISSUE:	28/10/2025	SECURITY:	

ORIGINATOR DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0195 | SHEET No: 1 of 1

CLIENT DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0195 | REV. No: P02