Flood Risk Assessment

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Fort Augustus
8 January 2024



Flood Risk Assessment

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Executive summary

Scottish & Southern Energy Networks (SSEN) has commissioned Jacobs to carry out a Flood Risk Assessment (FRA) to support a planning application for the proposed extension for the Fort Augustus substation in The Highlands, Scotland.

Flood risks have been considered from all sources including river, sea, surface water, groundwater, sewers and artificial drainage systems, canals and reservoirs. The assessment has considered the flood risks associated with the Proposed Development and the potential impacts it may have on third parties.

This assessment has concluded that there is a low or very low risk of flooding to or arising from the Proposed Development for all flood sources.

The principal flood sources in the vicinity of the Proposed Development are fluvial and surface water. However, these are managed by an already in-situ flood alleviation scheme and a proposed drainage system designed to a 0.1% AEP standard including allowance for climate change.

The in-situ flood alleviation scheme comprises a number of flow control structures on local watercourses, a flood bund and associated compensatory storage area.

This assessment has demonstrated that despite the loss of compensatory storage area volume due to extension of the substation, sufficient volume will remain to ensure its design standard (0.1% AEP) is not compromised.

Contents

Executive summary i
1. Introduction 1
1.1 Aims and Objectives 1
1.2 Synopsis 1
2. Proposed Development and Site Setting 2
2.1 Proposed Development 2
2.2 Site Setting 3
2.2.1 Site Location 3
2.2.2 Land Use 3
2.2.3 Topography 4
2.2.4 Hydrology and hydrological / hydraulic features 5
2.2.5 Geology and Hydrogeology 6
3. Planning Policy Review 8
3.1 Scottish Planning Policy 8
3.1.1 SEPA Technical Flood Risk Guidance for Stakeholders 8
3.2 Local Planning Policy and Evidence Base Review 10
3.2.1 Highland-wide Local Development Plan, The Highland Council, 2012 10
3.2.2 Highland and Argyll Flood Risk Management Plan 10
3.2.3 River Basin Management Plan 11
3.3 Consultations 11
4. Assessment of Risk to the Proposed Development 12
4.1 Fluvial Flood Risk 12
4.2 Surface Water Flood Risk 14
4.3 Groundwater Flood Risk 15
4.4 Flood Risk from Sewers and Artificial Drainage Systems 16
4.5 Flood Risk from Reservoirs 16
4.6 Flood Risk from Canals 17
4.7 Tidal Flood Risk 17
5. Assessment of risk arising from the Proposed Development 19
5.1 Fluvial Flood Risk 19
5.2 Surface Water Flood Risk 19
5.3 Groundwater Flood Risk 19
5.4 Sewers and Artificial Drainage Systems 20
5.5 Reservoir Flood Risk 20
5.6 Canal Flood Risk 20
5.7 Tidal Flood Risk 20
6. Additional Mitigation & Residual Risk 21

6.1 Residual Risks 21
7. Conclusions 23

Appendices

Appendix A. Flood Alleviation Scheme Construction Drawings ..... Error! Bookmark not defined.
Appendix B. Infiltration Test Data ..... Error! Bookmark not defined.
Appendix C. Stakeholder Consultation ..... Error! Bookmark not defined.
Appendix D. SLR (November, 2017) FRA extract ..... Error! Bookmark not defined.
Appendix E. Drainage Impact Assessment ..... Error! Bookmark not defined.

Tables

Table 6 - 1. Summary of Flood Risk 21

Figures

Figure 2 - 1. Proposed Development Layout 2
Figure 2 - 2. Site Location map for the Proposed Development. 3
Figure 2 - 3. Land use map of Fort Augustus and the surrounding area, denoting the substation location as site location. Data from the Scotland Habitat and Land Cover Map, 2020 4
Figure 2 - 4. A topographic map of the Fort Augustus station and its surrounding area. 5
Figure 2 - 5. Watercourses and hydrological / hydraulic features in the vicinity of the site 6
Figure 4 - 1. SEPA Flood map for the site 12
Figure 4 - 2. SLR defined flood mitigation measures 13
Figure 4 - 3. SLR 0.1% AEP flood extent 14
Figure 4 - 4. SEPA Surface Water flood extent map 15
Figure 4 - 5. SEPA reservoirs inundation map where the blue area represents areas flooded by the breach of Loch Ness 17
Figure 6 - 1. Possible areas for relocation of lost flood compensation area due to the Proposed Development. 22

1. Introduction

Jacobs has been commissioned by Scottish & Southern Energy Networks (SSEN) to complete a Flood Risk Assessment (FRA) to support the extension of an existing substation at Fort Augustus.

1.1 Aims and Objectives

The aim of this report is to present the assessment of flood risk to and potentially arising from the Proposed Development and the requirements for managing those risks.

In order to achieve this aim, the following objectives have been met:

- Consulted with local flood Risk Management Authorities (RMAs) for any information they hold in relation to flood risk and the requirements they may have of new development with regards to the management of flood risk to and arising from the Proposed Development;
- Reviewed information available in the public domain from various websites (Scottish Environment Protection Agency (SEPA) Flood Maps, Magic Map, Scotland's Soils, Asset Information and Maintenance Programme);
- Reviewed information available from a previous study[1] completed in support of a prior application for an extension of the substation;
- Undertaken a qualitative assessment of flood risk to and arising from the Proposed Development accounting for all information available; and,
- Where necessary identified measures to mitigate for flood risk to and arising from the Proposed Development including preparation of a drainage impact assessment to comply with local policy/regulatory requirements.

1.2 Synopsis

This FRA is structured as follows:

- Section 2: Site Setting and Proposed Development; describes the setting of the site in relation to local features significant for the assessment of flood risk, it also describes the Proposed Development, identifying significant features pertaining to the management of flood risk;
- Section 3: Planning Policy and Guidance; outlines the policies relevant to the Proposed Development with respect to flood risk;
- Section 4: Assessment of Flood Risk to the Proposed Development; presents information on the flood risk to the Proposed Development considering mitigation measures;
- Section 5: Assessment of Risk arising from the Proposed Development; assesses how flood risk may change in the surrounding area as a result of the Proposed Development;
- Section 6: Additional Mitigation Measures and Residual Risk presents any additional mitigation measures needed and the remaining risks after all inherent risks have been reduced to a practicable level; and
- Section 7: Conclusion and Recommendations summarises the FRA presenting the key information about the Proposed Development for design development.

[1] SLR, November 2017. Fort Augustus Substation, Auchteraw, Proposed Substation Extension: Platforms LT92 and LT94. Appendix FRA-A: Hydrological Modelling Report Flood Risk Assessment. SLR Ref No:405.00660.00047, Version 1; and,

SLR, November 2017. Fort Augustus Substation, Auchteraw, Proposed Substation Extension: Platforms LT92 and LT94. Appendix FRA-B: Hydraulic Modelling Report Flood Risk Assessment. SLR Ref No:405.00660.00047, Version 2

2. Proposed Development and Site Setting

2.1 Proposed Development

The Proposed Development comprises the construction of an extension to the existing Fort Augustus substation platform. The platform extension will be installed to tie into the existing platform, completed at an elevation of approximately 39.8m aOD.

This extension will include construction of transmission towers, a cable corridor, a GIS substation, super grid transformers, backstart reactors, overhead power lines and an access road to the site. (Figure 2 - 1). In addition to power transmission infrastructure the Proposed Development will also include a drainage system designed in accordance with current standards and a foul water treatment system independent of local foul sewer networks.

The main access road to the substation with remain as the existing access connecting to Auchteraw Road, northeast of the substation.

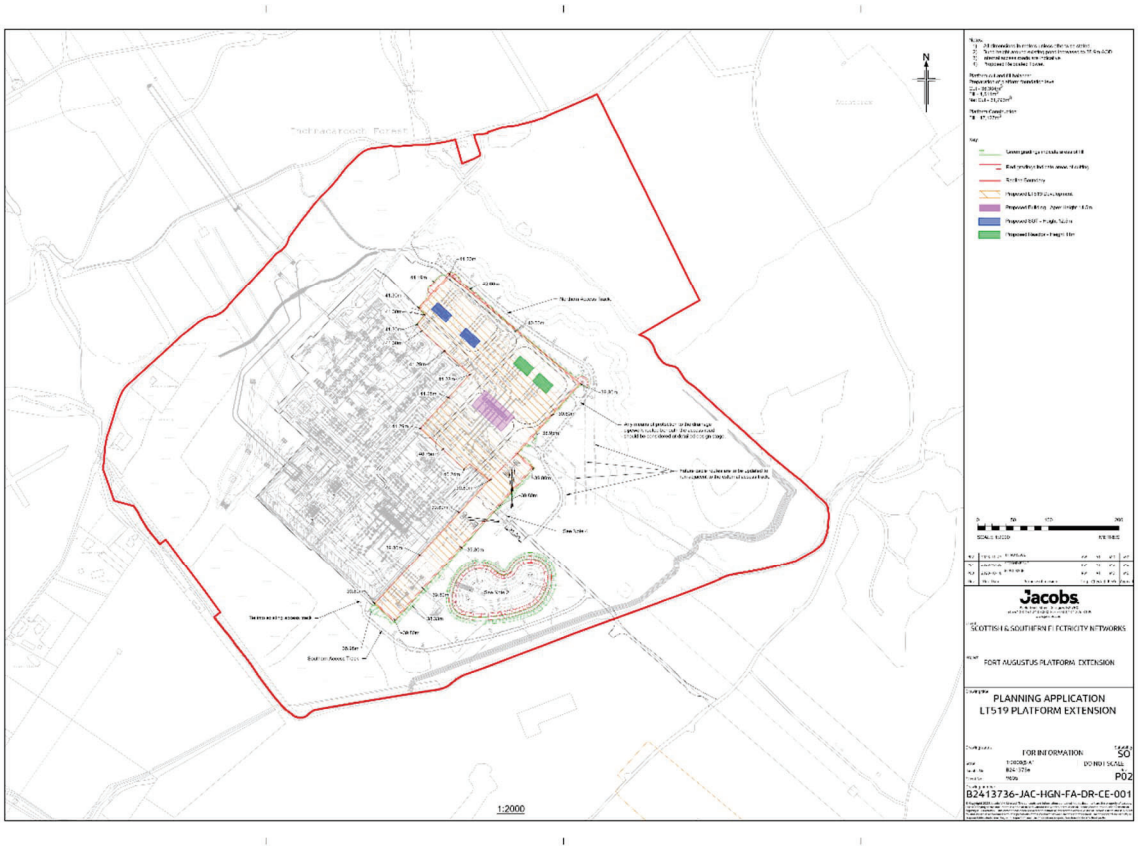


Figure 2 - 1. Proposed Development Layout

2.2 Site Setting

2.2.1 Site Location

Fort Augustus is located at the south-western tip of Loch Ness within the Scottish Highlands. The substation is located approximatley2.4km southwest of Fort Augustus, with a grid reference of NH 35233 08277 (Figure 2 - 2).

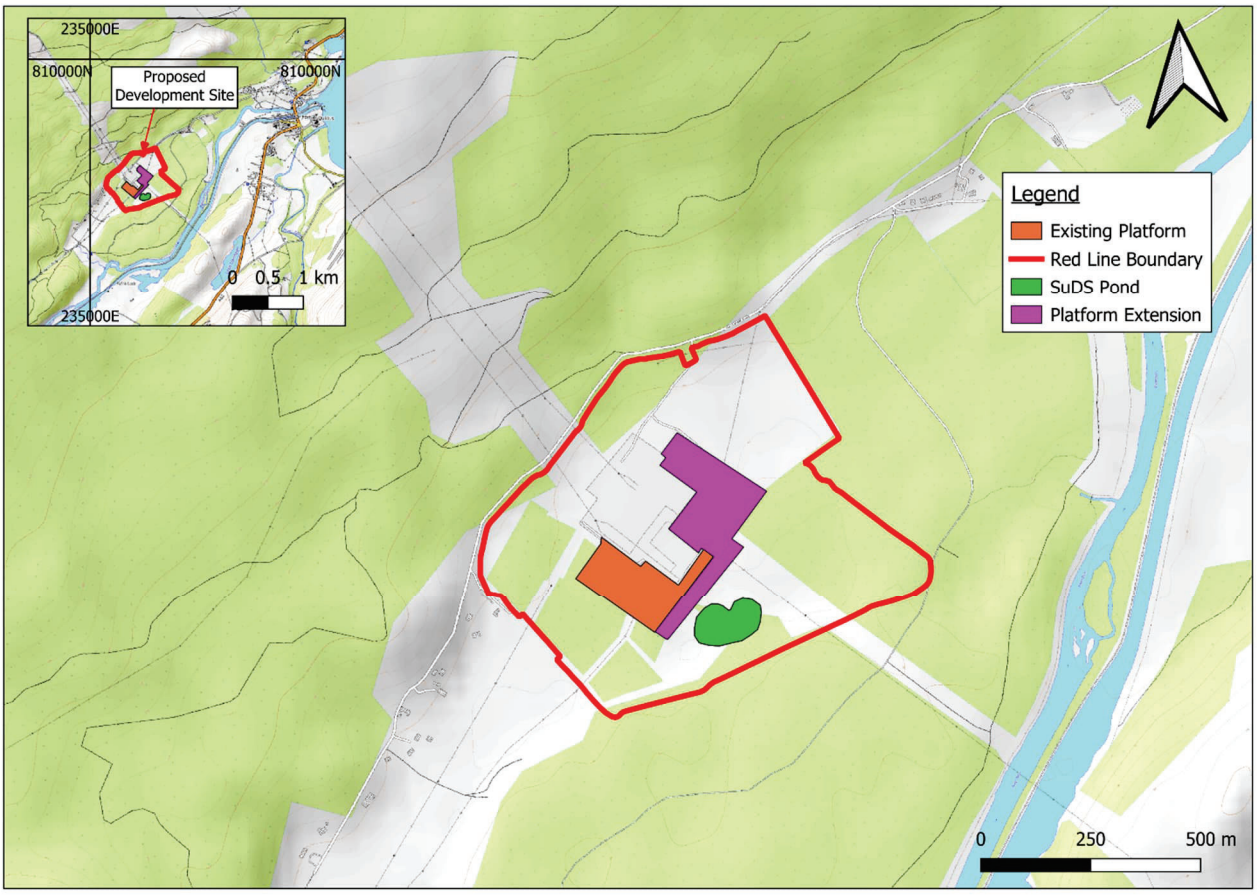


Figure 2 - 2. Site Location map for the Proposed Development.

2.2.2 Land Use

The site of the proposed extension comprises bare fields and grasslands. The immediate surrounding areas are mostly Scots pine or coniferous woodland, managed by Forestry and Land Scotland (FLS). The nearest urban area is Fort Augustus which lies approximately 2.4km northeast of the site (Figure 2 - 3).

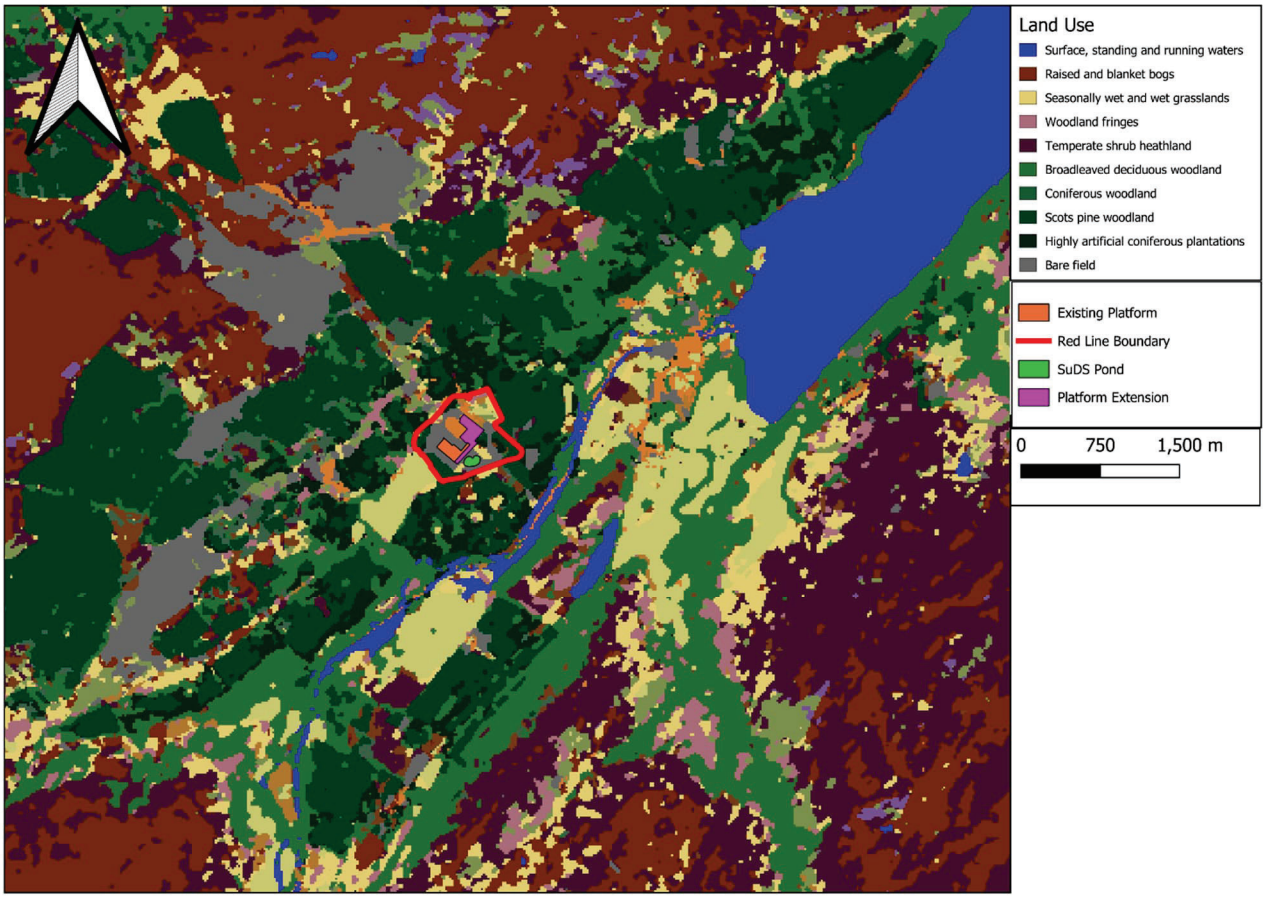


Figure 2 - 3. Land use map of Fort Augustus and the surrounding area, denoting the substation location as site location. Data from the Scotland Habitat and Land Cover Map, 2020.[2]

2.2.3 Topography

The existing substation site comprises a platform at an approximate elevation of ~40m aOD. This lies in an area at the base of a steeper, wooded region to the northwest of the substation. The site of the proposed extension lies at an elevation of approximately ~37m aOD (Figure 2 - 4). Within proximity of the substation ground elevations vary by approximately10m.

[2] http://mapapps.bgs.ac.uk/geologyofbritain/home.html

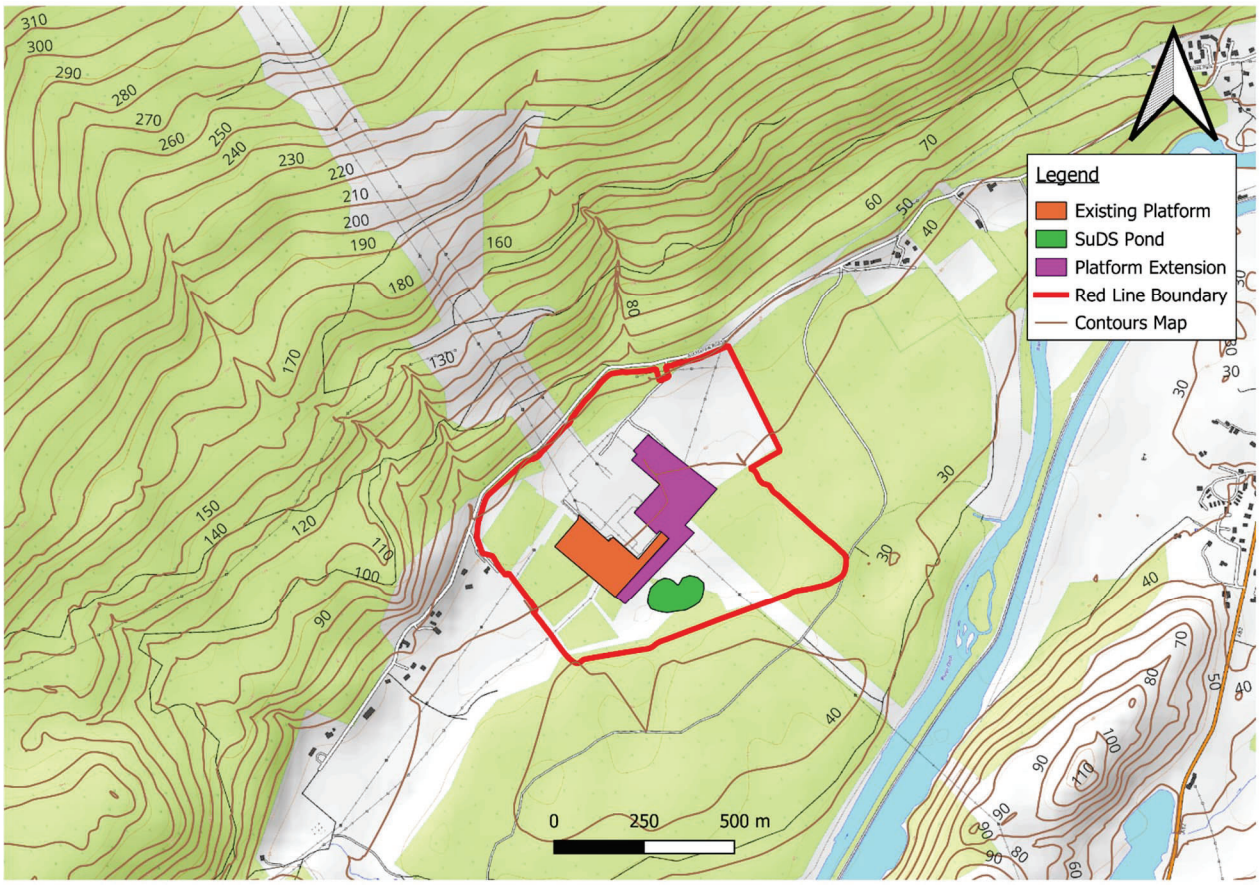


Figure 2 - 4. A topographic map of the Fort Augustus station and its surrounding area.

2.2.4 Hydrology and hydrological / hydraulic features

There are four watercourses in close proximity to the existing substation (Figure 2 - 5), these are:

- the Allt na Fearna flows from the northwest to the southeast approximately approximately165m northeast of the site. This watercourse drains a catchment area of approximately 2.79km² upstream of the site;
- the Auchteraw Burn flows from the west to the east lying approximately 270 to the south and southeast of the site. This watercourse drains a catchment area of approximately 3.31km² upstream of the site;
- a tributary of the Auchteraw Burn flowing from the northwest to the southeast approximately 360m southwest of the site. This watercourse drains a catchment area of approximately 0.54km² upstream of the site; and
- a realigned watercourse flowing from the northwest to the south east approximately 900m east of the site, converging with the Auchteraw Burn.

The River Oich also flows northward approximately1km east of the substation and lies within the River Ness catchment of the Scotland river basin district.

The Caledonian Canal lies approximately 500m southeast of the site adjacent to the River Oich at an elevation of approximately 30m aOD.

Construction drawings dated 2019-2020 for the site show several features constituting a flood alleviation scheme for the existing site and Proposed Development that influence flooding in the vicinity of the site. These comprise:

- A realigned watercourse. This combines flows from several watercourses upstream of the site to enable them to be conveyed past the site without resulting in flooding for events up to and including the 0.1% AEP event;
- A bund installed along the left bank of the Auchteraw Burn. This has a minimum crest level of 38.9m aOD and forms a flood compensation area across land to the south of the existing substation platform
- A control structure within the bund on the line of the realigned watercourse that restricts flow downstream / encourages back-up of flows within the flood compensation area
- A control structure on the Auchteraw Burn; and,
- A control structure on the Allt na Fearna

The locations of these features are illustrated in Figure 2 - 5. The influence of these features on local flood risk is discussed in Section 4.1. Drawings are provided in Error! Reference source not found..

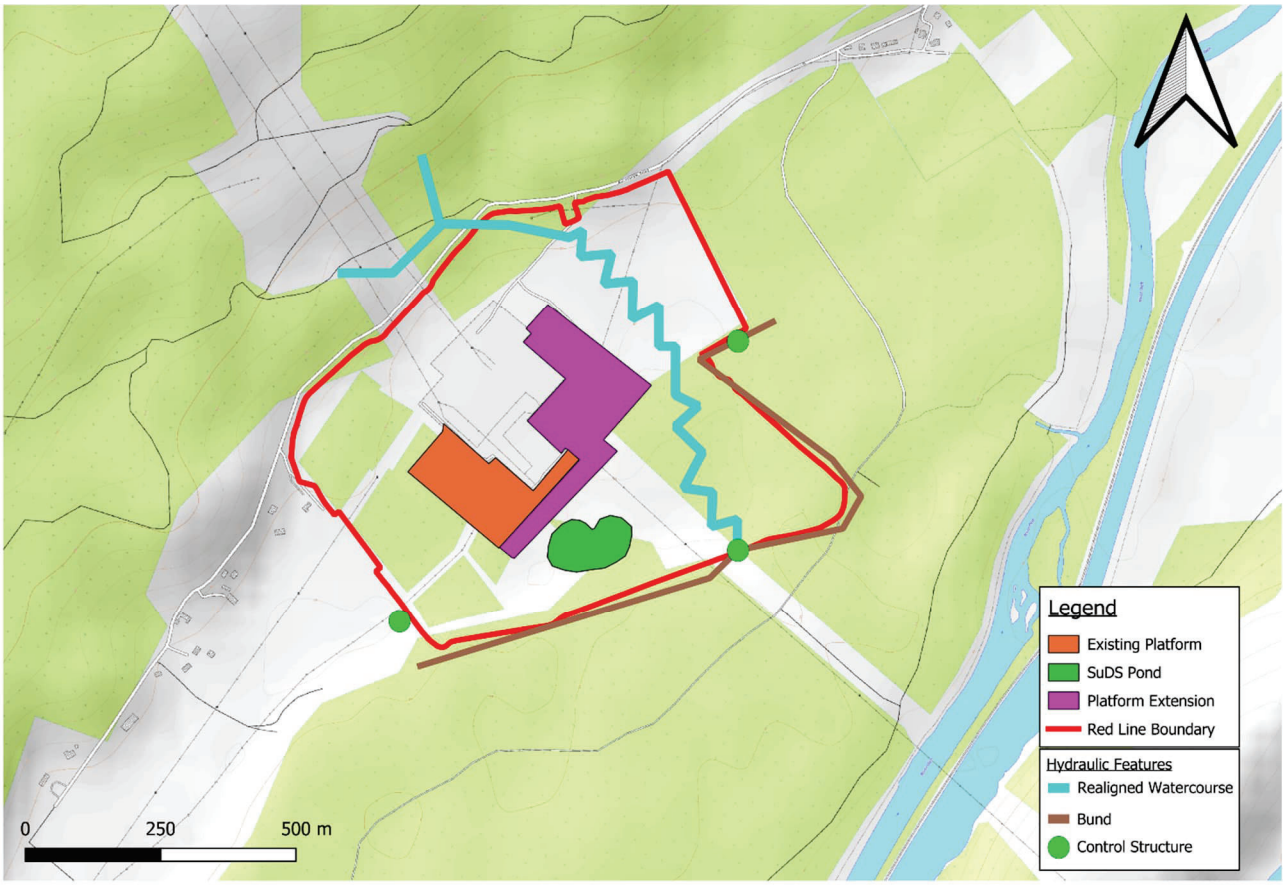


Figure 2 - 5. Watercourses and hydrological / hydraulic features in the vicinity of the site

2.2.5 Geology and Hydrogeology

The British Geological Survey (BGS) Geodex[3] viewer identifies the bedrock geology underlying the site as part of the Tarvie Psammite Formation (sandstone). In close proximity to the site lies the West Highland granite gneiss intrusion into which the River Oich incises. Superficial deposits mainly consist of glaciofluvial sheet deposits at the site with some alluvial fan deposits and alluvium nearer to the River Oich and the smaller nearby tributaries.

[3] http://mapapps.bgs.ac.uk/geologyofbritain/home.html

The National Soil Map of Scotland[4] shows that alluvial soils underlie the site, these soils are developed from river deposits and are typically peaty.

Soakage testing in accordance with the method of BRE365 was completed across the site of the proposed extension in August 2023. This established soakage rates between 2.4x10-5 and 8.8x10-5, with water draining to between 0.66m and 1.84m below ground level. Details of the soakage test results are provided within the Drainage Impact Assessment appended to this report (Error! Reference source not found.).

[4] https://map.environment.gov.scot/Soil_maps/?layer=1

3. Planning Policy Review

3.1 Scottish Planning Policy

The Scottish Planning Policy (SPP)[5] provides a statement on the Scottish Government's policy on nationally important land use planning issues such as flood risk. It outlines a series of considerations for developers including:

- FRAs should regard the flood maps prepared by SEPA and take account of finalised and approved Flood Risk Management Strategies (FRMS) and River Basin Management Plans (RBMP);
- Flood reduction: assessing flood risk, and where appropriate, undertaking flood management measures; and
- Avoidance of increased surface water flooding through requirements for Sustainable Drainage Systems (SuDS) and minimising the area of impermeable surface.

3.1.1 SEPA Technical Flood Risk Guidance for Stakeholders

SEPA's Technical Flood Risk Guidance for Stakeholders[6] states that a precautionary approach should be applied to FRAs and outlines the information required within an FRA should include:

- A site plan showing areas of flooding;
- An assessment of future climate change;
- Details of any structures that may influence local hydraulics, such as culverts;
- The flood extent for appropriate return periods indicated on a site plan; and
- Details of any mitigation measures proposed.

3.1.2 National Planning Framework 4 (NPF4), 2023

Policy 22 of the NPF4[7] gives guidance for reducing the vulnerability of existing and future developments to flooding. NPF4 provides a framework for when development proposals can/ cannot be built in areas of flood risk. Policy 22a states development proposals in flood risk areas will only be supported if they are for:

- Essential infrastructure when cannot be relocated for operational reasons, this applies to our proposed development
- Water compatible uses
- redevelopment of an existing building or site for an equal or less vulnerable use
- redevelopment of previously used sites in built up areas where the local development plan has identified a need to bring these into positive use (devised by local planning authorities)

Existing formal flood protection schemes can be used when determining flood risk for new developments. For new developments, it must be demonstrated that (NPF4, 2023):

- all risks of flooding are understood and addressed;

[5] https://www.gov.scot/publications/scottish-planning-policy/

[6] https://www.sepa.org.uk/media/162602/ss-nfr-p-002-technical-flood-risk-guidance-for-stakeholders.pdf

[7] https://www.gov.scot/publications/national-planning-framework-4/

- there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;
- the development remains safe and operational during floods;
- flood resistant and resilient materials and construction methods are used;
- future adaptations can be made to accommodate the effects of climate change
- safe egress and access can be achieved at the site when flooding occurs
- the first utilised floor/ underside of the development is above the flood risk level with an allowance for freeboard

Small-scale developments and alterations to existing buildings will only be approved if flood risk is not significantly altered (Policy 22b). Surface water risk cannot be increased by new developments and sustainable urban drainage systems (SUDS) should be used to ensure this (Policy 22c).

3.1.3 SEPA Flood Risk and Land Use Vulnerability Guidance, 2018

This SEPA guidance[8] sets out the relative vulnerability of different land uses to flooding, specifying various types of development (e.g. police stations, hospitals, shops) and their relative vulnerabilities. Also, the likelihood of SEPA planning approval being granted based on the type of development and flood risk of the underlying land (no risk, low risk, medium risk, or high risk).

The proposed development is essential infrastructure under SEPA guidance. Table 3-1 below outlines the probable decisions made by SEPA at various levels of flood risk in the planning process.

Table 3-1. A section of the SEPA matrix for flood risk.

	Little or no risk (>0.1% AP)	Low to medium risk (0.1-0.5% AP)	Medium to high risk within undeveloped and sparsely developed areas (>0.5%AP)
Essential Infrastructure	No constraints	Generally suitable for development.	Generally suitable where a flood risk location is required for operational reasons and an alternative lower-risk location, is not available – development should be designed and constructed to be operational during floods (i.e. 0.5% AP), and not impede water flow.

3.1.4 SEPA Flood Risk Standing Advice for Planning Authorities and Developers, 2020

The SEPA Flood Risk Standing Advice[9] gives many regulations for building essential infrastructure in flood risk areas. These are:

- the infrastructure must remain operational during floods and not impede water flow;
- safe and flood-free access and egress should be provided, where possible, for people of all mobilities;
- finished floor levels should be set 600mm above the design flood level to provide an allowance for freeboard;

[8] https://www.sepa.org.uk/media/143416/land-use-vulnerability-guidance.pdf

[9] https://www.sepa.org.uk/media/534740/sepa-flood-risk-standing-advice-for-planning-authorities-and-developers.pdf

- An allowance for climate change should be included within design flood levels calculation, of which SEPA guidance specifies;
- Designs should be flood resistant or resilient depending on the characteristics of the design flood;
- A 6m undeveloped buffer strip is recommended between all development types and watercourses. Note that the 6m buffer is for channels of width <1m and this buffer distance should increase proportionally with channel width.

3.1.5 SEPA Technical Flood Risk Guidance for Stakeholders

SEPA's Technical Flood Risk Guidance for Stakeholders[10] states that a precautionary approach should be applied to FRAs and outlines the information required within an FRA should include:

- A site plan showing areas of flooding;
- An assessment of future climate change;
- Details of any structures that may influence local hydraulics, such as culverts;
- The flood extent for appropriate return periods indicated on a site plan; and
- Details of any mitigation measures proposed.

3.2 Local Planning Policy and Evidence Base Review

3.2.1 Highland-wide Local Development Plan, The Highland Council, 2012

The Highland Council (THC) has supplementary guides to support the delivery of their Local Development Plan[11]. The relevant policies on carrying out FRAs from the Local Development Plan and supplementary guides are outlined below:

- Development proposals should avoid areas susceptible to flooding and promote sustainable flood management;
- Development proposals within medium to high flood risk areas should demonstrate compliance with SPP;
- Where flood management measures are required, natural methods such as restoration of floodplains, wetlands and water bodies should be incorporated, or adequate justification should be provided as to why they are impracticable; and
- All proposed developments must be drained by SuDS designed in accordance with The SuDS Manual.

3.2.2 Highland and Argyll Flood Risk Management Plan

The Highland and Argyll Flood Risk Management Plan (FRMP)[12] sets out the long-term ambition for flood risk management in the district. In this FRMP potentially vulnerable areas (PVAs) are identified, the nearest one to the Proposed Development being Fort Augustus, approximately 7km north of the Proposed Development. Additionally, the FRMP sets out a number of actions in relation to flood planning and flood risk. The Land Use Planning action states that planning policies aim to:

[10] https://www.sepa.org.uk/media/162602/ss-nfr-p-002-technical-flood-risk-guidance-for-stakeholders.pdf

[11] https://www.highland.gov.uk/info/178/development_plans/199/highland-wide_local_development_plan

[12] https://www.highland.gov.uk/info/1226/emergencies/81/flooding/3#:~:text=The%20plan%20explain%20what%20causes,to%20work%20towards%20those%20objectives.

- Restrict development within floodplains;
- Limit exposure of new receptors to flood risk;
- Promote flood reduction via natural and structural flood management measures; and
- Avoid increased surface water flooding through sustainable drainage, minimising impermeable surfaces where possible.

3.2.3 River Basin Management Plan

The River Basin Management Plan (RBMP) for Scotland 2021 – 2027[13] outlines the framework for protecting and improving the benefits provided by the water environment across Scotland. The RBMP outlines how it is proposed rural land is used to provide a contribution to Scotland. This includes using a spatial approach including the use of flood risk data to assess opportunities for development in rural areas.

3.3 Consultations

The following organisations were contacted for any flooding information held for the site:

- SEPA;
- The Highland Council; and
- Scottish Water.

A record of the information requested is included in Error! Reference source not found..

[13] https://www.sepa.org.uk/media/594088/211222-final-rbmp3-scotland.pdf

4. Assessment of Risk to the Proposed Development

4.1 Fluvial Flood Risk

Fluvial flooding is defined as flooding that arises when the water level in a river, lake or stream rises and overflows onto the surrounding banks, shores and neighbouring land. It occurs when excessive rainfall causes a waterbody to exceed its capacity.

SEPA flood maps define three areas at risk of flooding:

- The area at risk from a 10% AEP (annual exceedance event) flood;
- The area at risk from a 0.5% AEP flood, defined as the functional floodplain; and,
- The area at risk from a 0.1% AEP flood.

Figure 4 - 1 presents the SEPA flood map for the site. The mapping shows the existing substation and much of the land to its southeast to be at risk during the 10% AEP event.

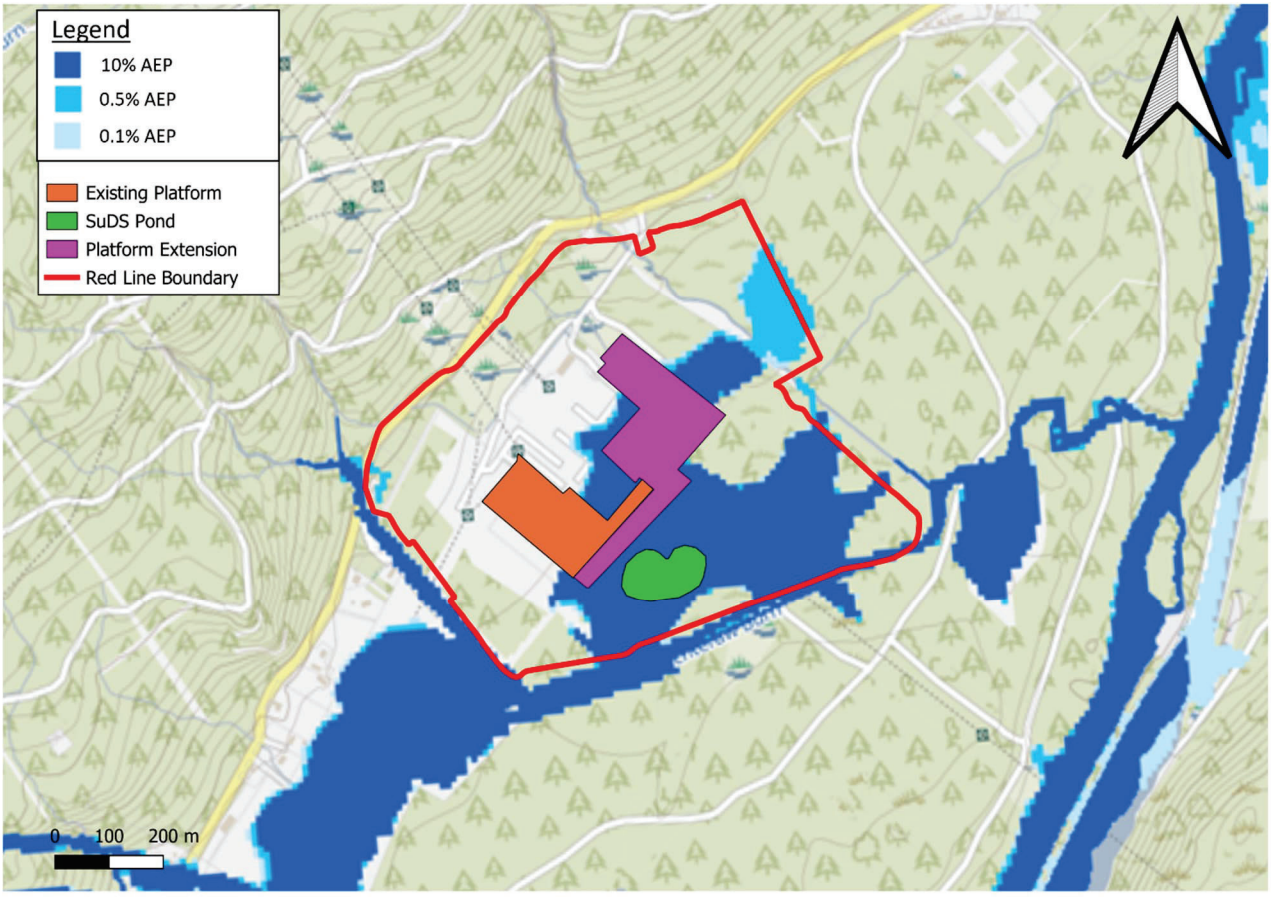


Figure 4 - 1. SEPA Flood map for the site

In support of a previous planning application for extension of the substation an assessment was completed by SLR[1] to define flood risk to the existing substation and site of the proposed extension. An extract of the FRA in support of this application is provided in Error! Reference source not found. .

The SLR report summarises hydraulic modelling hydrological estimation carried out to define flood risks to the existing substation site and the nature of measures necessary to manage flood risk to the existing and proposed extension of the substation, whilst preventing increases in flood risk elsewhere.

The mitigation proposed by SLR comprise (Figure 4 - 2):

- Three flood control structures at points A, B and C which regulate the passing of water downstream, encouraging flows in excess of the pass forward flow into a compensatory storage area;
- A flood storage bund of maximum height 39.2m aOD providing 500mm freeboard on the 0.1% AEP flood level of 38.3m aOD along the southern and eastern boundary;
- The flood storage bund then defines the extent of a compensatory flood storage area. The SLR assessment concludes that a compensatory storage area providing 45,000m³ would be required to mitigate for the throttled pass forward flows arising from control structures. The assessment further demonstrates that with a bund completed to a level of 39.2m aOD the compensatory storage area would provide 110,000m³ of storage.

Construction drawings of these measures are provided in Error! Reference source not found..

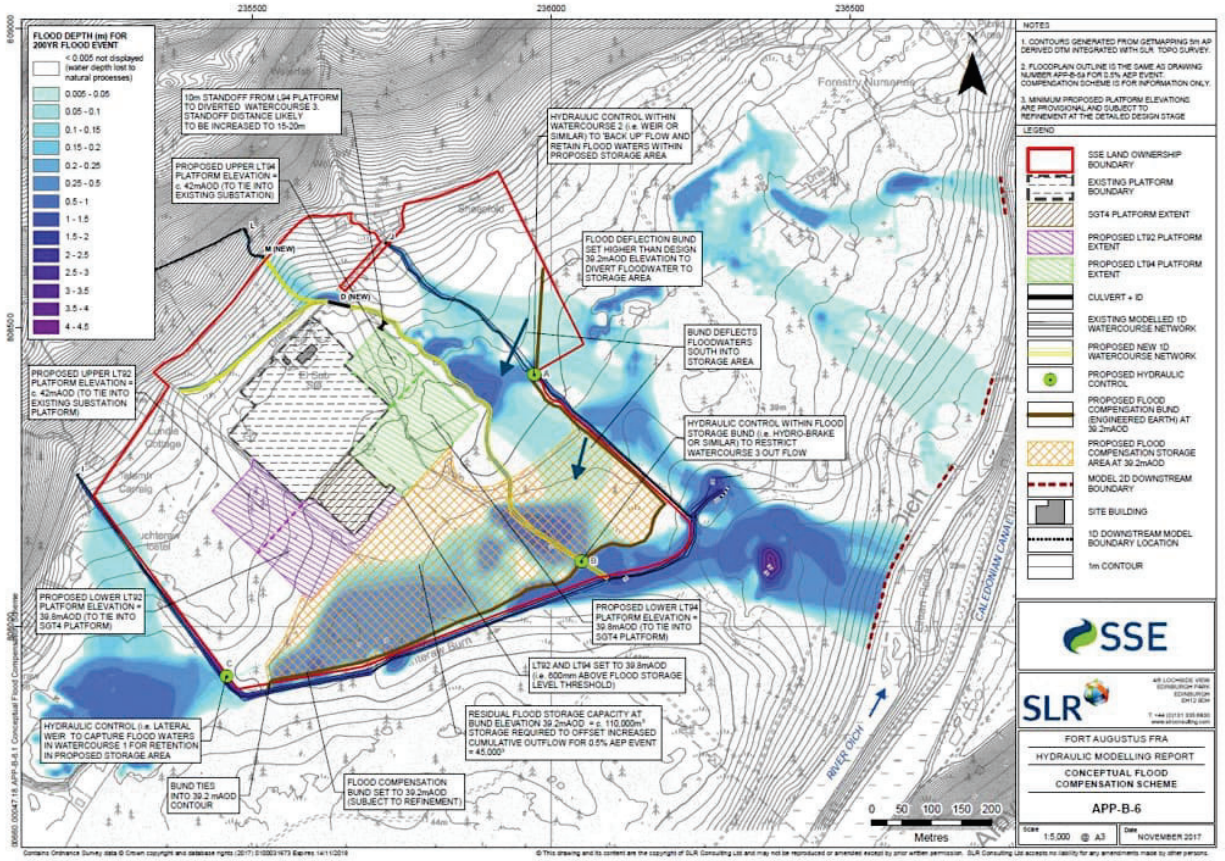


Figure 4 - 2. SLR defined flood mitigation measures

As part of this FRA checks have been undertaken on the dimensions of the flood storage bund and compensatory storage area. This has used LiDAR data provided by SSEN (collected in 2019 - 2020). Interrogation of this data has identified that the flood storage bund has been constructed with a minimum crest level of 38.9m aOD. Using this as the maximum level to which the compensatory storage area would impound flood water, the compensatory storage area can contain up to 164,543m³. This assessment determines that despite the lower crest level of the flood storage bund the compensatory storage area provides a significantly greater volume than assessed as necessary by SLR.

A flood map demonstrating the extent of the 0.1% AEP accounting for the effect of the SLR defined flood mitigation measures is provided as Figure 4 - 3.

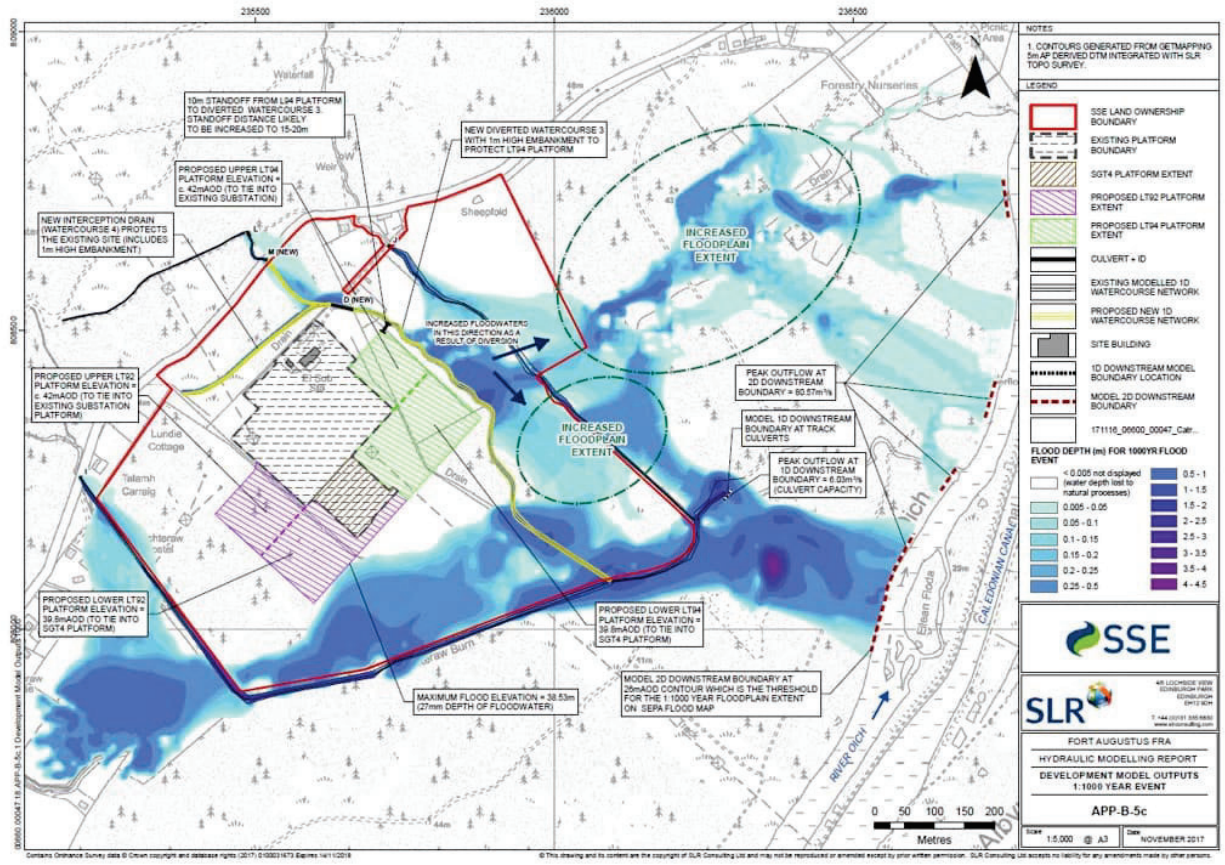


Figure 4 - 3. SLR 0.1% AEP flood extent

Whilst this illustrates the Proposed Development extending into the flood compensation area and extent of the 0.1% AEP flood, the proposed elevation of the platform of 39.8m aOD places it 900mm above the maximum water associated with the compensatory storage area and would therefore not be at risk of flooding.

The risk to the Proposed Development from fluvial sources is therefore assessed to be low for which additional mitigation measures are not considered necessary.

4.2 Surface Water Flood Risk

Surface water flooding typically occurs during or following periods of intense rainfall where the ground's ability to absorb rainfall is overwhelmed. As more runoff is expected from developed (impermeable) areas, urban areas tend to be more susceptible to flooding from surface water.

SEPA flood maps define three areas at risk of flooding:

- The area at risk from a 10% AEP (annual exceedance event) flood;
- The area at risk from a 0.5% AEP flood; and,
- The area at risk from a 0.1% AEP flood.

Figure 4 - 4 presents the SEPA flood map for the site. The mapping shows the existing substation to be at risk during the 0.5% AEP event.

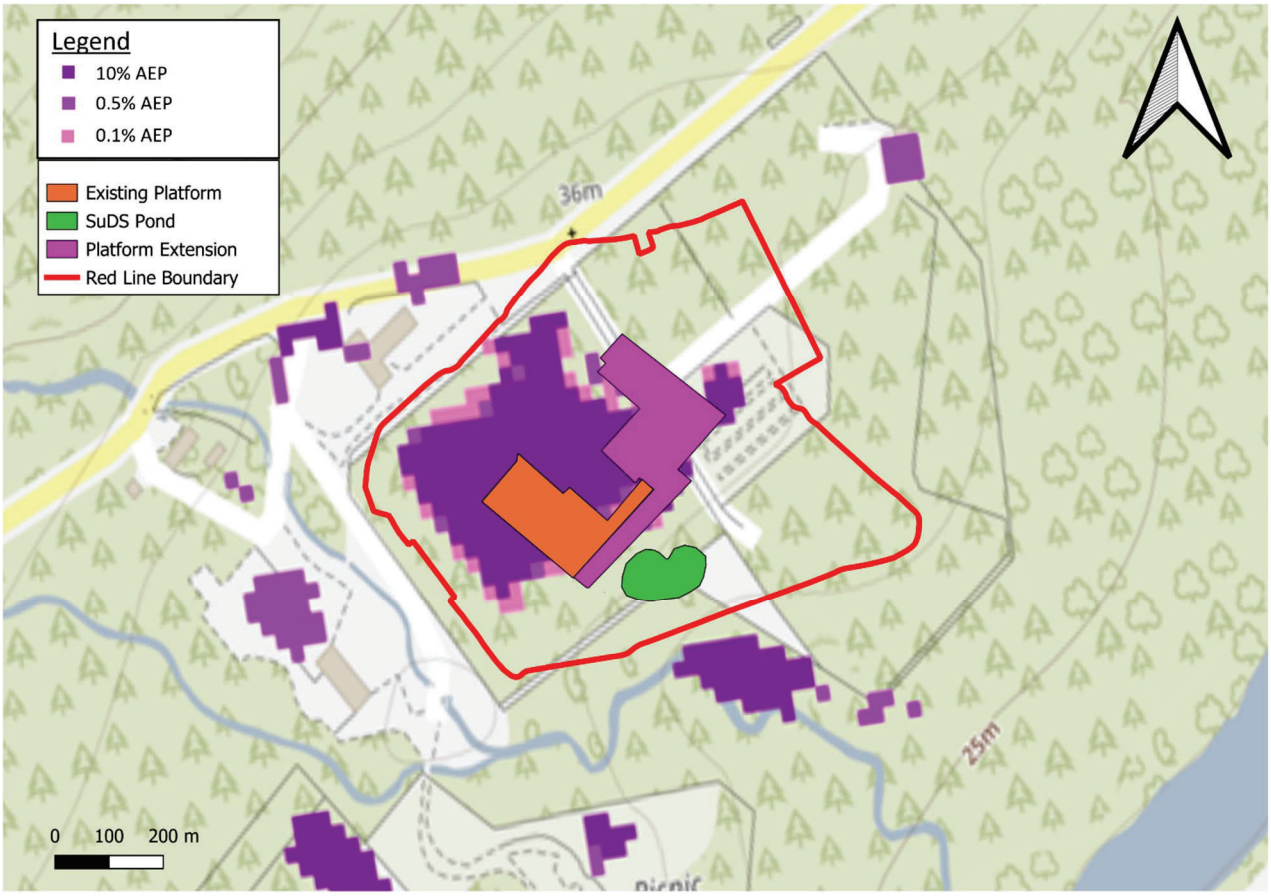


Figure 4 - 4. SEPA Surface Water flood extent map

The existing site is served by a surface water drainage system. This drainage system is designed to a minimum 0.1% AEP standard. Therefore, SEPA flood maps are not considered to be reliable for defining flood risk to the existing site.

A Drainage Impact Assessment prepared for the Proposed Development (Error! Reference source not found.) demonstrates that the drainage proposed for the extension will be effective at mitigating the surface water flood risk at the site for all events up to the 0.1% AEP event plus a 42% increase in rainfall intensity to account for the effects of climate change over the facilities design life.

The risk to the Proposed Development from surface water flood sources is therefore assessed to be low for which additional mitigation measures are not considered necessary.

4.3 Groundwater Flood Risk

Groundwater flooding is caused by the emergence of water from beneath the ground at either point or diffuse locations when the natural level of the water table rises above ground level. This can result in deep and long-lasting flooding of low-lying land and/or below ground infrastructure such as underpasses and basements.

The Highland and Argyll Flood Risk Management Plan (FRMP)[14] states that groundwater is usually a contributing factor to flooding rather than the primary source.

SEPA flood maps show the site is within a 'Potentially Vulnerable Area' as designated in 2018[15]. Potentially vulnerable areas are designated by the SEPA national flood risk assessment and are reviewed every six years. The risks within the Potentially Vulnerable Area are currently managed by the Fort Augustus Flood Protection Scheme.

The Proposed Development comprises the extension of the existing platform at a minimum level of 39.8m aOD. The perimeter of the extended platform will therefore be completed a minimum of 37mm above surrounding ground levels. Therefore, were groundwater to emerge at the surface it would accumulate in the flood compensation area achieving a maximum level of 38.9m aOD, 900mm lower than the minimum level of the extended substation platform.

The Proposed Development does not involve any basement structures or linear piling that could impact local groundwater flow. Therefore, flood risk to the Proposed Development from groundwater is assessed as low for which additional mitigation measures are not considered necessary.

4.4 Flood Risk from Sewers and Artificial Drainage Systems

Flooding from sewers primarily occurs when flow entering a sewer system exceeds the available capacity or if the network capacity has been reduced through blockage or collapse. In the case of surface water sewers that discharge to watercourses, the same effect can be caused as a result of high-water levels in the receiving watercourse. As a result, water can begin to surcharge the sewer network, emerging at ground level through gullies and manholes and potentially causing flooding to highways and properties. If this occurs flooding can represent a significant hazard to human health due to the potential for contaminants in flood water.

Site drainage systems are owned and maintained by SSEN. The surface water drainage systems across the site are designed to a minimum 0.1% AEP standard, discharging to the realigned watercourse.

Information on the wider local sewer network has been requested from Scottish Water, however, at the time of writing no response has been received therefore there is limited information available on drainage systems in the area. However due to the remote nature of the site it is assumed there will be limited sewers and artificial drainage systems in the area.

Flood risk to the Proposed Development from sewers is considered to be low for which additional mitigation measures are not considered necessary.

4.5 Flood Risk from Reservoirs

Reservoir failure can be a particularly dangerous form of flooding as it results in the sudden release of large volumes of water that can travel at high velocity. Reservoir flooding can result in deep and widespread flooding, potentially resulting in significant damage. However, the likelihood of a large, raised reservoir (>25,000m³) flood occurring is very low due to the requirements for regular inspections and maintenance as set out in the Reservoirs Act (Scotland) 2011[16].

SEPAs Reservoir Inundation Map shows an indicative area that may flood from an uncontrolled release of water from all possible dam failure scenarios13. If Loch Ness breached to the northeast of the Proposed Development, the resulting discharge southwest will miss the Proposed Development (Figure 4 - 5). The southern Tip of Loch Ness lies between 20-30m aOD compared to the 37-40m aOD of the site.

[14] https://www2.sepa.org.uk/frmplans/documents/lpd1-highland-and-argyll-frmp-2021.pdf

[15] https://map.sepa.org.uk/floodmap/map.htm

[16] https://www.gov.scot/publications/reservoirs-legislation/

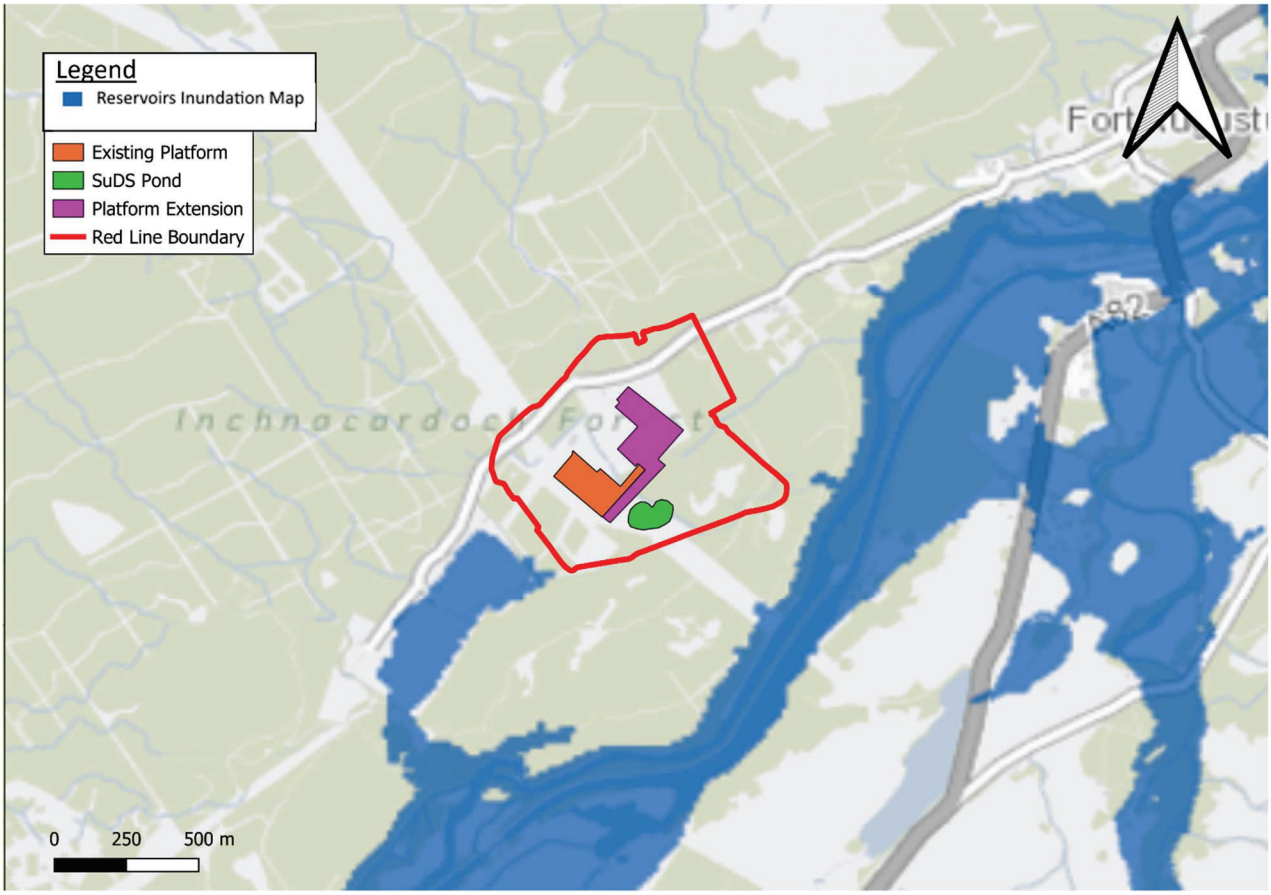


Figure 4 - 5. SEPA reservoirs inundation map where the blue area represents areas flooded by the breach of Loch Ness.

None of the Proposed Development area interfaces with areas at risk from a reservoir failure. Therefore, the risk is considered to be very low for which additional mitigation measures are not necessary.

4.6 Flood Risk from Canals

Canals and artificial waterways rarely flood as the water levels are generally managed all year round. However, large rainfall events, a lack of maintenance or overtopping from nearby rivers can cause flooding of canals and artificial waterways.

The Caledonian Canal is approximately 500m southeast of the Proposed Development, and at a lower elevation. Any flooding associated with the Canal will flowing local topography away from the site. The main risk here is fluvial flooding from the River Oich and the Caledonian Canal would act as a spill for this river.

Therefore, the risk of canal flooding is very low for which additional mitigation measures are not considered necessary.

4.7 Tidal Flood Risk

Tidal flooding can arise during normal or extreme tidal conditions. Such flooding is normally confined to coastal and estuarine areas but can, during extreme events, move further inland resulting in widespread lowland flooding. Extreme tidal flood events are normally associated with high tides which coincide with significant atmospheric depressions so their occurrence can be forecasted several days in advance. However, the magnitude of an event can be more difficult to forecast and is dependent on how storm systems travel and develop.

The Proposed Development is in the Scottish Highlands at an elevation of approximately30-40 m aOD and approximately 50km away from the nearest coastline. The risk from tidal flooding to the Proposed Development is very low for which additional mitigation measures are not considered necessary.

5. Assessment of risk arising from the Proposed Development

5.1 Fluvial Flood Risk

Whilst the Proposed Development will not be subjected to fluvial flooding due to its elevation the platform will extend into the flood compensation area, removing flood storage.

Measurement of the volume of storage available within compensatory storage area up to the minimum level of the flood compensation bund (38.9m aOD) determines there is a volume of 164,543m³. The proposed extension will remove approximately 5,543m³, leaving 159,000m³. The SLR assessment[1] concluded that the extension would require 45,000m³ of storage to limit downstream effects.

This assessment demonstrates that despite the reduction in flood compensation area volume, sufficient remains to ensure compliance with the SLR assessment.

Consequently, it is determined that the substation platform extension will not reduce the 0.1% AEP design standard of the compensatory storage area. The risk of the Proposed Development exacerbating flooding to nearby receptors is therefore considered to be low for which additional mitigation measures are not considered necessary.

5.2 Surface Water Flood Risk

Surface water generated by the existing substation is managed by drainage systems for all events up to and including a minimum of the 0.1% AEP event.

The Proposed Development will include a drainage system to manage surface water flood risk for all events up to and including the 0.1% AEP event including a 42% increase in rainfall intensity to allow for the effects of climate change over the developments lifetime. Discharges from this system will drain to ground via a SuDS pond.

However, on review of the volume of storage available within the compensatory storage area it was established that the crest level of the SuDS pond previously installed as part of the proposed drainage system is lower than the crest level of the flood storage bund. Therefore, the SuDS pond would be at risk of flooding from fluvial events with the volume of it not being available to attenuate site discharges.

To mitigate for this an assessment has been undertaken to determine the volume of storage lost from the compensatory storage area if the crest level of the SuDS pond were to be raised to 38.9m aOD (lowest level of the flood storage bund). This assessment has concluded that a further 13,175m³ of storage would be lost from the compensatory storage area.

Of the 159,000m³ of storage remaining after extension of the substation platform, the loss of a further 13,175m³, to isolate the SuDS pond from fluvial flood events, would reduce the compensatory storage area volume to 148,825m³, remaining significantly in excess of the 45,000m³ of storage assessed as necessary by SLR (November, 2017).

Isolating the SuDS pond will ensure its effective operation during fluvial flood events. Therefore, the risk of the Proposed Development exacerbating surface water flood risk to third parties is considered to be very low, for which additional mitigation measures are not considered necessary.

5.3 Groundwater Flood Risk

The Proposed Development does not involve any earthworks below ground level. There are no basement structures or linear features that could interfere with or modify local groundwater.

The risk of the Proposed Development exacerbating flood risk to nearby receptors is therefore considered to be very low for which additional mitigation measures are not considered necessary.

5.4 Sewers and Artificial Drainage Systems

The Proposed Development will not be connecting to any existing local sewer or artificial drainage systems. Surface water generated by the Proposed Development will drain to ground via a system designed to a 0.1% AEP standard (including allowance for climate change).

Foul water generated by the Proposed Development will similarly be managed on site discharging to ground after treatment.

The risk of the Proposed Development exacerbating flood risk from sewers and artificial drainage systems to third parties is very low for which additional mitigation measures are not considered necessary.

5.5 Reservoir Flood Risk

The Proposed Development is not within an area at risk of reservoir flooding and will therefore not displace reservoir flood waters (Figure 4 - 5). The Proposed Development does not involve any works which could compromise the structural integrity of local impounding structures.

The risk of the Proposed Development exacerbating flood risk from reservoirs to third parties during is very low for which additional mitigation measures are not considered necessary.

5.6 Canal Flood Risk

The Proposed Development does not involve any works which could compromise the structural integrity of the Caledonian Canal. In addition, the site is not in an area at risk in the event of a failure of the Caledonian Canal, due to its elevated position relative to the canal.

Therefore, the risk of the Proposed Development exacerbating flood risk from canals to third parties during construction and operation is very low for which additional mitigation measures are not considered necessary.

5.7 Tidal Flood Risk

The Proposed Development is in the Scottish Highlands, more than 50km away from the nearest coastline at an elevation of 30-40mAOD. The risk of the Proposed Development exacerbating flood risk from tidal sources to third parties is very low for which additional mitigation measures are not necessary.

6. Additional Mitigation & Residual Risk

Table 0-1 presents a summary of the flood risk to and arising from the Proposed Development as detailed in Section 4 and 5 respectively.

The summary highlights the low to very low risk to and arising from the Proposed Development.

Table 6 - 1. Summary of Flood Risk

Flood source	Risk to the Proposed Development	Risk arising from the Proposed Development	Additional mitigation measures required?
Fluvial	Low	Low	No
Surface water	Low	Low	No
Groundwater	Low	Low	No
Sewers and Artificial sources	Low	Very Low	No
Reservoirs	Very Low	Very Low	No
Canals	Very Low	Very Low	No
Tidal	Very Low	Very Low	No

The assessment has concluded that considering the constituent parts of the Proposed Development (Section 2.1) there are no further mitigation measures required to ensure the Proposed Development is not at unacceptable risk from flood sources or will exacerbate flooding to third parties.

6.1 Residual Risks

Notwithstanding the conclusion that further mitigation measures are not required for the Proposed Development, much of this assessment has drawn upon the conclusions of an SLR[1] assessment, underpinning the now in-situ flood mitigation measures around the existing and proposed substation.

At the time of the SLR assessment the guidance was to apply a 20% increase in peak river flows to account for the effects of climate change. Current guidance is to apply a 42% increase.

Reflecting on the effects of a 42% increase on fluvial flows it is considered that the risks to and arising from the Proposed Development will remain low. Control structures on the watercourses draining around the site will continue to limit downstream flows. Flood water throttled by these structures will back-up and accumulate within the compensatory storage area. Given the lowest level of the flood storage bund (38.9m aOD), the proposed development will always be afforded a freeboard above the maximum flood level of the compensatory storage area.

The assessment has also demonstrated that whilst the Proposed Development will remove volume from the compensatory storage area as will the SuDS pond, 148,825m³ of flood storage will remain to accommodate the 45,000m³ of storage assessed as necessary to compensate for the extension. It is therefore considered that despite a 42% increase in river flows the compensatory storage area will remain sufficient to attenuate the 0.1% AEP event.

Despite confidence that the compensatory storage area would continue to provide a 0.1% AEP standard of protection when accounting for current climate change allowances an exercise has been completed to investigate if volume lost due to the Proposed Development could be replaced through ground reprofiling.

This assessment has concluded that with a reduction in ground level to 36.6m aOD in areas of the compensatory storage area that are not subject to flooding during the 0.1% AEP event a volume of 14,547m³ could be created. Figure 6 - 1 identifies the locations for potential ground re-profiling.

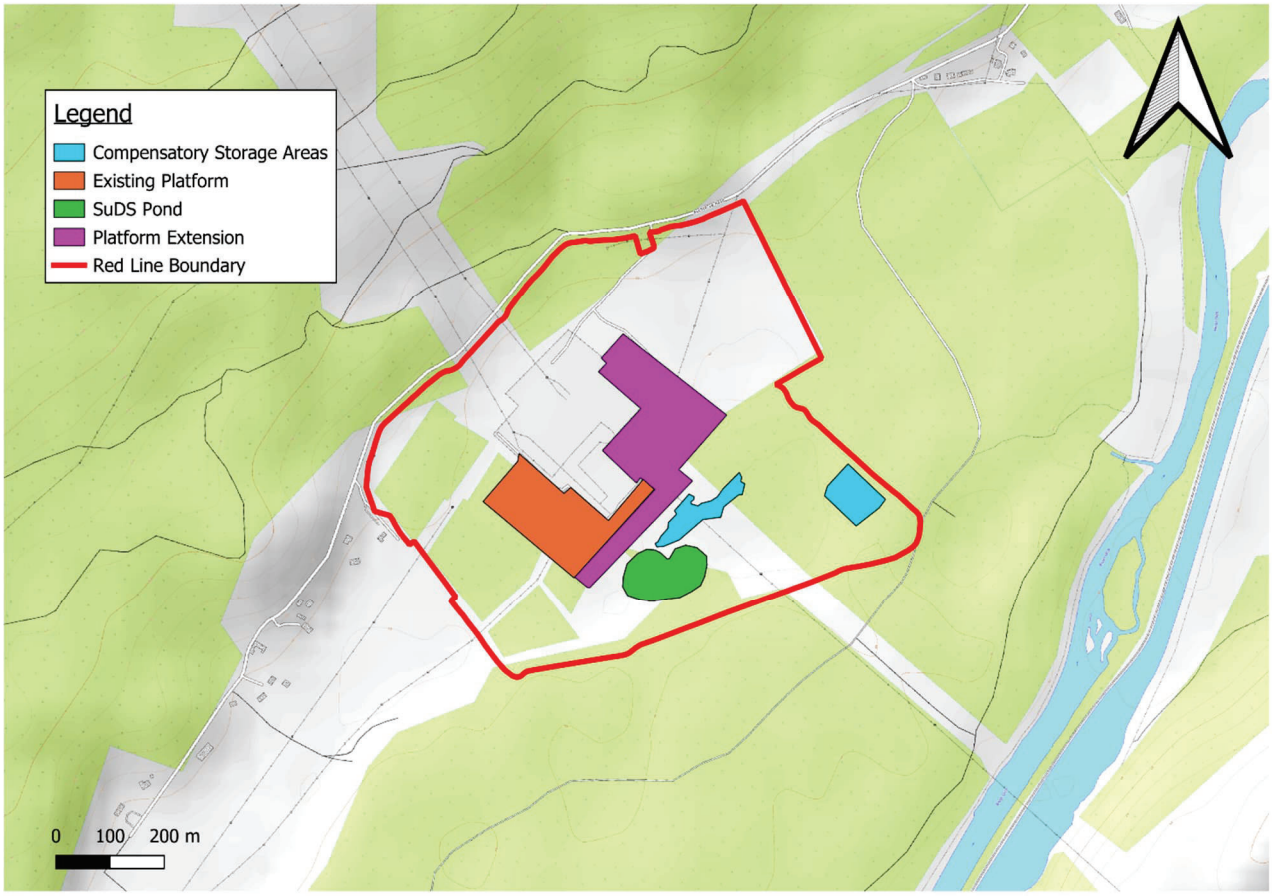


Figure 6 - 1. Possible areas for relocation of lost flood compensation area due to the Proposed Development.

7. Conclusions

This FRA has been prepared by Jacobs in support of a Proposed Development for extending an existing substation at Fort Augustus in the Scottish Highlands.

An assessment of all flood sources has concluded that there is a low or very low risk to and arising from the Proposed Development.

Fluvial and surface water are the principal flood sources presenting a risk to the Proposed Development, however these are mitigated by virtue of a flood alleviation scheme already in-situ, a 900mm freeboard from the maximum flood water level to the proposed platform level and the design of a surface water drainage system designed to a 0.1% AEP standard including allowance for climate change.

Since the flood alleviation scheme was designed by SLR in November 2017, climate change allowances have changed. Considering the effects of climate change and the scale of the flood alleviation measures it is considered that new climate change allowances are unlikely to erode the design standard of the measures meaning the Proposed Development will remain safe from the effects of flooding without impacting flood risk elsewhere.

Appendix A. Flood Alleviation Scheme Construction Drawings

Document Issue Sheet

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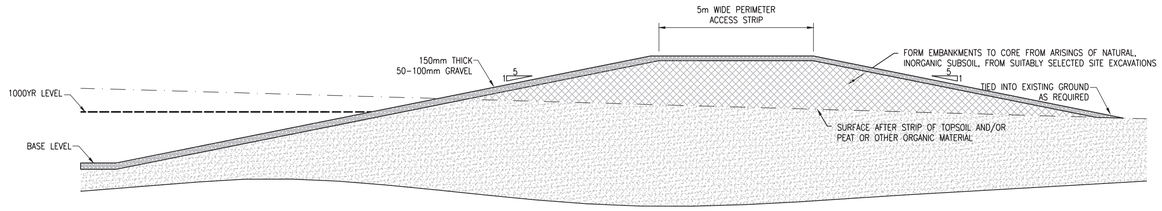
Project 22396 - Global Fort Augustus SUDS
Issue No 028
Date 18 Aug 2022
Issued By Holly Robertson (McGregor McMahon Consulting Engineers
Notes Drawings 121-147 amended to as built

Documents

Title	Description	Version	Media	Size	Copies	Issue Reason
22396-121 Border	Formation of SUDS Basin East	02	Email	-	0	As Built
22396-122 Border	SUDS Basin Setting Out	02	Email	-	0	As Built
22396-131 Border	Realigned Water Course 3 Sections	02	Email	-	0	As Built
22396-140 Border	Outflow Control Culvert with Bund	02	Email	-	0	As Built
22396-141 Border	Flood Mitigation Bund Details	02	Email	-	0	As Built
22396-142 Border	Overflow Control Culvert Inlet / Outlet & Section Details	02	Email	-	0	As Built
22396-143 Border	Spillway Apron & Reno Mattress Details	02	Email	-	0	As Built
22396-145 Border	Upstream Culvert General Arrangement Plan	02	Email	-	0	As Built
22396-146 Border	Upstream Culvert RC Culvert & Inlet Details	02	Email	-	0	As Built
22396-147 Border	Upstream Culvert, Watercourse Sections & Details	02	Email	-	0	As Built

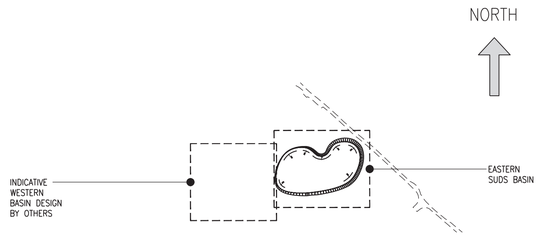
Recipients

Recipient Name	Role
Craig Robb (Global Infrastructure (Scotland) Ltd)	



TYPICAL SECTION THROUGH FILL EMBANKMENT TO SUDS BASINS

SCALE 1:100



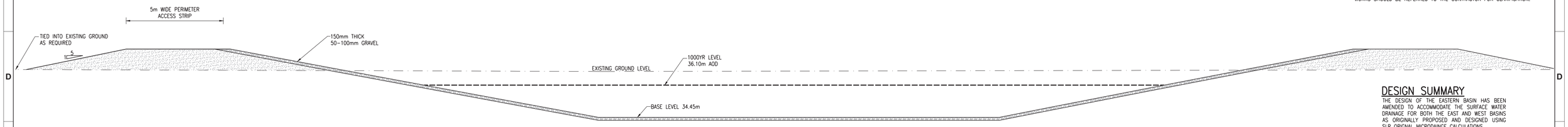
KEY SITE PLAN

SCALE 1:5000

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SECTION G-G - EASTERN SUDS BASIN

SCALE 1:100

DESIGN SUMMARY

THE DESIGN OF THE EASTERN BASIN HAS BEEN AMENDED TO ACCOMMODATE THE SURFACE WATER DRAINAGE FOR BOTH THE EAST AND WEST BASINS AS ORIGINALLY PROPOSED AND DESIGNED USING SLR ORIGNAL MICRODAINGE CALCULATIONS.

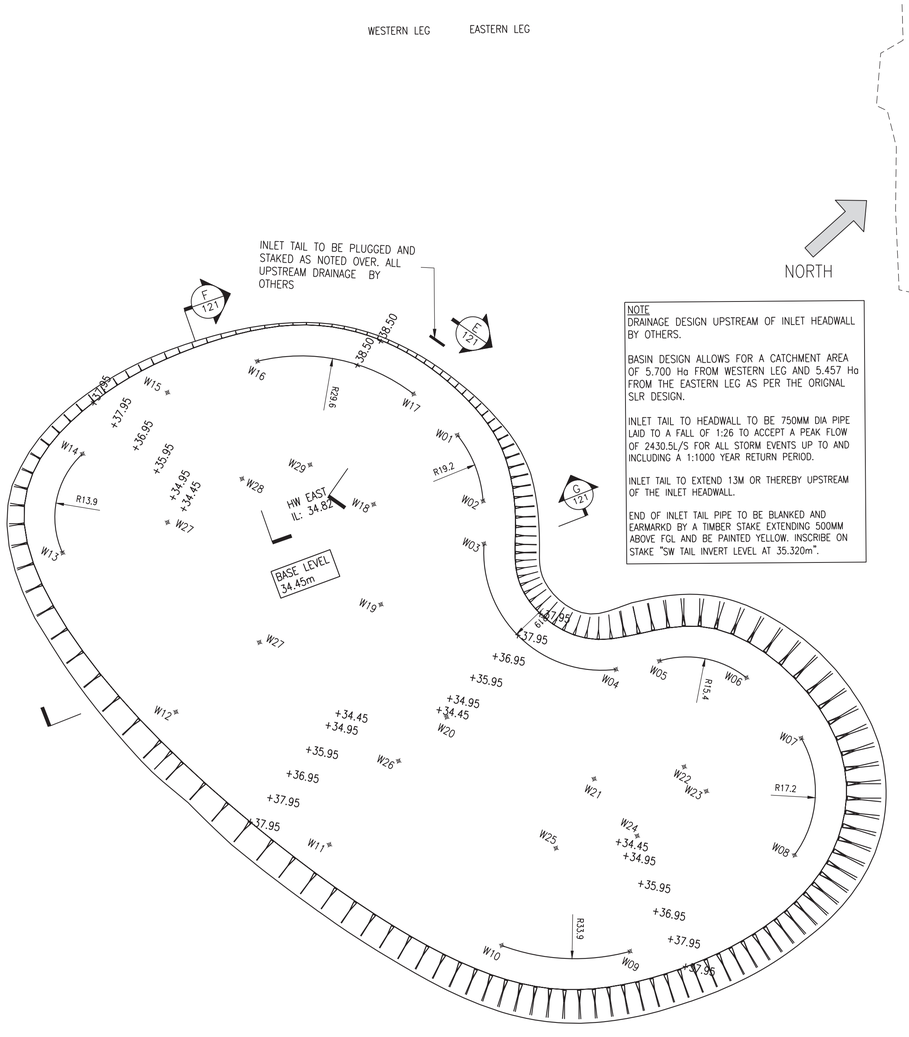
THE PERCOLATION RATE USED IS AS PER THAT NOTED FOR THE EAST BASIN WITHIN THE ORIGNAL SLR MICRODRAINAGE CALCULATIONS.

ACCORDINGLY, NO LIABILITY IS ASSUMED WHATSOEVER FOR ANY ERROR AND/OR OMISSION ARSING FROM THE RELIANCE OF SUCH DATA PROVIDED BY OTHERS.

THE ANALYSIS AND DESIGN OF THE AMENDED BASIN UTILISED THE CAUSEWAY MODELLING SOFTWARE. A COPY OF THE CALCULATIONS HAVE BEEN PROVIDED WITHIN THE ASSOCIATED REPORT REFERENCED 22396 AND ENTITLED "SURFACE WATER DRAINAGE REPORT"

NOTES

REFER TO DRAWING 22396/141/- FOR GENERAL NOTES AND EARTHWORKS SPECIFICATION



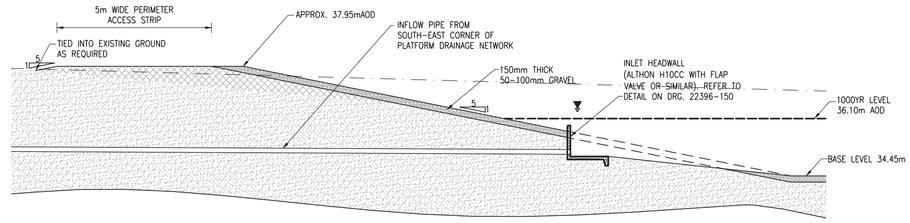
NOTE
DRAINAGE DESIGN UPSTREAM OF INLET HEADWALL BY OTHERS.

BASIN DESIGN ALLOWS FOR A CATCHMENT AREA OF 5.700 Ha FROM WESTERN LEG AND 5.457 Ha FROM THE EASTERN LEG AS PER THE ORIGNAL SLR DESIGN.

INLET TAIL TO HEADWALL TO BE 750MM DIA PIPE LAID TO A FALL OF 1:26 TO ACCEPT A PEAK FLOW OF 2430.5L/S FOR ALL STORM EVENTS UP TO AND INCLUDING A 1:1000 YEAR RETURN PERIOD.

INLET TAIL TO EXTEND 13M OR THEREBY UPSTREAM OF THE INLET HEADWALL.

END OF INLET TAIL PIPE TO BE BLANKED AND EARMARKD BY A TIMBER STAKE EXTENDING 500MM ABOVE FGL AND BE PAINTED YELLOW. INSCRIBE ON STAKE "SW TAIL INVERT LEVEL AT 35.320m".

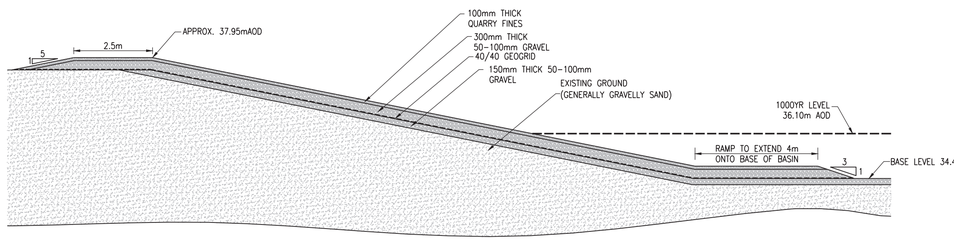


SECTION E-E - EASTERN SUDS BASIN

SCALE 1:100

HEALTH AND SAFETY

THE DESIGN HAS HIGHLIGHTED ONLY COMMON HAZARDS, WHICH ARE CONSIDERED TO BE WITHIN THE NORMAL EXPERIENCE OF A COMPETENT CONTRACTOR.



SECTION F-F - EASTERN SUDS BASIN (RAMP)

SCALE 1:100



HW 200 LARGE PRECAST CONCRETE HEADWALL BY FP McCANN

1. ALL HEADWALLS SHALL BE MANUFACTURED AS A MONOLITHIC PRECAST UNIT
2. ALL HEADWALLS SHALL BE MANUFACTURED TO A QUALITY MANAGEMENT SYSTEM ACCREDITED TO ISO 9001:2008 WITH ALL CONSTITUENT PRODUCTS SUBJECT TO REGULAR QUALITY INSPECTION.
3. ALL HEADWALLS SHALL BE MANUFACTURED TO MINIMUM STRUCTURAL CLASSES XD2.
4. FOR PIPES BETWEEN GREATER THAN 450MM DIAMETER, BUT LESS THAN 900MM DIAMETER, USE FPMCCANN HW200 LARGE HEADWALLS OR SIMILAR AND EQUAL APPROVED.

OUTLINE METHOD STATEMENT

ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE MANUFACTURERS INSTALLATION RECOMMENDATIONS. THE FOLLOWING IS AN INDICATIVE METHOD STATEMENT AND NO LIABILITY CAN BE ASSUMED BY MCGREGOR MCMAHON FOR ITS RELIANCE DURING CONSTRUCTION.

1. CUT AND INSTALL THE LAST SECTION OF PIPE THAT THE HEADWALL WILL COVER. ENSURE THAT THE PIPE IS FULLY FITTED LEAVING EITHER THE FIRST (OR LAST) SECTION OF PIPE FREE FROM BACKFILL TO ATTACH TO THE HEADWALL.
1. EXCAVATE TO FORMATION LEVEL, PLACE AND COMPACT A 300MM BED OF 50MM CLEAN DRAINAGE STONE OR SIMILAR FREE DRAINING AGGREGATE.
2. PLACE THE HEADWALL UNIT ONTO THE BEDDED SURFACE AND SUCH THAT THE HEADWALL IS ALIGNED WITH THE CENTRE OF THE PIPE.
3. INSTALL THE HEADWALL ONTO THE END OF THE PIPELINE.
4. USING A CEMENT GROUT SUITABLE FOR USE UNDER WATER, OR AN EPOXY RESIN, FILL IN THE VOID BETWEEN THE REINFORCED CONCRETE HEADWALL AND THE PIPE TO ENSURE ENSURE A FIRM FIT.
5. BACKFILL THE PIPE SECTION BETWEEN THE HEADWALL AND EMBANKMENT WITH 300MM SURROUND OF 50MM OR SIMILAR FREE DRAINAGE AGGREGATE

ISSUE	02	REMARKS:	
DATE	11/08/22	DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBB/HENDERSON) DATED 05.07.22	
DRAWN	HR		
CHKD 1	IH		
APPD	IH		
ISSUE	01	REMARKS:	
DATE	21/09/20	FIRST ISSUE	
DRAWN	CW		
CHKD 1	IH		
APPD	IH		

BIM CODE:

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-DET-0804-1022-01	FORMAT: ACAD
(CLIENT) CONTRACT NUMBER: 35222	SIZE: A1

TITLE:

FORMATION OF SUDS BASIN EAST

DATE	21/02/2020	CHKD	IH
DRAWN	CW	APPD	IH

SITE: GLOBAL INFRASTRUCTURE FORT AUGUSTUS SUBSTATION SUDS / FLOODING MITIGATION

PROJECT CODE:

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SCALE: AS SHOWN | SHEET: 1 OF _

DRAWING No. 22396-121 | ISSUE: 02

Scottish & Southern Electricity Networks

DRAWING STATUS : AS BUILT

SSEN CONTRACT NUMBER	35222	
SSEN MDR NUMBER	0039-FAUG400KV-DET-0804-1022-01	
SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

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EAST BASIN SETTING OUT		
REF	EASTING	NORTHING
001-01	329971.3718	694873.1005
001-02	329978.9668	694873.1005
001-03	329978.9668	694864.2705
001-04	329971.3718	694864.2705
002-01	329960.1200	694871.0486
002-02	329967.2070	694871.0485
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003-03	329964.7689	694887.0610
003-04	329955.9164	694885.4967
004-01	329963.8652	694892.1586
004-02	329955.0169	694890.5963
005-01	329962.9405	694897.4027
005-02	329954.0871	694895.8416
006-01	329962.5645	694899.5649
006-02	329953.7111	694898.0038
006-03	329961.6389	694904.8122
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007-02	329951.8840	694908.3470
008-01	329959.8356	694915.0060
008-02	329950.9819	694913.4427
009-01	329958.9109	694920.2501
009-02	329950.0575	694918.6890
010-01	329958.1975	694922.3583
010-02	329949.6759	694920.8558
010-03	329957.1844	694928.1035
010-04	329948.6629	694926.6010

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DATE	21/09/20	
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CHKD 1	IH	
APPD	IH	

BIM CODE:

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Scottish & Southern Electricity Networks

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SUDS BASIN SETTING OUT POINTS

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DRAWN	CW	APPD	IH

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FORT AUGUSTUS SUBSTATION
SUDS / FLOODING MITIGATION

PROJECT CODE:

Scottish & Southern Electricity Networks

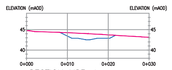
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SSEN CONTRACT NUMBER	35222	
SSEN MDR NUMBER	0039-FAUG400KV-GA-0804-1023-01	
SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

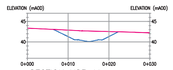
SCALE: 1:200 | SHEET: 1 OF 1

DRAWING No. 22396-122 | ISSUE: 02

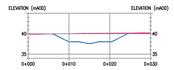
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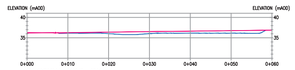
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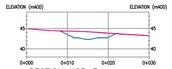
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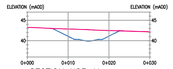
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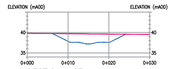
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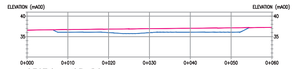
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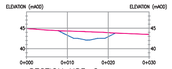
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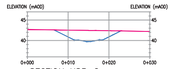
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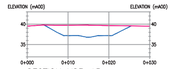
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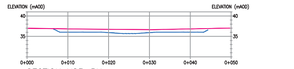
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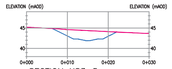
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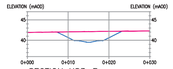
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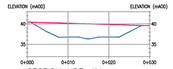
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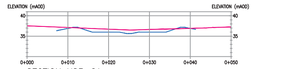
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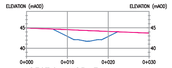
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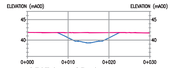
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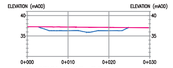
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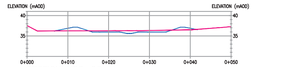
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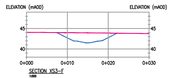
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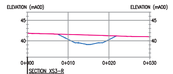
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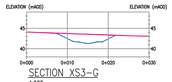
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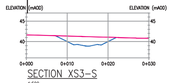
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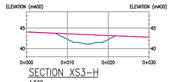
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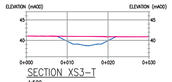
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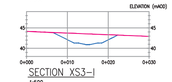
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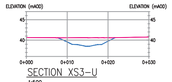
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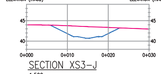
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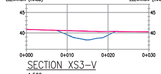
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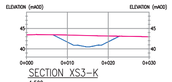
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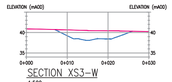
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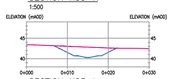
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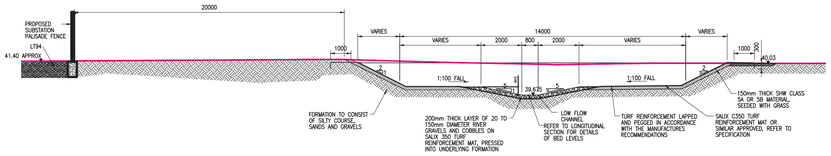
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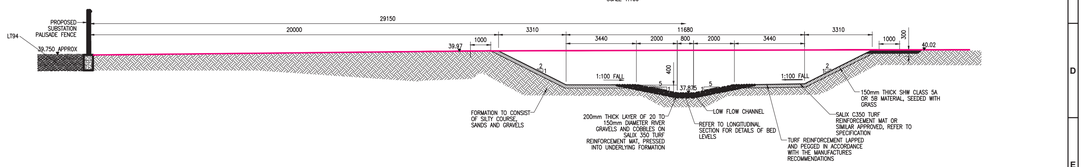
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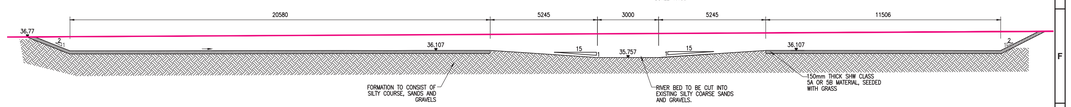
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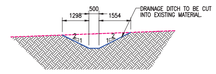
WATERCOURSE 3 SECTION G–G' (REACH 1)
SCALE 1:100



WATERCOURSE 3 SECTION H–H' (REACH 2)
SCALE 1:100



WATERCOURSE 3 SECTION I–I' (REACH 3)
SCALE 1:100



WATERCOURSE 3 SECTION I–I'
SCALE 1:100

LEGEND

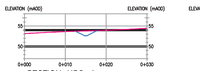
- PROPOSED GROUND LEVELS
- EXISTING GROUND LEVEL

AS BUILT DRAWING ISSUE

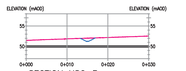
THE AS BUILT INFORMATION ON THIS DRAWING WAS SUPPLIED BY GLOBAL UNDER COVER OF AN EMAIL DATED 05.07.22.

- THE CONTRACTOR HAS CONFIRMED THAT IS AN ACCURATE REPRESENTATION OF THE WORKS COMPLETED AS AT THE DATE OF THE EMAIL NOTED ABOVE.
- MCGREGOR MCMAHON HAVE RELIED SOLELY ON THE CONTRACTOR FOR THE PROVISION OF THIS INFORMATION AND THEREFORE ACCEPT NO RESPONSIBILITY FOR THE ACCURACY OF THE AS BUILT INFORMATION PROVIDED.
- ANY DISCREPANCY BETWEEN THIS AS BUILT DRAWING AND THE COMPLETED WORKS SHOULD BE REFERRED TO THE CONTRACTOR FOR CLARIFICATION.

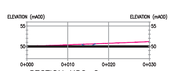
WATERCOURSE 3 CROSS SECTIONS LOW FLOW CHANNEL



SECTION XS6–A
1:500



SECTION XS6–B
1:500



SECTION XS6–C
1:500

SECTION XS6–D
1:500

SECTION XS6–E
1:500

SECTION XS6–F
1:500

SECTION XS6–G
1:500

SECTION XS6–H
1:500

SECTION XS6–I
1:500

SECTION XS6–J
1:500

SECTION XS6–K
1:500

WATERCOURSE 3 CROSS SECTIONS

WATERCOURSE 3 LONG SECTION (DOWNSTREAM OF NEW CULVERT D)
1:1000H
1:250V

HEALTH AND SAFETY

THE DESIGN HAS HIGHLIGHTED ONLY COMMON HAZARDS, WHICH ARE CONSIDERED TO BE WITHIN THE NORMAL EXPERIENCE OF A COMPETENT CONTRACTOR.

ISSUE	02	REMARKS:
DATE	11/08/22	DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBSHENDERSON) DATED 05.07.22
DRAWN	HR	
CHKD 1	IH	
APPD	IH	
ISSUE	01	REMARKS:
DATE	21/09/20	FIRST ISSUE
DRAWN	CW	
CHKD 1	IH	
APPD	IH	
BIM CODE:		

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-DET-0804-1025-01
FORMAT: ACAD

(CLIENT) CONTRACT NUMBER: 35222
SIZE: A0

TITLE:

REALIGNED WATER COURSE 3 SECTIONS

DATE	03/02/2020	CHKD	IH
DRAWN	CW	APPD	IH

SITE:
GLOBAL INFRASTRUCTURE
FORT AUGUSTUS SUBSTATION
SUDS / FLOODING MITIGATION

PROJECT CODE:

SCALE: 1:1000
SHEET: 1 OF 1

DRAWING No. 22329-131
ISSUE: 02

Scottish & Southern Electricity Networks

DRAWING STATUS: AS BUILT

SSEN CONTRACT NUMBER	35222
SSEN WORK NUMBER	0039-FAUG400KV-DET-0804-1025-01

SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

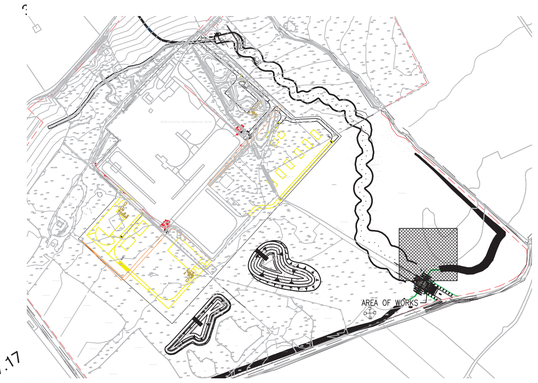
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KEY	
SYMBOL	DESCRIPTION
37.11	EXISTING GROUND LEVEL
38.023m ✦	PROPOSED GROUND LEVEL
	DENOTES GROUND FALL (MAXIMUM 1:3)
	SITE BOUNDARY

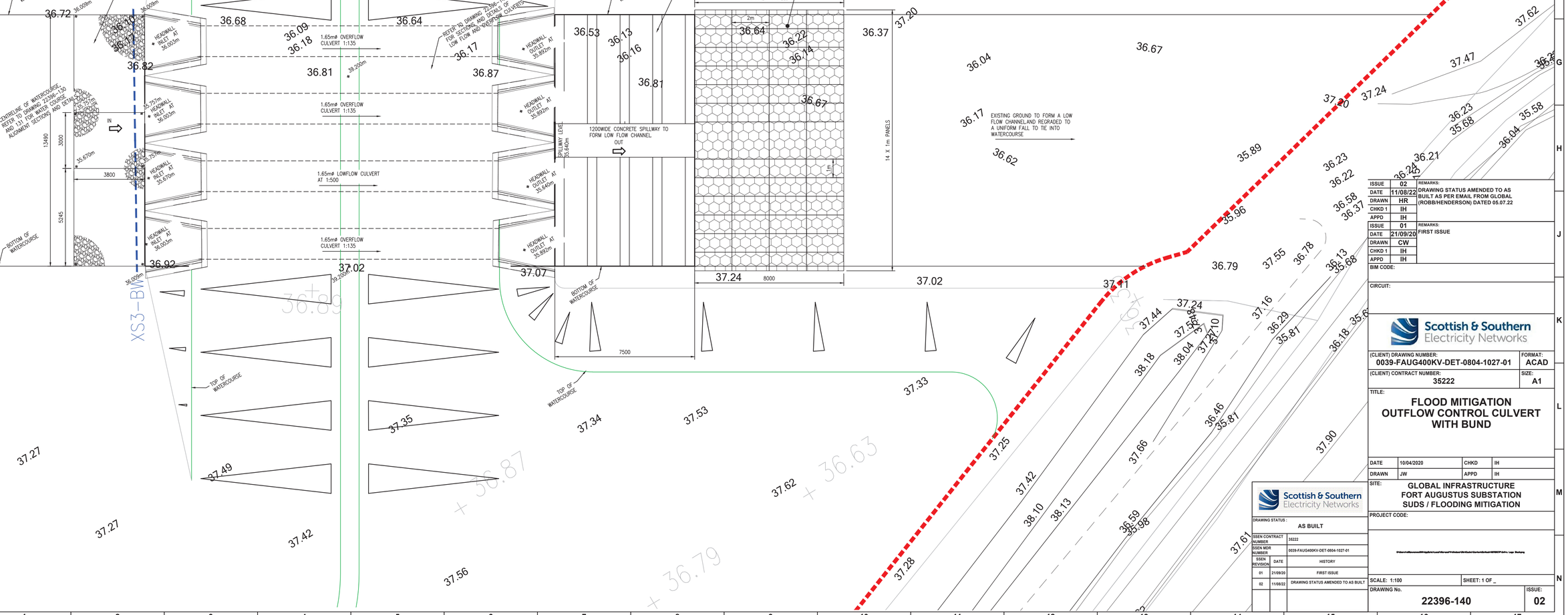
AS BUILT DRAWING ISSUE

THE AS BUILT INFORMATION ON THIS DRAWING WAS SUPPLIED BY GLOBAL UNDER COVER OF AN EMAIL DATED 05.07.22.

- THE CONTRACTOR HAS CONFIRMED THAT IS AN ACCURATE REPRESENTATION OF THE WORKS COMPLETED AS AT THE DATE OF THE EMAIL NOTED ABOVE.
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- ANY DISCREPANCY BETWEEN THIS AS BUILT DRAWING AND THE COMPLETED WORKS SHOULD BE REFERRED TO THE CONTRACTOR FOR CLARIFICATION.



SITE PLAN
SCALE1:5000



ISSUE	02	REMARKS:	DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBB/HENDERSON) DATED 05.07.22
DATE	11/08/22		
DRAWN	HR		
CHKD 1	IH		
APPD	IH		
ISSUE	01	REMARKS:	FIRST ISSUE
DATE	21/09/20		
DRAWN	CW		
CHKD 1	IH		
APPD	IH		

BIM CODE:

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-DET-0804-1027-01	FORMAT: ACAD
(CLIENT) CONTRACT NUMBER: 35222	SIZE: A1

TITLE:

FLOOD MITIGATION OUTFLOW CONTROL CULVERT WITH BUND

DATE	10/04/2020	CHKD	IH
DRAWN	JW	APPD	IH

SITE: GLOBAL INFRASTRUCTURE FORT AUGUSTUS SUBSTATION SUDS / FLOODING MITIGATION

PROJECT CODE:

SCALE: 1:100 | SHEET: 1 OF _

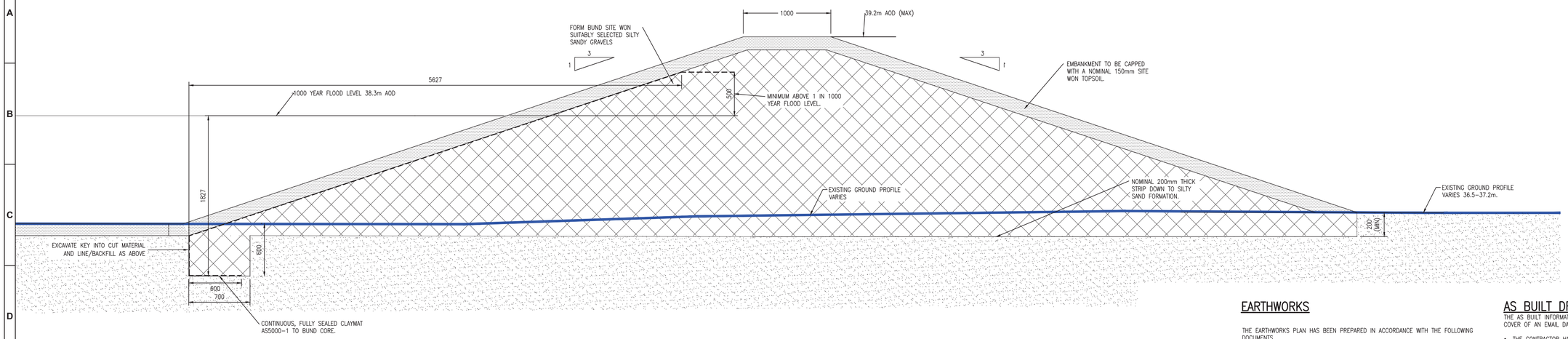
DRAWING No. 22396-140 | ISSUE: 02

Scottish & Southern Electricity Networks

DRAWING STATUS : AS BUILT

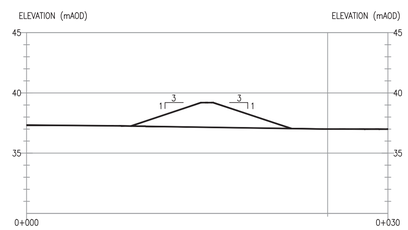
SSEN CONTRACT NUMBER	35222	
SSEN MDR NUMBER	0039-FAUG400KV-DET-0804-1027-01	
SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

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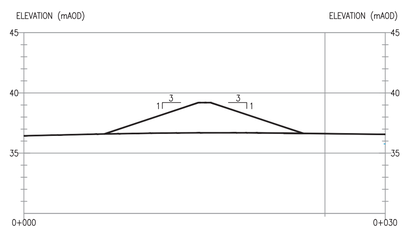
TYPICAL CROSS SECTION THROUGH BUND

SCALE 1:25



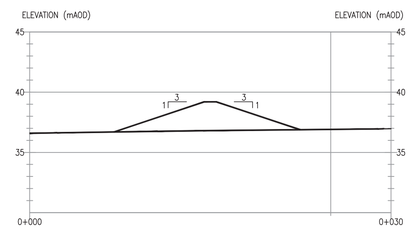
SECTION A–A

1:250



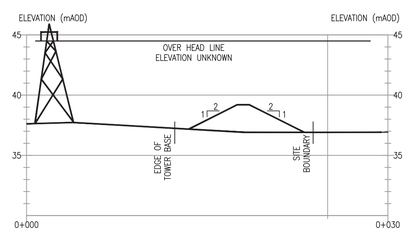
SECTION C–C

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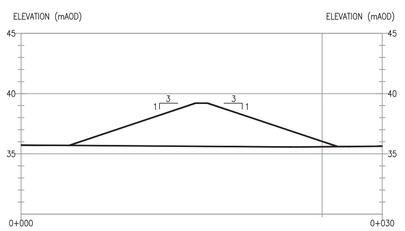
SECTION E–E

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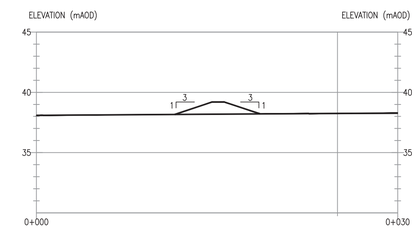
SECTION B–B

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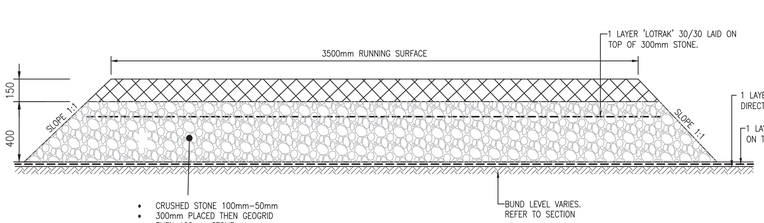
SECTION D–D

1:250



SECTION F–F

1:250



HAUL ROUTE : BUND PROTECTION DETAIL

1:20

EARTHWORKS

THE EARTHWORKS PLAN HAS BEEN PREPARED IN ACCORDANCE WITH THE FOLLOWING DOCUMENTS.

- McGREGOR McMAHON SITE INVESTIGATION REPORT
  Ref: 13973G PHASE I/II SITE INVESTIGATION REPORT – REV A.
  Date: 18/08/14
- DESIGN MANUAL FOR ROADS AND BRIDGES SPECIFICATION FOR HIGHWAY WORKS (SHW).

ANTICIPATED PLATFORM FORMATION LEVEL IS BASED ON THE REMOVAL OF ALL MADE GROUND, TOP-SOIL/PEAT AND SHOULD BE VERIFIED BY INSPECTION WHERE GROUND CONDITIONS DICTATE.

IN ACCORDANCE WITH THE SITE INVESTIGATION UNDERTAKEN BY MCGREGOR MCMAHON, THE SUB SOILS ARE DEFINED AS BEING NATURAL LOOSE TO COMPACT SANDS AND GRAVELS WITH GRADING CURVES GENERALLY COMPLIANT WITH A CLASS 6F1 MATERIAL.

ALL TURF/TOPSOIL TO BE EXCAVATED AND SET ASIDE FOR FINISHING TO SLOPES. LOOSE SANDS CAN BE SET ASIDE AND RELAID AS A 6F1 MATERIAL.

ORGANIC, SILTS AND MADE GROUND SHALL BE DEEMED AS UNSUITABLE FOR USE AS FILL TO THE BUND AND ASSOCIATED FLOOD MITIGATION STRUCTURES.

CONTRACTOR SHALL COMPACT 6F1/6F2 MATERIAL AND COMPACT IN LAYERS. ALL IN ACCORDANCE WITH TABLE 6/4 OF SERIES 600 SHW.

ALL IMPORTED MATERIAL SHALL BE 6F4, MATERIAL CERTIFICATION SHALL BE IN ACCORDANCE WITH TABLE 6/1 OF SHW SERIES 600.

CONTRACTOR SHALL COMPACT TYPE 1 SUB-BASE (TABLE 8/2 OF SHW REFERS) AND LAY AND COMPACT IN ACCORDANCE WITH TABLE 8/1 OF THE SHW.

ALL VERGES AND EMBANKMENTS TO BE DRESSED IN 150 TOPSOIL PREVIOUSLY SET ASIDE. WHERE POSSIBLE EXISTING TURF TO BE RELAID, SEEDED WITH :

TOPSOIL & SEEDING
SPECIAL SPECIES RICH SCOTTISH PROVENANCE MIX COMPRISING
10.6% BROWNTOP BENT
12.8% ROUGH STALKED MEADOW GRASS
21.2% CHEWING FESCUE
26.5% SLENDER CREEPING RED FESCUE
13.6% SMOOTH STALKED MEADOW GRASS
3% OXEYE DAISY
2.5% RIB GRASS PLANTAIN
1% COMMON KNAPWEED
1% COMMON VETCH
1.25% SAINFOIN
1.25 SALAD BURNET
1.2% BIRDSFOOT TREFOIL
1% YARROW
0.75% SHEEPS PARSLEY
0.75% RED CAMPION
0.75% LADYS BEDSTRAN
0.3% BLACK MEDICK
0.25% WHITE CLOVER DEMAND

DESIGN SPECIFICATION FILL EMBANKMENT TO FLOOD MITIGATION BUND

- HEIGHT OF EMBANKMENT IS NOT TO EXCEED 5m MEASURED FROM THE CREST TO THE EXCAVATION LEVEL.
- UPSTREAM AND DOWNSTREAM SLOPES MAX GRADIENT – 1 VERTICAL: 3 HORIZONTAL. UNO.
- CREST WIDTH OF EMBANKMENT TO BE A MINIMUM OF 1m.
- CREST SHOULD CAMBER AT 5% OF EMBANKMENT WIDTH
- PROVIDE AN IMPERMEABLE MEMBRANE TO THE FLOOD SIDE OF THE BUND. MEMBRANE SHALL BE APPLIED TO ANY PART OF THE EMBANKMENT THAT SHALL BE FORMED IN AREAS OF FILL. MEMBRANE SHALL COMPRISE CLAYMAT AS 500-1 LINER, OR SIMILAR AND EQUAL APPROVED, TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
- EMBANKMENT TO BE FOUNDED ON NATURAL SANDY GRAVELS INCUT. ALL MADE GROUND, ORGANIC CLAY / PEAT AND SILTS MATERIAL IS TO BE REMOVED.

GENERAL NOTES

1. THE CONTRACTOR'S ATTENTION IS DRAWN TO THE USE OF BES 6001 – FRAMEWORK STANDARD FOR THE RESPONSIBLE SOURCING OF CONSTRUCTION PRODUCTS, BY BRE, WHEN PROCURING MATERIALS AND PRODUCTS FOR THE CONSTRUCTION OF THE DEVELOPMENT, SUBJECT TO THE AGREEMENT OF THE CLIENT.

2. THESE NOTES SHOULD BE READ IN CONJUNCTION WITH THE ENGINEERING DRAWINGS, AND ARCHITECTURAL DRAWINGS AND SPECIFICATION. ANY DISCREPANCY OR CONFLICT BETWEEN THE DRAWINGS / SPECIFICATION SHOULD BE REFERRED TO EITHER PARTY BEFORE PROCEEDING WITH THE WORKS.

3. ALL WORKS SHOULD BE IN ACCORDANCE WITH THE RELEVANT EUROCODES AND UK NATIONAL ANNEX CODES OF PRACTICE, WHERE NOT SUPERSEDED BRITISH STANDARD CODES OF PRACTICE AND SCOTTISH BUILDING STANDARDS.

4. DO NOT SCALE FROM THESE DRAWINGS. ALL DIMENSIONS ARE TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORK ON SITE OR ANY FABRICATION OR MATERIALS ORDERING.

5. THE CONTRACTOR'S ATTENTION IS DRAWN TO THEIR RESPONSIBILITY TO ENSURE THE SAFETY AND WELL BEING OF BOTH SITE OPERATIVES AND THE PUBLIC DURING THE COURSE OF WORKS.

AS BUILT DRAWING ISSUE

THE AS BUILT INFORMATION ON THIS DRAWING WAS SUPPLIED BY GLOBAL UNDER COVER OF AN EMAIL DATED 05.07.22.

- THE CONTRACTOR HAS CONFIRMED THAT IS AN ACCURATE REPRESENTATION OF THE WORKS COMPLETED AS AT THE DATE OF THE EMAIL NOTED ABOVE.
- MCGREGOR MCMAHON HAVE RELIED SOLELY ON THE CONTRACTOR FOR THE PROVISION OF THIS INFORMATION AND THEREFORE ACCEPT NO RESPONSIBILITY FOR THE ACCURACY OF THE AS BUILT INFORMATION PROVIDED.
- ANY DISCREPANCY BETWEEN THIS AS BUILT DRAWING AND THE COMPLETED WORKS SHOULD BE REFERRED TO THE CONTRACTOR FOR CLARIFICATION.

THIRD PARTY INFORMATION

THE LAYOUT OF THE BASIN IS IN ACCORDANCE WITH THE FOLLOWING INFORMATION

- SLR TOPOGRAPHICAL SURVEY
  Ref: 001
  Date: FEBRUARY 2019
- SLR SITE DRAINAGE LAYOUT
  Ref: C8-9-002
  Date: APRIL 2019

McGREGOR McMAHON ACCEPT NO LIABILITY / RESPONSIBILITY WHATSOEVER FOR THE LOST ARISING FROM ERRORS IN SUCH THIRD PARTY INFORMATION

HEALTH AND SAFETY

THE DESIGN HAS HIGHLIGHTED ONLY COMMON HAZARDS, WHICH ARE CONSIDERED TO BE WITHIN THE NORMAL EXPERIENCE OF A COMPETENT CONTRACTOR.

ISSUE	02	REMARKS:
DATE	11/08/22	DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBB/HENDERSON) DATED 05.07.22
DRAWN	HR	
CHKD 1	IH	
APPD	IH	
ISSUE	01	REMARKS:
DATE	21/09/20	FIRST ISSUE
DRAWN	CW	
CHKD 1	IH	
APPD	IH	

BIM CODE:

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-DET-0804-1028-01
FORMAT: ACAD
(CLIENT) CONTRACT NUMBER: 35222
SIZE: A1

TITLE:

FLOOD MITIGATION BUND CONSTRUCTION DETAILS SPECIFICATION AND SECTIONS

DATE	03/02/2020	CHKD	IH
DRAWN	CW	APPD	IH

SITE:
GLOBAL INFRASTRUCTURE
FORT AUGUSTUS SUBSTATION
SUDS / FLOODING MITIGATION

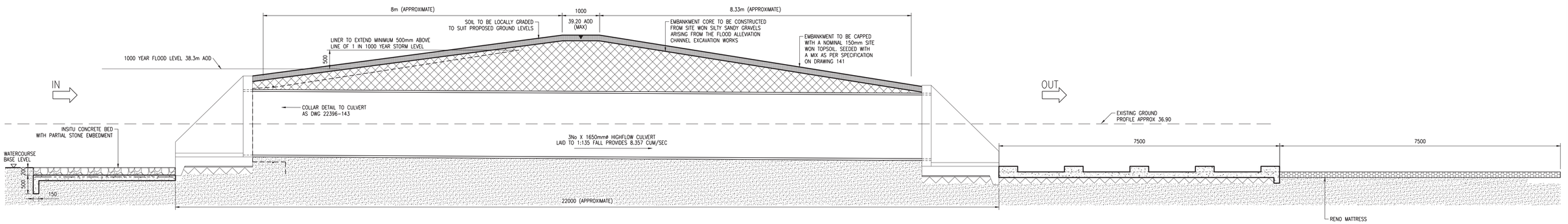
PROJECT CODE:

Scottish & Southern Electricity Networks

DRAWING STATUS :	AS BUILT	
SSEN CONTRACT NUMBER	35222	
SSEN MDR NUMBER	0039-FAUG400KV-DET-0804-1028-01	
SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

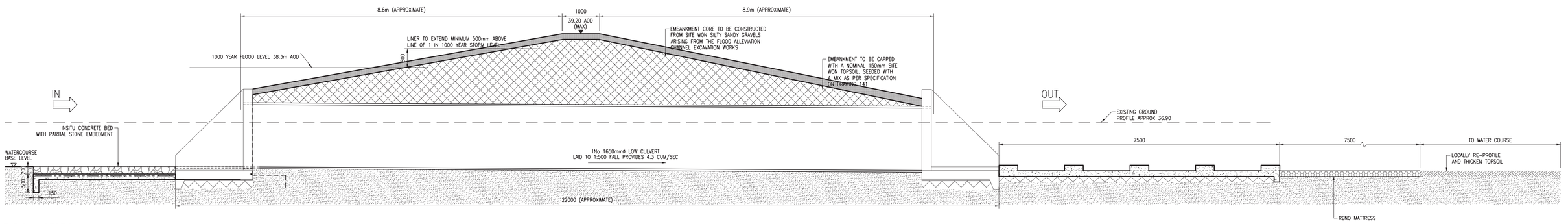
SCALE: AS SHOWN
SHEET: 1 OF _
DRAWING No. 22396-141
ISSUE: 02

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TYPICAL SECTION THROUGH OVERFLOW CULVERT

SCALE 1:50 - (REFER TO DWG 22396-141 FOR BUND CONSTRUCTION)



TYPICAL SECTION THROUGH LOW CULVERT

SCALE 1:50 - (REFER TO DWG 22396-141 FOR BUND CONSTRUCTION)

PIPE CULVERT SPECIFICATION

PIPES SHALL WHERE POSSIBLE BE OF SINGLE SECTION LENGTH HDPE PIPES BY WEHOLITE (OR SIMILAR AND EQUAL APPROVED)

PIPES SHALL BE MANUFACTURED AND CERTIFIED TO MEET THE MATERIAL AND PERFOMANCE REQUIREMENTS OF BS EN 13476, PLASTIC PIPING SYSTEMS FOR NON-PRESSURED UNDERGROUND DRAINAGE AND SEWERAGE

ALL PIPES TO BE INSTALLED STRCITLY IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS

CONCRETE SPECIFICATION

CONCRETE SPECIFICATION

THE GENERAL SPECIFICATION FOR CONCRETE SHALL BE AS PER SHE-T TRANSMISSION SUBSTATION CONCRETE SPECIFICATION (SP-PS-412) REVISON 1.02.

PARTICULAR SPECIFICATION FOR THE WORKS SHALL BE AS FOLLOWS.

WHERE THERE IS AN OMISSION WITHIN THE PARTICULAR SPECIFICATION OF A CLAUSE, THE CLAUSES WITHIN THE GENERAL SPECIFICATION SHALL PREVAIL.

WHERE THERE IS A CONFLICT BETWEEN THE PARTICULAR AND GENERAL SPECIFICATION, THE LATTER SHALL PREVAIL.

MIXES SHALL BE AS FOLLOWS;

BLINDING

DESIGNATED MIX: GEN 3

CLASS FINISH: F1

CONCRETE SPILLWAYS

DESIGNATED MIX: RC40

CLASS FINISH: F2

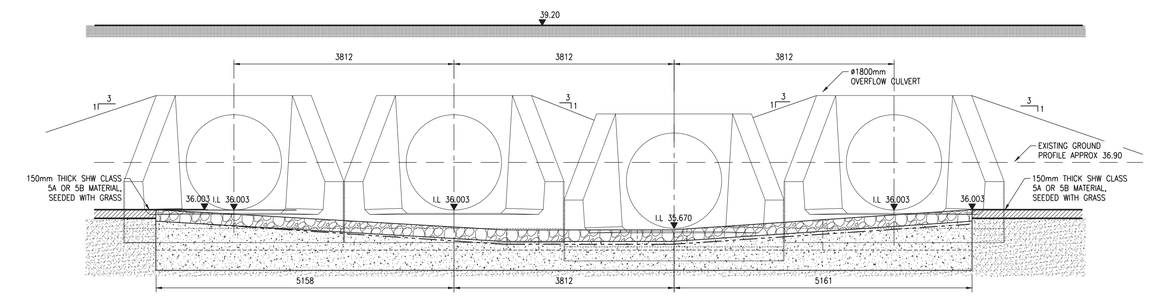
PRECAST CONCRETE HEADWALLS SPECIFICATION

1. ALL HEADWALLS SHALL BE MANUFACTURED AS PRECAST UNITS
2. ALL HEADWALLS SHALL BE MANUFACTURED TO A QUALITY MANAGEMENT SYSTEM ACCREDITED TO ISO 9001:2008 WITH ALL CONSTITUENT PRODUCTS SUBJECT TO REGULAR QUALITY INSPECTION.
3. ALL HEADWALLS SHALL BE MANUFACTURED TO MINIMUM STRUCTURAL CLASSES XD2 AND/OR XD3/4 DEPENDING ON ACTUAL UNIT AND USE REQUIRED.
4. HEADWALLS SAHLL BE FPMCCANN OR SMILIAR AND EQUAL APPROVAED, CAPABLE OF OF ACCEPTING A PIPE OF 1760 OUTSIDE DIAMETER.

OUTLINE METHOD STATEMENT

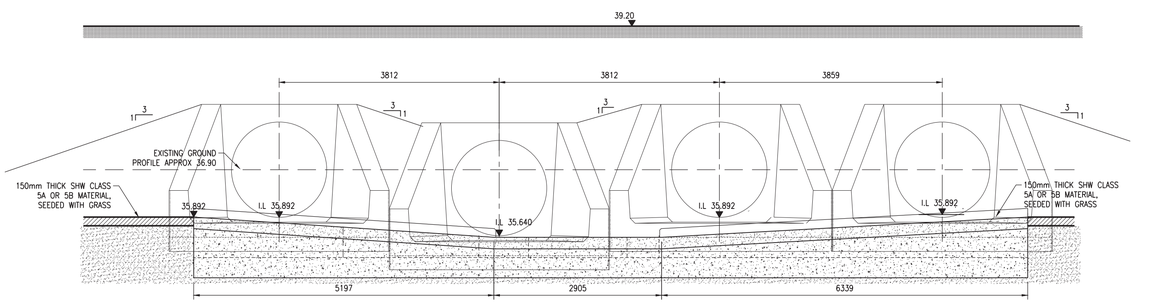
ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE MANUFACTURERS INSTALLATION RECOMMENDATIONS. THE FOLLOWING IS AN INDICATIVE METHOD STATEMENT AND NO LIABILITY CAN BE ASSUMED BY MCGREGOR MCMAHON FOR ITS RELIANCE DURING CONSTRUCTION.

1. CUT AND INSTALL THE LAST SECTION OF PIPE THAT THE HEADWALL WILL COVER. ENSURE THAT THE PIPE IS FULLY FITTED LEAVING EITHER THE FIRST (OR LAST) SECTION OF PIPE FREE FROM BACKFILL TO ATTACH TO THE HEADWALL.
1. EXCAVATE TO FORMATION LEVEL, PLACE AND COMPACT A 300MM BED OF 50MM CLEAN DRAINAGE STONE OR SIMILAR FREE DRAINING AGGREGATE.
2. PLACE THE HEADWALL UNIT ONTO THE BEDDED SURFACE AND SUCH THAT THE HEADWALL IS ALIGNED WITH THE CENTRE OF THE PIPE.
3. INSTALL THE HEADWALL ONTO THE END OF THE PIPELINE.
4. USING A CEMENT GROUT SUITABLE FOR USE UNDER WATER, OR AN EPOXY RESIN, FILL IN THE VOID BETWEEN THE REINFORCED CONCRETE HEADWALL AND THE PIPE TO ENSURE ENSURE A FIRM FIT.
5. BACKFILL THE PIPE SECTION BETWEEN THE HEADWALL AND EMBANKMENT WITH 300MM SURROUND OF 50MM OR SIMILAR FREE DRAINAGE AGGREGATE



SECTION THROUGH INLET OF CULVERT

SCALE 1:50



SECTION THROUGH OUTLET OF CULVERT

SCALE 1:50

AS BUILT DRAWING ISSUE

THE AS BUILT INFORMATION ON THIS DRAWING WAS SUPPLIED BY GLOBAL UNDER COVER OF AN EMAIL DATED 05.07.22.

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Scottish & Southern Electricity Networks

DRAWING STATUS :	AS BUILT
SSEN CONTRACT NUMBER	35222
SSEN MDR NUMBER	0039-FAUG400KV-DET-0804-1029-01

SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

HEALTH AND SAFETY

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ISSUE	02	REMARKS:
DATE	11/08/22	DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBB/HENDERSON) DATED 05.07.22
DRAWN	HR	
CHKD 1	IH	
APPD	IH	
ISSUE	01	REMARKS:
DATE	21/09/20	FIRST ISSUE
DRAWN	JW	
CHKD 1	IH	
APPD	IH	

BIM CODE:

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-DET-0804-1029-01	FORMAT: ACAD
(CLIENT) CONTRACT NUMBER: 35222	SIZE: A1

TITLE:

FLOOD MITIGATION OVERFLOW CONTROL CULVERT INLET / OUTLET & SECTION DETAILS

DATE	10/04/2020	CHKD	IH
DRAWN	JW	APPD	IH

SITE: GLOBAL INFRASTRUCTURE FORT AUGUSTUS SUBSTATION SUDS / FLOODING MITIGATION

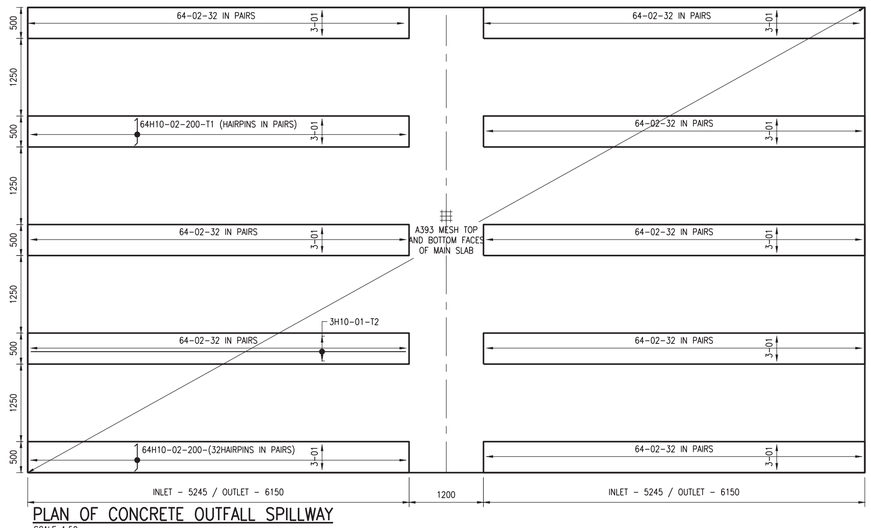
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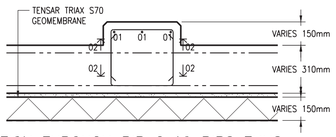
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DRAWING No. 22396-142 | ISSUE: 02

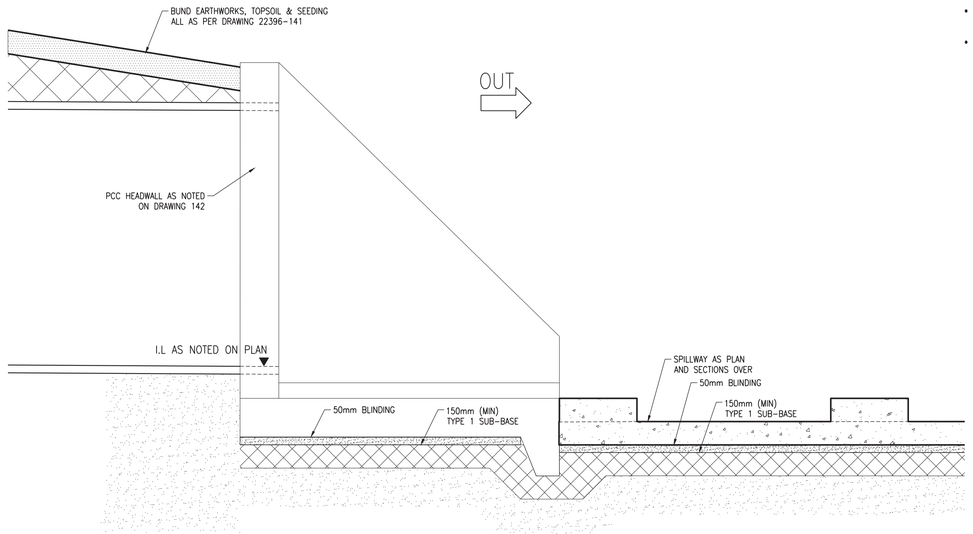
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PLAN OF CONCRETE OUTFALL SPILLWAY
SCALE 1:50



SECTION THROUGH RIB 2x10 RIBS THUS
SCALE 1:20



OUTFALL CULVERT: SECTION THROUGH OUTLET APRON / HEADWALL
SCALE 1:20

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REINFORCEMENT NOTES

1. REFER TO SEPARATE BAR BENDING SCHEDULES IN ACCORDANCE WITH BS8666-2005.

2. COVER TO REINFORCEMENT SHALL BE 40mm.

3. ALL BARS AND MESH SHALL BE HIGH YIELD DEFORMED STEEL TYPE 2.

4. NO BAR SHALL BE CUT OR WELDED UNLESS NOTED ON THE DRAWINGS OR BY OTHER PRIOR AGREEMENT.

5. REINFORCEMENT SHALL BE HELD IN PLACE BY THE ADEQUATE USE OF APPROVED SPACERS AND MALLEABLE IRON TYING WIRE. SPACERS ARE NOT SCHEDULED.

6. BARS ARE LABELLED IN THE FORM DESCRIBED IN THE 'STANDARD METHOD OF DETAILING REINFORCED CONCRETE' E.G. 9H10-56-200NF DENOTES: NINE 10MM DIAMETER DEFORMED HIGH YIELD BARS MARK 56 AT 200MM CENTRES TO THE NEAR FACE.

7. ABBREVIATIONS ARE AS FOLLOWS:
NF MEANS BARS IN NEAR FACE
FF MEANS BARS IN FAR FACE
T MEANS BARS IN TOP LAYER
B MEANS BARS IN BOTTOM LAYER
EF MEANS EACH FACE
AB MEANS ALTERNATE BARS.

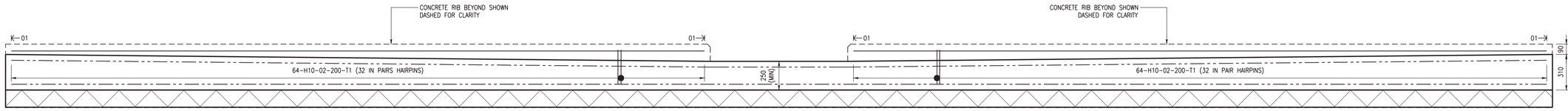
8. BAR LAPS SHALL BE AS SHOWN AND NO LESS THAN 38 TIMES THE DIAMETER OF THE SMALLER BAR LAPPED.

I.E H10 LAP = 380mm

MESH LAPS SHALL BE 400mm

HEALTH AND SAFETY

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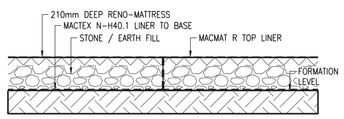
SECTION THROUGH SPILLWAY
SCALE 1:20

OUTLINE METHOD STATEMENT: RENO MATTRESS

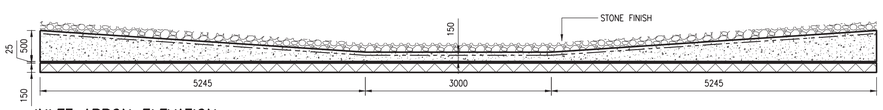
RENO MATTRESS SHOULD BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS. THE FOLLOWING PROVIDES A BRIEF SUMMARY AND DOSE NOT SUPERSEDE SUCH INSTRUCTION.

1. UNFOLD EACH MATTRESS AND LACE UP PANELS TO FORM OPEN BOX PANELS.
2. LIFT AND LAY PANELS INTO POSITION.
3. LAY MACTEX N-H 401 MEMBRANE TO BASE.
4. FILL PANELS FROM THE BOTTOM OF A SLOPE TO THE TOP. EACH PANEL MUST BE FILLED PRIOR TO COMMENCING THE NEXT ADJACENT PANEL.
5. SLIGHTLY OVERFILL TO ALLOW FOR SETTLEMENT.
6. INFILL VOIDS WITH SOILS TO PROMOTE GROWTH.
7. LAY MACMAT R MEMBRANE.
8. LACE LIDS TO CLOSE OFF MATTRESS.

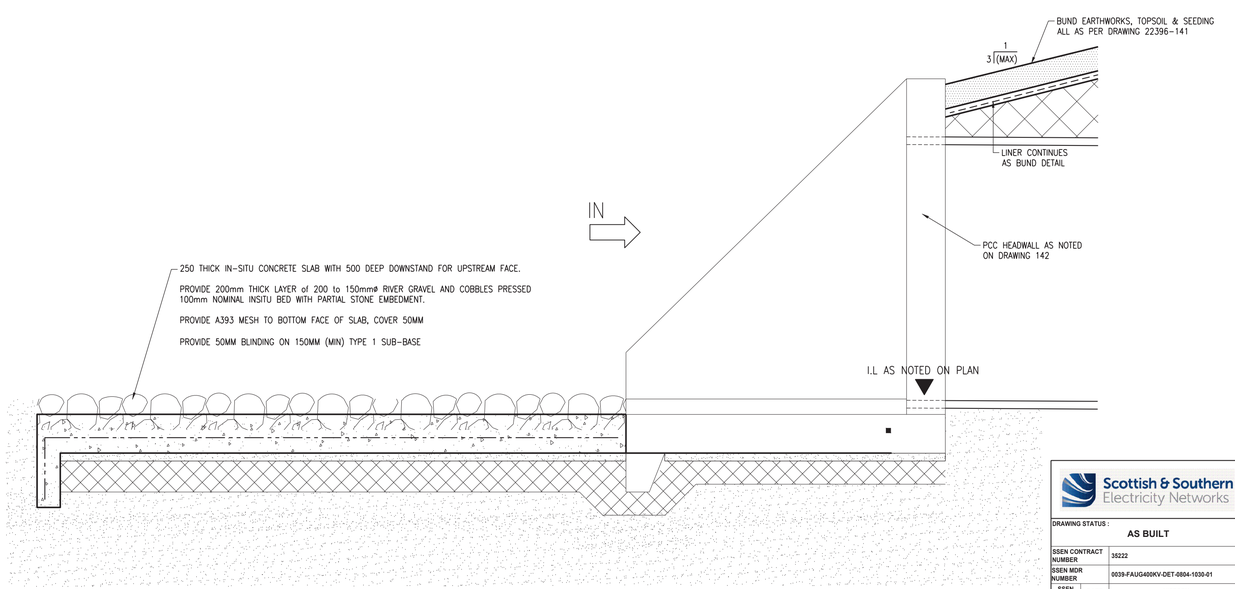
STONE FILL: TO BE 50-150mm STONE



SECTION THROUGH RENO-MATTRESS
SCALE 1:20



INLET APRON ELEVATION
SCALE 1:50



OUTFALL CULVERT: SECTION THROUGH INLET APRON / HEADWALL
SCALE 1:20

ISSUE	02	REMARKS: DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBB/HENDERSON) DATED 05.07.22
DATE	11/08/22	
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BIM CODE:

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-DET-0804-1030-01	FORMAT: ACAD
(CLIENT) CONTRACT NUMBER: 35222	SIZE: A1

TITLE:

FLOOD MITIGATION SPILLWAY APRON AND RENO MATTRESS DETAILS

DATE	10/04/2020	CHKD	IH
DRAWN	JW	APPD	IH

SITE: GLOBAL INFRASTRUCTURE
FORT AUGUSTUS SUBSTATION
SUDS / FLOODING MITIGATION

PROJECT CODE:

Scottish & Southern Electricity Networks

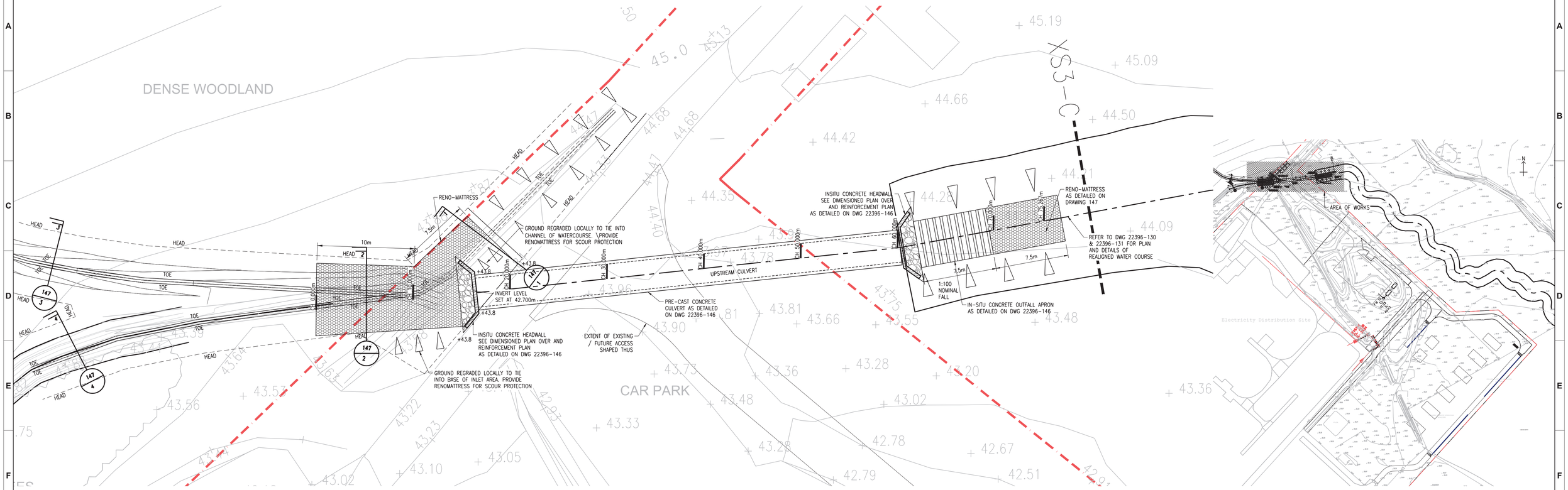
DRAWING STATUS : AS BUILT

SSEN CONTRACT NUMBER	35222	
SSEN MDR NUMBER	0039-FAUG400KV-DET-0804-1030-01	
SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

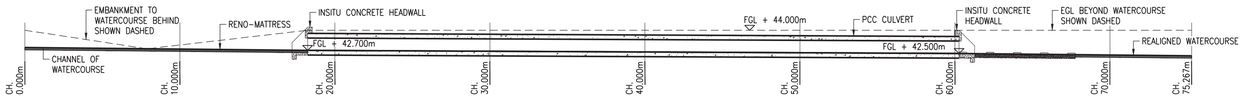
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DRAWING No. 22396-143 | ISSUE: 02

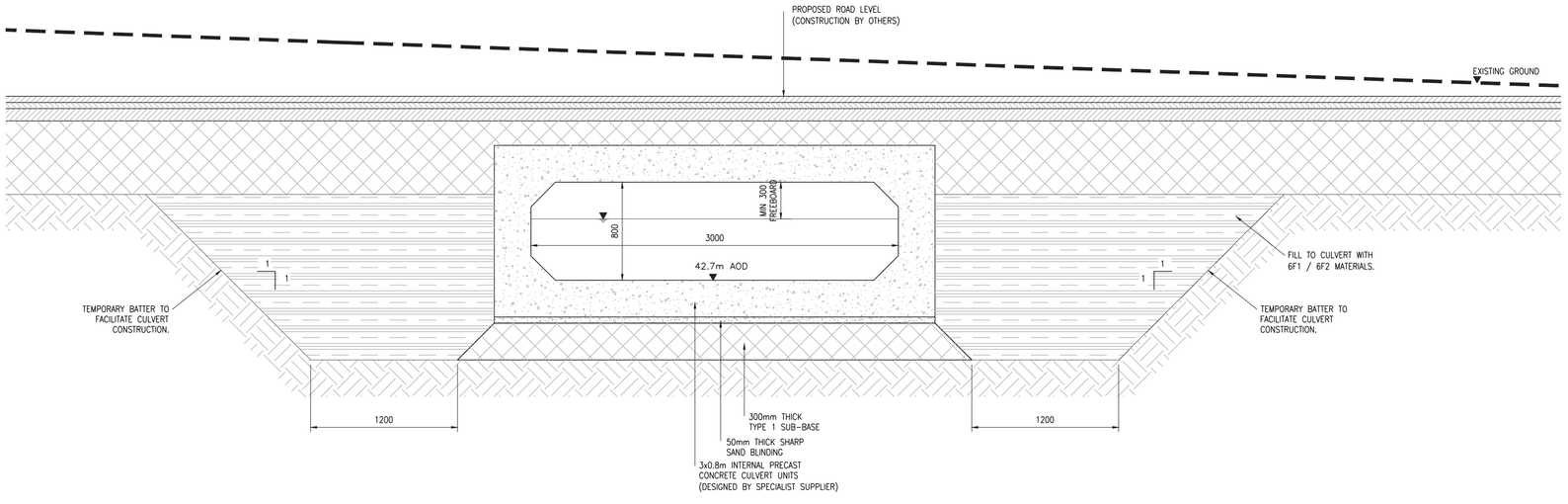
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SITE PLAN
SCALE 1:2000



LONGITUDINAL SECTION THROUGH CULVERT
SCALE1:100



SECTION THROUGH UPSTREAM CULVERT
SCALE 1:25

AS BUILT DRAWING ISSUE
THE AS BUILT INFORMATION ON THIS DRAWING WAS SUPPLIED BY GLOBAL UNDER COVER OF AN EMAIL DATED 05.07.22.

- THE CONTRACTOR HAS CONFIRMED THAT IS AN ACCURATE REPRESENTATION OF THE WORKS COMPLETED AS AT THE DATE OF THE EMAIL NOTED ABOVE.
- MCGREGOR MCMAHON HAVE RELIED SOLELY ON THE CONTRACTOR FOR THE PROVISION OF THIS INFORMATION AND THEREFORE ACCEPT NO RESPONSIBILITY FOR THE ACCURACY OF THE AS BUILT INFORMATION PROVIDED.
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HEALTH AND SAFETY
THE DESIGN HAS HIGHLIGHTED ONLY COMMON HAZARDS THAT ARE CONSIDERED TO BE WITHIN THE NORMAL EXPERIENCE OF A COMPETENT CONTRACTOR.

OUTLINE METHOD STATEMENT OF INSTALLATION OF PCC CULVERT EXCAVATE DOWN TO FORMATION LEVEL
LAY WELL-COMPACTED GRANULAR MATERIAL OVER THE FULL WIDTH OF THE TRENCH TO A MINIMUM DEPTH OF 200MM, HAVING FIRST REMOVED ANY PROTECTIVE LAYER
BLIND THE SURFACE WITH FINE MATERIAL TO ASSIST LEVELLING IMMEDIATELY BEFORE LIFTING AND PLACING A UNIT,
CLEAN AND PRIME THE INNER AND SLOPING FACES BOTH SPIGOT AND SOCKET AND ALLOW TO DRY
APPLY A CONTINUOUS JOINTING STRIP, IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS, TO THE INTERNAL CORNER OF THE SOCKET
LAY THE BOX CULVERT LINE FROM THE DOWNSTREAM END WITH SOCKETS FACING UPSTREAM TO RECEIVE THE NEXT BOX CULVERT.
APPLY HEAT, AS RECOMMENDED, TO SOFTEN BITUMEN BASED STRIP WHEN THE WEATHER IS VERY COLD
FIT THE UNITS TOGETHER AND CLOSE THE JOINT TO THE SPECIFIED NOMINAL GAP
MAKE GOOD ANY HOLES USED FOR LIFTING AND LAYING
INTERNALLY SEAL JOINTS USING A MASTIC MATERIAL SUITABLE FOR USE WITHIN A WET ENVIRONMENT. APPLY A PRIMER OR BOND BREAK MATERIAL AS REQUIRED.
BACKFILL AT THE EARLIEST OPPORTUNITY FOLLOWING THE LAYING OF SECTIONS OF THE CULVERT.
FILL THE TRENCH TO THE LEVEL OF THE TOP OF THE BOX CULVERT WORKING EVENLY ON EACH SIDE USING SUITABLY SELECTED SITE WON MATERIAL COMPLIANT WITH 6F1/6F2 MATERIAL AS SPECIFIED WITH THE DMRB, SPECIFICATION FOR HIGHWAY WORKS.
BACKFILL MATERIAL TO BE WELL COMPACTED IN LAYERS NOT EXCEEDING 200MM
DO NOT USE HEAVY VIBRATORY EQUIPMENT
BACKFILL OVER THE BOX CULVERT IN NON-TRAFFICKED AREAS AS PER THE ABOVE.
BACKFILL OVER THE CULVERT IN TRAFFICKED AREAS TO ROAD FORMATION LEVEL USING TYPE 1 MATERIAL AS SPECIFIED WITH THE DMRB, SPECIFICATION FOR HIGHWAY WORKS.
DO NOT RUN HEAVY ROLLERS OR CONSTRUCTION PLANT OVER THE BOX CULVERT WITHOUT PROTECTION

DRAWING REFERENCES
FOR EARTHWORKS SPECIFICATION – REFER TO DRAWING 22396-141
FOR CONCRETE SPECIFICATION – REFER TO DRAWING 22396-142
FOR RENO MATTRESS SPECIFICATION – REFER TO DRAWING 22396-147

ISSUE	02	REMARKS: DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBB/HENDERSON) DATED 05.07.22
DATE	11/08/22	
DRAWN	HR	
CHKD 1	IH	
APPD	IH	
ISSUE	01	REMARKS: FIRST ISSUE
DATE	21/09/20	
DRAWN	JW	
CHKD 1	IH	
APPD	IH	

BIM CODE:

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-GA-0804-1031-01 — FORMAT: ACAD

(CLIENT) CONTRACT NUMBER: 35222 — SIZE: A1

TITLE:

FLOOD MITIGATION UPSTREAM CULVERT GENERAL ARRANGEMENT PLAN

DATE	10/04/2020	CHKD	IH
DRAWN	JW	APPD	IH

SITE: GLOBAL INFRASTRUCTURE FORT AUGUSTUS SUBSTATION SUDS / FLOODING MITIGATION

PROJECT CODE:

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SCALE: AS SHOWN — SHEET: 1 OF _

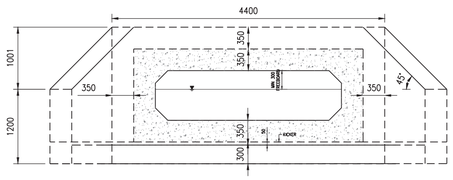
DRAWING No. 22396-145 — ISSUE: 02

Scottish & Southern Electricity Networks

DRAWING STATUS : AS BUILT

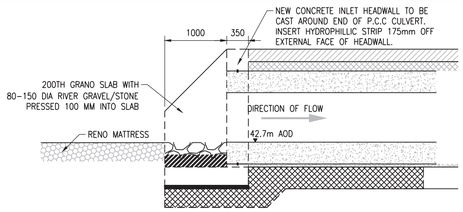
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SSEN MDR NUMBER	0039-FAUG400KV-GA-0804-1031-01	
SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

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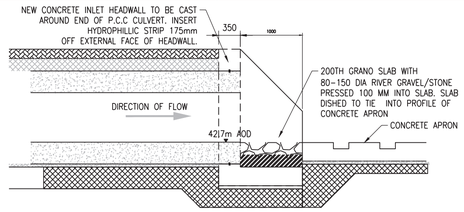
UPSTREAM CULVERT INLET AND OUTLET HEADWALLS FRONT ELEVATION

SCALE 1:50



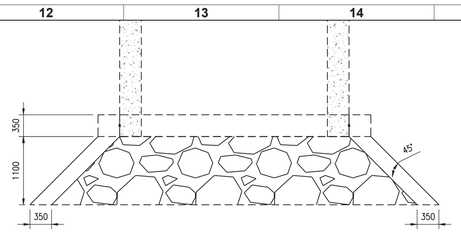
UPSTREAM CULVERT SECTION THROUGH INLET HEADWALL

SCALE 1:50



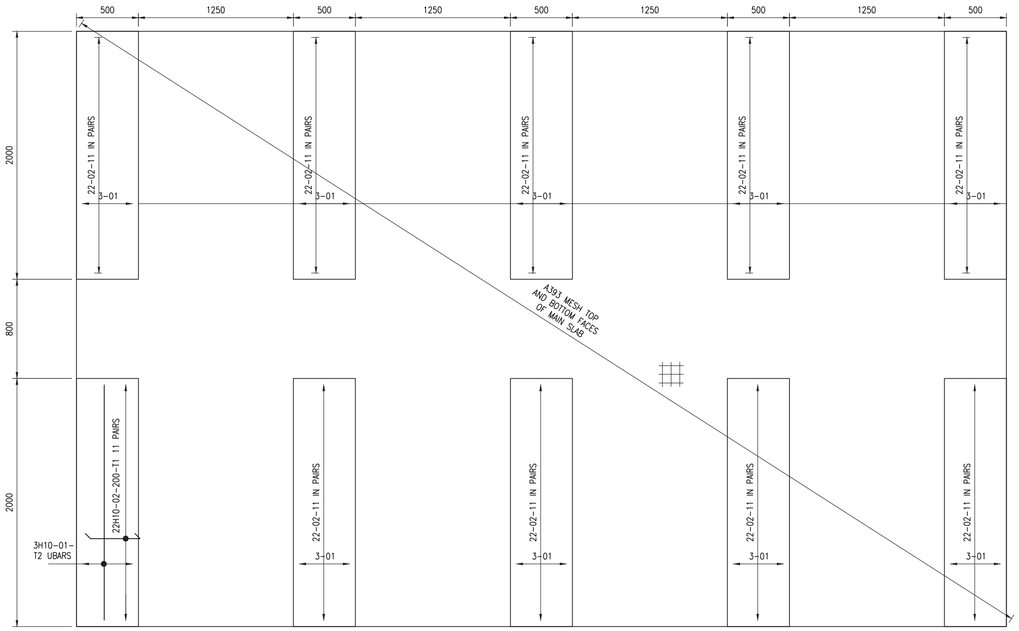
UPSTREAM CULVERT SECTION THROUGH OUTLET HEADWALL

SCALE 1:50



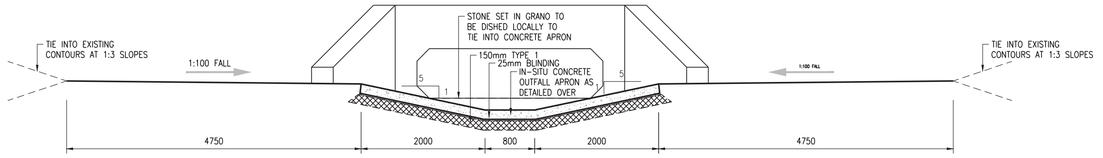
UPSTREAM CULVERT INLET AND OUTLET HEADWALLS ON PLAN

SCALE 1:50



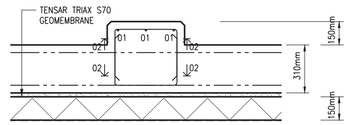
PLAN OF UPSTREAM CULVERT CONCRETE SPILLWAY TO OUTFALL

SCALE 1:25



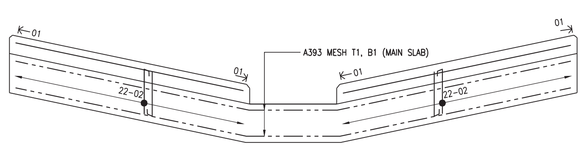
SECTION 4-4: THROUGH OUTFALL CONCRETE APRON

SCALE 1:50



SECTION THROUGH RIB 2x10 RIBS THUS

SCALE 1:20



SECTION THROUGH SPILLWAY

SCALE 1:25

HEALTH AND SAFETY

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AS BUILT DRAWING ISSUE

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REINFORCEMENT NOTES

1. REFER TO SEPARATE BAR BENDING SCHEDULES IN ACCORDANCE WITH BS8666-2005.

2. COVER TO REINFORCEMENT SHALL BE 40mm.

3. ALL BARS AND MESH SHALL BE HIGH YIELD DEFORMED STEEL TYPE 2.

4. NO BAR SHALL BE CUT OR WELDED UNLESS NOTED ON THE DRAWINGS OR BY OTHER PRIOR AGREEMENT.

5. REINFORCEMENT SHALL BE HELD IN PLACE BY THE ADEQUATE USE OF APPROVED SPACERS AND MALLEABLE IRON TYING WIRE. SPACERS ARE NOT SCHEDULED.

6. BARS ARE LABELLED IN THE FORM DESCRIBED IN THE 'STANDARD METHOD OF DETAILING REINFORCED CONCRETE' E.G. 9H10.56-200NF DENOTES: NINE 10MM DIAMETER DEFORMED HIGH YIELD BARS MARK 56 AT 200MM CENTRES TO THE NEAR FACE.

7. ABBREVIATIONS ARE AS FOLLOWS:
NF MEANS BARS IN NEAR FACE
FF MEANS BARS IN FAR FACE
T MEANS BARS IN TOP LAYER
B MEANS BARS IN BOTTOM LAYER
EF MEANS EACH FACE
AB MEANS ALTERNATE BARS.

8. BAR LAPS SHALL BE AS SHOWN AND NO LESS THAN 38 TIMES THE DIAMETER OF THE SMALLER BAR LAPPED.

I.E H10 LAP = 380mm

MESH LAPS SHALL BE 400mm

ISSUE	02	REMARKS:	DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBB/HENDERSON) DATED 05.07.22
DATE	11/08/22		
DRAWN	HR		
CHKD 1	IH		
APPD	IH		
ISSUE	01	REMARKS:	FIRST ISSUE
DATE	21/09/20		
DRAWN	JW		
CHKD 1	IH		
APPD	IH		

BIM CODE:

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-DET-0804-1032-01	FORMAT: ACAD
(CLIENT) CONTRACT NUMBER: 35222	SIZE: A1

TITLE:

FLOOD MITIGATION UPSTREAM CULVERT INLET AND OUTLET HEADWALL DETAILS

DATE	10/04/2020	CHKD	IH
DRAWN	JW	APPD	IH

SITE:

GLOBAL INFRASTRUCTURE
FORT AUGUSTUS SUBSTATION
SUDS / FLOODING MITIGATION

PROJECT CODE:

C:\Users\williamsonj\Desktop\Archive\Fort Augustus\Drawings\Flood Mitigation\0039-FAUG400KV-DET-0804-1032-01 Upstream Culvert Inlet and Outlet Headwall Details.dwg

SCALE: AS SHOWN | SHEET: 1 OF _

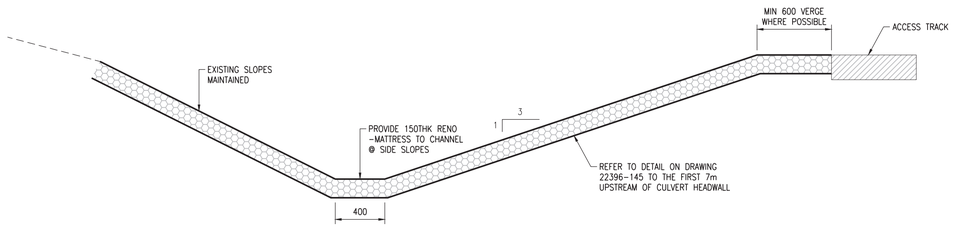
DRAWING No. 22396-146 | ISSUE: 02

Scottish & Southern Electricity Networks

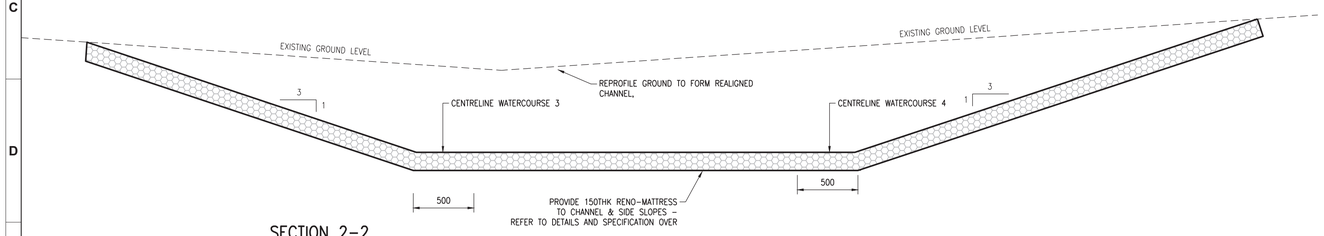
DRAWING STATUS : AS BUILT

SSEN CONTRACT NUMBER		35222
SSEN MDR NUMBER		0039-FAUG400KV-DET-0804-1032-01
SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

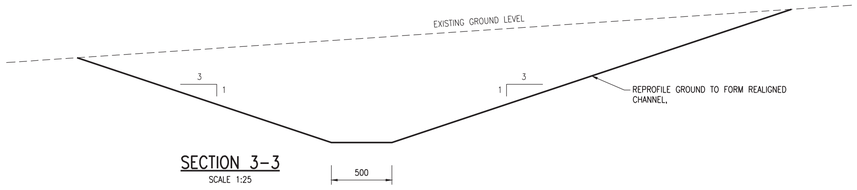
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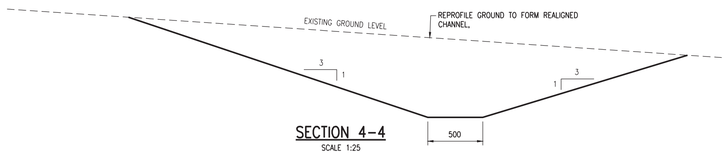
SECTION 1-1
SCALE 1:25



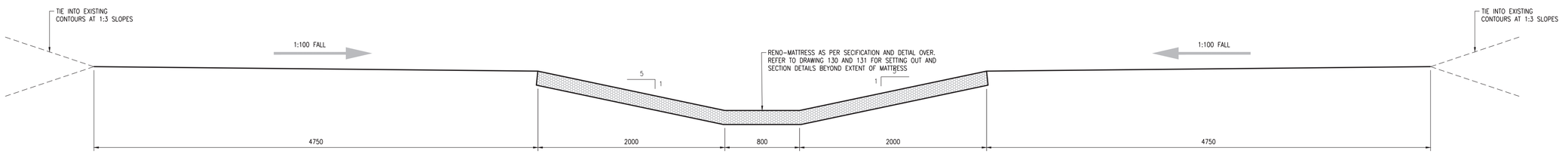
SECTION 2-2
SCALE 1:25



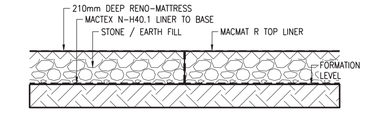
SECTION 3-3
SCALE 1:25



SECTION 4-4
SCALE 1:25



SECTION 5-5: THROUGH OUTFALL RENO-MATTRESS
SCALE 1:25



SECTION THROUGH RENO-MATTRESS
SCALE 1:20

AS BUILT DRAWING ISSUE

THE AS BUILT INFORMATION ON THIS DRAWING WAS SUPPLIED BY GLOBAL UNDER COVER OF AN EMAIL DATED 05.07.22.

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OUTLINE METHOD STATEMENT: RENO MATTRESS

RENO MATTRESS SHOULD BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS. THE FOLLOWING PROVIDES A BRIEF SUMMARY AND DOSE NOT SUPERSEDE SUCH INSTRUCTION.

1. UNFOLD EACH MATTRESS AND LACE UP PANELS TO FORM OPEN BOX PANELS.
2. LIFT AND LAY PANELS INTO POSSITION.
3. LAY MACTEX N-H 401 MEMBRANE TO BASE.
4. FILL PANELS FROM THE BOTTOM OF A SLOPE TO THE TOP. EACH PANEL MUST BE FILLED PRIOR TO COMMENCING THE NEXT ADJACENT PANEL.
5. SLIGHTLY OVERFILL TO ALLOW FOR SETTLEMENT.
6. INFILL VOIDS WITH SOILS TO PROMOTE GROWTH.
7. LAY MACMAT R MEMBRANE.
8. LACE LIDS TO CLOSE OFF MATTRESS.

STONE FILL: TO BE 50-150mm STONE

HEALTH AND SAFETY

THE DESIGN HAS HIGHLIGHTED ONLY COMMON HAZARDS THAT ARE CONSIDERED TO BE WITHIN THE NORMAL EXPERIENCE OF A COMPETENT CONTRACTOR.

ISSUE	02	REMARKS: DRAWING STATUS AMENDED TO AS BUILT AS PER EMAIL FROM GLOBAL (ROBB/HENDERSON) DATED 05.07.22
DATE	11/08/22	
DRAWN	HR	
CHKD 1	IH	
APPD	IH	
ISSUE	01	REMARKS: FIRST ISSUE
DATE	21/09/20	
DRAWN	IH	
CHKD 1	IH	
APPD	IH	

BIM CODE:

CIRCUIT:

Scottish & Southern Electricity Networks

(CLIENT) DRAWING NUMBER: 0039-FAUG400KV-DET-0804-1033-01	FORMAT: ACAD
(CLIENT) CONTRACT NUMBER: 35222	SIZE: A1

TITLE:

FLOOD MITIGATION UPSTREAM CULVERT WATERCOURSE SECTIONS AND DETAILS

DATE	10/04/2020	CHKD	IH
DRAWN	IH	APPD	IH

SITE: GLOBAL INFRASTRUCTURE FORT AUGUSTUS SUBSTATION SUDS / FLOODING MITIGATION

PROJECT CODE:

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SCALE: AS SHOWN | SHEET: 1 OF _

DRAWING No. 22396-147 | ISSUE: 02

Scottish & Southern Electricity Networks

DRAWING STATUS : AS BUILT

SSEN CONTRACT NUMBER	35222	
SSEN MDR NUMBER	0039-FAUG400KV-DET-0804-1033-01	
SSEN REVISION	DATE	HISTORY
01	21/09/20	FIRST ISSUE
02	11/08/22	DRAWING STATUS AMENDED TO AS BUILT

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Appendix B. Infiltration Test Data

35 36

09 09

Scottish & Southern Electricity Networks
TRANSMISSION

FATP01 FAB01 FATP02 FAB02 FATP04 FAB03 FAB04 FATP07 FATP05 FATP03 FAB05 FATP08 FATP06 FAB06 FAB08 FAB07 FATP09 FAB09 FATP10 FATP14 FATP11 FAB10 FATP12 FAB11 FATP15 FATP17 FATP16 FATP18 FAB12 FATP13

08 08

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Scale @ A3: 1:5,000

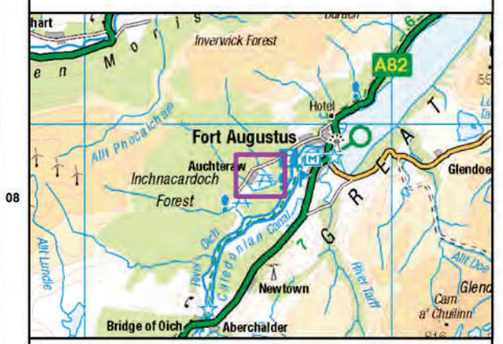
0 0.03 0.06 0.12 0.18 0.24 0.3 km

Maxar, Microsoft

35 36

Legend

- Trial Pits
- Boreholes
- SSE Current Ownership
- PHASE 1 - LT92
- PHASE 2 - LT94
- PHASE 2 ALTERNATIVE - LT94
- OPERATIONAL BOUNDARY
- EXISTING PLATFORM BOUNDARY



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Project No:	LT000519
Project:	Fort Augustus 400kV Upgrade
Title:	Borehole Locations
Drawn by:	BC
Date:	25/07/2023
Drawing:	LT000519_ENV_001_Boreholes

TERRA TEK
Site Investigation & Laboratory Services

Site	LT519 FORT AUGUSTUS 400K V UPGRADE	Contract No	26491
		Test Pit No	FATP10
Client	SHE - Transmission	Test Run No	1
Engineer	Jacobs	Date of Test	24.08.23

Time (minute)	Depth to Water (m)
0	0.45
0.5	0.46
1	0.47
1.5	0.49
2	0.51
2.5	0.53
3	0.54
3.5	0.55
4	0.56
4.5	0.56
5	0.58
6	0.61
7	0.63
8	0.66
9	0.68
10	0.70
12	0.73
14	0.77
16	0.80
18	0.83
20	0.86
25	0.93
30	0.99
40	1.11
50	1.20
60	1.28
70	1.35

Weather Conditions
Sunny with mixed showers

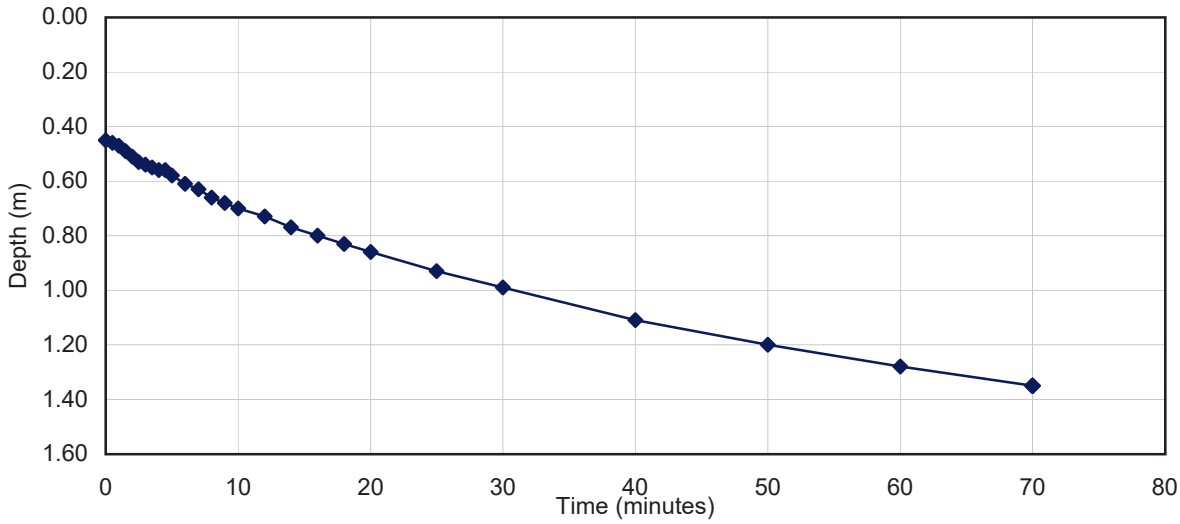
Non Engineering Strata Description
Orangish brown and light brown SAND and GRAVEL

Test Pit Dimensions		
Length	m	2.00
Width	m	1.00
Depth	m	1.45

Test Parameters		
Maximum Effective Depth	m	0.45
75% Effective Depth	m	0.70
25 % Effective Depth	m	1.20
Effective Storage Volume	m^3	1.00
Surface Area a_{p50}	m^2	5.00
Time for 75%	min	10
Time for 25%	min	50
t_{p75-25}	min	40

Soil Infiltration Rate
8.3E-05 m/s

Comments
~



Originator	Checked & Approved
JD	IM 29/09/2023

SOAKAWAY
BRE 365

62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK
Site Investigation & Laboratory Services

Site	LT519 FORT AUGUSTUS 400K V UPGRADE	Contract No	26491
		Test Pit No	FATP10
Client	SHE - Transmission	Test Run No	2
Engineer	Jacobs	Date of Test	24.08.23

Time (minute)	Depth to Water (m)
0	0.45
0.5	0.46
1	0.48
1.5	0.49
2	0.51
2.5	0.53
3	0.54
3.5	0.55
4	0.55
4.5	0.56
5	0.56
6	0.57
7	0.58
8	0.59
9	0.61
10	0.62
12	0.64
14	0.67
16	0.70
18	0.73
20	0.75
25	0.80
30	0.84
40	0.93
50	0.99
60	1.07
70	1.13
80	1.19
90	1.26
100	1.31
110	1.37

Weather Conditions
Sunny with mixed showers

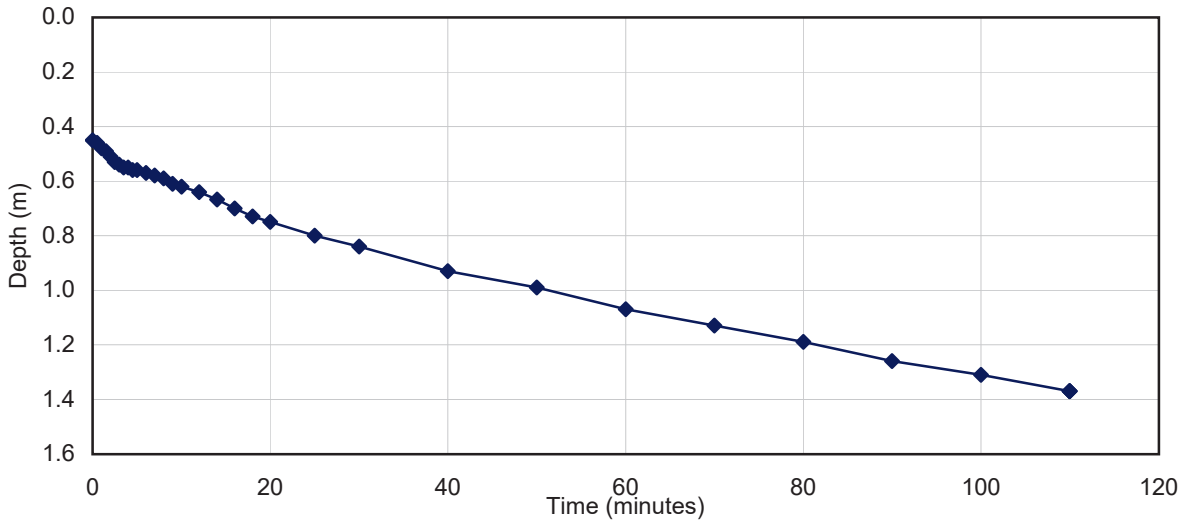
Non Engineering Strata Description
Orangish brown and light brown SAND and GRAVEL

Test Pit Dimensions		
Length	m	2.00
Width	m	1.00
Depth	m	1.45

Test Parameters		
Maximum Effective Depth	m	0.45
75% Effective Depth	m	0.70
25 % Effective Depth	m	1.20
Effective Storage Volume	m^3	1.00
Surface Area a_{p50}	m^2	5.00
Time for 75%	min	16
Time for 25%	min	81
t_{p75-25}	min	65

Soil Infiltration Rate
5.1E-05 m/s

Comments
~



Originator	Checked & Approved
JD	IM 29/09/2023

SOAKAWAY
BRE 365

TK

62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK
Site Investigation & Laboratory Services

Site	LT519 FORT AUGUSTUS 400K V UPGRADE	Contract No	26491
		Test Pit No	FATP10
Client	SHE - Transmission	Test Run No	3
Engineer	Jacobs	Date of Test	24.08.23

Time (minute)	Depth to Water (m)
0	0.45
0.5	0.46
1	0.46
1.5	0.46
2	0.47
2.5	0.47
3	0.48
3.5	0.48
4	0.49
4.5	0.50
5	0.51
6	0.52
7	0.53
8	0.54
9	0.56
10	0.58
12	0.62
14	0.64
16	0.66
18	0.67
20	0.69
25	0.73
30	0.79
40	0.84
50	0.91
60	0.98
70	1.05
80	1.11
90	1.16
100	1.21
110	1.25
120	1.30

Weather Conditions
Sunny with mixed showers

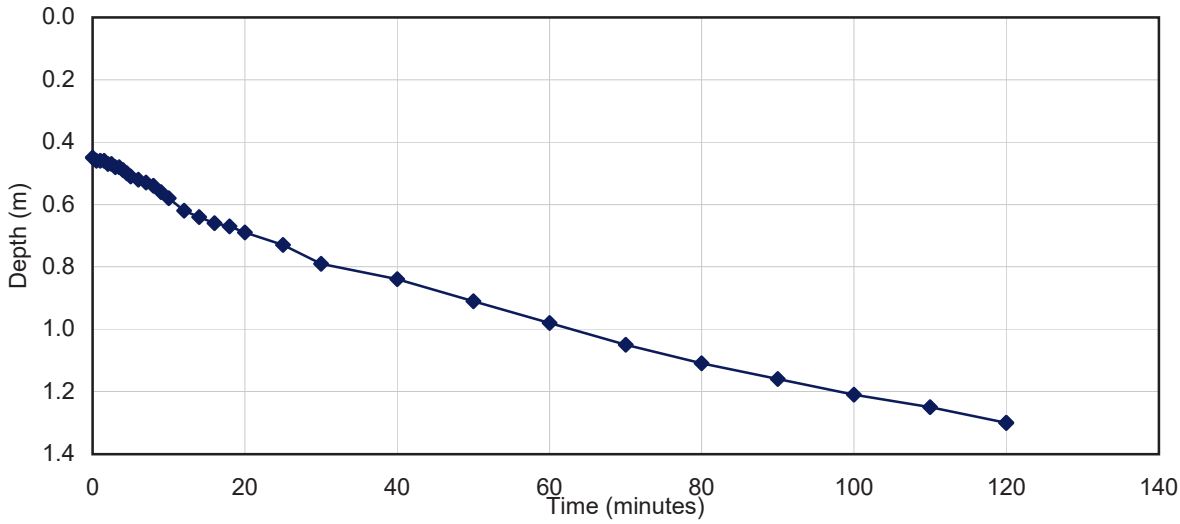
Non Engineering Strata Description
Orangish brown and light brown SAND and GRAVEL

Test Pit Dimensions		
Length	m	2.00
Width	m	1.00
Depth	m	1.45

Test Parameters		
Maximum Effective Depth	m	0.45
75% Effective Depth	m	0.70
25 % Effective Depth	m	1.20
Effective Storage Volume	m^3	1.00
Surface Area a_{p50}	m^2	5.00
Time for 75%	min	21
Time for 25%	min	98
t_{p75-25}	min	77

Soil Infiltration Rate
4.3E-05 m/s

Comments
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Originator	Checked & Approved
JD	IM 29/09/2023

SOAKAWAY
BRE 365

62 Rochsolloch Road, Airdrie, ML6 9BG
Lab Project No A14979-1 : 09/29/2023 16:26:47

TERRA TEK
Site Investigation & Laboratory Services

Site	LT519 FORT AUGUSTUS 400K V UPGRADE	Contract No	26491
		Test Pit No	FATP12
Client	SHE - Transmission	Test Run No	1
Engineer	Jacobs	Date of Test	24.08.23

Time (minute)	Depth to Water (m)
0	0.25
1	0.27
2	0.29
3	0.30
4	0.32
5	0.33
6	0.34
7	0.34
8	0.35
9	0.36
10	0.37
12	0.38
14	0.41
16	0.41
18	0.42
20	0.43
25	0.48
30	0.50
40	0.55
50	0.61
60	0.66
70	0.71

Weather Conditions
Sunny with mixed showers

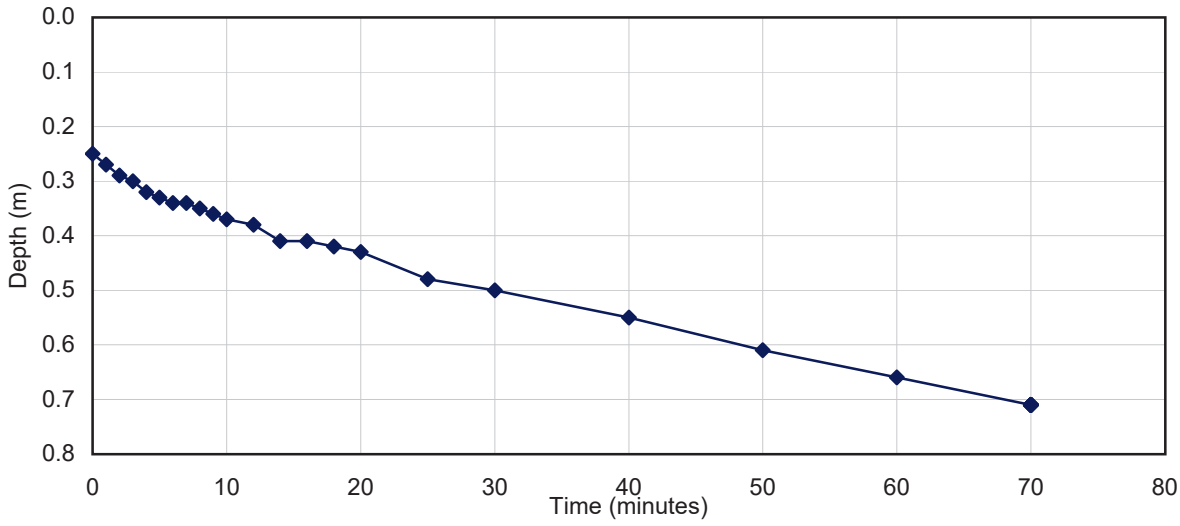
Non Engineering Strata Description
Orangish brown and light brown SAND

Test Pit Dimensions		
Length	m	1.80
Width	m	0.70
Depth	m	0.75

Test Parameters		
Maximum Effective Depth	m	0.25
75% Effective Depth	m	0.38
25 % Effective Depth	m	0.63
Effective Storage Volume	m^3	0.32
Surface Area a_{p50}	m^2	2.51
Time for 75%	min	12
Time for 25%	min	54
t_{p75-25}	min	42

Soil Infiltration Rate
5.0E-05 m/s

Comments
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Originator	Checked & Approved
JD	IM 29/09/2023

SOAKAWAY
BRE 365

62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK
Site Investigation & Laboratory Services

Site	LT519 FORT AUGUSTUS 400K V UPGRADE	Contract No	26491
		Test Pit No	FATP12
Client	SHE - Transmission	Test Run No	2
Engineer	Jacobs	Date of Test	24.08.23

Time (minute)	Depth to Water (m)
0	0.25
1	0.25
2	0.25
3	0.26
4	0.26
5	0.27
6	0.28
7	0.29
8	0.30
9	0.30
10	0.31
12	0.32
14	0.33
16	0.34
18	0.35
20	0.36
25	0.38
30	0.40
40	0.44
50	0.47
60	0.51
70	0.54
80	0.59
90	0.63
100	0.66

Weather Conditions
Sunny with mixed showers

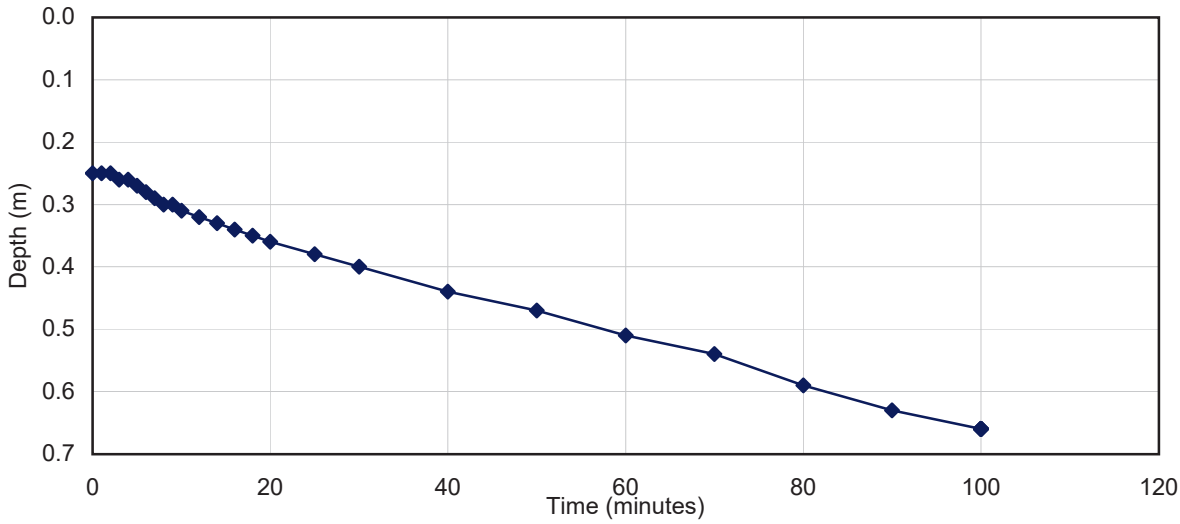
Non Engineering Strata Description
Orangish brown and light brown SAND

Test Pit Dimensions		
Length	m	1.80
Width	m	0.70
Depth	m	0.75

Test Parameters		
Maximum Effective Depth	m	0.25
75% Effective Depth	m	0.38
25 % Effective Depth	m	0.63
Effective Storage Volume	m^3	0.32
Surface Area a_{p50}	m^2	2.51
Time for 75%	min	25
Time for 25%	min	90
t_{p75-25}	min	65

Soil Infiltration Rate
3.2E-05 m/s

Comments
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Originator	Checked & Approved
JD	IM 29/09/2023

SOAKAWAY
BRE 365

62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK
Site Investigation & Laboratory Services

Site	LT519 FORT AUGUSTUS 400K V UPGRADE	Contract No	26491
		Test Pit No	FATP12
Client	SHE - Transmission	Test Run No	3
Engineer	Jacobs	Date of Test	24.08.23

Time (minute)	Depth to Water (m)
0	0.25
1	0.25
2	0.26
3	0.26
4	0.27
5	0.27
6	0.28
7	0.28
8	0.29
9	0.29
10	0.30
12	0.31
14	0.31
16	0.32
18	0.33
20	0.34
25	0.35
30	0.38
40	0.41
50	0.44
60	0.47
70	0.52
80	0.54
90	0.57
100	0.59
110	0.61
120	0.64

Weather Conditions
Sunny with mixed showers

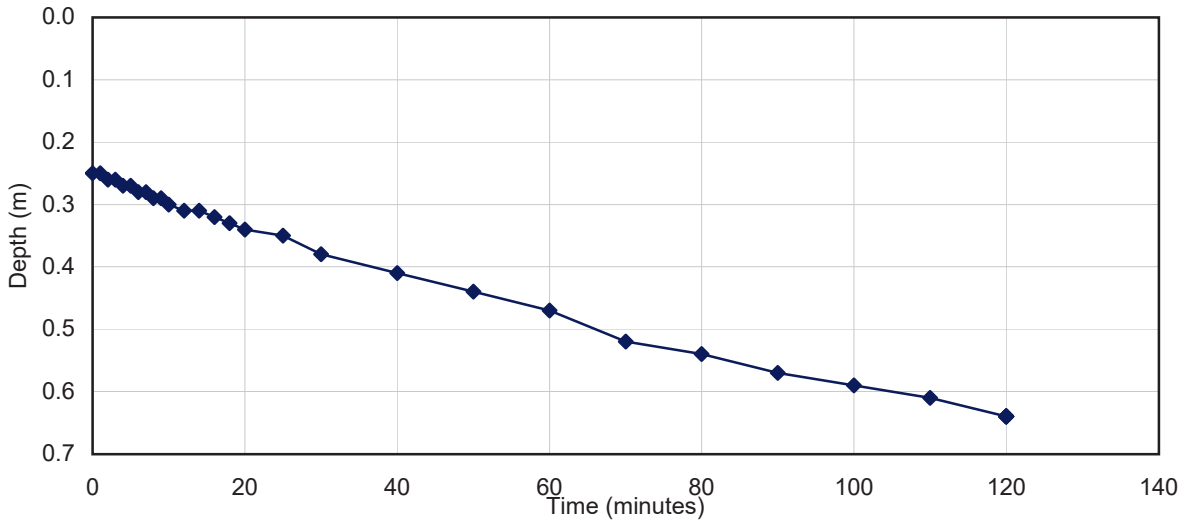
Non Engineering Strata Description
Orangish brown and light brown SAND

Test Pit Dimensions		
Length	m	1.80
Width	m	0.70
Depth	m	0.75

Test Parameters		
Maximum Effective Depth	m	0.25
75% Effective Depth	m	0.38
25 % Effective Depth	m	0.63
Effective Storage Volume	m^3	0.32
Surface Area a_{p50}	m^2	2.51
Time for 75%	min	30
Time for 25%	min	116.5
t_{p75-25}	min	87

Soil Infiltration Rate
2.4E-05 m/s

Comments
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Originator	Checked & Approved
JD	IM 29/09/2023

SOAKAWAY
BRE 365

62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK
Site Investigation & Laboratory Services

Site	LT519 FORT AUGUSTUS 400K V UPGRADE	Contract No	26491
		Test Pit No	FATP15
Client	SHE - Transmission	Test Run No	1
Engineer	Jacobs	Date of Test	23.08.23

Time (minute)	Depth to Water (m)
0	1.00
0.5	1.02
1	1.04
1.5	1.07
2	1.08
2.5	1.09
3	1.10
3.5	1.12
4	1.14
4.5	1.15
5	1.16
6	1.19
7	1.22
8	1.23
9	1.26
10	1.28
12	1.31
14	1.36
16	1.39
18	1.41
20	1.45
25	1.52
30	1.58
35	1.63
40	1.69
50	1.78
60	1.86

Weather Conditions
Sunny with mixed showers

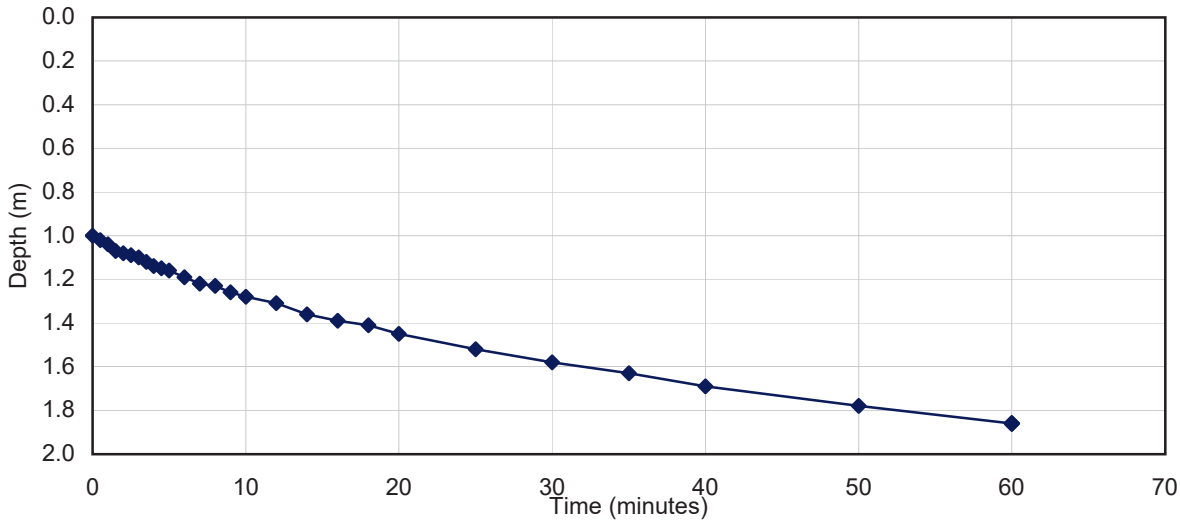
Non Engineering Strata Description
Orangish brown and light brown SAND and GRAVEL

Test Pit Dimensions		
Length	m	2.60
Width	m	0.90
Depth	m	2.00

Test Parameters		
Maximum Effective Depth	m	1.00
75% Effective Depth	m	1.25
25 % Effective Depth	m	1.75
Effective Storage Volume	m^3	1.17
Surface Area a_{p50}	m^2	5.84
Time for 75%	min	8.7
Time for 25%	min	46.5
t_{p75-25}	min	38

Soil Infiltration Rate
8.8E-05 m/s

Comments
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Originator	Checked & Approved
JD	IM 29/09/2023

SOAKAWAY
BRE 365

62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK
Site Investigation & Laboratory Services

Site	LT519 FORT AUGUSTUS 400K V UPGRADE	Contract No	26491
		Test Pit No	FATP15
Client	SHE - Transmission	Test Run No	2
Engineer	Jacobs	Date of Test	23.08.23

Time (minute)	Depth to Water (m)
0	0.95
0.5	0.96
1	0.97
1.5	0.98
2	0.98
2.5	0.98
3	0.99
3.5	0.99
4	1.00
4.5	1.01
5	1.02
6	1.04
7	1.05
8	1.06
9	1.08
10	1.10
12	1.13
14	1.16
16	1.18
18	1.22
20	1.24
25	1.28
30	1.33
40	1.43
50	1.50
60	1.57
70	1.64
80	1.72
90	1.75
100	1.78
120	1.81

Weather Conditions
Sunny with mixed showers

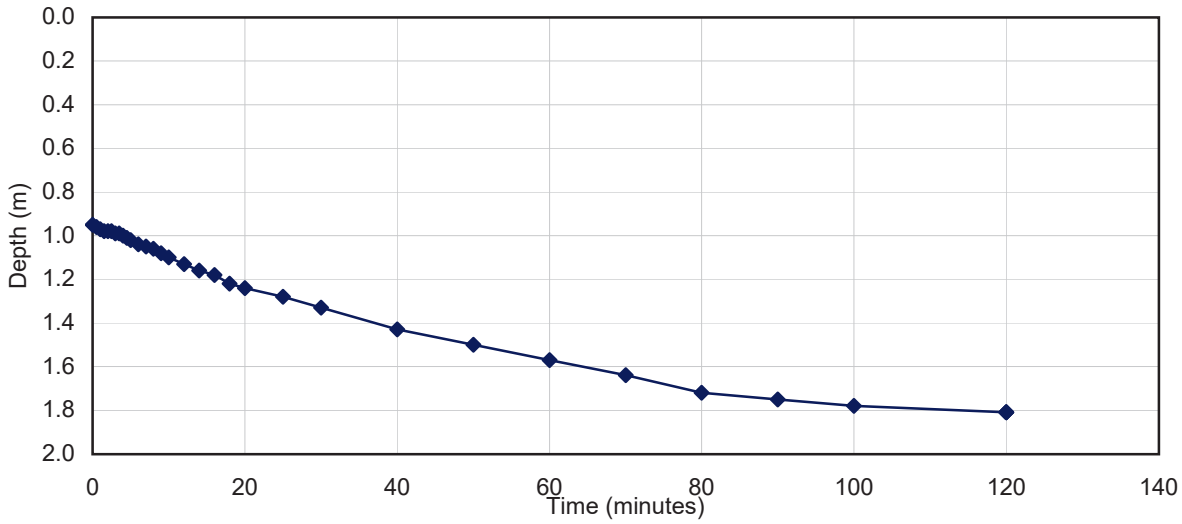
Non Engineering Strata Description
Orangish brown and light brown SAND and GRAVEL

Test Pit Dimensions		
Length	m	2.60
Width	m	0.90
Depth	m	1.95

Test Parameters		
Maximum Effective Depth	m	0.95
75% Effective Depth	m	1.20
25 % Effective Depth	m	1.70
Effective Storage Volume	m^3	1.17
Surface Area a_{p50}	m^2	5.84
Time for 75%	min	17
Time for 25%	min	77
t_{p75-25}	min	60

Soil Infiltration Rate
5.6E-05 m/s

Comments
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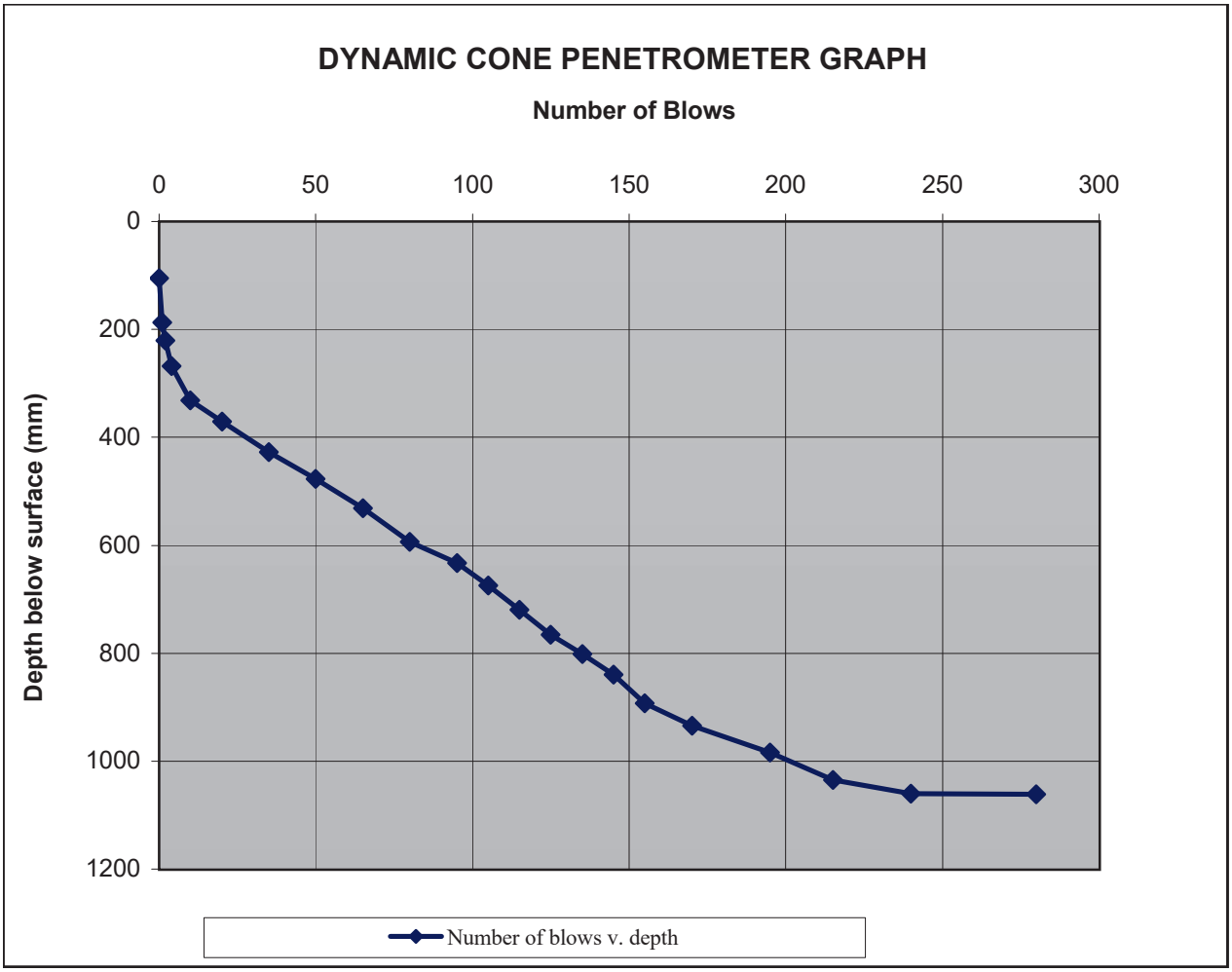
Originator	Checked & Approved
JD	IM 29/09/2023

SOAKAWAY
BRE 365

62 Rochsolloch Road, Airdrie, ML6 9BG

igne	Site: LT519 FORT AUGUSTUS 400K V UPGRADE Client: SHE - Transmission Engineer: Jacobs	**Contract No. 26491**

Date tested	24.08.23	Test Location	FATP 5
Tested by	JD	DCP No.	1
Weather	Dry, sunny	Zero Error (mm)	105



Start Depth (mm)	Finish Depth (mm)	No. of Blows	Blows per Layer	Material	DCP mm/blow	Estimated average CBR over depth range (%)
105	268	4	4	Topsoil	40.75	6
268	331	10	6	Unknown	10.50	25
331	633	95	85	Unknown	3.55	79
633	893	155	60	Unknown	4.33	64
893	1060	240	85	Unknown	1.96	148
1060	1061	280	40	Unknown	0.03	14907

Remarks:

Cone Angle 60° UKAS accredited test - No

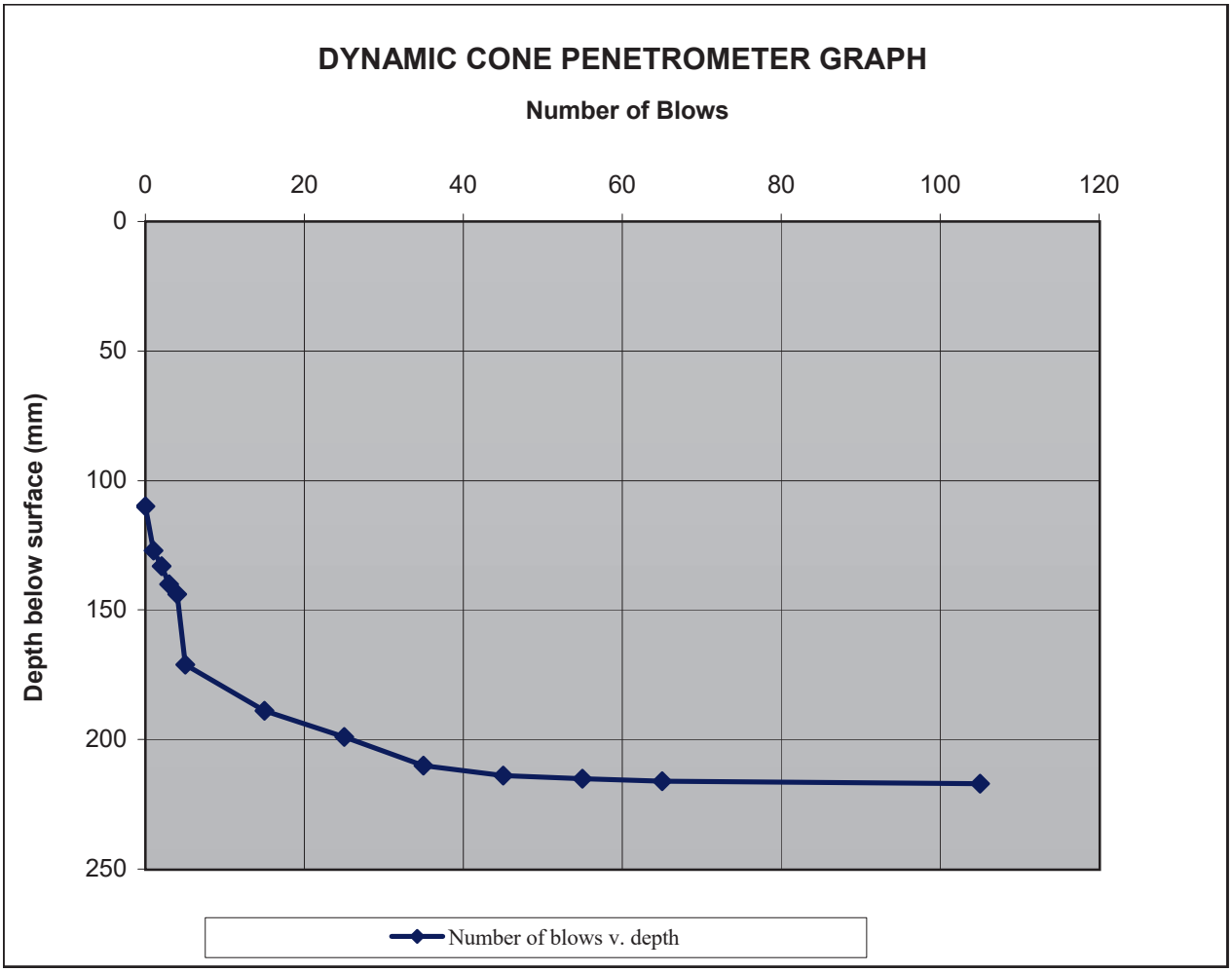
Test stopped to add extension rods at a depth of 877mm

Test stopped at 1061mm due to refusal of equipment to further penetration

Originator	Checked & Approved	Dynamic Cone Penetrometer	
IM	IM 29/09/2023	In-house procedure TP166 with reference to CS 229 cl 6 of the DMRB	Sheet 1 of 1

igne	Site: LT519 FORT AUGUSTUS 400K V UPGRADE	
	Client: SHE - Transmission	
	Engineer: Jacobs	

Date tested	23.08.23	Test Location	FATP 4
Tested by	JD	DCP No.	3
Weather	Dry, sunny	Zero Error (mm)	110



Start Depth (mm)	Finish Depth (mm)	No. of Blows	Blows per Layer	Material	DCP mm/blow	Estimated average CBR over depth range (%)
110	144	4	4	Topsoil	8.50	31
144	171	5	1	Unknown	27.00	9
171	210	35	30	Unknown	1.30	229
210	216	65	30	Unknown	0.20	1655
216	217	105	40	Unknown	0.03	14907

Remarks:

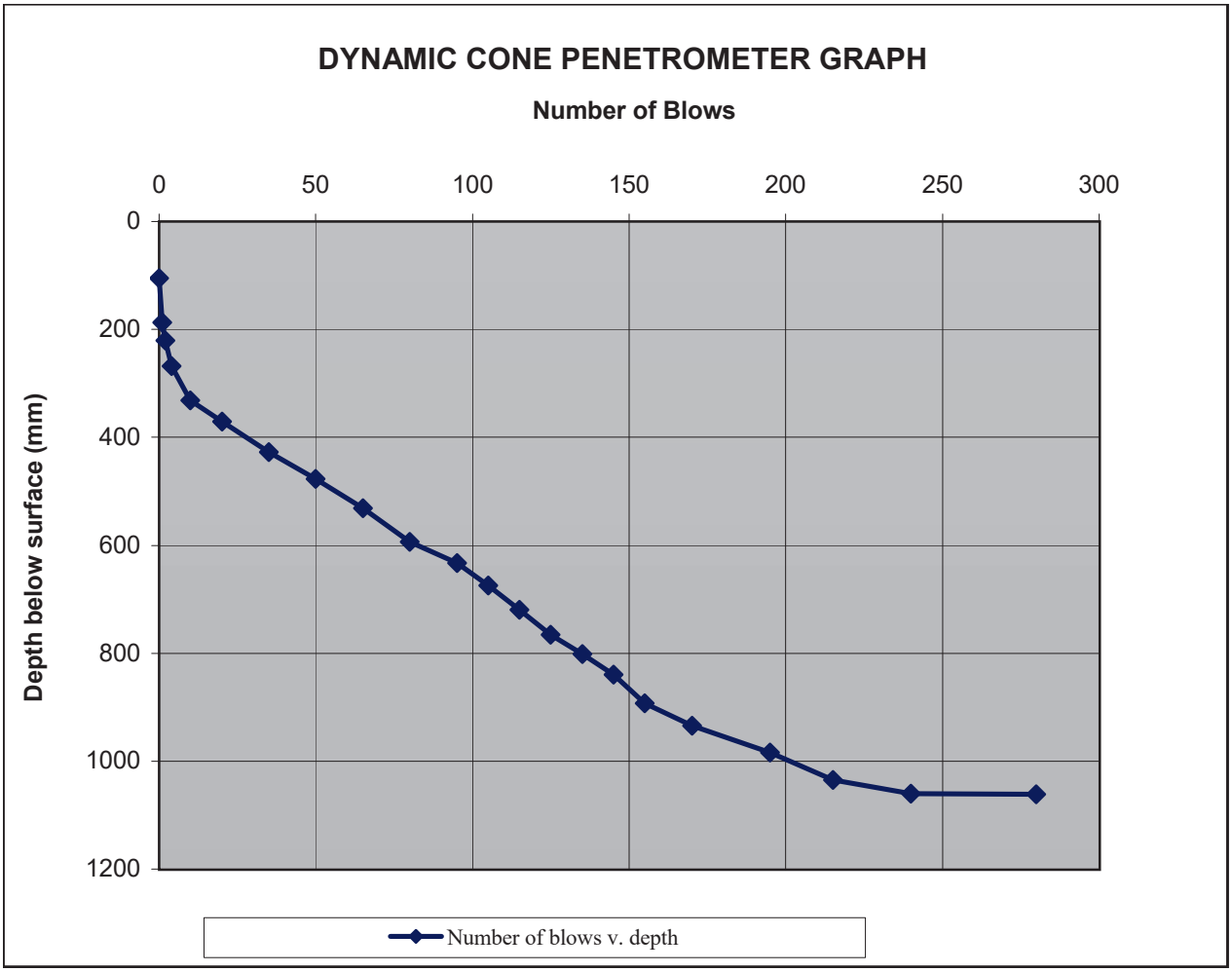
Cone Angle 60° UKAS accredited test - No

Test stopped at 217mm due to refusal of equipment to further penetration

Originator	Checked & Approved	Dynamic Cone Penetrometer	
IM	IM 29/09/2023	In-house procedure TP166 with reference to CS 229 cl 6 of the DMRB	Sheet 1 of 1

igne	Site: LT519 FORT AUGUSTUS 400K V UPGRADE	
	Client: SHE - Transmission	
	Engineer: Jacobs	

Date tested	24.08.23	Test Location	FATP 5
Tested by	JD	DCP No.	1
Weather	Dry, sunny	Zero Error (mm)	105



Start Depth (mm)	Finish Depth (mm)	No. of Blows	Blows per Layer	Material	DCP mm/blow	Estimated average CBR over depth range (%)
105	268	4	4	Topsoil	40.75	6
268	331	10	6	Unknown	10.50	25
331	633	95	85	Unknown	3.55	79
633	893	155	60	Unknown	4.33	64
893	1060	240	85	Unknown	1.96	148
1060	1061	280	40	Unknown	0.03	14907

Remarks:

Cone Angle 60° UKAS accredited test - No

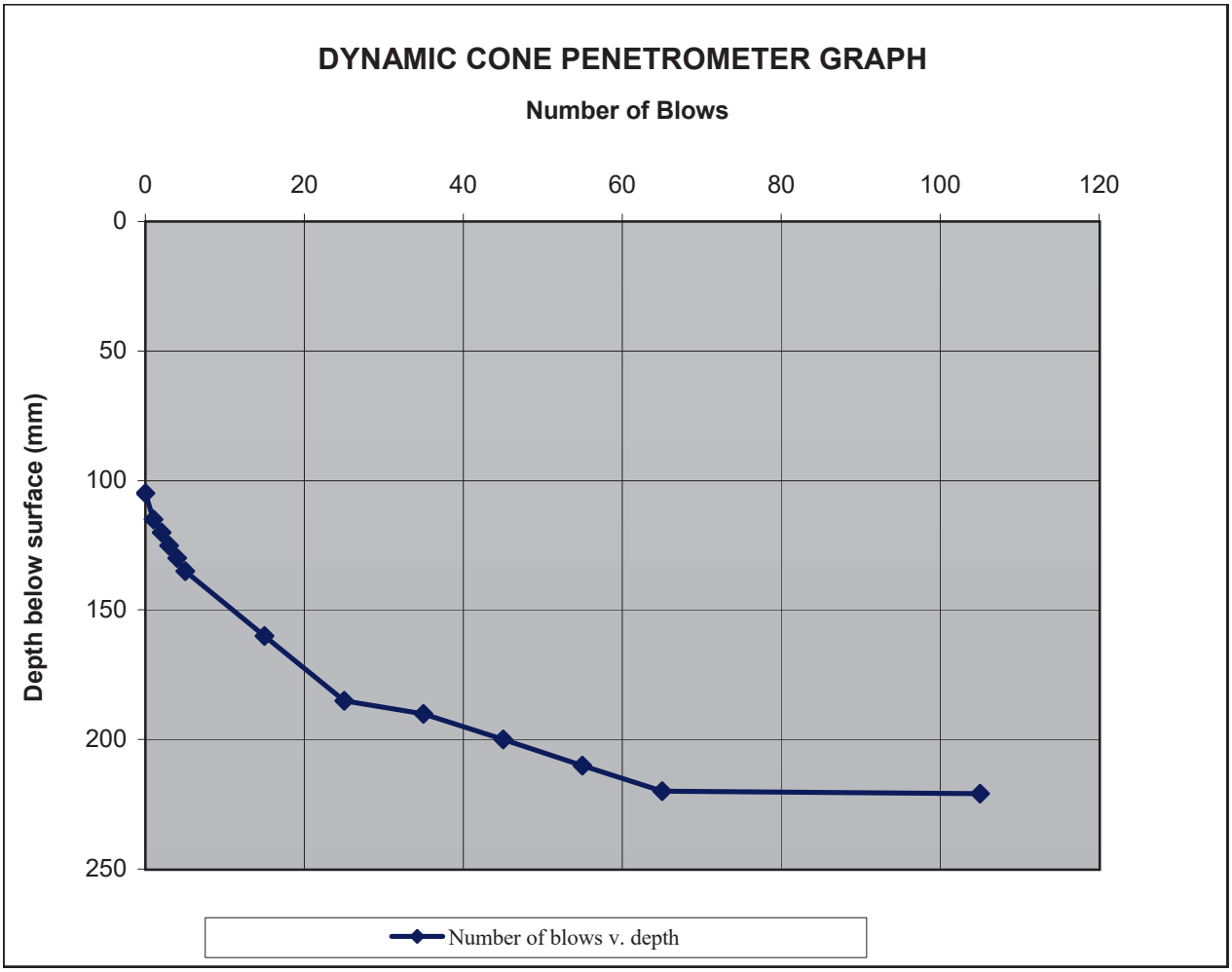
Test stopped to add extension rods at a depth of 877mm

Test stopped at 1061mm due to refusal of equipment to further penetration

Originator	Checked & Approved	Dynamic Cone Penetrometer	
IM	IM 29/09/2023	In-house procedure TP166 with reference to CS 229 cl 6 of the DMRB	Sheet 1 of 1

igne	Site: LT519 FORT AUGUSTUS 400K V UPGRADE	
	Client: SHE - Transmission	
	Engineer: Jacobs	

Date tested	23.08.23	Test Location	FATP 7
Tested by	JD	DCP No.	4
Weather	Dry, sunny	Zero Error (mm)	105



Start Depth (mm)	Finish Depth (mm)	No. of Blows	Blows per Layer	Material	DCP mm/blow	Estimated average CBR over depth range (%)
105	135	5	5	Brown SAND and GRAVEL	6.00	45
135	185	25	20	Unknown	2.50	115
185	190	35	10	Unknown	0.50	628
190	220	65	30	Unknown	1.00	302
220	221	105	40	Unknown	0.03	14907

Remarks:

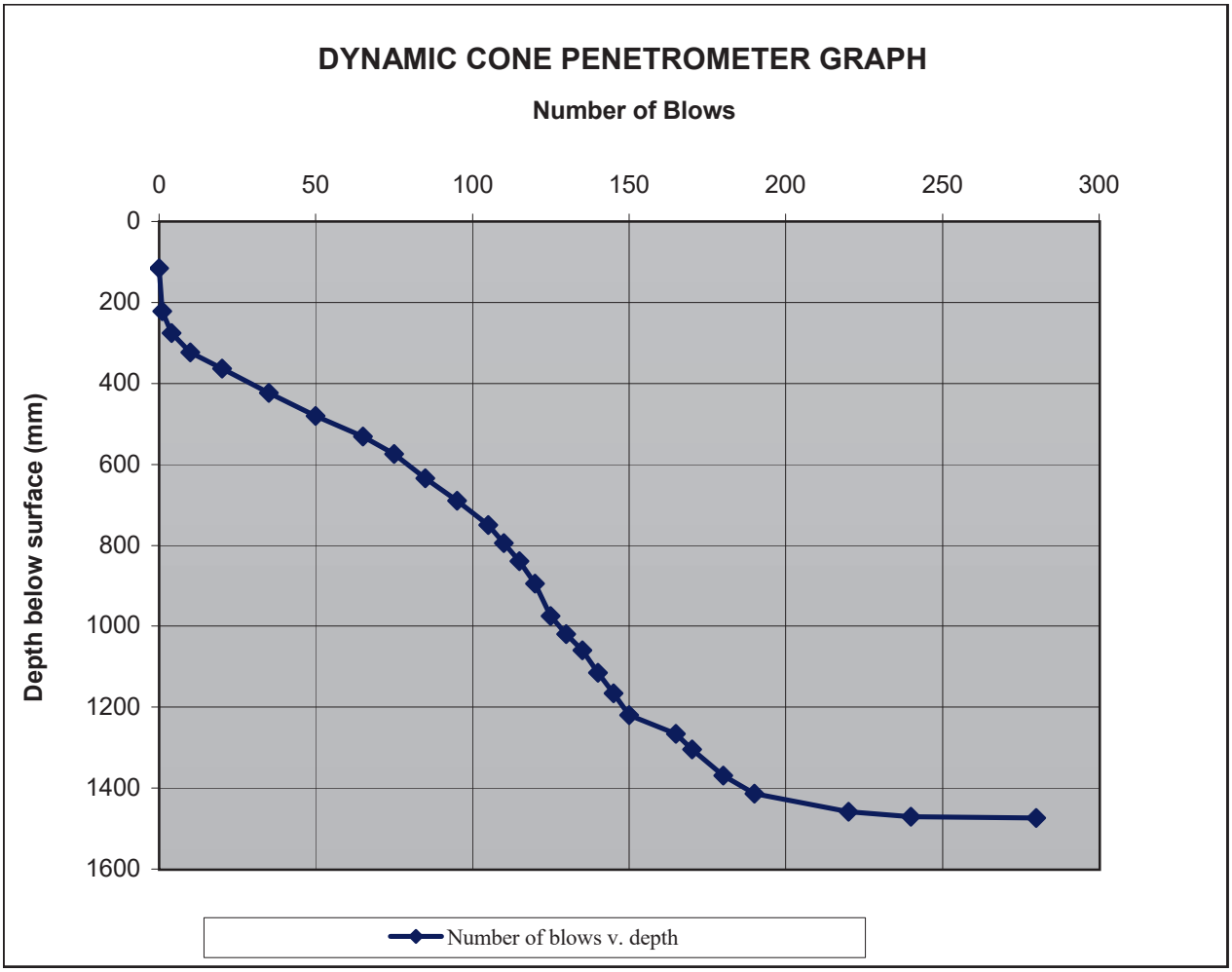
Cone Angle 60° UKAS accredited test - No

Test stopped at 221mm due to refusal of equipment to further penetration

Originator	Checked & Approved	Dynamic Cone Penetrometer	
IM	IM 29/09/2023	In-house procedure TP166 with reference to CS 229 cl 6 of the DMRB	Sheet 1 of 1

igne	Site: LT519 FORT AUGUSTUS 400K V UPGRADE	
	Client: SHE - Transmission	
	Engineer: Jacobs	

Date tested	23.08.23	Test Location	FATP 11
Tested by	JD	DCP No.	2
Weather	Dry, sunny	Zero Error (mm)	115



Start Depth (mm)	Finish Depth (mm)	No. of Blows	Blows per Layer	Material	DCP mm/blow	Estimated average CBR over depth range (%)
115	275	4	4	Topsoil	40.00	6
275	575	75	71	Unknown	4.23	66
575	750	105	30	Unknown	5.83	47
750	1220	150	45	Unknown	10.44	25
1220	1266	165	15	Unknown	3.07	92
1266	1414	190	25	Unknown	5.92	46
1414	1471	240	50	Unknown	1.14	263
1471	1474	280	40	Unknown	0.08	4667

Remarks:

Cone Angle 60° UKAS accredited test - No

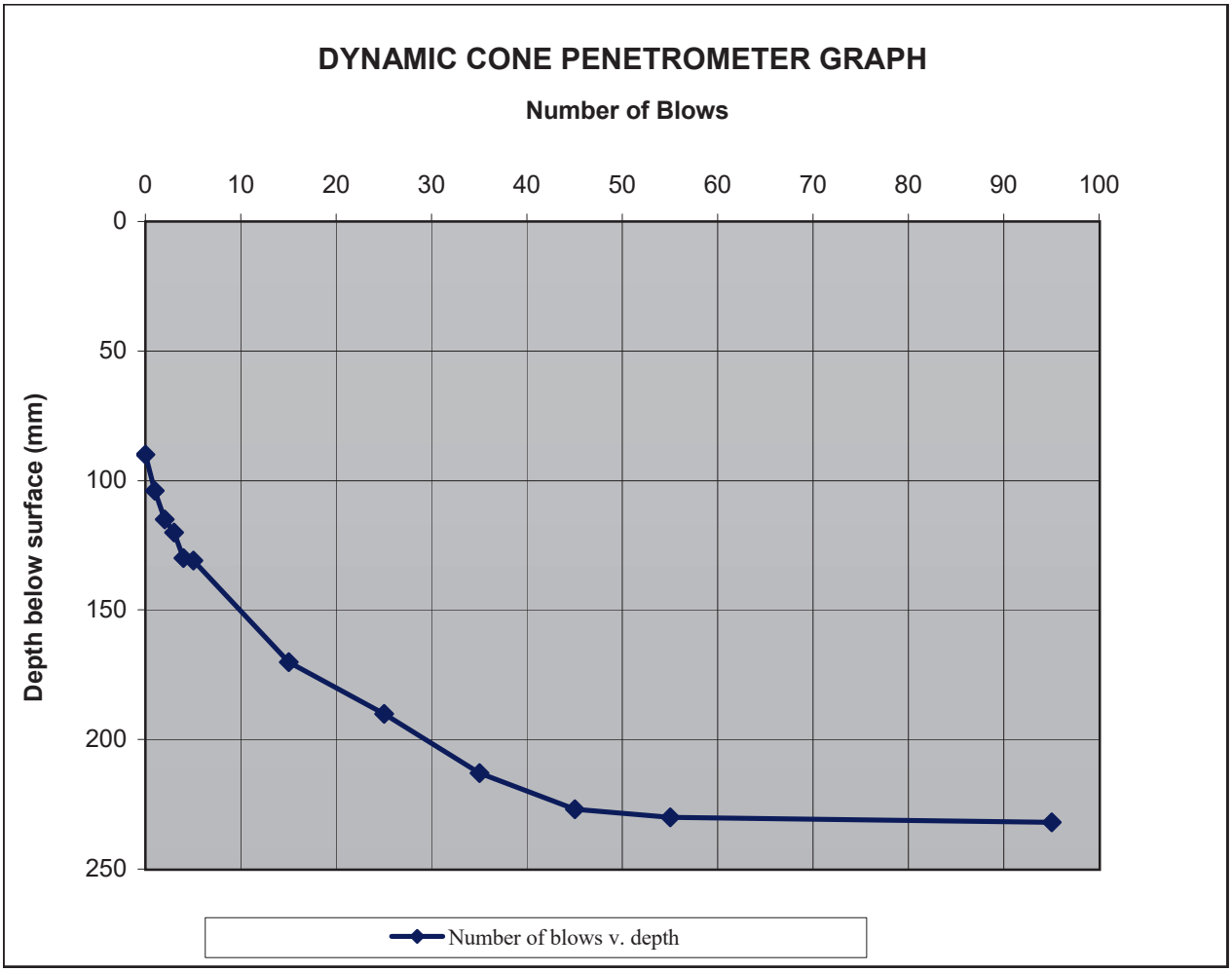
Test stopped to add extension rods at a depth of 895mm

Test stopped at 1474mm due to refusal of equipment to further penetration

Originator	Checked & Approved	Dynamic Cone Penetrometer	
IM	IM 29/09/2023	In-house procedure TP166 with reference to CS 229 cl 6 of the DMRB	Sheet 1 of 1

igne	Site: LT519 FORT AUGUSTUS 400K V UPGRADE	
	Client: SHE - Transmission	
	Engineer: Jacobs	

Date tested	23.08.23	Test Location	FATP 14
Tested by	JD	DCP No.	5
Weather	Dry, sunny	Zero Error (mm)	90



Start Depth (mm)	Finish Depth (mm)	No. of Blows	Blows per Layer	Material	DCP mm/blow	Estimated average CBR over depth range (%)
90	130	4	4	Brown SAND and GRAVEL	10.00	26
130	131	5	1	Unknown	1.00	302
131	170	15	10	Unknown	3.90	72
170	213	35	20	Unknown	2.15	134
213	227	45	10	Unknown	1.40	212
227	230	55	10	Unknown	0.30	1078
230	232	95	40	Unknown	0.05	7165

Remarks:

Cone Angle 60° UKAS accredited test - No

Test stopped at 232mm due to refusal of equipment to further penetration

Originator	Checked & Approved	Dynamic Cone Penetrometer	
IM	IM 29/09/2023	In-house procedure TP166 with reference to CS 229 cl 6 of the DMRB	Sheet 1 of 1

Appendix C. Stakeholder Consultation

C.1 Consultation with SEPA

September 2023

Scottish Environment Protection Agency
(By email: serviceonsepa sepa.org.uk)

Project Name: Fort Augustus
Project Number: B2413736

Subject: Fort Augustus Data Re uest

Dear Sir/Madam

We are currently undertaking a Flood Risk Assessment (FRA) on behalf of SSE, in support of a project to extend an existing substation in Fort Augustus.

The FRA is being prepared to appraise the impacts of the extension to the substation. The approximate location of the substation at Fort Augustus is NH 35233 08277.

Consequently, we are seeking any information that SEPA hold on flooding and drainage in the vicinity of the site, to inform our assessment of flood risk.

Specifically, we are seeking information on flooding and drainage at and near the above area (NH 35233 08277 – Fort Augustus). The site and areas of interest are attached to this letter (Figure 1).

We note from SEPA flood map risk information, and given the location of the site, that the site is at high risk of fluvial flooding, including the area where the extension is proposed.

We would be grateful for the following information:

- Confirmation of whether any part of the project site is considered a Critical Drainage Area
- Previous studies of flood risk in the area of interest, if available
- Details of flood defences which may affect the flood risk at the site including crest heights, associated standard of protection, and condition on last inspection. For the flood defences, please provide any available information on breach modelling outputs such as breach locations and local impacts downstream. If applicable, please provide details of improvements to these flood defenses.
- Any information related to groundwater (i.e., groundwater rebound, etc.) and groundwater flooding in this area. If possible, please provide borehole locations and levels, groundwater abstraction sites, and details of the strata monitored. Where the site lies within Groundwater Source Protection ones (GSP s) please provide plans showing these.
- Mapping of historical flood events on site, from all sources (i.e., fluvial, surface water, groundwater, sewer, reservoir, canal, etc.). Where available, could you please include flood levels, estimated return periods, photographs and reports and other such data as may be relevant to our flood risk assessment.
- Details about drainage within the area of interest/ local area including any known drainage problems
- Details to assist us in assessing whether collected surface water generated by the site can be discharged to soakaway or infiltration, in accordance with regulatory requirements. For example, details of sensitive aquifers in the area, known ground /groundwater contamination issues, soakage tests etc.

- Guidance on any surface water discharge requirements including: runoff rates, waterbody(-ies) to be discharged to, and any Sustainable Drainage System (SuDS) / bridge or culverting requirements that you may have
- An outline of any mitigation requirements, for example compensation storage, that you may have for the site

Please provide any other information that you think may be of use to help us produce an FRA for this development.

ours sincerely

James Buckley

Graduate Hydrologist

James.Buckley1 jacobs.com

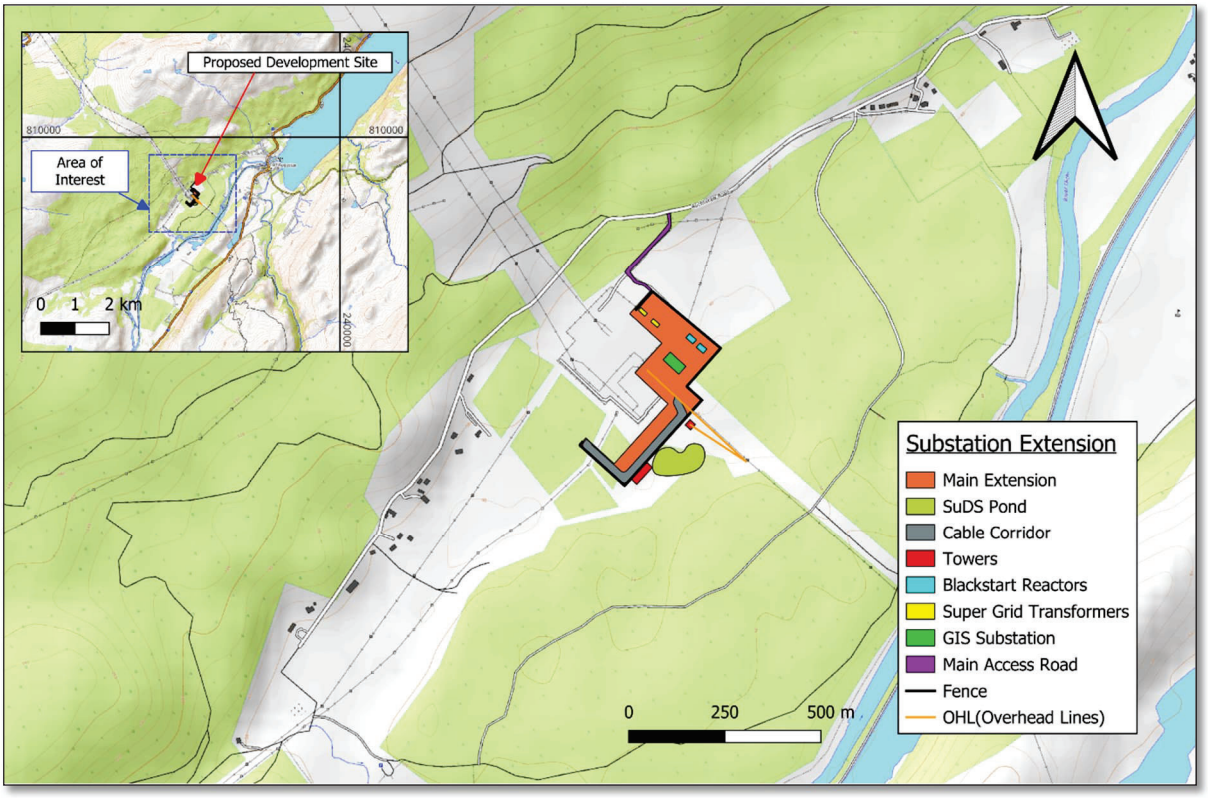


Figure 1. The area of interest for the Fort Augustus Flood Risk Assessment as well as an inlet map showing details of the proposed substation extension.

Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

RESPONSE TO F0196126

Request Timeline

Date	Status
10/10/2023	EIR Request received [statutory deadline 07/11/2023]
08/11/2023	Late request update issued
13/11/2023	EIR Response issued

Requested Information

[…] Flood Risk Assessment (FRA) […]

The approximate location of the substation at Fort Augustus is NH 35233 08277.

Specifically, we are seeking information on flooding and drainage at and near the above area (NH 35233 08277 – Fort Augustus). The site and areas of interest are attached to this letter (Figure 1).

We would be grateful for the following information:

1. Confirmation of whether any part of the project site is considered a Critical Drainage Area

2. Previous studies of flood risk in the area of interest, if available

3. Details of flood defences which may affect the flood risk at the site including crest heights, associated standard of protection, and condition on last inspection. For the flood defences, please provide any available information on breach modelling outputs such as breach locations and local impacts downstream. If applicable, please provide details of improvements to these flood defenses.

4. Any information related to groundwater (i.e., groundwater rebound, etc.) and groundwater flooding in this area. If possible, please provide borehole locations and levels, groundwater abstraction sites, and details of the strata monitored. Where the site lies within Groundwater Source Protection Zones (GSPZs) please provide plans showing these.

5. Mapping of historical flood events on site, from all sources (i.e., fluvial, surface water, groundwater, sewer, reservoir, canal, etc.). Where available, could you please include flood levels, estimated return periods, photographs and reports and other such data as may be relevant to our flood risk assessment.

6. Details about drainage within the area of interest/ local area including any known drainage problems

7. Details to assist us in assessing whether collected surface water generated by the site can be discharged to soakaway or infiltration, in accordance with regulatory requirements. For example, details of sensitive aquifers in the area, known ground / groundwater contamination issues, soakage tests etc.

8. Guidance on any surface water discharge requirements including: runoff rates, waterbody(-ies) to be discharged to, and any Sustainable Drainage System (SuDS) / bridge or culverting requirements that you may have

9. An outline of any mitigation requirements, for example compensation storage, that you may have for the site

10. Please provide any other information that you think may be of use to help us produce an FRA for this development.

Response

We confirm that we have handled your request under the terms of the Environmental

Information (Scotland) Regulations 2004 (EIRs).

We apologise for the delay in providing this response.

Q	Response	Data Reuse
[1]	**Confirmation of whether any part of the project site is considered a Critical Drainage Area** We are not involved in determining whether an area is a “Critical Drainage Area”. This is an Environment Agency term which is not routinely used by SEPA. Exceptions/Regulations Applied: **Regulation 10(4)(a) – Information not held**	In cases where no information is held, data reuse does not apply.
[2]	**Previous studies of flood risk in the area of interest, if available** We are not aware of, nor do we hold, any information on previous flood studies. **General Flood Risk Advice** Development within an area at risk of flooding is generally unacceptable, however, exceptions to this include essential infrastructure uses as outlined within Policy 22a of the National Planning Framework 4 www.gov.scot/publications/national-planning-framework-4/pages/1/ and SEPA’s Land Use Vulnerability Guidance. www.sepa.org.uk/media/143416/land-use-vulnerability-guidance.pdf In such cases, it will be demonstrated by the applicant that: • all risks of flooding are understood and addressed;	In cases where no information is held, data reuse does not apply.

Q	Response	Data Reuse
	• there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes; • the development remains safe and operational during floods; • flood resistant and resilient materials and construction methods are used; and • future adaptations can be made to accommodate the effects of climate change For essential infrastructure we also refer you to our Flood Risk Standing Advice, www.sepa.org.uk/media/534740/sepa-flood-risk-standing-advice-for-planning-authorities-and-developers.pdf particularly section 5 on essential infrastructure and water compatible uses. All the advice in that section should be followed. We still recommend that lower risk locations be considered first, and the layout is designed to avoid the highest risk areas of the site. It should be noted that the development should result in no reduction in floodplain capacity e.g. through landraising. Any parts of the development that need to be protected from flooding should therefore be located outside the areas at risk. SEPA's Future Flood Maps indicate which areas are at risk of flooding and they can be used in development design to avoid flooding as far as possible. Please note the above links have been provided under Regulation 9. We are currently updating all our guidance to bring it in line with National Planning Framework (NPF4). Guidance issued after 13 February has been updated. Whilst any guidance issued	

Q	Response	Data Reuse
	before this date will still contain relevant and useful information, you should be aware that some parts may be out of date. As a result, our planning consultation responses may not match the information set out in this guidance. Exceptions/Regulations Applied: **Regulation 9 – Advise and Assist** **Regulation 10(4)(a) – Information not held**	
[3]	**Details of flood defences which may affect the flood risk at the site including crest heights, associated standard of protection, and condition on last inspection. For the flood defences, please provide any available information on breach modelling outputs such as breach locations and local impacts downstream. If applicable, please provide details of improvements to these flood defenses.** Information on flood defences in Scotland can be accessed through the Scottish Flood Defence Asset Database (SFDAD), which you can register to access here: https://www.scottishflooddefences.gov.uk/. While this contains most defences, in some instances there are some for which information is not available. However, we can confirm that we are not currently aware of any additional defences to those listed in the SFDAD.	External link: please refer to terms and conditions on website. SEPA cannot advise about third party data re-use.

Q	Response	Data Reuse
	We recommend that you contact the Flood Risk Management team at Highland Council, who are the local flood risk management authority and are responsible for flood defences for that area. They will be able to provide further details on flooding and flood alleviation in this area, contact details provided in 'Application of Regulation/Exceptions' section below. Exceptions/Regulations Applied: **Regulation 9 – Advise and Assist** **Regulation 10(4)(a) – Information not held** **Regulation 14(1)(b) – Other Authority**	
[4]	**Any information related to groundwater (i.e., groundwater rebound, etc.) and groundwater flooding in this area. If possible, please provide borehole locations and levels, groundwater abstraction sites, and details of the strata monitored. Where the site lies within Groundwater Source Protection Zones (GSPZs) please provide plans showing these.** **Ground water flooding** We do not routinely comment on groundwater flood risk. Groundwater Flood Maps can be found on our website here map.sepa.org.uk/floodmap/map.htm	**SEPA Flood maps**: This data is licenced under the current Open Government Licence: www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Q	Response	Data Reuse
	Abstractions **There are no abstractions within the search area.** Please find attached a spreadsheet containing the authorisations within a 1km radius from the National Grid Reference (NGR) NH 35233 08277. The spreadsheet does not contain details for authorisation CAR/S/1195027. We have included a copy of the licence which may be of interest. • **F0196126 – 18-10-2023** • **CAR_S_1195027_Licence_Land_SW_Whitebridge_Cottage_Auchteraw_Fort_AugustusRR** Please note: • SEPA's Public Register remains impacted by the cyber-attack and we are rebuilding in phases. We are providing you with the best information we currently have available but cannot confirm it is complete or accurate. Any use you make of this information will be at your own risk. • Private drinking water supply abstractions of 10m^3 or less are covered by a General Binding Rule (GBR). As compliance with the GBR is mandatory and no formal SEPA authorisation or registration is required, we do not hold a record of these. It is the responsibility of the local authority to maintain a register of private drinking water supplies and we suggest you contact Highland Council for this	**Abstractions spreadsheet:** This data is licenced under the current Open Government Licence: www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Q	Response	Data Reuse
	information, contact details provided in 'Application of Regulation/Exceptions' section below. • In the interest of public safety, we cannot disclose the locations of public drinking water supply abstractions. **Groundwater Monitoring** There are no SEPA groundwater level monitoring locations within the area of interest. **Groundwater Source Protection Zones (GSPZs)** Source protection zones have not been defined in Scotland. However, all of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas (DWPA) and require protection for their current use or future potential as drinking water resources. www.sepa.org.uk/environment/water/monitoring/protected-areas/ DWPA in the Scotland River Basin District are defined by The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013. www.legislation.gov.uk/ssi/2013/29/made Maps of the DWPA have been published by the Scottish Government.	

Q	Response	Data Reuse
	www.gov.scot/publications/drinking-water-protected-areas-scotland-river-basin-district-maps/ Exceptions/Regulations Applied: **Regulation 9 – Advise and Assist** **Regulation 10(4)(a) – Information not held** **Regulation 11(2) – Personal Data** **Regulation 10(5)(a) – International relations, national security, public safety** **Regulation 14(1)(b) – Other Authority**	External link: please refer to terms and conditions on website. SEPA cannot advise about third party data re-use.
[5]	**Mapping of historical flood events on site, from all sources (i.e., fluvial, surface water, groundwater, sewer, reservoir, canal, etc.). Where available, could you please include flood levels, estimated return periods, photographs and reports and other such data as may be relevant to our flood risk assessment.** SEPA's Observed Flood Event database currently holds no records of flooding affecting your site of interest. SEPA's Observed Flood Event database is a collection of flood event records known to SEPA at this time and does not constitute a complete record of all flooding that may have occurred in the area.	In cases where no information is held, data reuse does not apply.

Q	Response	Data Reuse
	If we do not hold any records of flooding for an area, this does not mean it has never flooded, simply that we do not have a record of it. Exceptions/Regulations Applied: **Regulation 10(4)(a) – Information not held**	
[6]	**Details about drainage within the area of interest/ local area including any known drainage problems** We do not routinely provide comments or advice on drainage issues. This is better answered by the Local Authority (The Highland Council) or Scottish Water who have a duty to manage surface water runoff and drainage, their contact details are provided in 'Application of Regulation/Exceptions' section below. Exceptions/Regulations Applied: **Regulation 10(4)(a) – Information not held** **Regulation 14(1)(b) – Other Authority**	In cases where no information is held, data reuse does not apply.
[7]	**Details to assist us in assessing whether collected surface water generated by the site can be discharged to soakaway or infiltration, in accordance with regulatory requirements. For example, details of sensitive aquifers in the area, known ground / groundwater contamination issues, soakage tests etc.**	In cases where no information is held, data reuse does not apply.

Q	Response	Data Reuse
	We do not hold any records of land contamination issues at the site. The site is not identified as Contaminated Land under Part IIA of the Environmental Protection Act 1990. The local authority is in most instances to lead agency for land contamination under Part IIA of the Environmental Protection Act 1990 and should be contacted for information, The Highland Council's contact details are provided in 'Application of Regulation/Exceptions' section below. Exceptions/Regulations Applied: **Regulation 10(4)(a) – Information not held** **Regulation 14(1)(b) – Other Authority**	
[8]	**Guidance on any surface water discharge requirements including: runoff rates, waterbody(-ies) to be discharged to, and any Sustainable Drainage System (SuDS) / bridge or culverting requirements that you may have** We have a variety of guidance pages and documents that are publicly available on our website. Please refer to the CAR (Controlled Activities Regulations) Practical Guide www.sepa.org.uk/media/dw5de0kh/car-a-practical-guide.pdf which gives guidance regarding discharge (Section 3) and engineering works (Section 6).	Not applicable

Q	Response	Data Reuse
	For SuDS (sustainable urban drainage systems) you can look at the relevant page on the website www.sepa.org.uk/regulations/water/diffuse-pollution/diffuse-pollution-in-the-urban-environment/ If more guidance is still needed, then answers may be found on our guidance page www.sepa.org.uk/regulations/water/guidance/ Exceptions/Regulations Applied: **Regulation 6(1)(b) - Publicly Available**	
[9]	**An outline of any mitigation requirements, for example compensation storage, that you may have for the site** Pre-application advice can be sought from our Planning colleagues. They would consult relevant teams in SEPA for comment. We would then be able to provide advice regarding the application and what is likely to be acceptable under Scottish Planning Guidance/Policy in regard to flood risk as well as outline any requirements, like mitigation in this case. There is a section on our website that summarises what SEPA can provide planning advice on - www.sepa.org.uk/environment/land/planning/ and includes a link to a Word document with the relevant planning email addresses.	Not applicable

Q	Response	Data Reuse
	Exceptions/Regulations Applied: **Regulation 9 – Advise and Assist**	
10	**Please provide any other information that you think may be of use to help us produce an FRA for this development.** We do not hold any further information that may be of use in a Flood Risk Assessment (FRA). **Regulation 10(4)(a) – Information not held**	In cases where no information is held, data reuse does not apply.

Application of Regulations and Exceptions

Section 39(2)

The information you are requesting is environmental information. We have applied Section 39(2) of the Freedom of Information (Scotland) Act 2002 (FOISA). We are therefore handling your request under the Environmental Information (Scotland) Regulations 2004 (EIRs).

Regulation 6(1)(b) Publicly Available and Easily Accessible

Where we have advised above that information is publicly available & easily accessible Regulation 6(1)(b) applies, the text of which is reproduced below;-

6(1) Where an applicant requests that environmental information be made available in a particular form or format, a Scottish public authority shall comply with that request unless- (b) the information is already publicly available and easily accessible to the applicant in another form or format.

Regulation 9 – Advice and assistance

Where we have issued additional information or advice this is provided in line with SEPA's duty to advise and assist under Regulation 9 of The Environmental Information (Scotland) Regulations 2004.

Regulation 10(4)(a) – Information not held

Where we have advised above that SEPA does not hold this information it is excepted under Regulation 10(4)(a) of the Environmental Information Regulations 2004. The text of which is reproduced below;

(4) A Scottish public authority may refuse to make environmental information available to the extent that;- (a) it does not hold that information when an applicant's request is received.

The exception in regulation 10(4)(a) is subject to the public interest test in regulation 10(1)(b) of the EIRs. As SEPA does not hold the information in question there is no conceivable public interest in requiring that the information be made available.

Regulation 10(5)(a) – International relations, national security, public safety

The locations of public drinking water supply abstractions are withheld from release under the terms of Regulation 10(5)(a) of the EIRs. The text of which is reproduced below.

10 (5) A Scottish public authority may refuse to make environmental information available to the extent that its disclosure would, or would be likely to, prejudice substantially, (a) international relations, defence, national security or public safety;

The Public Interest Test was carried out in relation to the information which is to be withheld under Regulation 10(5)(a) of the EIRs. It is acknowledged that there are public interest arguments in favour of disclosure of the subject information. However, there is a stronger public interest in withholding information that if disclosed would likely to prejudice substantially public safety in providing the locations of the public's drinking water supplies.

Regulation 11(2) – Personal data

Personal data relating to SEPA staff and private individuals has been redacted from the released documents in accordance with Regulation 11(2) of the EIRs and Data Protection Principles. SEPA has not withheld complete documents which contain such personal data and have released all other information within the document.

Regulation 14(1)(b) – Other authority

As confirmed above SEPA does not hold this information. In accordance with the terms of the EIRs regulation 14(1)(b), The text of which is reproduced below.

14(1) Where a Scottish public authority has received a request to make environmental information available and does not hold that information but believes that another public authority holds the information requested then it shall (b) supply the applicant with the name and address of that other authority,

We advise that you contact:

Freedom of Information Officer

The Highland Council
Headquarters
Glenurquhart Road
Inverness
IV3 5NX
www.highland.gov.uk/info/704/data_protection_and_freedom_of_information/340/freedom_of_information

Scottish Water
The Bridge
6 Buchanan Gate
Stepps
Glasgow
G33 6FB
Email: foi@scottishwater.co.uk

www.scottishwater.co.uk/help-and-resources/access-to-information

What to expect when making a Request for Information

Each request for information, under The Environmental Information (Scotland) Regulations 2004 or the Freedom of Information (Scotland) Act 2002, is formally logged by the authority. The request falls within a process that has two internal stages carried out by the authority; a right of appeal to the Scottish Information Commissioner followed by an appeal to the Court of Session on a point of law only.

•Stage 1 – Request for information
•Stage 2 – Formal Review
•Stage 3 – Appeal for decision by Scottish Information Commissioner (OSIC)
•Stage 4 – Appeal to the Court of Session on a point of law only.

Each enquiry will have a unique Reference Number which should be quoted when you contact us.

How you will be kept informed

You will receive an acknowledgement for your request and Formal Review. We aim to reply to all enquiries promptly, within 20 working days. You will receive a response along with the requested information and/or an explanation regarding any withheld information. We may also contact you if we require clarification or if we are issuing a fees notice.

What happens once your enquiry has been responded to?

If you are not happy with the response or have failed to receive a response, you have the right to request a Formal Review from SEPA.

Guidance on your rights and how to ask for a review is on the Scottish Information Commissioner's website; http://itspublicknowledge.info/YourRights/Askingforareview.aspx

We will ensure that all personal data is processed, recorded and retained in accordance with the requirements of the Data Protection Act 2018 throughout the handling of each request. You have a right to see information about yourself via submitting a Subject Access Request under the Data Protection Act 2018.

What to do if you are not happy with how your enquiry and review were handled

If you are unsatisfied with our Formal Review response or have failed to receive a response, you can then appeal to the Scottish Information Commissioner via the links below.

www.itspublicknowledge.info/appeal
http://www.itspublicknowledge.info/home/ContactUs/ContactUs.aspx

Should you wish to appeal against the Scottish Information Commissioner's decision, you have the right to appeal to the Court of Session on a point of law only. Any such appeal must be made within 42 days after the date of intimation of the decision.

SEPA
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SCOTTISH ENVIRONMENT PROTECTION AGENCY

WATER ENVIRONMENT AND WATER SERVICES (SCOTLAND) ACT 2003
WATER ENVIRONMENT (CONTROLLED ACTIVITIES) (SCOTLAND) REGULATIONS 2011 ("THE REGULATIONS")

WATER USE LICENCE

Licence Number:	CAR/S/1195027
Responsible Person:	Global Infrastructure Scotland Limited
Site or Location of Activity/Activities	Land 325m SW of Whitebridge Cottage Auchteraw Fort Augustus PH32 4BT

The Scottish Environment Protection Agency, in accordance with regulations 8 and 15 of the Regulations, hereby authorises the carrying on of the controlled activity or activities set out in Schedule 1 of this licence, at or near or in connection with the site or location set out above, subject to the requirements of the Regulations and to the conditions contained in the schedules attached to and forming part of this licence.

The person responsible for securing compliance with this licence and its conditions ("the responsible person") shall be Global Infrastructure Scotland Limited, company registration number SC289013, having its registered office at Beauly Quarry, Wester Balblair, Beauly, Inverness-Shire, Scotland, IV4 7BG.

This licence and its conditions shall, except where otherwise provided in any of those conditions, take effect on 15 December 2020.

Signed: [redacted]..... Date: 15 December 2020

Authorised to sign on behalf of the
Scottish Environment Protection Agency

Right of Appeal

You are entitled to appeal to the Scottish Ministers, within three months of the date of this licence, if you have been granted a form of authorisation which is different from the form of authorisation which you believe ought to have been granted (under regulation 50(b) of the Regulations) or against any condition or conditions of this licence (under regulation 50(c) of the Regulations). The bringing of an appeal against a condition will not have the effect of suspending the operation of the condition. The procedures for the making of an appeal are set out in Schedule 9 of the Regulations.

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CONTENTS

INTERPRETATION OF TERMS 2
SCHEDULE 1. CONTROLLED ACTIVITIES 5
1.1. Specification of the Authorised Activities 5
1.2. Purpose of the Authorised Activities 5
SCHEDULE 2. GENERAL CONDITIONS 6
2.1. Responsible person 6
2.2. Environmental harm 6
2.3. Incidents 6
2.4. Records 6
2.5. Notifications 6
2.6. Reports and submissions 7
2.7. Construction Phase 7
SCHEDULE 3. FURTHER GENERAL CONDITIONS APPLYING TO THE ACTIVITIES LISTED IN TABLE 1.1 9
3.1. Timing of works 9
3.2. Drawing(s) 9
3.3. Method statement 9
SCHEDULE 4. CONDITIONS APPLYING TO IMPOUNDING WORKS LISTED IN TABLE 1.1 10
SCHEDULE 5. CONDITIONS APPLYING TO CHANNEL MODIFICATION ACTIVITY LISTED IN TABLE 1.1 11
5.1. Channel modification at NH 3574 0834 11

INTERPRETATION OF TERMS

For the purposes of this licence, and unless the context requires otherwise, the following definitions shall apply:

Generic

"the Act" means the Water Environment and Water Services (Scotland) Act 2003;

"controlled activity" means an activity to which the Regulations apply, in accordance with regulation 3(1) of the Regulations;

"incident" means:

- any accident which has had or could have an adverse impact on the water environment; or
- any malfunction, breakdown or failure of plant or techniques which has had or could have an adverse impact on the water environment; or
- any event, such as force majeure or action taken to save human life or limb, which results, or is likely to result, in a breach of any condition of this licence;

"pollution", in relation to the water environment, means the direct or indirect introduction, as a result of human activity, of substances or heat into the water environment, or any part of it, which may give rise to any harm, and "harm" shall have the same meaning as in the Act;

"responsible person" means the person who is responsible for securing compliance with the terms of this licence and has been identified as such by SEPA in accordance with regulation 8(6) of the Regulations, and in this context 'person' includes a body corporate, limited liability partnership and Scottish partnership;

"the Regulations" means the Water Environment (Controlled Activities) (Scotland) Regulations 2011;

"SEPA" means the Scottish Environment Protection Agency;

"SEPA officer" means a person authorised by SEPA under regulation 31(4) of the Regulations or, pursuant to paragraph 6(c) of Schedule 10 of the Regulations, under regulation 27(4) of the Water Environment (Controlled Activities) (Scotland) Regulations 2005;

"the water environment" means all surface water, groundwater and wetlands; and "surface water", "groundwater" and "wetlands" shall have the same meanings as in the Act;

"body of inland surface water" means a body of surface water which is also inland water; and "body of surface water" and "inland water" shall have the same meanings as in the Act;

"watercourse" shall have the same meaning as in the Act;

Impounding works

"fish pass" means any fish pass, ladder, fish way, lift or other device which facilitates the free passage, upstream or downstream, of fish around, over or through an impounding works;

"height", in relation to an impounding works, means the height as measured from the downstream toe of the impounding works to the crest or top of the spillway;

"impounding works" means, in relation to surface water -

- any dam, weir or other works by which water may be impounded,
- any works diverting the flow of water in connection with the construction or alteration of any dam, weir or other works falling within paragraph a);

"natural reasons" means any reason which is not related to (a) the operation of an impounding works or (b) the abstraction of surface water by the operator of an impounding works or (c) the abstraction of surface water for a purpose for which an impounding works was constructed or is being used;

"normal operation" means the operation of an impounding works under normal operating rules and management agreements without incidents or major maintenance works;

Engineering works

"bankfull" means the highest point on the bank of any watercourse at which flowing water is held within the channel of the watercourse before spilling over onto the floodplain;

"bank height" means the height of the bank of any body of inland surface water measured vertically from the bank toe to the bank top, excluding any artificial heightening of the bank (e.g. embankments, retaining walls);

"bank toe" means the lowest point on the bank of any body of inland surface water where the bank meets the bed of the body of inland surface water;

"bank top" means the first major break in the slope of the bank of any body of inland surface water, beyond which cultivation or development would be possible;

"channel" means the bankfull cross-section that any watercourse occupies, including any exposed bars and vegetated islands;

"channel width" means the straight line distance that is between opposite bank toes of a watercourse and which spans the bed of the watercourse, including any exposed bars and vegetated islands;

"destabilise" means significantly disturb the natural state of balance between sediment erosion and deposition;

"existing" means existing prior to any works authorised by this licence being carried out;

"hydraulic drop" means any sudden change in the water level of any watercourse;

"left" or "right", in relation to the bank of any watercourse, shall be determined when facing downstream;

"substrate" means the material making up the bed of any body of inland surface water

Any reference to a numbered Condition, numbered Paragraph, group of Conditions, group of Paragraphs, Schedule, Table, Appendix or Figure or is a reference to the condition, paragraph, group of conditions, group of paragraphs, schedule, table, appendix or figure bearing that number in this licence.

Except where specified otherwise in this licence:

- "day" means any period of 24 consecutive hours,
- "week" means any period of 7 consecutive days,
- "month" means a calendar month,
- "quarter" means a calendar quarter,
- "year" means any period of 12 consecutive months;

and any derived words (e.g. "monthly", "quarterly") shall be interpreted accordingly.

Except where specified otherwise in this licence, any reference to an enactment or statutory instrument includes a reference to it as amended (whether before or after the date of this licence) and to any other enactment, which may, after the date of this licence, directly or indirectly replace it, with or without amendment.

SCHEDULE 1. CONTROLLED ACTIVITIES

1.1. Specification of the Authorised Activities

1.1.1. This licence authorises the controlled activities set out in the first column of Table 1.1 below that are carried on at the national grid reference (NGR) given for each of them in the second column of that table.

1.1.2. The location of each of those activities is referred to throughout this licence by the name or reference given for it in the fourth column of Table 1.1 below.

1.1.3. The activities specified above ("the Authorised Activities") are authorised subject to the general conditions contained in Schedule 2.

1.1.4. Each of the Authorised Activities is authorised subject also to the particular conditions contained in the numbered schedule or schedules of conditions given for it in the fifth column of Table 1.1 below.

1.2. Purpose of the Authorised Activities

1.2.1. The Authorised Activities are for the primary purpose of realignment of a watercourse and flood defence to enable reinforcement of electrical substation assets.

Table 1.1: Authorised Activities

Controlled Activity	NGR	Affected Waters	Name/Reference	Applicable Schedule(s) of Conditions
Construction and operation of impounding works for flood defence	NH 3608 0809	Unnamed tributary of Auchteraw Burn	Fort Augustus Substation Dev, Eng Wks, Flood Defence on U/T of Auchteraw Burn	Schedule 3 & 4
Realignment of a watercourse	NH 3574 0834	Unnamed tributary of Auchteraw Burn	Fort Augustus Substation Dev, Eng Wks, Realignment on U/T of Auchteraw Burn	Schedule 3 & 5

SCHEDULE 2. GENERAL CONDITIONS

2.1. Responsible person

2.1.1. The responsible person to whom this licence is issued shall secure compliance with the conditions contained within it.

2.2. Environmental harm

2.2.1. Other than as specifically permitted or limited by any condition of this licence, none of the Authorised Activities shall have a significant adverse impact on, or cause pollution of, the water environment.

2.3. Incidents

2.3.1. In the event of an incident, SEPA shall be **notified** without delay and in any case by the next working day after identification of the incident, such notification to include:

(a) the time and duration of the incident,

(b) a description of the cause of the incident,

(c) any effect on the environment as a result of the incident and

(d) any measures taken to minimise or mitigate the effect and prevent a recurrence.

2.3.2. Where requested by SEPA, a written **report** shall be made following any incident, containing such further information as SEPA reasonably requires.

2.4. Records

2.4.1. A copy of this licence and, subject to Condition 2.4.2 below, of every record made in compliance with a condition of this licence shall be:

(a) kept on site or at another location agreed with SEPA in writing, such that they are readily accessible for examination by all relevant persons, and

(b) made available to a SEPA officer on request.

2.4.2. Unless otherwise specified in a condition of this licence, every such record shall be:

(a) preserved for not less than five years from the date of its being made; and

(b) kept as set out in Condition 2.4.1 for not less than one year from the date of its being made and thereafter at a location previously **notified** to SEPA in writing, if that location is not the site or other location agreed as above.

2.4.3. All such records shall be legible, and any amendment made to any record shall be made in such a way as to leave the original entry clear and legible, with the reason for each amendment explained in the said record.

2.5. Notifications

2.5.1. Where any condition of this licence requires SEPA to be **notified**, the notification shall be made using the contact details for notifications given in the explanatory notes attached to this licence, unless the condition in question requires otherwise.

2.6. Reports and submissions

2.6.1. Where any condition of this licence, as specified in the second column of Table 2.1 below, requires information to be **reported** or **submitted**, the following shall apply:

(a) The report or submission shall be forwarded to SEPA at the address for reports given in the explanatory notes attached to this licence, unless otherwise agreed in writing with SEPA.

(b) The report or submission shall be in a format agreed with SEPA or, failing such agreement, in a format specified by SEPA.

(c) The report or submission shall be forwarded by the date(s) or within the period or at the frequency specified in the third column of Table 2.1 below, as applicable.

(d) Where applicable, the first such report shall be due on the date specified in the fourth column of that table.

(e) The report or submission shall include the reference number of this licence and the name of the responsible person.

Table 2.1: Summary of Reporting and Submission Requirements

Summary of information to be reported/submitted	Licence Condition	Date by / period within / frequency at which to be reported/submitted	Date first report due
Incident follow-up	2.3.2	Within 14 days of SEPA's request	N/A
Method Statement	3.2.1 and 3.2.3	No less than 4 weeks prior to the proposed date of commencement and if any change proposed.	N/A

2.7. Construction Phase

2.7.1. All reasonable steps shall be taken to prevent the transport of sediment or other matter disturbed by the works into waters beyond the worked stretch.

2.7.2. Vegetation shall be removed only to the extent necessary to carry out the activities. Any vegetation that is removed shall not be disposed of into any inland surface water.

2.7.3. The activity should be undertaken in accordance with the method statement to prevent the spread of invasive non-native species

2.7.4. During the activities all reasonable steps shall be taken to ensure that work does not result in increased erosion of the bed or banks of the inland surface water.

2.7.5. Any vehicle, plant or other equipment used in connection with the Authorised Activities shall only be operated in surface water or wetlands where it is impracticable for it to be operated on dry land.

2.7.6. Any such vehicle, plant or other equipment used in or near any surface water or wetland shall be maintained and/or bunded so as to prevent spillage of any oil, fuel or other matter liable to cause pollution of the water environment.

2.7.7. The refuelling and/or washing of any such vehicle, plant or other equipment shall be undertaken at least 10 metres from any surface water, wetland or any groundwater abstraction point, and water from such washing shall be prevented from entering any surface water, wetland or groundwater abstraction point.

2.7.8. Any such vehicle, plant or other equipment shall not be operated in surface water if there is a reasonable likelihood that, within 50 metres of such an operation, there are freshwater pearl mussels.

2.7.9. Any static plant or equipment used temporarily within 10 metres of any surface water or wetland shall be positioned on a suitably sized and maintained impervious drip tray with a capacity equal to 110% of the capacity of the fuel tank which is supplying the said plant or equipment.

SCHEDULE 3. FURTHER GENERAL CONDITIONS APPLYING TO THE ACTIVITIES LISTED IN TABLE 1.1

3.1. Timing of works

3.1.1. No construction works authorised by this licence shall be commenced until SEPA has approved the required method statement for that works in terms of Condition(s) 3.3.2.

3.1.2. The activities shall be completed by 04 May 2021, proposed changes to the completion date shall be submitted in writing for approval by SEPA.

3.1.3. The activities shall not be undertaken during periods in which fish are likely to be spawning in the inland surface water nor in the period between any such spawning and the emergence of juvenile fish[1].

3.2. Drawing(s)

3.2.1. The activities shall be carried out in accordance with the drawing(s) 22396-130 Rev 03, 22396-131 Rev 01, 22396-132 Rev 02, 22396-140 Rev 05, 22396-141 Rev 06, 22396-142 Rev 05, 22396-143 Rev 05, 22396-145 Rev 02, 22396-146 Rev 04, 22396-147 Rev 02, as submitted with the application for this licence. Where any licence condition conflicts with the drawing(s), the licence condition shall take precedence over the drawing(s).

3.2.2. Proposed changes to the drawing(s) shall be submitted in writing to SEPA and the proposed changes shall not be implemented until SEPA has given its written agreement.

3.3. Method statement

3.3.1. No less than 4 weeks prior to the proposed date of commencement of the activities, a method statement shall be submitted to SEPA for approval detailing the method of construction of each said activity.

3.3.2. Following adjustment, if necessary, and written approval by SEPA of each method statement, construction of the activities shall be carried out in accordance with the approved method statement(s).

3.3.3. No changes shall be made to any approved method statement(s) without SEPA's prior written approval.

[1] For advice on the presence of fish please consult with NatureScot (www.nature.scot) and Fisheries Management Scotland (www.fms.scot)

SCHEDULE 4. CONDITIONS APPLYING TO IMPOUNDING WORKS LISTED IN TABLE 1.1

4.1.1. The height of the impoundment structure described in Table 1.1 shall not exceed 3.56 metres.

4.1.2. Four pipe culverts shall be installed.

4.1.3. The culverts shall extend no more than 19 metres along the length of the inland surface water.

4.1.4. The diameter of the culverts shall be no less than 1650 millimetres.

4.1.5. The total length of bank reinforcement and bed reinforcement required for the construction of the culverts shall not exceed 15.5 metres.

4.1.6. The impoundment shall not destabilise the bed or banks of the inland surface water.

SCHEDULE 5. CONDITIONS APPLYING TO CHANNEL MODIFICATION ACTIVITY LISTED IN TABLE 1.1

5.1. Channel modification at NH 3574 0834

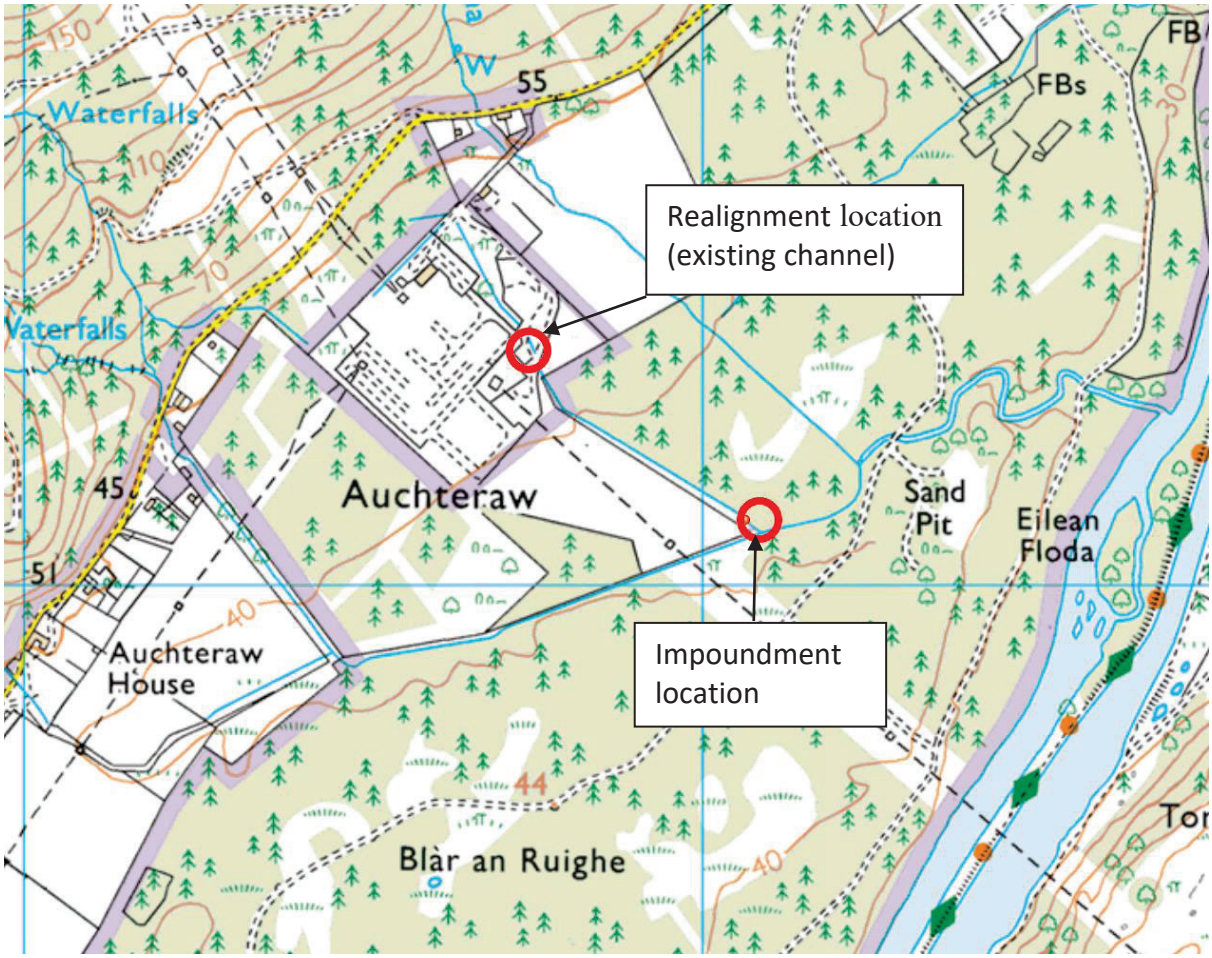
5.1.1. The length of the unnamed tributary of Auchteraw Burn to be realigned ("the original channel") shall not exceed 683 metres.

5.1.2. The length of the new channel shall not exceed 808 metres.

5.1.3. Realignment of the unnamed tributary of Auchteraw Burn shall only be undertaken between upstream NGR NH 3563 0854 and downstream NH 3608 0809.

5.1.4. Areas of bare earth shall be planted with native vegetation and/or lined with a biodegradable geotextile.

APPENDIX A CONTROLLED ACTIVITIES LOCATION



EXPLANATORY NOTES

(These explanatory notes do not form part of the licence)

1. THE WATER FRAMEWORK DIRECTIVE

The Water Framework Directive (WFD) is a wide-ranging piece of European environmental legislation which became law in Scotland at the end of 2003 through the Water Environment and Water Services (Scotland) Act 2003 and in April 2006 through the Water Environment (Controlled Activities) (Scotland) Regulations 2005. In March 2011, the Water Environment (Controlled Activities) (Scotland) Regulations 2005 were replaced with the Water Environment (Controlled Activities)(Scotland) Regulations 2011 ("the Regulations", also known as CAR).

The WFD establishes a legal framework for the protection, improvement and sustainable use of the water environment across Europe by requiring member states to:

- Prevent deterioration and enhance status of aquatic ecosystems, including groundwater;
- Promote sustainable water use;
- Reduce pollution; and
- Contribute to the mitigation of floods and droughts.

The Regulations set out the regulatory framework for achieving some of the aims of the WFD in Scotland, through a regime for authorising "controlled activities", e.g. point source discharges, abstractions, impoundments and engineering activities. They provide for three levels of authorisation, dependent on the risks associated with a controlled activity. A licence is the highest level of authorisation.

Having differing levels of authorisation allows for proportionate and cost-effective controls, so that environmental protection can be achieved whilst minimising the regulatory burden.

2. WATER EFFICIENCY

Regulation 5 of the Regulations imposes a general duty to use water efficiently:

"It is the duty of any person carrying out a controlled activity authorised under these Regulations to take all reasonable steps to secure efficient and sustainable water use."

For example, water efficiency could be the management of the total quantity of water abstracted from a source of supply using measures to minimise wastage, optimise use and reduce consumption.

The means of achieving this can be varied but may include good housekeeping, management systems and procedures, reusing and recycling water and the redesign of operations.

Water audits are the first step to using water efficiently. Water audits develop an understanding of the water system, enable detection of leakages and areas of water wastage and are a means of identifying opportunities for reduced water use.

3. APPEALS

If you are aggrieved by any of the conditions of the licence or the level of authorisation, you may appeal to the Scottish Ministers. Further information on your right of appeal and the appeals procedure is contained in regulations 50 to 53 and Schedule 9 of the Regulations.

Formal notice of appeal under regulation 50(b) or (c) is to be given within three months of the date that the licence is issued. Paragraph 2 of Schedule 9 lists the documents that the appellant has to submit to the Scottish Ministers.

4. SUBSISTENCE CHARGES

An annual subsistence charge may be payable in respect of the licence in terms of the current Water Environment (Controlled Activities) Fees and Charges (Scotland) Scheme, copies of which are available from SEPA. Where a subsistence charge is payable, an invoice will be sent to you.

The charging scheme provides that it is a condition of every authorisation that the fees and charges prescribed in the scheme are paid in accordance with the scheme. Failure to pay such charges may therefore constitute an offence.

5. GENERAL STATUTORY REQUIREMENTS

A licence under the Regulations does not disapply any other statutory requirements applicable to the licence holder or his/her operations, such as any need to obtain planning permission or a building warrant, or any responsibilities under legislation for health, safety and welfare in the workplace.

6. CONTACT DETAILS FOR NOTIFICATIONS

The contact address and telephone number for notifications in terms of Condition 2.5.1 of the licence is as follows:

Scottish Environment Protection Agency
Carr's Corner Industrial Estate
Lochybridge
Fort William
PH33 6TL

During office hours

Tel No: 01397 704426

Out of office hours and public holidays

Tel No: 0800 80 70 60

7. ADDRESS FOR REPORTS AND SUBMISSIONS

The contact address for all information to be reported or submitted in terms of Condition 2.6.1 of the licence is as follows:

The Registry
Scottish Environment Protection Agency
Graesser House
Fodderty Way
Dingwall
IV15 9XB
DingwallRegistry@sepa.org.uk

8. SEPA REVIEW AND VARIATION OF CONDITIONS

The conditions of the licence will be periodically reviewed by SEPA and may be varied under regulation 22 of the Regulations as a result of that review.

9. OPERATOR-INITIATED VARIATION OF CONDITIONS

The responsible person may apply to SEPA under regulation 24 for a variation of the conditions of the licence.

10. TRANSFER OF AUTHORISATION

A responsible person may apply to transfer the licence to another person under regulation 25 by making a joint application with the other person.

11. SURRENDER OF AUTHORISATION

Where the controlled activities authorised by the licence have ceased, or it is intended that the controlled activities will cease, the responsible person may apply to SEPA to surrender the licence under regulation 27.

12. SUSPENSION AND REVOCATION OF AUTHORISATION

SEPA may at any time suspend or revoke an authorisation (in whole or in part) by serving a notice on the responsible person under regulation 29.

13. ENFORCEMENT NOTICES

Where SEPA is of the opinion that an activity

a) has contravened, is contravening or is likely to contravene any condition of the licence or

b) has caused, is causing or is likely to cause significant adverse impacts on the water environment or

c) has caused, is causing or is likely to cause a direct or indirect discharge into groundwater of any hazardous substance (as determined pursuant to Schedule 2 of the Regulations) or any other pollutant

SEPA may serve an enforcement notice on the responsible person under regulation 32.

This notice will specify the steps to be taken by the responsible person which SEPA considers to be necessary or appropriate to prevent, mitigate or remedy the contravention, the impact on the environment or the discharge into groundwater.

14. OFFENCES

It is an offence to carry on, or cause or permit others to carry on, any controlled activity except insofar as it is authorised under the Regulations and carried on in accordance with that authorisation.

It is an offence to fail to comply with or contravene, or cause or permit others to fail to comply with or contravene, a water use licence, including any condition imposed.

It is an offence to fail to comply with, or cause or permit others to fail to comply with, the requirements of an enforcement notice.

It is an offence to intentionally make, or cause or permit others to make, a false entry in any record required to be kept under a condition of an authorisation.

Further details on these and other offences and on penalties liable to be imposed upon conviction for an offence are provided in regulation 44 of the Regulations.

Directors, managers and other individuals within a company may be held personally liable for offences under the Regulations.

All personnel who are responsible for fulfilling any condition of the licence should be made aware of these facts.

Please note that your licence authorises you to carry out the activity or activities outlined in your application to SEPA in accordance with the licence and its conditions. Be aware, however, that any activity outwith the terms of the licence is prohibited under regulation 4 of the Regulations. Should you undertake any activity which does not conform to the terms of your licence, you may be subject to criminal proceedings in accordance with regulation 44(1)(a) and/or (d) of the Regulations. This prohibition encompasses any activity which is liable to cause pollution of the water environment. Section 20 of the Water Environment and Water Services (Scotland) Act 2003 includes definitions of “pollution” and “water environment”.

The statutory definition of pollution, as set out in that section, is as follows:-

’”Pollution”, in relation to the water environment, means the direct or indirect introduction, as a result of human activity, of substances or heat into the water environment, or any part of it , which may give rise to any harm, and “harm” means –

a) harm to the health of human beings or other living organisms,

b) harm to the quality of the water environment, including-

i) harm to the water environment taken as a whole,

ii) other impairment of or interference with, the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems,

c) offence to the senses of human beings,

d) damage to property, or

e) impairment of, or interference with, amenities or other legitimate uses of the water environment.’

Authorisation No	Site	Authorisation Status	Authorisation Status Date	Legislation	Category	Authorisation Holder	Authorisation Activity	Site NGR
CAR/R/1012034	1 The Steadings, Auchterawe, Fort Augustus --- 1 THE STEADINGS, AUCHTERAWE, FORT AUGUSTUS PH32 4BT	Granted	August 1, 2006	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35050 07850
CAR/R/1019415	2 The Steadings, Auchterawe, F. William --- 2 The Steadings, Auchterawe, Fort Augustus PH32 4BT	Granted	June 20, 2007	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35031 07817
CAR/R/1021463	7 Auchterawe, Fort Augustus --- 7 AUCHTERAWE, FORT AUGUSTUS PH32 4BT	Granted	September 28, 2007	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35708 08690
CAR/R/1026079	New House E 5 Auchteraw, Fort Augustus --- NEW HOUSE 100M EAST OF, 5 AUCHTERAWE, AUCHTERAW, FORT AUGUSTUS	Granted	April 25, 2008	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35100 08100
CAR/R/1026080	Chalet 1 E 5 Auchteraw, Fort Augustus --- CHALET 1 100M EAST OF, 5 AUCHTERAW, AUCHTERAW, FORT AUGUSTUS	Granted	April 25, 2008	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35080 08261
CAR/R/1026082	Chalet 2 E of Auchteraw, Fort Augustus --- CHALET 2 100M EAST OF, 5 AUCHTERAW, AUCHTERAW, FORT AUGUSTUS	Granted	April 25, 2008	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35160 08230
CAR/R/1031547	Whinhill, Auchterawe, Fort Augustus --- Whinhill, Auchterawe, Fort Augustus PH32 4BT	Granted	October 2, 2008	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35098 08003
CAR/R/1031577	Plot at Auchterawe Farm, Fort Augustus --- New Dwelling, Auchterawe Farm, Fort Augustus PH32 4BT	Granted	October 2, 2008	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Secondary	NH 35170 07670
CAR/R/1036995	Pinetops, Auchterawe, Fort Augustus --- Pinetops, Auchterawe, Fort Augustus PH32 4BT	Granted	April 15, 2009	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35201 08082
CAR/R/1037137	Auchterawe House, Auchterawe, Fort Augustus --- AUCHTERAWE HOUSE, AUCHTERAWE, PH32 4BT PH32 4BT	Granted	April 16, 2009	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35022 07930
CAR/R/1048103	Sionnaich, 2 Auchterawe, Fort Augustus --- 2 Auchterawe, Fort Augustus PH32 4BT	Granted	June 12, 2009	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35300 07750
CAR/R/1104081	7b Auchterawe & Caravan, Fort Augustus --- 7b Auchterawe & Caravan, Fort Augustus ph32 4bt	Granted	June 25, 2012	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35346 08038
CAR/R/1104360	6 Auchterawe, Fort Augustus --- 6 Auchterawe, FORT AUGUSTUS PH32 4BT	Granted	July 5, 2012	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35722 08692
CAR/R/1117793	Hawks View, Auchterawe, Fort Augustus --- Hawks View, Auchterawe, FORT AUGUSTUS PH32 4BT	Granted	December 13, 2013	CAR	Registration	PRIVATE CONTACT	Sewage (Private) Primary	NH 35115 07962
CAR/R/1132817	Fort Augustus Eng Wks, Auchteraw --- Fort Augustus, Auchteraw Eng Wks, Auchteraw	Granted	February 13, 2015	CAR	Registration	J MUPRHY AND SONS	Pipeline / Cable Crossing	NH 35570 08380
CAR/R/1132818	Fort Augustus Eng Wks, Auchteraw --- Fort Augustus, Auchteraw Eng Wks, Auchteraw	Granted	February 13, 2015	CAR	Registration	J MUPRHY AND SONS	Pipeline / Cable Crossing	NH 35570 08380
CAR/R/1132819	Fort Augustus Eng Wks, Auchteraw --- Fort Augustus, Auchteraw Eng Wks, Auchteraw	Granted	February 13, 2015	CAR	Registration	J MUPRHY AND SONS	Pipeline / Cable Crossing	NH 35570 08380
CAR/R/1133458	Skye T Reinforecement Eng Wks, Auchteraw --- Skye T, Auchteraw	Granted	March 23, 2015	CAR	Registration	SCOTTISH HYDRO ELECTRIC TRANSMISSION PLC	Bridge	NH 34740 07500
CAR/R/1185319	Muir Pit Eng Wks, Auchteraw, Ft Augustus --- Muir Pit Eng Wks, Auchteraw, Fort Augustus PH32 4BT 8 AUCHTERAWE FORT AUGUSTUS PH32 4BT	Granted	August 29, 2019	CAR	Registration	CNOCLEE LIMITED	Bridging Culvert	NH 35995 08046
CAR/R/3002139		Granted	December 19, 2021	CAR	Registration		Point Source - Existing Sewage Treatment System (PSTS)	NH 35259 08135
CAR/R/5002941	Fort Augustus Substation, Auchterawe, Fort Augustus, PH32 4BT	Granted	August 8, 2022	CAR	Registration		Point Source - New Sewage Treatment System to Land	NH 3559 0845
CAR/R/5005435	Auchterawe Underground Cable, Auchterawe, PH32 4BT	Granted	June 14, 2023	CAR	Registration	Cnoclee Ltd	Engineering - Pipe Crossing	NH 35428 07947
CAR/S/1195027	Land 325m SW of Whitebridge Cott, Auchteraw --- Land 325m SW of Whitebridge Cott, Auchteraw	Granted	December 15, 2020	CAR	Licence			NH 35890 08450
PSTS/623e66	Forest Lodge, Auchterawe, Fort Augustus, PH32 4BT	Granted	March 30, 2021	CAR	Registration		Point Source - Existing Sewage Treatment System (PSTS)	NH 35191 08131

C.2 Consultation with The Highland Council

September 2023

Flood Risk Management Team
The Highlands Council
(By email: frm highland.gov.uk)

Project Name: Fort Augustus
Project Number: B2413736

Subject: Fort Augustus Data Re uest

Dear Sir/Madam

We are currently undertaking a Flood Risk Assessment (FRA) on behalf of SSE, in support of a project to extend an existing substation in Fort Augustus.

The FRA is being prepared to appraise the impacts of the new... The approximate location of the substation at Fort Augustus is NH 35233 08277.

Consequently, we are seeking any information that the Lead Local Flood Authority hold on flooding and drainage in the vicinity of the site to inform our assessment.

Specifically, we are seeking information on flooding and drainage at and near the above areas (NH 35233 08277 – Fort Augustus). The site and areas of interest are attached to this letter (Figure 1).

We would therefore be grateful if you could provide us with:

- Details of any sewers, piped drainage systems and flood risk management assets that the Council is aware of and has responsibility for in the vicinity of the site
- Any information related to groundwater flooding in this area. If possible please provide borehole locations, groundwater levels and details of the strata monitored.
- Any mapping of historical flooding events at/near the development site, from all sources (i.e. fluvial, surface water, groundwater, sewer, reservoir, canal, etc.),
- Any information on drainage within the site and the local area, including any known drainage problems
- Details to assist us in assessing whether collected surface water generated by the site can be discharged to soakaway or infiltration, in accordance with regulatory requirements. For example, details of sensitive aquifers in the area, known ground /groundwater contamination issues, soakage tests etc.
- Information on any future development plans in the vicinity of the site

If you do not hold any of the information requested above, can you please state this for each dataset this applies to (and suggest who would be appropriate to contact to obtain these data).

An early response would be much appreciated.

ours Sincerely

James Buckley
Graduate Hydrologist
James.Buckley1 jacobs.com

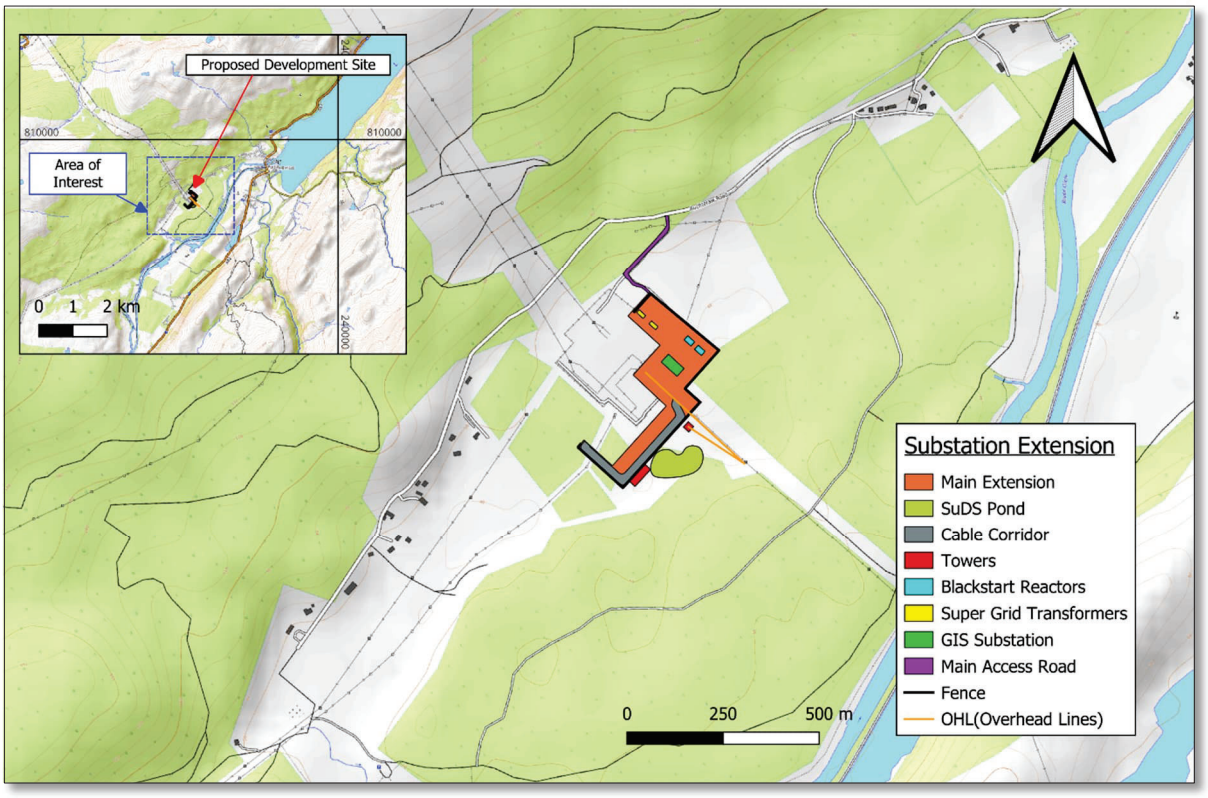


Figure 1. The area of interest for the Fort Augustus Flood Risk Assessment as well as an inlet map showing details of the proposed substation extension.

Buckley, James

From: The Highland Council <donotreply@highland.gov.uk>
Sent: 30 October 2023 11:44
To: Buckley, James
Subject: [EXTERNAL] Freedom of Information request FS-Case-553389655 - Request complete

Dear Mr Buckley,

Original FOI request: Flooding information

The response below refers to the geographical extent shown in the supplied image, only. (This does not include the Ft Augustus urban area).

• Details of any sewers, piped drainage systems and flood risk management assets that the Council is aware of and has responsibility for in the vicinity of the site
• Any information related to groundwater flooding in this area. If possible please provide borehole locations, groundwater levels and details of the strata monitored.
• Any mapping of historical flooding events at/near the development site, from all sources (i.e. fluvial, surface water, groundwater, sewer, reservoir, canal, etc.),
• Any information on drainage within the site and the local area, including any known drainage problems
• Details to assist us in assessing whether collected surface water generated by the site can be discharged to soakaway or infiltration, in accordance with regulatory requirements. For example, details of sensitive aquifers in the area, known ground /groundwater contamination issues, soakage tests etc.

The information you have requested is not held by the Council. The information is, therefore excepted under Regulation 10(4)(a) of the EIRs. The Council does not hold information on sewers, piped drainage, groundwater flooding, flooding events, drainage problems or ground contamination issues or future development plans for this area.

• Information on any future development plans in the vicinity of the site

Under Regulation 6(1)(b) of the EIR's we would advise this information is already publicly available. Information pertaining to planning applications can be found in the relevant planning case file in the planning register which forms part of the Council's publication scheme.

Users are able to search for applications in a specific area by using the map tab and zooming to the area. The type of application displayed can be filtered under "Legend and Filter"
https://wam.highland.gov.uk/wam/spatialDisplay.do?action=display&searchType=Application

If you have created an online account you can save the searched area, details on how to do this can be found at https://wam.highland.gov.uk/wam-skin/help/pagehelp/mapSearchLegacy.htm

Under Section 20 of Freedom of Information (Scotland) Act, you have the right to request that the Highland Council reviews any aspect of how it has dealt with your request. This requirement for review should be requested to the Freedom of Information Officer, Chief Executive's Office, Glenurquhart Road, Inverness IV3 5NX, or dpo@highland.gov.uk, within 40 working days of receipt of this response. The request should include details of the information requested and the aspects of the Highland Council's response which you are not satisfied with.

If you are subsequently dissatisfied with the outcome of the Council's review, you have the right to appeal to the Scottish Information Commissioner under Section 47 of the Freedom of Information (Scotland) Act, within six months of receiving the Council's review response.

Yours sincerely
Customer Resolution and Improvement Team

Unless related to the business of The Highland Council, the views or opinions expressed within this e-mail are those of the sender and do not necessarily reflect those of The Highland Council, or associated bodies, nor does this e-mail form part of any contract unless so stated.
Mura h-eil na beachdan a tha air an cur an cèill sa phost-d seo a' buntainn ri gnothachas Chomhairle na Gàidhealtachd, 's ann leis an neach fhèin a chuir air falbh e a tha iad, is chan eil iad an-còmhnaidh a' riochdachadh beachdan na Comhairle, no buidhnean buntainneach, agus chan eil am post-d seo na phàirt de chunnradh sam bith mura h-eil sin air innse.

C.3 Consultation with Scottish Water

September 2023

Scottish Water
(By email: developmentoperations scottishwater.co.uk)

Project Name: Fort Augustus
Project Number: B2413736

Subject: Fort Augustus Data Re uest

Dear Sir/Madam

We are currently undertaking a Flood Risk Assessment (FRA) on behalf of Scottish and Southern Energy (SSE), in support of a project to extend an existing substation in Fort Augustus.

The FRA is being prepared to appraise the impacts of the extension to the substation. The approximate location of the substation at Fort Augustus is NH 35233 08277.

Specifically, we are seeking information on flooding and drainage at and near the above areas (NH 35233 08277 – Fort Augustus). The site and areas of interest are attached to this letter (Figure 1).

We would therefore be grateful if you could provide us with:

- Asset location maps which include the location and dimensions of your potable water supply network/infrastructure
- Potable water pipework flood history reports for the services at and around the project site
- Details of asset location maps which include the location and dimensions of your drainage network and infrastructure
- Drainage network flood history reports for the services at and around the project site
- Any other available information on potable water pipework flooding in this area, or on flooding from any other source
- Any information related to groundwater in this area and water abstraction boreholes. If possible, please provide borehole locations and levels and details of the strata monitored.

If you do not hold any of the information requested above, can you please state this for each dataset this applies to (and suggest who would be appropriate to contact to obtain these data).

An early response would be much appreciated.

ours sincerely

James Buckley
Graduate Hydrologist
James.Buckley1 jacobs.com

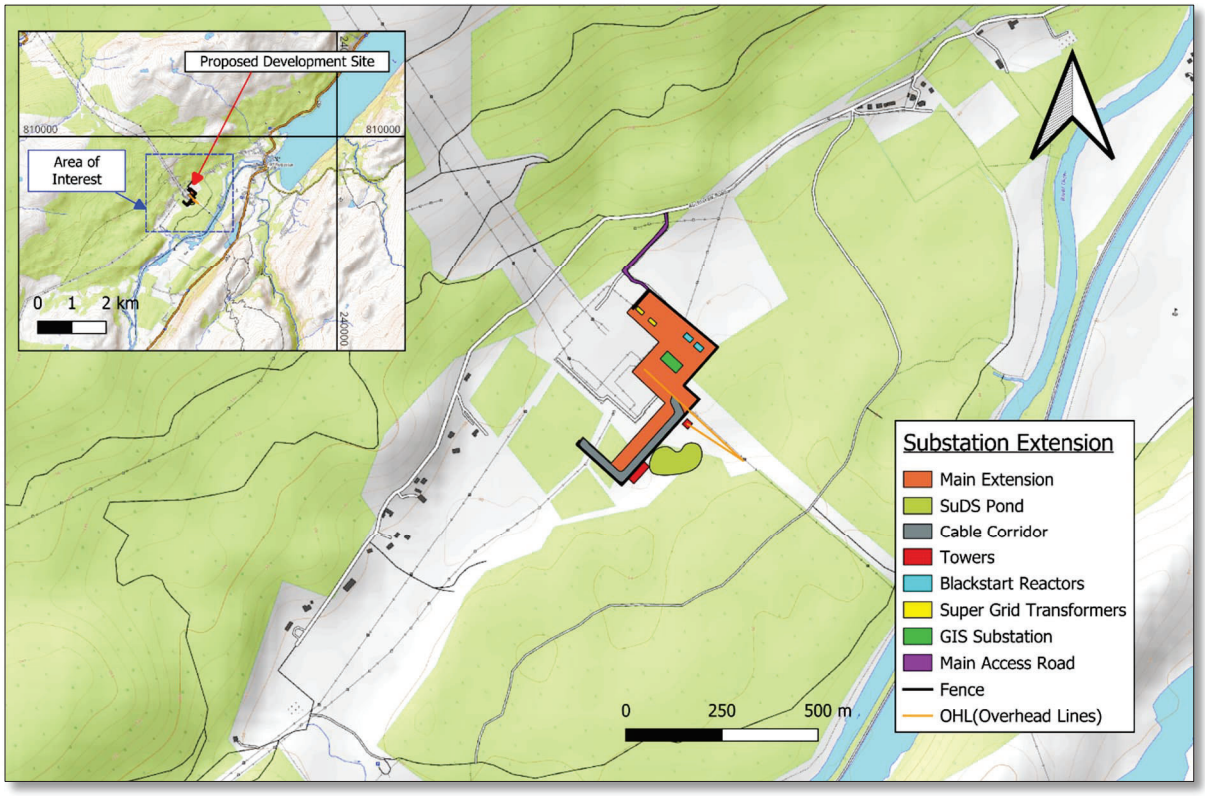


Figure 1. The area of interest for the Fort Augustus Flood Risk Assessment as well as an inlet map showing details of the proposed substation extension.

Appendix D. SLR (November, 2017) FRA extract

FORT AUGUSTUS SUBSTATION AUCHTERAW

Proposed Substation Extension
Platforms LT92 and LT94

APPENDIX FRA-A: Hydrological Modelling Report

FLOOD RISK ASSESSMENT

Prepared for: Scottish and Southern Energy

SLR Ref: 405.00660.00047
Version No: 1
November 2017

BASIS OF REPORT

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CONTENTS

1.0 INTRODUCTION 1
1.1 Context 1
1.2 Model Scenarios 1
1.3 Model Inflow locations 1
2.0 HYDROLOGICAL ANALYSIS 3
2.1 Rainfall-Runoff Method 3
2.2 Statistical Method 4
2.2.1 Overview 4
2.2.2 Gauging Stations 4
2.2.3 QMED 4
2.2.4 Growth Curve 5
2.3 Revitalised Flood Hydrograph 6
2.4 Institute of Hydrology Report No. 124 (IH124) 6
2.5 Summary of Hydrograph Method Selection 7
2.6 Hyetograph 8
3.0 1D DOWNSTREAM MODEL (OUTFLOW) BOUNDARY 8
4.0 CLIMATE CHANGE 9
5.0 CONCLUSIONS 9

DOCUMENT REFERENCES

TABLES AND EQUATIONS

Table 1-1 Baseline Model – Hydrological Overview 1
Table 1-2 Development Model – Hydrological Overview 2
Table 2-1 QMED Estimates – Statistical Method (results in m^3s^{-1}) 5
Table 2-2 QMED Estimates (results in m^3s^{-1}) 7

FIGURES

Figure 1 Downstream Boundary Developed Rating Curves 8

DRAWINGS

Drawing No. APP-A-1: Baseline Model Hydrological Overview
Drawing No. APP-A-2: Development Model Hydrological Overview

APPENDICES

Appendix 01: Baseline Model Inflow Hydrographs
Appendix 02: Development Model Inflow Hydrographs

1.0 Introduction

1.1 Context

SLR Consulting Ltd (SLR) has been appointed by Scottish and Southern Energy (SSE) to undertake a Flood Risk Assessment (FRA) to support a planning application for the proposed extension of the existing electrical substation facility at Auchteraw, Fort Augustus (the Site) in the Scottish Highlands.

The proposed substation expansion comprises the construction of 2no. new platforms referred to as LT92 and LT94 which will adjoin to the existing platform boundary.

SEPAs Flood Maps for the Study Site, are produced at an indicative and strategic level scale and only modelled for watercourses with catchment areas >3km^2 and thus fails to capture the potential flood risk posed by the 'minor' watercourses flowing through and adjacent to the development site area.

This report therefore presents the detailed Hydrological Analysis for the flood flows to inform the 1-Dimensional (1D)/2-Dimensional (2D) linked TUFLOW model developed for the FRA. Appendix FRA-B should be referred to for detail of the hydraulic model developed and associated mapped outputs.

1.2 Model Scenarios

Two separate model scenarios have been considered for the Hydraulic Model:

- **Baseline** – assesses the flood risk to the existing platform during a 0.5% and 0.1% Annual Exceedance Probability (AEP) events. The flood risk to the existing platform when allowing for the impact of climate change (+20%) on the 0.5% AEP event has also been assessed.
- **Proposed Development** – assesses the impact of the proposed LT92 and LT94 substation platforms on the flood risk at the development site and elsewhere. Under this scenario, flood mitigation measures, including new / diverted watercourses and culverts have been assessed (without flood compensatory analysis to determine the likely initial compensation requirements to be detailed at the post-planning stage). As for the baseline scenario, the impact of the proposed platforms on flood risk has been assessed during a 0.5% (with and without a +20% allowance for climate change) and 0.1% AEP events.

1.3 Model Inflow locations

There are 4no. watercourses relevant to the assessment and these are depicted on Drawing No. APP-A-1 and APP-A-2 - these have been explicitly represented within the Hydraulic Flood Models for the Baseline and Development scenarios.

Modelled inflow location are also presented on the aforementioned drawings and summary hydrological details are provided in Table 1-1 and Table 1-2 below for the Baseline and Development models.

Table 1-1
Baseline Model – Hydrological Overview

Inflow ID	Inflow Type	Watercourse	Catchment Delineation NGR	Catchment Area (km^2)	SAAR[1] (mm)	SPRHOST[2]	BFIHOST[3]	Upstream Boundary Condition
B_I1(a)	Point Hydrograph	Auchteraw Burn (Watercourse 1)	NH 35205 08257	3.13	1481	0.52	0.32	Site access road bridge at NGR: NH 35724 08641

Inflow ID	Inflow Type	Watercourse	Catchment Delineation NGR	Catchment Area (km^2)	SAAR[1] (mm)	SPRHOST[2]	BFIHOST[3]	Upstream Boundary Condition
B_I1(b)	Point Hydrograph	Auchteraw Burn (Watercourse 1)	NH 35459 07898	0.54	1455	0.49	0.38	Governed by water level in the Auchteraw Burn
B_I2	Point Hydrograph	Allt na Fearna (Watercourse 2)	NH 35721 08644	2.79	1492	0.54	0.311	Minor road bridge at NGR: NH 35207 08254
B_I3(a)	Hyetograph (overland flow)	Tributary to the Auchteraw Burn (Watercourse 3)	NH35370 08491	0.06	1455	0.49	0.38	Governed by capacity of the NW Boundary ditch
B_I3(b)	Point Hydrograph	Tributary to the Auchteraw Burn (Watercourse 3	NH 35195 08518	0.59	1455	0.49	0.38	Forestry Track Drainage Ditch at NH 35195 08518
B_I4	Point Hydrograph	Tributary to the Auchteraw Burn (Watercourse 4)	NH 35481 08373	0.0025	1455	0.49	0.38	Governed by the capacity of Culvert H

Table 1-2
Development Model – Hydrological Overview

Inflow ID	Inflow Type	Watercourse	Catchment Delineation NGR	Catchment Area (km^2)	SAAR (mm)	SPR HOST	BFI HOST	Upstream Boundary Condition
D_I1(a)	Point Hydrograph	Auchteraw Burn (Watercourse 1)	NH 35205 08257	3.13	1481	0.52	0.32	Site access road bridge at NGR: NH 35724 08641
D_I1(b)	Point Hydrograph	Auchteraw Burn (Watercourse 1)	NH 35459 07898	0.54	1455	0.49	0.38	Governed by water level in the Auchteraw Burn
D_I2	Point Hydrograph	Allt na Fearna (Watercourse 2)	NH 35721 08644	2.79	1492	0.54	0.311	Minor road bridge at NGR: NH 35207 08254
D_I3	Point Hydrograph	Tributary to the Auchteraw Burn (Watercourse 3	NH 35195 08518	0.59	1455	0.49	0.38	Forestry Track Drainage Ditch at NH 35195 08518
D_I4	Point Hydrograph	Tributary to Watercourse 3 (Watercourse 4)	NH35386 08422	0.0554	1455	0.49	0.38	Beginning of Watercourse 4

2.0 Hydrological Analysis

2.1 Overview

All watecourses relevant to the assessment are ungauaged and thus flow estimation using the methods outlined in the Flood Estimation Handbook (FEH)[1] for ungauged catchments in the UK has been adopted.

The FEH offers two principal methods of flood flow estimation; the Rainfall-Runoff Method and the Statistical Method. The Statistical Method estimates peak flow for a catchment for a given AEP event using a combination of historic gauging station data and catchment descriptors. The Rainfall Runoff Method estimates the response of a catchment to a rainfall event of a given AEP and generates a peak flow based entirely on catchment descriptors.

The FEH is supported by WINFAP-FEH and the Revitalised Flood Hydrograph V.2 (ReFH2) software applications which are used in combination with the FEH Web Service[2].

The FEH Web Service provides digital catchment descriptors for any catchment in the UK with an area greater than 0.5km^2. Physical catchment descriptors are estimated from the Institute of Hydrology Digital Terrain Model (IHDTM). Other catchment descriptors are estimated from various publically available sources including soils and climatic datasets.

The WINFAP-FEH software supports the statistical procedures for flood frequency estimation, using historic annual maxima data alongside catchment descriptors. The latest version of WINFAP, version 4.0, has been used in this study.

2.2 Rainfall-Runoff Method

The ReFH2 design package utilises the Rainfall Runoff Method to generate a hydrograph for any catchment generated by a rainfall event of a given AEP. The ReFH2 software is the first version to incorporate SEPA data and thus be calibrated to Scottish catchments/environmental conditions. This method is therefore considered appropriate for this study. It should be noted that during the calibration of ReFH2 the estimated time to peak is considerably reduced and the peak flow increased to reflect the more responsive nature of a Scottish upland catchment[3].

The Institute of Hydrology carried out a number of studies on revising the runoff equations produced in the original Flood Studies Report (1975). IH124 was specifically produced to address the runoff from small catchments (Institute of Hydrology, 1994) and is thus regarded as a valid method for the Site, with the largest inlfow catchment having an area of only 3.13ha.

However, the IH124 method relies on an equation / relationship which does not take into account key catchment descriptors such as the SPRHOST and BFIHOST. It therefore considered to be less accurate than the more recent FEH based methods[4].

---

[1]Centre for Ecology and Hydrology (CEH), 1999. Flood Estimation Handbook
[2]Centre for Ecology and Hydrology (CEH), 2017. Flood Estimation Handbook Web Service accessed on 05.09.2017 at: https://fehweb.ceh.ac.uk/GB/map
[3]WHS, 2016. Revitalised Flood Hydrograph Model ReFH2: Technical Guidance, pp 67
[4] CIRIA C753, 2015. The SuDS Manual, 24.3.2

2.3 Statistical Method

2.3.1 Overview

The Statistical Method is broadly a two part process; the estimation of the mean annual flood (QMED) and the derivation of a growth curve. The growth curve relates the increase in peak flow as a multiple of QMED against the rarity of the AEP event.

QMED can be generated from either annual maxima flow data or catchment descriptors, whereas the growth curve is generated solely from annual maxima data.

The annual maxima data required to generate the growth curve can either be from a single gauged site, or from a pooled group of hydrologically similar gauged sites.

The use of the single site analysis technique is only recommended when the flow record length, R, for a gauging station is longer than the required return period, T.

If the record length is between T and 2T, then it is suggested that both a pooling group and single site analysis are competed. Only if the flood data record is longer than 2T is it suggested to use only single site analysis. The record lengths for the selected gauging stations are 34 and 35 years. As the flood risk at the Site is being assessed for a 0.1% AEP both the single site and pooled analyses have been completed for this study.

The statistical method is only applied on the downstream end of the Site at the 1D model outflow location (i.e. on Watercourse 1 – the Auchteraw Burn) as the individual upstream catchment sizes are considered too small for the statistical method to be appropriately applied. Instead the downstream peak flow values are scaled using the relevant catchment areas to upstream inflow locations – this is considered to be a pragmatic approach as all other individual watercourses form tributaries to Watercourse 1 and thus are hydrologically of the same catchment system.

2.3.2 Gauging Stations

Two hydrologically similar gauging stations were selected as donor sites. These were the National River Flow Archive (NRFA) gauging station 28033 – River Dove at Hollinsclough; and 91802 on the Allt Leachdach. Both these sites have small catchment areas with similar key FEH catchment characteristics such as Flood Attenuation by Reservoirs and Lakes (FARL) index, BFIHOST, SAAR and SPRHOST.

2.3.3 QMED

The QMED for the Site is applied to the growth curve to estimate the flood flow of a given AEP event.

There are three methods for deriving a value of QMED for an ungauged site, these are:

1. Directly from the FEH catchment descriptors downloaded for the Site. The QMED estimation from catchment descriptors performed by WINFAP-FEH is in line with the updated 2008 statistical guidelines published by Kjeldsen (2008)[5].
2. FEH donor transfer scheme which provides an estimate of QMED at the target location. This adjusts the value of QMED at the selected donor sites based of the differences in the catchment areas and geographical centroids of the target and donor sites. The donor transfer scheme is applied to both donor locations.

[5]Kjeldsen et al, 2008. Improving the FEH statistical procedures for flood frequency estimation

3. WINFAP multiple donor QMED adjustment function. This method is new for WINFAP V.4 and based upon Kjeldsen et al. (2014)[6]. It uses six donor catchments selected by WINFAP to adjust the catchment descriptor derived value of QMED for the target location.

Estimates of QMED using each method are summarised in Table 2-1 below.

Table 2-1
QMED Estimates – Statistical Method (results in m^3s^{-1})

Inflow ID	Physical Catchment Descriptors	Donor Transfer (91802)	Donor Transfer 28033	WINFAP Multiple Donor Adjustment
Downstream Boundary	8.08	6.95	8.08	8.71

The analysis indicates how the estimate of QMED from the WINFAP Multiple Donor Adjustment method is slightly higher than QMED derived from catchment descriptors or donor transfer. Taking a precautionary (conservative) approach which is entirely appropriate for flood risk assessments, the value of QMED derived from the WINFAP Multiple Donor Adjustment has been selected to develop the Hydraulic Model flood flows.

2.3.4 Growth Curve

Single Site Analysis

Single site analysis requires annual maxima flow data to estimate the peak flow for a given AEP event. As the target location is ungauged, the single site analysis will be performed on the two selected donor sites.

The gauging station annual maxima flow data is used to generate growth curves. L-moments are the preferred Statistical Method[7] for estimating parameters of a probability distribution from a data sample as they are robust in the presence of outliers in the data set, which are often present in flood data sets.

A flood growth curve for NFRA Gauges 91802 and 28033 has been generated in WINFAP-FEH by fitting a set of extreme value distributions to the observed annual maxima data. The General Logistic (GL), 3 Parameter Lognormal (LN3) and Generalised Extreme Value (GEV) distributions provided the best fit to the annual maxima data. However, the GL distribution was selected to estimate peak flows for a range of AEPs for the Site in line with the FEH guidance (Section 17.3.2). The guidance concludes that the GL distribution is the most appropriate selection for UK catchments.

No adjustment for urbanisation is required as the catchment is essentially rural as discussed at Section 2.2.

Pooling Group Analysis

As discussed previously, due to a record length of 25 years at NFRA 4006, a pooling group analysis alongside a single site analysis is advised for flood frequency estimation of peak flow for lower AEP events. A pooling group comprises gauging stations with similar catchment characteristics to the target site. Gauging stations within a pooling group need not to be close to one another in geographical space, but rather have similar area

[6]Kjeldsen, T. R., D. A. Jones, and D. G. Morris (2014), Using multiple donor sites for enhanced flood estimation in ungauged catchments, Water Resour. Res., 50, 6646–6657, doi:10.1002/ 2013WR015203.
[7] Centre for Ecology and Hydrology (CEH), 1999. Flood Estimation Handbook

(AREA), SAAR and BFIHOST. By utilising a pooling group, more flood data becomes available to obtain more reliable estimates for lower probability AEP events.

A pooling group for both the target site and the both donor sites were automatically generated using WINFAP-FEH. Discordancy of a pooling station is a measure of how different annual maxima data is from the pooled values L-moment ratios, with a higher value indicating a higher degree of variation. The discordancy values indicate the annual maxima data for one gauging station in the 28033 pooling group was deemed unsuitable (NFRA Gauge 49006) and so was removed from the pooling group. NFRA Gauge 26802 was added as a replacement. The remaining gauging stations were suitably similar to the pooled values L-moment ratios. Values of discordancy and heterogeneity statistic (H_2) are measures to evaluate pooling station suitability to predict a flood curve for the target or donor site. H_2 compares the variability of L-CV and L-skewness across the pooling group, with a high H_2 value indicating that group members have different growth curves. The low H_2 values for the donor site pooling groups indicate that both pooling groups are acceptably homogenous and that there is no hydrological reason for adjusting the pooling group further.

A set of flood growth curves has been generated for each of the pooling groups in WINFAP-FEH. The 'goodness of fit' test, which evaluates the fit of extreme value distributions to the pooled data, indicates that GL, GEV and LN3 are statistically acceptable fits. Of the three, the GL distribution has been selected for both pooling groups as it is widely used in UK flood frequency analyses with a strong theoretical justification[10]. It also provides the highest peak flow estimates for all AEP events and is therefore deemed a precautionary approach.

2.4 Revitalised Flood Hydrograph

Unlike the Statistical Method discussed previously, which provide only an estimate of peak flow, the Rainfall Runoff Method provides a full flood hydrograph for a given AEP flood event.

The catchment descriptors extracted from the FEH Web Service for each catchment detailed in Table 2-1 and 2-2 were used in the ReFH2 Scottish catchments analysis to generate a 0.1% and 05% AEP event hydrographs for each model input locations. The R&D Technical Report FD1913/TR report, published jointly by the Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency in 2005, recommends a winter design profile be used for rural catchments (URBEXT < 0.125).

The rainfall depth is distributed across the design storm duration using the appropriate design storm profile as described by Houghton-Carr (1999)[8].

2.5 Institute of Hydrology Report No. 124 (IH124)

Due to the small input catchment areas, the IH124 is a suitable method to estimate the model input peak flows. The FEH catchment descriptors as summarsied in Table 1-1 and Table 1-2 have been used to provide the values of SAAR and SPRHOST for each catchment. The IH124 calculation has been completed within the 'Rural-Runoff' calculator built-into the MicroDrainage software package. The minimum area for a IH124 catchemnt in microdrainage is 50ha, so 50ha has been used for each area and then the value has been scaled linearly for each catchment, as stated in CIRIA SuDS Manual EQ 24.3[9].

[8] Centre for Ecology and Hydrology (CEH), 1999. Flood Estimation Handbook (Vol 4)
[9] CIRIA C753 2015. The SuDS Manual, page 513

2.6 Summary of Hydrograph Method Selection

A summary of the peak flows derived for the downstream boundary catchment for the baseline are included in Table 2-2 below.

Table 2-2
QMED Estimates (results in m^3s^{-1})

Annual Exceedance Probability (%)	ReFH2	IH 124	Statistical Methods				
			Donor (28033)		Donor (91802)		Target
			Single	Pooled	Single	Pooled	Pooled
0.5	22.1	266.54	43.44	35.90	23.56	23.35	30.54
0.5+20% CC	26.52	319.85	52.13	43.08	28.28	28.01	***36.65***
0.1	28.08	344.31	80.82	56.46	33.73	32.27	45.13

It is clear that the peak flow values generated from the IH124 method are an order of magnitude higher than the alternative methods and are therefore discounted. However, as discussed at Section 2.0, IH124 method is relatively simple approach derived in 1994[10]. As such, the more advanced and up to date techniques of the Statistical analysis and ReFH2 are seen as providing more reliable peak flow results for the input catchments.

The Statistical Method is preferred to the Rainfall Runoff Method due to the inclusion of observed flood data from a pooling group. The Statistical Method also provides higher estimates of peak flow and has therefore been adopted as a precautionary approach.

As discussed at Section 2.1.1, the Statistical Method has been applied to the two donor sites, pooling groups for each of these donor sites and the target site. The single site analysis for the two donor sites have been discounted as the record length is insufficient for the long return period required for the hydraulic analysis (0.1% AEP). When comparing the relative merits of the donor and target pooling groups, it must be noted that the target pooling group generated is directly applicable to the Site, as the pooling group was generated using the Site catchment descriptors rather than those for the donor station.

The Statistical Method applied to the pooled group target site has therefore been adopted as the preferred method for the estimation of flood flows for input to the hydraulic model. The downstream value of flow for the 0.1% and 0.5% AEP events have been scaled directly to each catchment via their relative areas.

The preferred method of estimating input catchment flows provides only a peak flow and a flood hydrograph is required as an input to the model. The ReFH2 hydrographs for each catchment have then been scaled so that the peak matches the target pooling group peak flow for each catchment. This provides a hydrograph which has the form/shape relative to each catchment (smaller catchments having shorter hydrographs) but with the peak flow from the chosen hydrological method.

The **Development** model hydrographs have been scaled using their relative areas from the **Baseline** hydrographs.

[10] HR Wallingford, 2017, UKSUDS. Accessed on 13.09.2017 at http://www.uksuds.com/FAQRetrieve.aspx?ID=55033

The design hydrographs developed and used for the **Baseline** and **Development** Hydraulic Models are enclosed as Appendix 01 and Appendix 02.

2.7 Hyetograph

The above discussed methodology has been applied to all catchments except Catchment I3(a) – in the Baseline Model only - as demonstrated in Drawing No.APP-A-1.

The receiving watercourse (part of Watercourse 3) is essentially flat with no positive (unilateral) flow direction and is aligned perpendicular to the runoff flow direction from the upstream catchment. The watercourse will therefore intercept runoff along its reach rather than at a discrete location. A hyetograph has been selected for use for this catchment rather than a point inflow. The hyetograph has been applied across the upstream catchment area.

The Rainfall Runoff Method is the only hydrological method discussed above which can generate a hyetograph, which uses the FEH catchment descriptors to generate a hyetograph. The hyetograph has been generated for a 0.5% and 0.1% AEP events and a copy of the graphical input also included in Appendix 01.

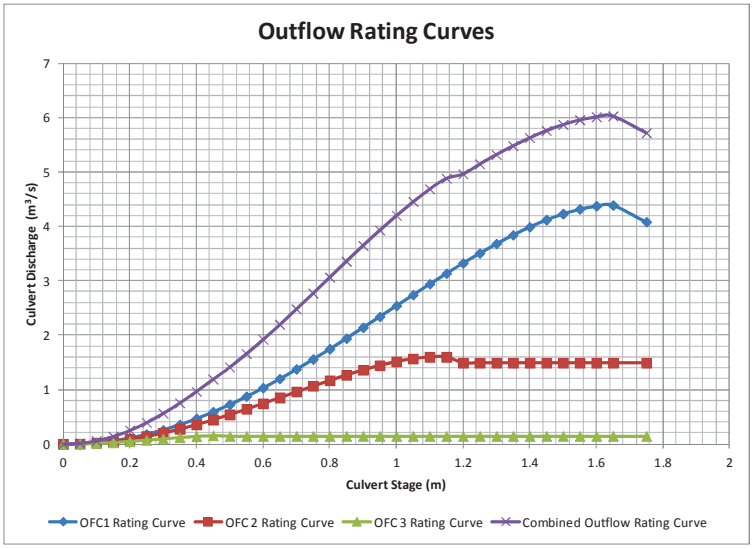
The hyetograph was removed in favour of a point inflow for Watercourse 4 in the Development model which replaced the flat section of Watercourse 3 from the Baseline model – refer to Inflow I4 on Drawing No.APP-B-2

3.0 1D Downstream Model (Outflow) Boundary

The 1D model outflow boundary condition is governed by the outflow capacity of 3 x circular corrugated steel culverts on the Auchteraw Burn (Watercourse 1), which are located approximately 550m southeast of the proposed development area as shown on Drawing No's. APP-B-1 and APP-B-2. Thus a total combined rating curve has been derived by applying Manning's principles of pipe flow.

The combined outflow rating curve combines the individual rating curves for each of the three culverts (OFC 1, OFC 2 and OFC 3) as presented in Figure 1 below.

Figure 1
Downstream Boundary Developed Rating Curves



The same combined rating curve is used in both the baseline and proposed development and models.

4.0 Climate change

Scottish Planning Policy (SPP)[11] recommends that:

> *'a precautionary approach to flood risk from all sources, including coastal, water course (fluvial), surface water (pluvial), groundwater, reservoirs and drainage systems (sewers and culverts)' be adopted by the planning system, 'taking account of the predicted effects of climate change.'*

Although the 2009 climate change predictions (UKCP09) provides information on spatial variations in the potential effects climate change, a 20% increase in peak flow has been adopted in line with SEPA recommendations.

A 20% increase has therefore been applied to the 0.5% AEP flood hydrographs to represent the impact of climate change on fluvial flood flows.

5.0 Conclusions

This summary Hydrological Modelling report forms Appendix FRA-A to the Flood Risk Assessment report and informs the development of Flood flows for the 1D/2D linked Hydraulic TUFLOW Models for the Baseline and Development scenarios - Appendix FRA-B should be consulted for full details of the hydraulic modelling.

The hydrological analysis undertaken is considered to be suitable for the purposes of this assessment and takes due cognisance of SEPAs requirements and adopts current industry best practice for the development of flood flows using the most current industry standard hydrological modelling methods / packages.

[11] The Scottish Government, 2014. Scottish Planning Policy

DRAWINGS

235000 235500 236000 236500

809000 808500 808000

INFLOW I3a DETAILS:
CATCHMENT AREA = 0.06km^2
(MODELLED AS HYETOGRAPH INPUT)
PEAK 1:200yr FLOW = 0.24m^3/s
PEAK 1:200yr + 20% CC FLOW = 0.29m^3/s
PEAK 1:1000yr FLOW = 0.35m^3/s

INFLOW I2 DETAILS:
CATCHMENT AREA = 2.79km^2
PEAK 1:200yr FLOW = 11.17m^3/s
PEAK 1:200yr + 20% CC FLOW = 13.4m^3/s
PEAK 1:1000yr FLOW = 16.5m^3/s

INFLOW I4 DETAILS:
CATCHMENT AREA = 0.0025km^2
PEAK 1:200yr FLOW = 0.01m^3/s
PEAK 1:200yr + 20% CC FLOW = 0.012m^3/s
PEAK 1:1000yr FLOW = 0.015m^3/s

INFLOW I3b DETAILS:
CATCHMENT AREA = 0.59km^2
PEAK 1:200yr FLOW = 2.36m^3/s
PEAK 1:200yr + 20% CC FLOW = 2.83m^3/s
PEAK 1:1000yr FLOW = 3.49m^3/s

INFLOW I1a DETAILS:
CATCHMENT AREA = 3.13km^2
PEAK 1:200yr FLOW = 12.53m^3/s
PEAK 1:200yr + 20% CC FLOW = 15.03m^3/s
PEAK 1:1000yr FLOW = 18.51m^3/s

INFLOW I1b DETAILS:
CATCHMENT AREA = 0.54km^2
PEAK 1:200yr FLOW = 2.16m^3/s
PEAK 1:200yr + 20% CC FLOW = 2.59m^3/s
PEAK 1:1000yr FLOW = 3.19m^3/s

I1a I1b I2 I3a I3b I4

A B C D E F G H J K L M

EXISTING SUBSTATION
PROPOSED LT94
PROPOSED LT92
EXISTING SGT4
FILTER DRAIN AND SOAKAWAY TO DISCHARGE FLOW FROM I4
AUCHTERAW BURN DISCHARGES TO RIVER OICH
DOWNSTREAM MODEL BOUNDARY AT CULVERTS BENEATH FORESTRY TRACK

Waterfall Weir Waterfalls Drain Sheepfold Forestry Nurs Path FB Lundie Cottage Talamh Carraig Auchteraw Hostel Torr Sionnaich Whinhill Auchteraw House Auchteraw Burn Track River

48m 43m 39m 54m 51m 44m 41m

N

0 50 100 150 200
Metres

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- WATERCOURSE 1 - AUCHTERAW BURN
- WATERCOURSE 2 - ALLT NA FEARNA
- WATERCOURSE 3 - MINOR WATERCOURSE (ENGINEERED)
- WATERCOURSE 4 - MINOR WATERCOURSE (ENGINEERED)
- MODEL INFLOW LOCATION + ID
- UPSTREAM MODEL BOUNDARY LOCATION
- DOWNSTREAM MODEL BOUNDARY LOCATION
- WATERCOURSES RELEVANT TO STUDY (NOT MODELLED)
- SITE BUILDING
- 1m CONTOUR

SSE

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FORT AUGUSTUS FRA
HYDROLOGICAL MODELLING REPORT
BASELINE MODEL
APP-A-1

Scale 1:5,000 @ A3
Date NOVEMBER 2017

00660.00047.18.AppA-1.0 Hydrological Overview

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235000 235500 236000 236500

809000 808500 808000

INFLOW I2 DETAILS:
CATCHMENT AREA = 2.79km^2
PEAK 1:200yr FLOW = 11.17m^3/s
PEAK 1:200yr + 20% CC FLOW = 13.4m^3/s
PEAK 1:1000yr FLOW = 16.5m^3/s

INFLOW I4 DETAILS:
CATCHMENT AREA = 0.06km^2
PEAK 1:200yr FLOW = 0.22m^3/s
PEAK 1:200yr + 20% CC FLOW = 0.27m^3/s
PEAK 1:1000yr FLOW = 0.33m^3/s

INFLOW I3 DETAILS:
CATCHMENT AREA = 0.59km^2
PEAK 1:200yr FLOW = 2.36m^3/s
PEAK 1:200yr + 20% CC FLOW = 2.83m^3/s
PEAK 1:1000yr FLOW = 3.49m^3/s

INFLOW I1a DETAILS:
CATCHMENT AREA = 3.13km^2
PEAK 1:200yr FLOW = 12.53m^3/s
PEAK 1:200yr + 20% CC FLOW = 15.03m^3/s
PEAK 1:1000yr FLOW = 18.51m^3/s

INFLOW I1b DETAILS:
CATCHMENT AREA = 0.54km^2
PEAK 1:200yr FLOW = 2.16m^3/s
PEAK 1:200yr + 20% CC FLOW = 2.59m^3/s
PEAK 1:1000yr FLOW = 3.19m^3/s

10m STANDOFF FROM L94 PLATFORM TO DIVERTED WATERCOURSE 3. STANDOFF DISTANCE LIKELY TO BE INCREASED TO 15-20m

STEPPED PLATFORM ELEVATIONS

STEPPED PLATFORM ELEVATIONS

EXISTING SUBSTATION

PROPOSED LT94

PROPOSED LT92

EXISTING SGT4

AUCHTERAW BURN DISCHARGES TO RIVER OICH

DOWNSTREAM WATERCOURSE NETWORK BOUNDARY AT TRACK CULVERTS

I1a I1b I2 I3 I4 L M (NEW) J D (NEW)

Waterfall Weir Waterfalls Waterfalls Sheepfold Forestry Nurs Path FB Drain Drain Drain Drain Lundie Cottage Talamh Carraig Auchteraw House Auchteraw Burn Track Track River

48m 39m 54m 51m 44m 41m

0 50 100 150 200 Metres

N

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

2. LAYOUT AND DETAILS OF PROPOSED WATERCOURSE DIVERSIONS AND NEW WATERCOURSE ARE CONSIDERED INITIAL DESIGN AND SUBJECT TO REFINEMENT AT THE POST PLANNING STAGE.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- WATERWAYS RELEVANT TO STUDY (NOT MODELLED)
- WATERCOURSE 1 - AUCHTERAW BURN (UNCHANGED)
- WATERCOURSE 2 - ALLT NA FEARNA (UNCHANGED)
- WATERCOURSE 3 - REVISED DESIGN
- WATERCOURSE 4 - NEW INTERCEPTION DRAIN
- SITE BUILDING
- MODEL INFLOW LOCATION + ID
- UPSTREAM MODEL BOUNDARY LOCATION
- DOWNSTREAM MODEL BOUNDARY LOCATION
- 1m CONTOUR

SSE

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FORT AUGUSTUS FRA

HYDROLOGICAL MODELLING REPORT

DEVELOPMENT MODEL HYDROLOGICAL OVERVIEW

APP-A-2

Scale 1:5,000 @ A3

Date NOVEMBER 2017

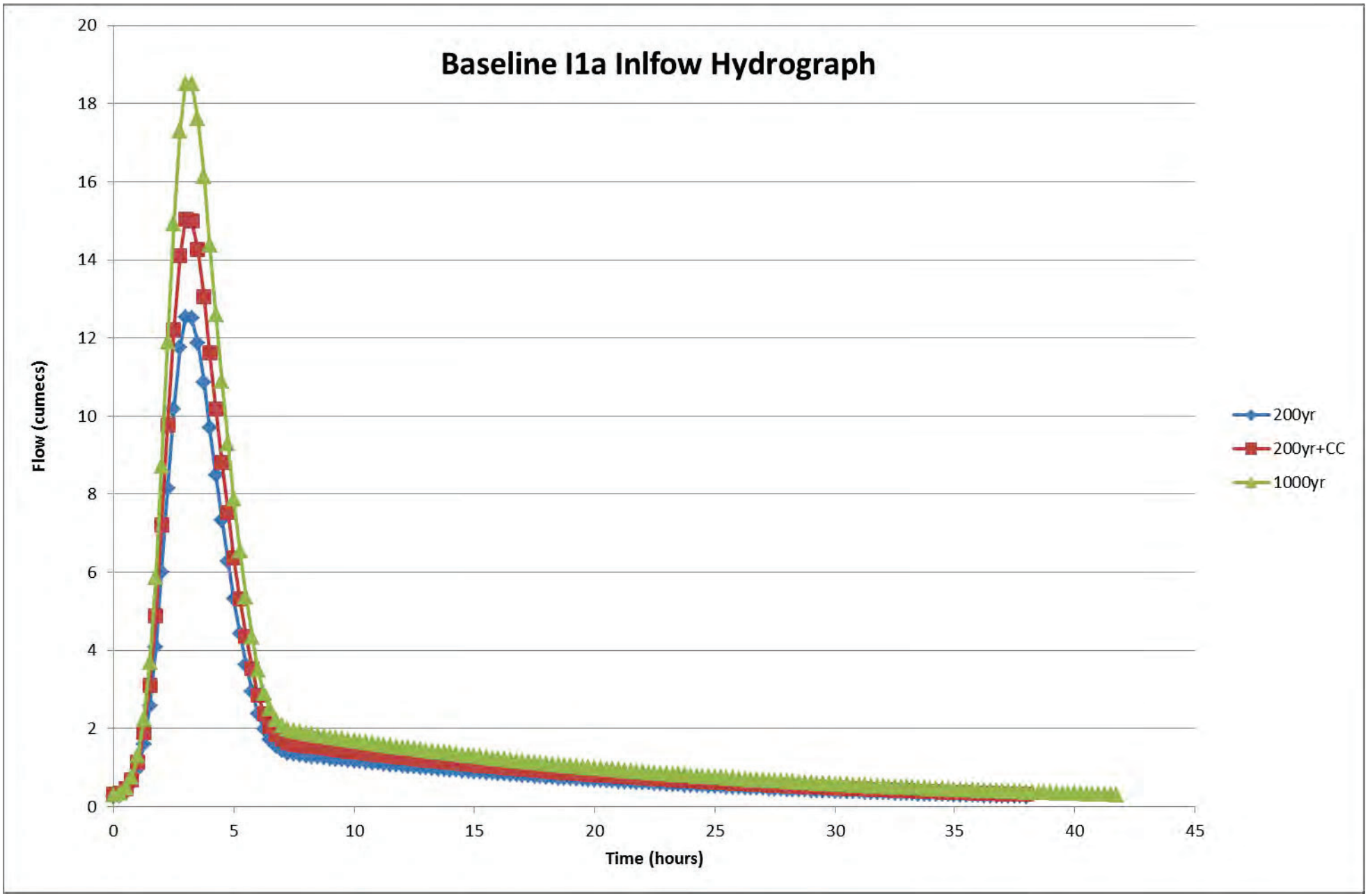
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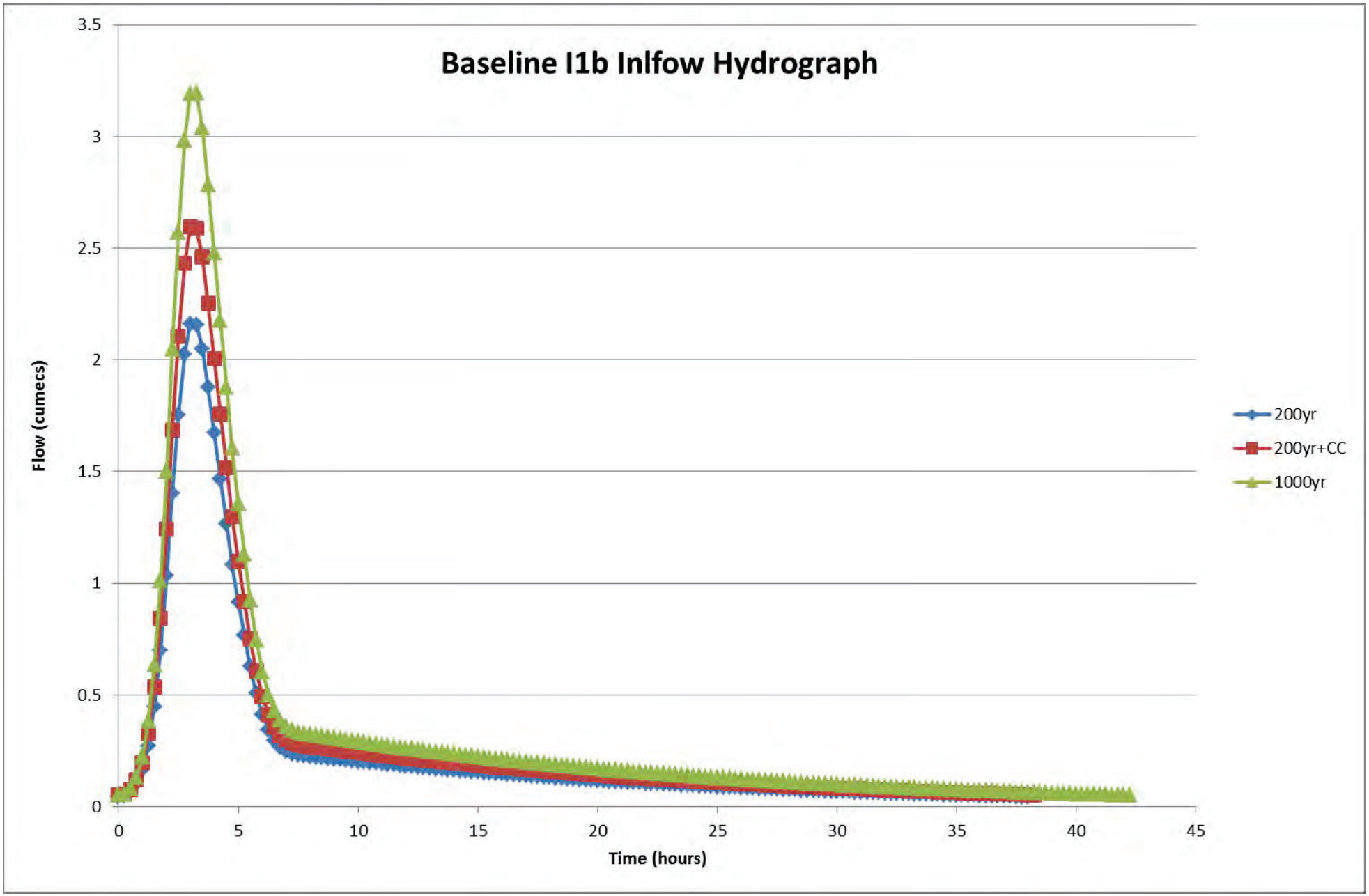
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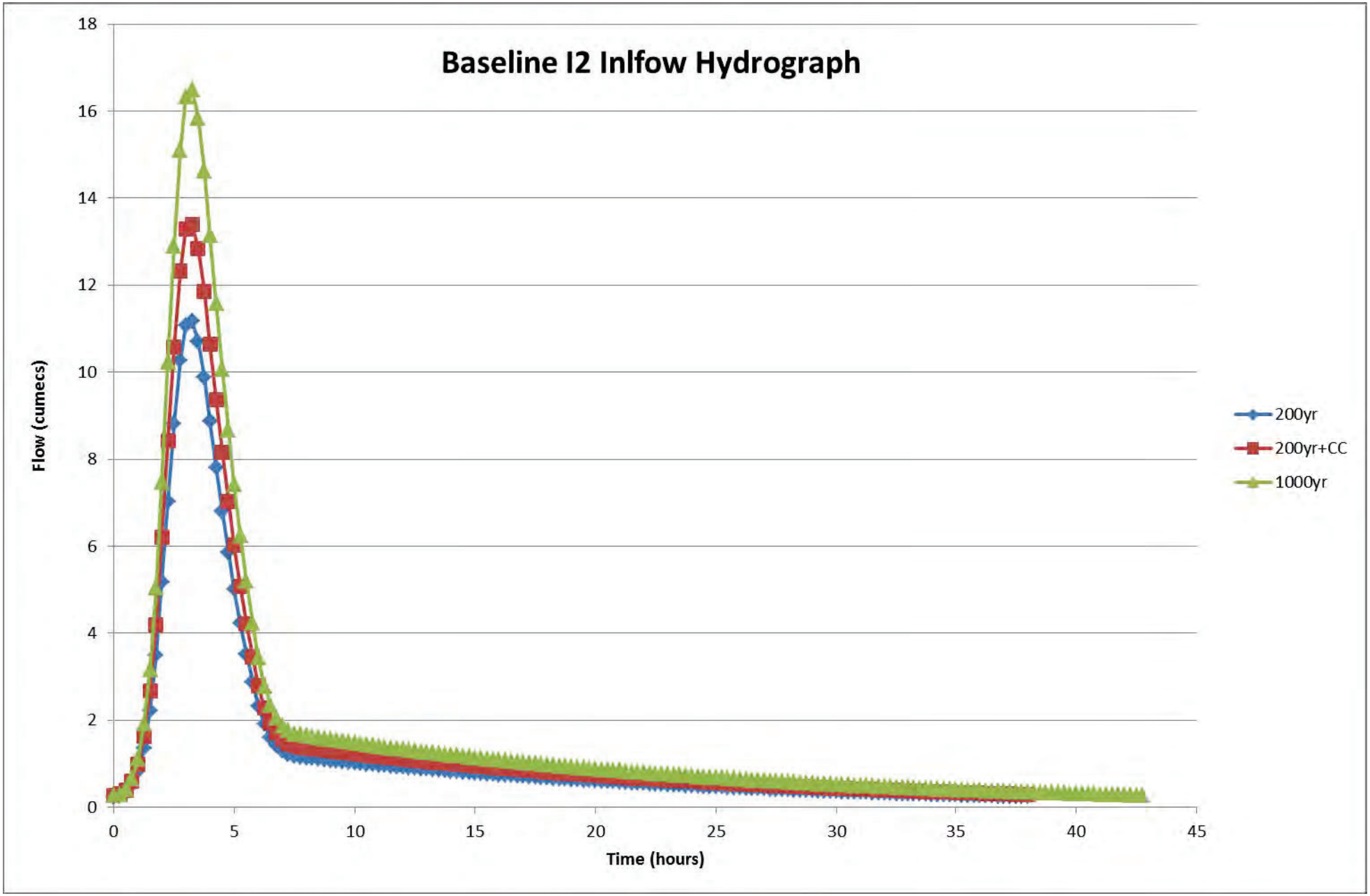
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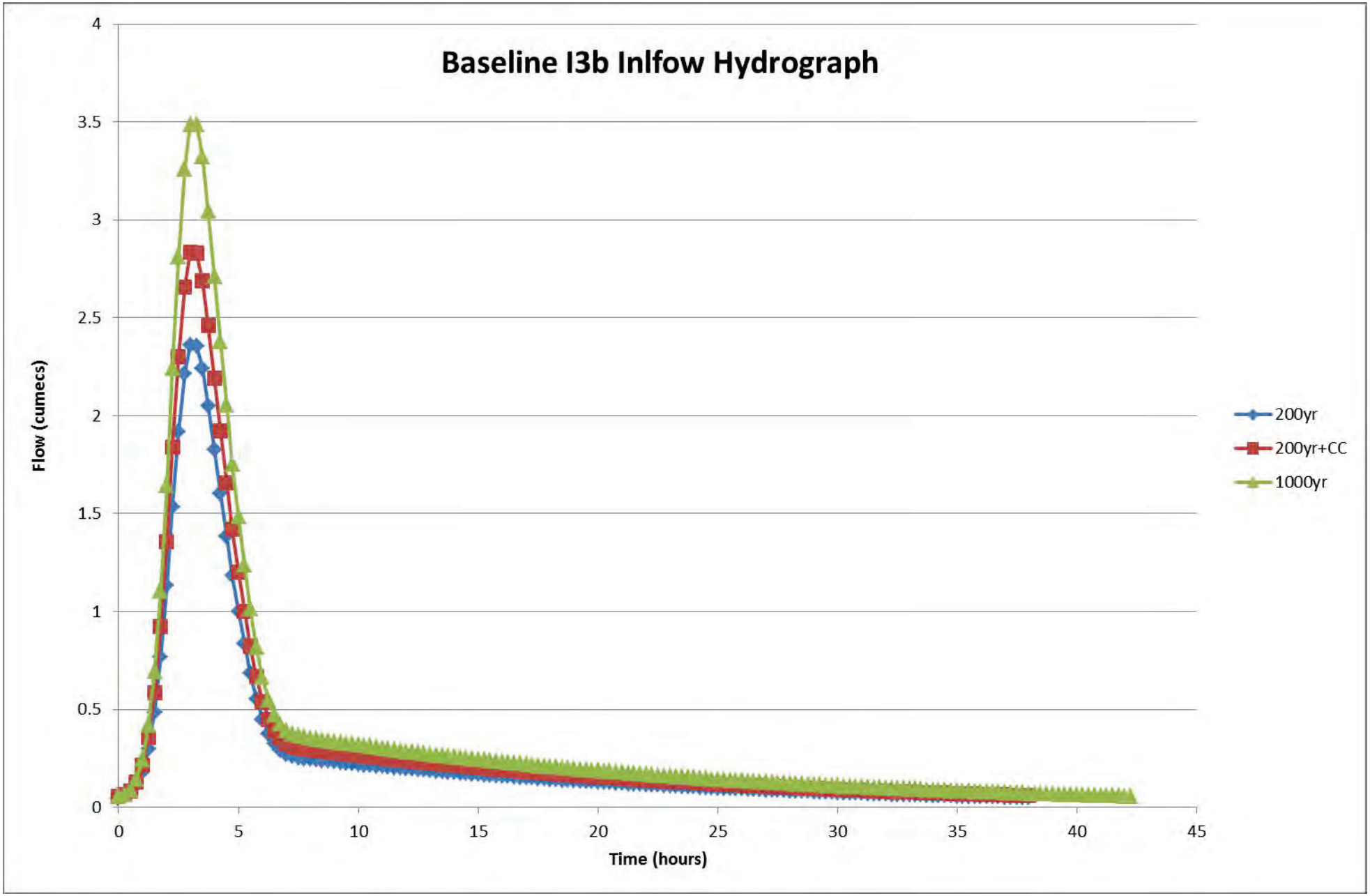
APPENDIX 01

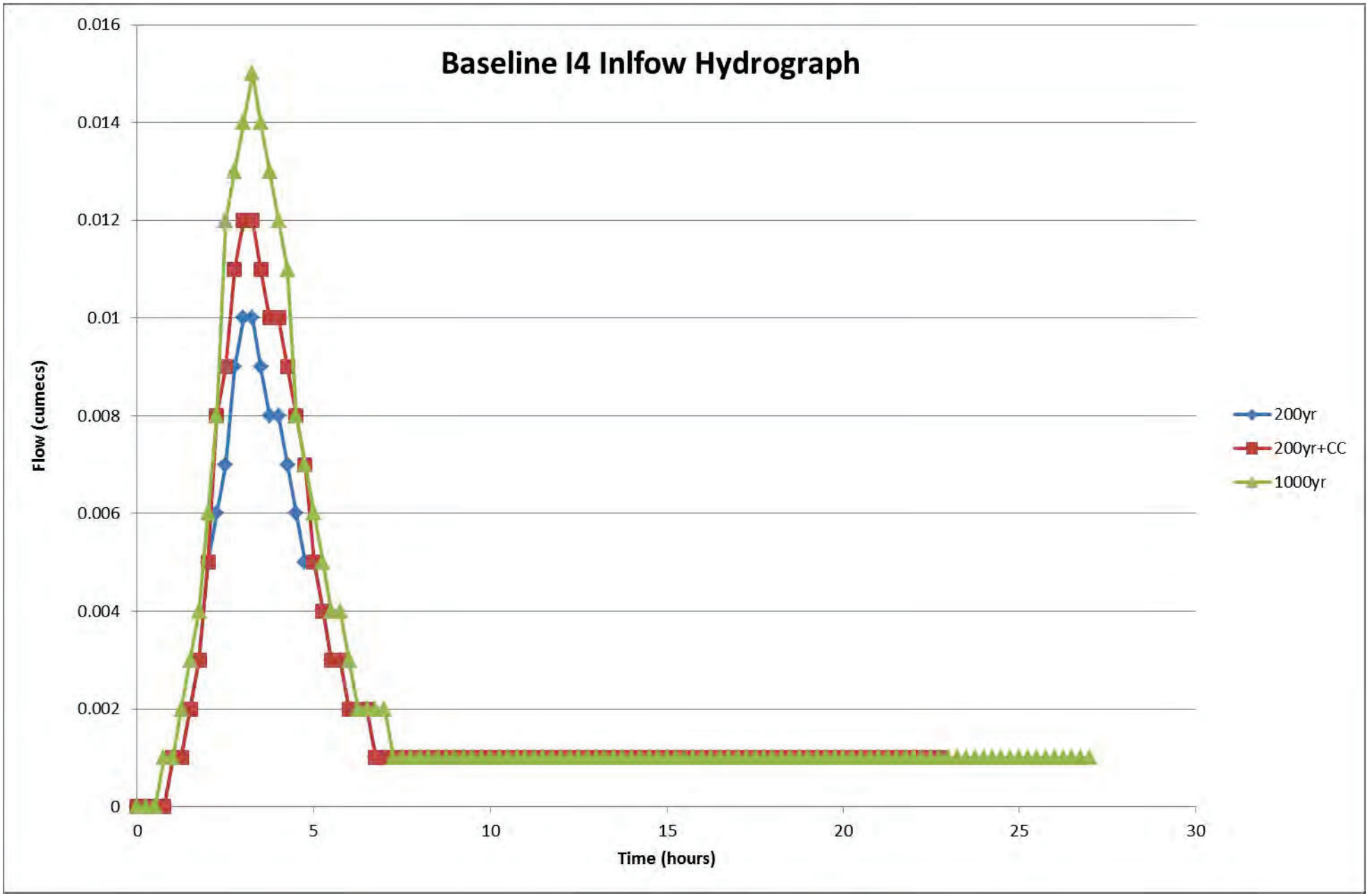
Baseline Model Inflow Hydrographs

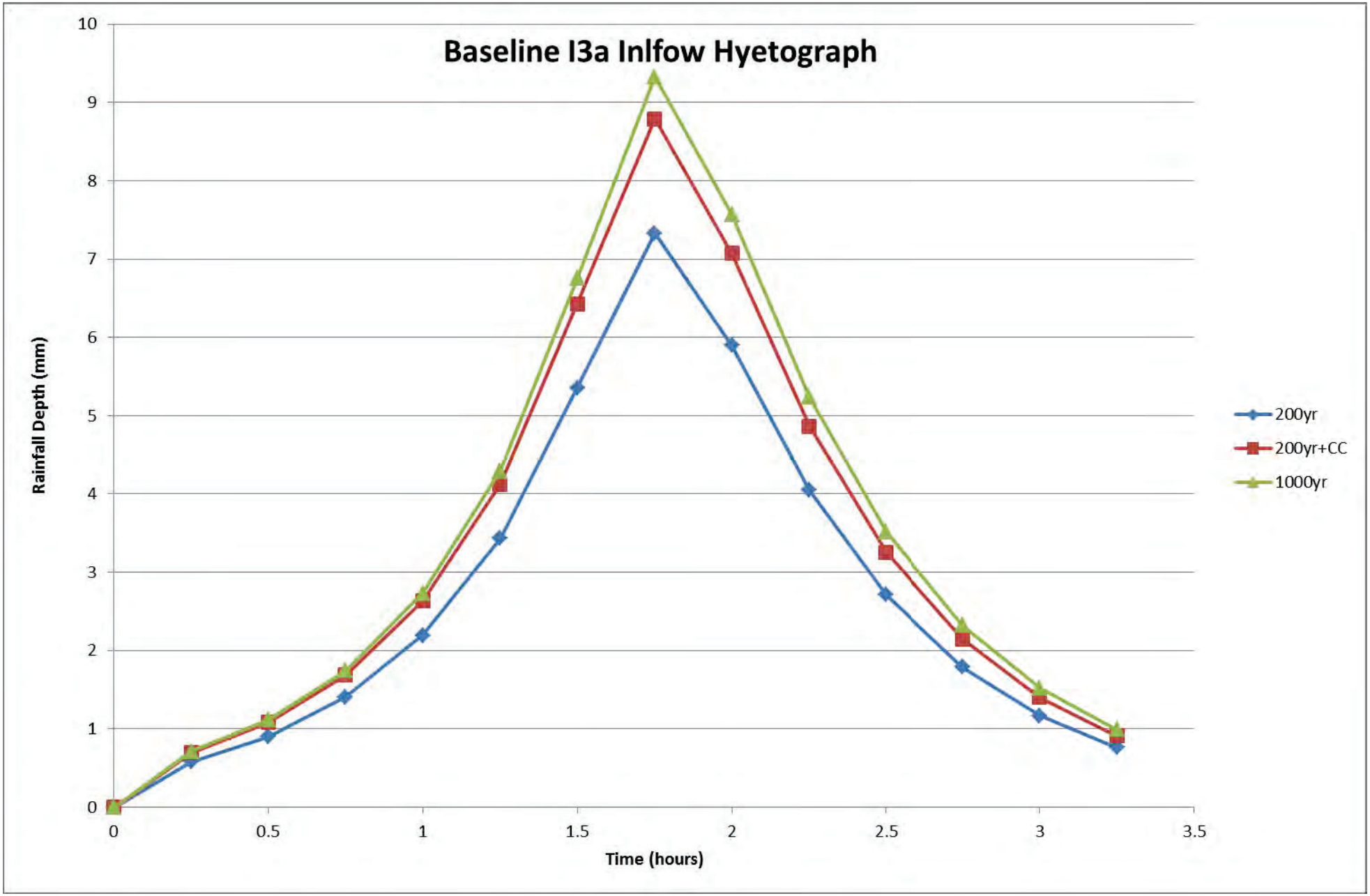

Baseline I1a Inlfow Hydrograph
Flow (cumecs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
0
5
10
15
20
25
30
35
40
45
200yr
200yr+CC
1000yr


Baseline I1b Inlfow Hydrograph
Flow (cumecs)
Time (hours)
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30
35
40
45
200yr
200yr+CC
1000yr


Baseline I2 Inlfow Hydrograph
Flow (cumecs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
0
5
10
15
20
25
30
35
40
45
200yr
200yr+CC
1000yr

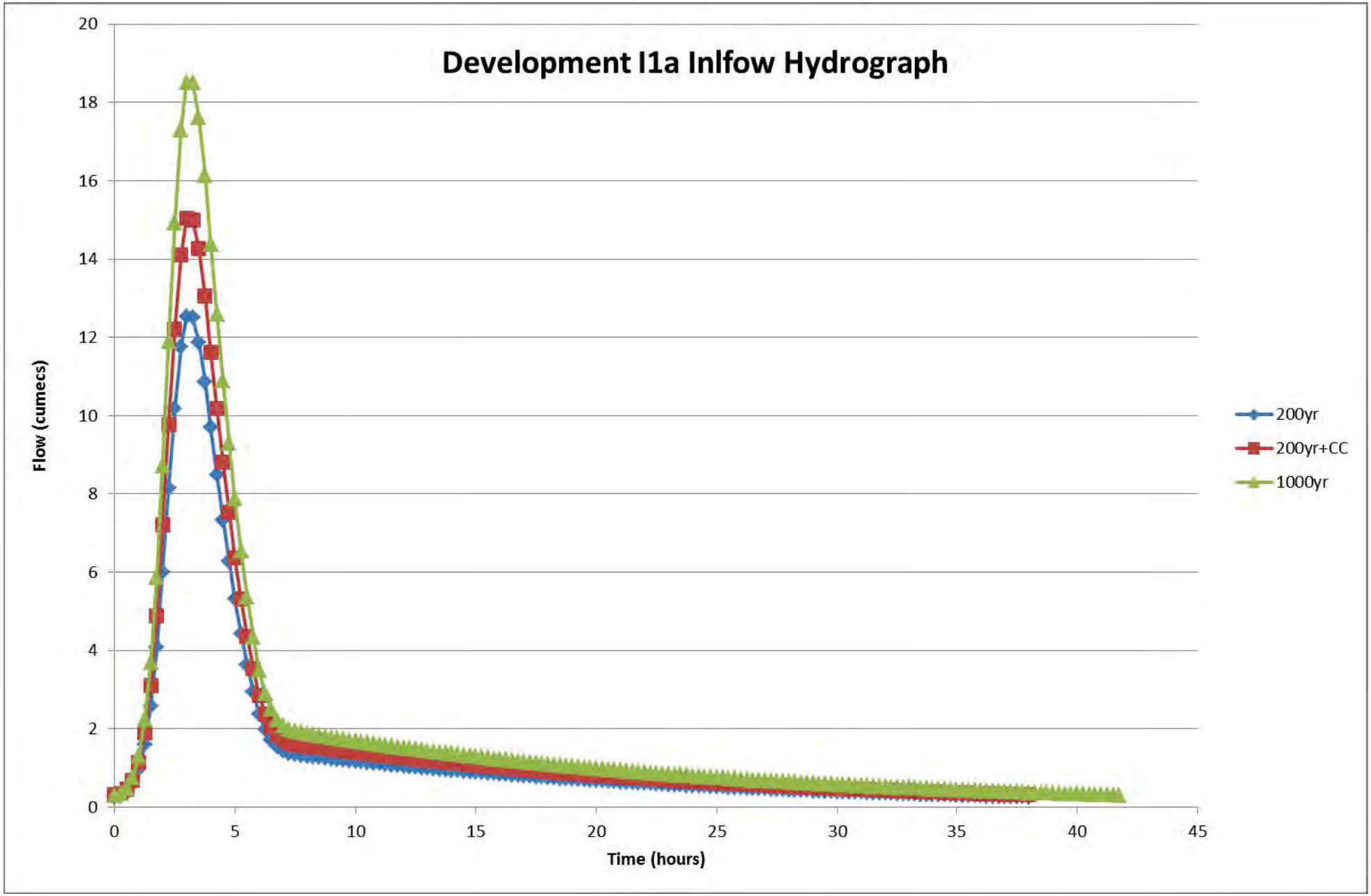

Baseline I3b Inlfow Hydrograph
Flow (cumecs)
Time (hours)
0
0.5
1
1.5
2
2.5
3
3.5
4
0
5
10
15
20
25
30
35
40
45
200yr
200yr+CC
1000yr

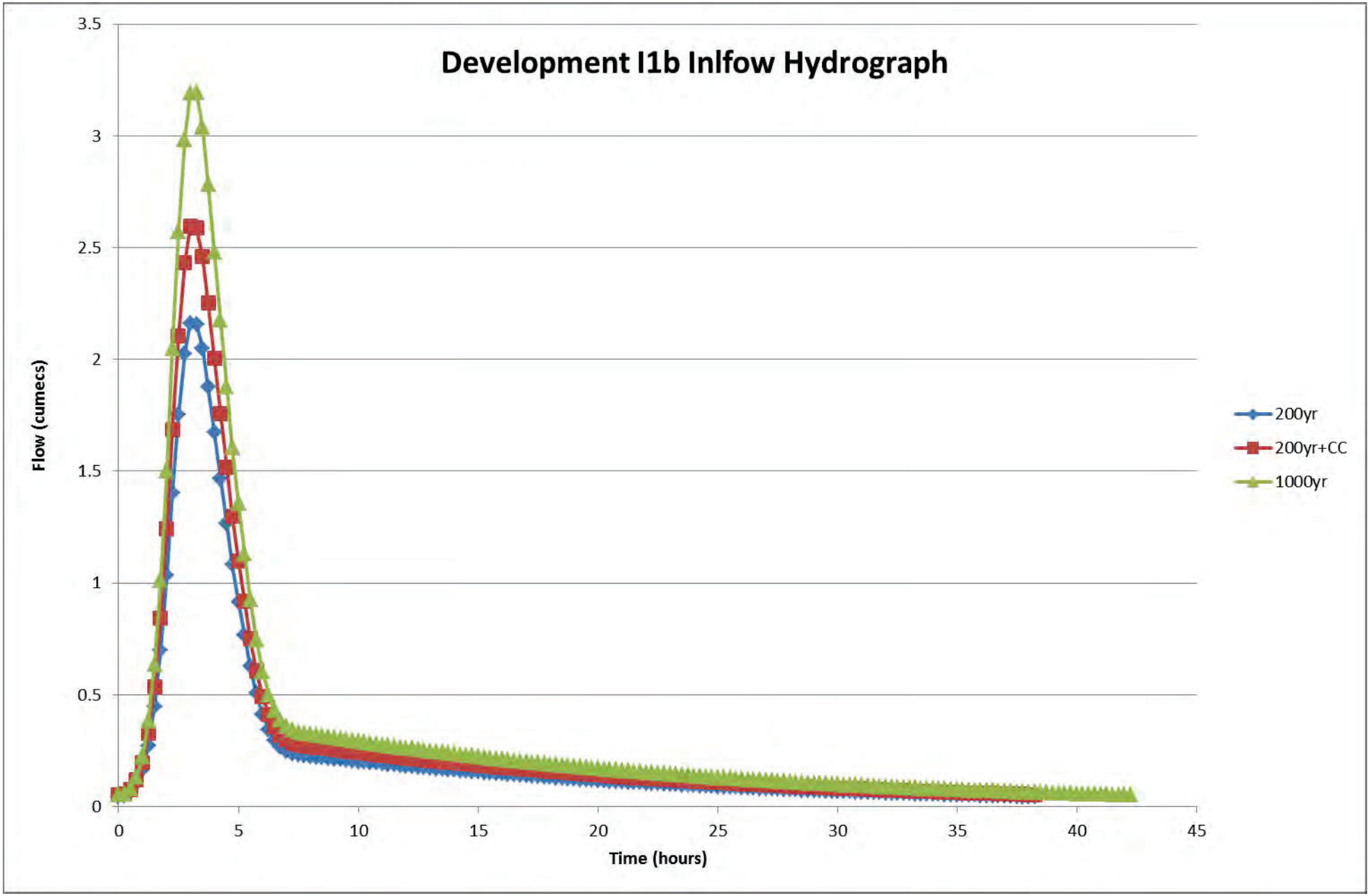

Baseline I4 Inlfow Hydrograph
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Flow (cumecs)
0
5
10
15
20
25
30
Time (hours)
200yr
200yr+CC
1000yr

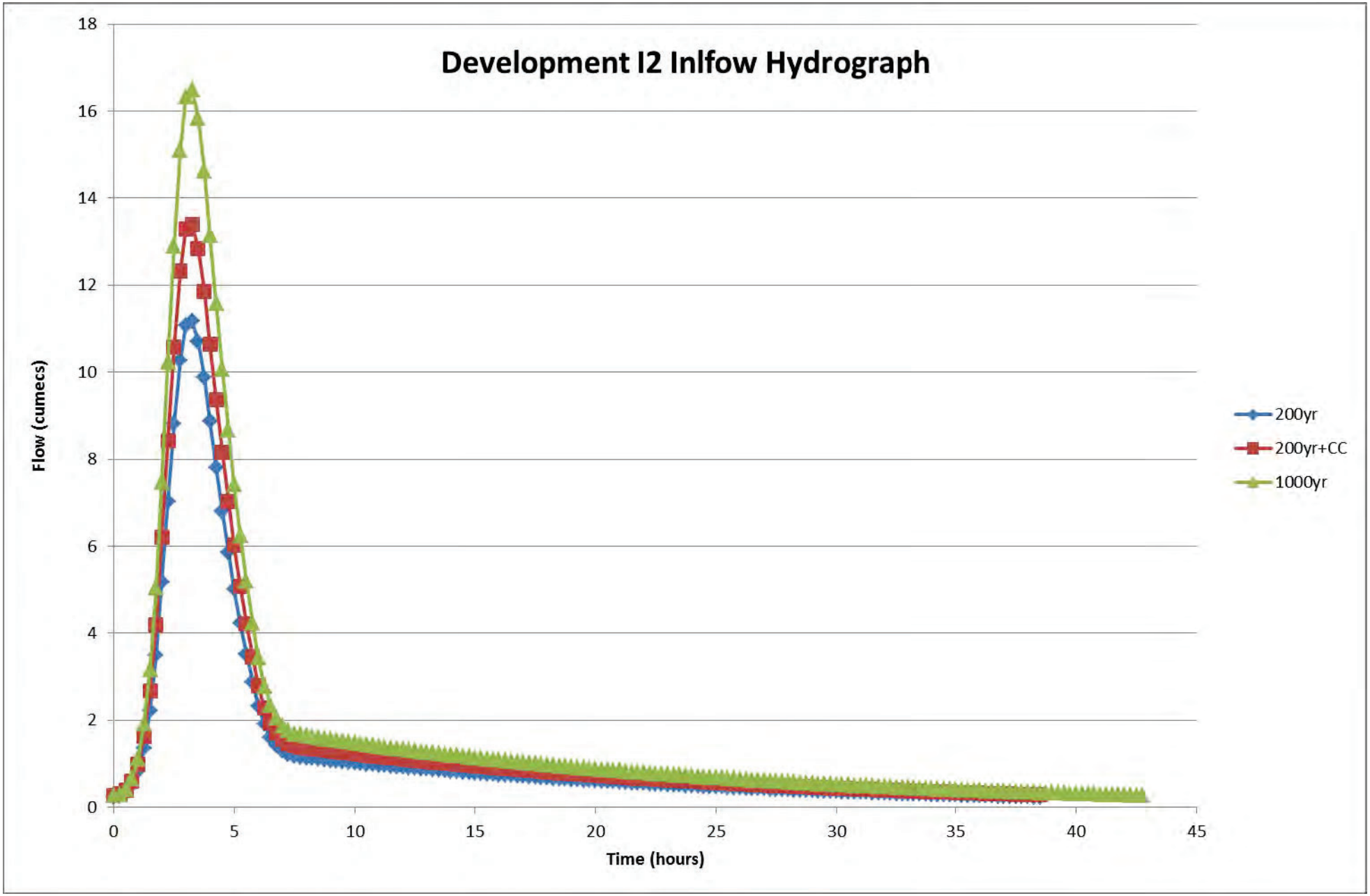

Baseline I3a Inlfow Hyetograph
Rainfall Depth (mm)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
0
0.5
1
1.5
2
2.5
3
3.5
200yr
200yr+CC
1000yr

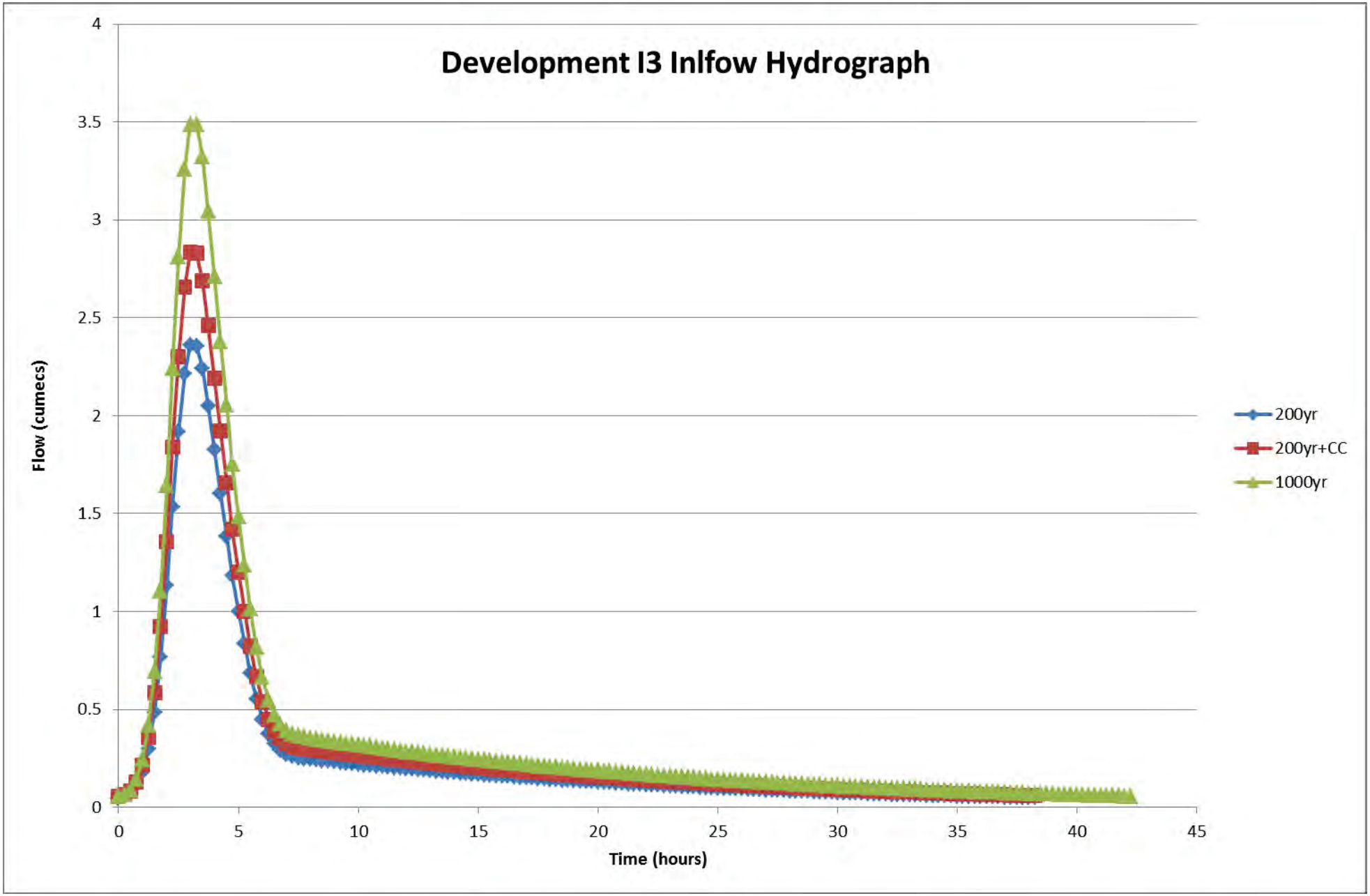
APPENDIX 02

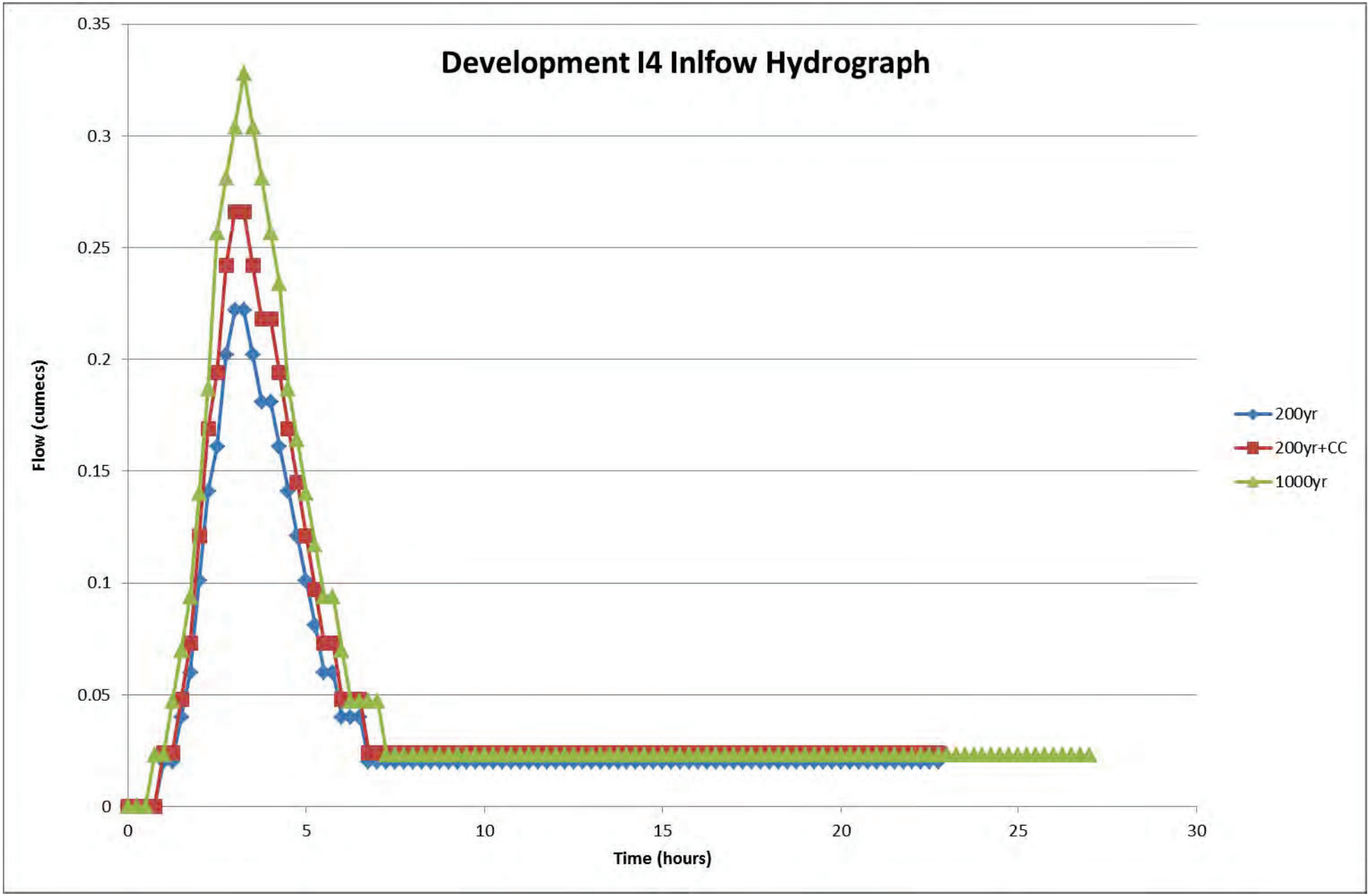
Development Model Inflow Hydrographs


Development I1a Inlfow Hydrograph
Flow (cumecs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
0
5
10
15
20
25
30
35
40
45
200yr
200yr+CC
1000yr


Development I1b Inlfow Hydrograph
Flow (cumecs)
Time (hours)
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30
35
40
45
200yr
200yr+CC
1000yr


Development I2 Inlfow Hydrograph
Flow (cumecs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
0
5
10
15
20
25
30
35
40
45
200yr
200yr+CC
1000yr


Development I3 Inlfow Hydrograph
Flow (cumecs)
Time (hours)
0
0.5
1
1.5
2
2.5
3
3.5
4
0
5
10
15
20
25
30
35
40
45
200yr
200yr+CC
1000yr


Development I4 Inlfow Hydrograph
Flow (cumecs)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
5
10
15
20
25
30
Time (hours)
200yr
200yr+CC
1000yr

APPENDIX FRA-B

Hydraulic Modelling Report

FORT AUGUSTUS SUBSTATION AUCHTERAW

Proposed Substation Extension
Platforms LT92 and LT94

APPENDIX FRA-B: Hydraulic Modelling Report

FLOOD RISK ASSESSMENT

Prepared for: Scottish and Southern Energy

SLR Ref: 405.00660.00047
Version No: 2
November 2017

BASIS OF REPORT

This document has been prepared by SLR Consulting Limited with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with Scottish and Southern Energy (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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CONTENTS

1.0 INTRODUCTION 1
1.1 Terms of Reference and Objectives 1
1.2 Model Selection 1
2.0 DATA COLLECTION 2
2.1 Overview 2
2.1.1 Channel Topographic Cross Sections 2
2.1.2 Floodplain Topography 2
2.1.3 Structures 2
2.1.4 Roughness (Manning' n) 3
3.0 BASELINE MODEL 3
3.1 Software Version 3
3.2 Grid Size and Timestep 3
3.3 Model Extents 3
3.4 Hydraulic Boundaries 3
3.4.1 Upstream Boundary 4
3.4.2 Downstream Boundary 4
3.5 Cross Sections 4
3.6 Structures 4
3.7 Manning's n Values 5
3.8 Existing Substation Platforms and Buildings 6
3.9 ESTRY/TUFLOW Interface 6
4.0 PROPOSED DEVELOPMENT MODEL 6
4.1 Hydraulic Boundaries 6
4.2 Cross Sections and Structures 6
5.0 MODEL RESULTS 7
5.1 Baseline Model 7
5.2 Development Model 8
5.3 Baseline $_v$ Development Model Results and Flood Compensation 9
6.0 CONCLUSIONS 10

DOCUMENT REFERENCES

TABLES

Table 3-1 Baseline Scenario: Culvert / Structure Details 4
Table 3-2 2D Manning's n Values 5
Table 4-1 Proposed Development Model: Culvert / Structure Details 7
Table 5-1 Baseline 1D Model: Outflow Summary 7
Table 5-2 Baseline 2D Model: Outflow Summary 8
Table 5-3 Development 1D Model: Outflow Summary 8
Table 5-4 Development 2D Model: Outflow Summary 8
Table 5-5 Combined 1D/2D Outflow: Baseline v Development Model Comparison 9

DRAWINGS

Drawing No. APP-B-1: Baseline Model Network Overview
Drawing No. APP-B-2: Development Model Network Overview
Drawing No. APP-B-3: New Watercourse Section Details
Drawing No. APP-B-4a: 200yr Baseline Model Outputs
Drawing No. APP-B-4b: 200yr +20% CC Baseline Model Output
Drawing No. APP-B-4c: 1,000yr Baseline Model Output
Drawing No. APP-B-5a: 200yr Development Model Output
Drawing No. APP-B-5b: 200yr +20% CC Development Model Output
Drawing No. APP-B-5c: 1,000yr Development Model Output
Drawing No. APP-B-6: Conceptual Flood Compensation Scheme

1.0 Introduction

1.1 Terms of Reference and Objectives

SLR Consulting Ltd (SLR) has been appointed by Scottish and Southern Energy (SSE) to undertake a Flood Risk Assessment (FRA) to support a planning application for the proposed extension of the existing electrical substation facility at Auchteraw, Fort Augustus in the Scottish Highlands.

The proposed substation expansion comprises the construction of 2no. new platforms referred to as LT92 and LT94 which will adjoin to the existing platform boundary.

SEPAs Flood Maps for the Study Site, are produced at an indicative and strategic level scale and only modelled for watercourses with catchment areas >3km^2 and thus fails to capture the potential flood risk posed by the 'minor' watercourses flowing through and adjacent to the development site area.

This document presents the summary Hydraulic Modelling Report (HMR) which forms Appendix FRA-B to the FRA and summarises the construction of a linked 1-Dimensional (1D) 2-Dimensional (2D) hydraulic model of the watercourses in the vicinity of the proposed development area, developed to inform the FRA and detailed site development proposals in the context of fluvial flood risk.

Two separate model scenarios have been considered for the hydraulic model:

- **Baseline** – This assesses the flood risk to the existing platform during a 0.5% and 0.1% Annual Exceedance Probability (AEP) events. The flood risk to the existing platform when allowing for the impact of climate change (+20%) on the 0.5% AEP event has also been assessed.
- **Proposed Development** – assesses the impact of the proposed LT92 and LT94 substation platforms on the flood risk at the development site and elsewhere. Under this scenario, flood mitigation measures, including new / diverted watercourses and culverts have been assessed (without flood compensatory analysis to determine the likely initial compensation requirements to be detailed at the post-planning stage). As for the baseline scenario, the impact of the proposed platforms on flood risk has been assessed during a 0.5% (with and without a +20% allowance for climate change) and 0.1% AEP events.

A diagrammatic overview of the baseline and proposed development scenarios are presented as Drawing No.APP-B-1 and APP-B-2 enclosed.

1.2 Model Selection

A linked 1-Dimensional/2-Dimensional (1D/2D) hydraulic model has been selected to quantify the extent and depth of flooding at the development as it provides a more accurately representation of 'out-of-bank' flows and flood water propagation than a 1D hydraulic model.

The hydraulic model has been constructed using the ESTRY TUFLOW linked hydraulic modelling package. This packaged is distributed by CH2M Hill and is widely used throughout the UK.

The watercourses across the Site along with the structures such a bridges and culverts have been modelled using the 1D hydraulic model package, ESTRY, which is linked to the 2D hydraulic modelling package, TUFLOW. The out-of-bank flood propagation (2D flow) has been simulated using TUFLOW. The 2D TUFLOW computational engine computes flow paths by dividing the floodplain into a grid of individual cells.

The flow of water between cells is then computed repeatedly at regular time-steps by solving the 2D Shallow Wave Equation (Syme, 1991[1]; Huxley, 2004[2] and WBM, 2006[3]) to estimate the spread of flooding. As each cell contains information on the ground level, flood flows can be routed in any direction and will naturally tend to follow the local topography. These models are therefore ideally suited to cope with morphological changes in the floodplain particularly in area with complex flow paths.

2.0 Data Collection

2.1 Overview

The construction of 1D/2D linked hydraulic models requires a number of data sets and parameters which are summarised below:

- Channel topographic cross sections;
- Floodplain topography in the form of a digital terrain model (DTM);
- Hydraulic structures; and
- Roughness (Manning's n).

2.1.1 Channel Topographic Cross Sections

Cross sections of the flood model river channels were surveyed by SLR in separate surveys in 2014 and 2017 - copies of the topographic surveys are enclosed at Appendix FRA-D of the FRA.

Georeferenced levels were taken along cross sections along the watercourses within the extent of the study area shown on Drawing No.APP-B-1. The location of each section was converted to a chainage relative to the left bank of each watercourse. To enable the channel to be accurately represented in the 1D domains, cross sections were specified where a significant change in the river morphology occurred, such as at a change in direction, channel width or channel depth.

It is noted that, due to the dense riperian forestry along a few of the river corridors, some of the cross sections have been interpolated using a combination of upstream and downstream surveyed sections and site observations / measurements.

2.1.2 Floodplain Topography

As no aerial photogrammetry data (LiDAR) is available for the Study Site, a Digital Terrain Model (DTM) of the study area has been generated from an amalgamation of 5m DTM grid resolution, the highest grid resolution available for the area at the time of writing, and the 2014 and 2017 topographic surveys.

2.1.3 Structures

There are a number of structures (i.e. culverts) along watercourses relevant to the assessment and these have been explicitly represented within the 1D model. The structural details of the culverts and bridges which are required for 1D modelling were collected during the 2014 and 2017 surveys. These include invert levels, soffit

[1] Syme, W. J., 1991. *Dynamically linked two dimensional / one dimensional hydrodynamic modelling program for rivers, estuaries and coastal waters*, Masters Thesis, Department of Civil Engineering, The University of Queensland
[2] Huxley, C.D. 2004. *TUFLOW Testing and Validation*, Undergraduate Thesis for Bachelor of Engineering in Environmental Engineering, School of Environmental Engineering, Griffith University, June 2004
[3] WBM Oceanics, 2006. *TUFLOW user manual: GIS Based 2D/1D Hydrodynamic Modelling*, WBM Oceanics Australia

levels, culvert diameters, type of structure, condition and blockage percentage, along with the length and width of each structure.

2.1.4 Roughness (Manning' n)

Channel and floodplain roughness was represented within the model by Manning's n coefficients. Values are based upon those published within texts such as Chow (1959) by comparison with site observations and photographs of the river and floodplain taken during the topographic surveys.

3.0 Baseline Model

3.1 Software Version

The TUFLOW model was constructed using the TUFLOW.2016-03-AE-w64 version of the software which was the latest model version at the start of the project.

3.2 Grid Size and Timestep

The 2D domain was constructed with a 1m grid which was considered an appropriate grid size, being less that the width of the narrowest cross section (some 1.7m). The top of bank on either side of the watercourses are therefore explicitly captured by separate cells resulting in an effective estimate of the exchange of water between the 1D and 2D interface.

In accordance with best practice, the timestep used for the 2D element of the model should be between $^1/_5$ and $^1/_2$ of the grid size while the timestep for the 1D element of the model should be set at $^1/_2$ the timestep of the 2D element. As such, a 0.2 second timestep has been used for the 2D element and 0.1 second for the 1D element.

3.3 Model Extents

The extent of watercourses pertinent to the Baseline modelling scenario is outlined on Drawing No.APP-B-1.

The 2D model extent extends to the edge of River Oich in the south and across the flat forested land to the east of the Site. This allows for the natural propagation of the 2D flows across this area which will then follow the local topography gradually towards the River Oich.

The 2D boundary is set along the 26.0m Above Ordnance Datum (AOD) contour parallel to the River Oich which is identified as the 1,000yr floodplain extent on SEPAs Indicative Flood Map[4].

3.4 Hydraulic Boundaries

Hydraulic boundaries were selected to be located a minimum of approximately 100m from the existing and proposed platforms such that hydraulic features likely to impact flood mechanism at the platforms are explicitly represented and accounted for.

[4] Scottish Environment Protection Agency (2017) Online Interactive Flood Map Tool, available at: http://map.sepa.org.uk/floodmap/map.htm (accessed 5th November 2017).

3.4.1 Upstream Boundary

The hydrological inputs mark the upstream boundaries for each modelled watercourse extent. These are all represented as hydrographs with the exception of Inflow I3a for the baseline scenario which is represented as an inflow Hyetograph as discussed at Section 2.5 of the Hydrology Report, enclosed as Appendix FRA-A of the FRA.

The upstream boundaries are located where possible at constraints in the 1D domain, i.e. culverts and are shown on Drawing No.APP-B-1 for the baseline modelling scenario.

3.4.2 Downstream Boundary

The 1D model outflow boundary condition is governed by the outflow capacity of 3no. circular corrugated steel culverts on the Auchteraw Burn (Watercourse 1), which are located approximately 550m southeast of the proposed development area. Thus a total combined rating curve has been derived by applying Manning's principles of pipe flow. Refer to Section 3.0 of the Hydrological Modelling Report contained as Appendix FRA-A to the FRA for further details.

A 2D outflow boundary has also been applied along the River Oich at 26.0mAOD, the downstream extent of the 2D domain, and allows flood water to dissipate beyond the model extent and prevents 'glass walling' effects and an overestimate of flood depth.

A rating curve has also been for the 2D downstream boundary albeit generated automatically by TUFLOW based on gradient perpendicular to the boundary of 0.0833.

3.5 Cross Sections

The georeferenced cross sections of the watercourses across the study site surveyed by SLR were used to build the 1D channel cross sections. Cross sections were trimmed to the left and right top of bank so that the edge of the 1D domain could be limited to the watercourses and out-of-bank flow solely represented within the 2D model element.

3.6 Structures

The location of the 1D structures in the baseline scenario are shown on Drawing No. APP-B-1 and Table 3-1 below contains the surveyed details included within the 1D model.

Blockages of culverts have been estimated from site observations and photographs taken during the 2014 and 2017 SLR site surveys.

Table 3-1
Baseline Scenario: Culvert / Structure Details

Structure ID	Type	Dimensions	Material	% Blocked	Condition	Manning's *n* Value	Length (m)
A	Circular Culvert	300mm ø	PVC	80%	OK	0.015	48.944
B	Rectangular Culvert	W= 0.55m H = 0.275m	PVC	10%	OK	0.015	3.541
C	Circular Culvert	275mm ø	PVC	0%	OK	0.015	0.405
D	Circular Culvert	600mm ø	Corrugated	0%	Moderately	0.024	15.181

Structure ID	Type	Dimensions	Material	% Blocked	Condition	Manning's *n* Value	Length (m)
			Steel		deteriorated		
E	Circular Culvert	600mm ø	PVC	50%	Moderately deteriorated	0.013	6.916
F	Circular Culvert	275mm ø	Corrugated Steel	80%	Unknown (due to blockage)	0.024	56.004
G	Circular Culvert	350mm ø	PVC	0%	OK	0.015	25.200
H	Circular Culvert	500mm ø	PVC	0%	OK	0.015	177.063
I	Open Span Rectangular Bridge	W= 2.248m H= 1.24m	Concrete	0%	OK	0.02	2.687
J	Open Span Rectangular Bridge	W= 4.078m H = 1.78m	Concrete	0%	OK	0.02	5.838
K	Circular Culvert	450mm ø	PVC	0%	OK	0.015	15.883
L	Circular Culvert	500mm ø	Steel	0%	OK	0.015	9.307
M	Twin Circular Culvert	2 x 375mm ø	Concrete	0%	OK	0.015	4.193

3.7 Manning's n Values

The Manning's n values in 1D and 2D domains are based on published values set out in Chow (1959). 1D Manning's n values have been based on site observation and photographs of the river and floodplain taken during the site surveys. Along reaches containing dense overgrown vegetation / timber debris within the watercourses, the 1D Manning's n values were increased to 0.1 which represents significant hydraulic constraint.

The 2D Manning's n values have been allocated using satellite images / site observations of the site to ascertain the land use. Table 3-2 below summarises the different Manning's n values to different land uses across the study site.

Table 3-2
2D Manning's n Values

Manning's 'n' Value	Land use
0.1	Default global (Floodplain - Trees - Heavy stand of timber)
0.038	Roads
0.2	Buildings
0.035	Inland Water
0.08	Wood
0.03	Pasture

3.8 Existing Substation Platforms and Buildings

The current substation platform have been explicitly represented in the DTM for both the baseline and proposed development scenarios. Ground levels along the north western boundary of the existing platform are around 42-42.5mAOD and gently fall to approximately 41-41.5m AOD at the south eastern boundary. The SGT4 platform (Constructed in 2015) is located at 39.8mAOD as recommended within the FRA completed by SLR in 2014, undertaken to advise the finished platform level.

The buildings in the northern end of the existing platforms have been assigned increased elevations to exclude 2D flows across the footprint of these buildings and represent site conditions during a flood event i.e. flows are diverted around the buildings as would be expected based on site observations.

3.9 ESTRY/TUFLOW Interface

The 1D and 2D elements of the model have been linked along the top of banks using HX lines. The left and right hand top of bank lines have been allocated elevations to allow for the correct interaction between the 1D and 2D domains. These elevations are extracted from the right and left hand top of bank points of the 1D cross sections.

4.0 Proposed Development Model

4.1 Hydraulic Boundaries

As discussed at Section 2.5 of the Hydrology Report, the hyetograph for catchment 3I(a) has removed and a point inflow, applied as a hydrograph at I4, has been adopted for Watercourse 4. This is a conservative approach as it is inputting the entire downstream catchment at the beginning of the watercourse.

All other upstream model boundaries remain the same as the Baseline Model scenario.

Similarly the downstream model boundary remains the same as the Baseline Model scenario.

Model boundaries are for the Development Model are depicted on Drawing No.APP-B-2.

4.2 Cross Sections and Structures

Drawing No.APP-B-3 outlines the new watercourse section details (initial designs) for the proposed development scenario however, a summary of the key alterations to the baseline model is provided below and an overview depicted in plan on Drawing No.APP-B-3:

- The existing (under capacity) circular **Culvert D** is replaced with a new box culvert with dimensions 4.5m (wide) x 1.5m (high) to have sufficient capacity to convey the design 0.1% AEP flow.
- Existing (undersized) **Culvert M** will be replaced with new box culvert dimensions 3.3m (wide) x 1.2m (high) to have sufficient capacity to convey the 0.1% AEP flow.
- Existing **Culvert H**, outflow Filter Trench / Soakaway and perimeter section of Watercourse 3 (along northwest boundary of existing substation platform) to be made redundant (can be maintained on site however will have limited functionality).
- **Watercourse 3** between point Inflow I3 and Culvert L to be upsized to contain the design 0.1% AEP flow and has a 1m high embankment along the right hand bank.
- **Watercourse 3** from new Culvert D is diverted around eastern edge of the proposed LT94 platform. However, the location of the confluence of Watercourse 3 and Watercourse 1 (Auchteraw Burn) for the

baseline scenario has been retained. The diverted watercourse has an increased capacity compared to existing and has a 1m high embankment along the right hand bank to protect LT94.

- **Watercourse 3** between Culvert D and Culvert M to be re-profiled and upsized to contain the design 0.1% AEP flow.
- Introduction of new 'interception' drain (**Watercourse 4**) upslope of the current perimeter section of Watercourse 3 (along northwest boundary of existing substation platform) to contain the design 0.1% AEP flow. This acts as effective interception and storage of runoff / fluvial flows from small catchment between Watercourse 3 further up-gradient and the existing substation. The new Watercourse 4 discharges at a new confluence with Watercourse 3 immediately upstream of the new box Culvert D. Watercourse 4 also has a 1m bund on downstream side

Table 4-1 below provides an overview of New and Revised structures / culverts proposed for the Development Model.

Table 4-1
Proposed Development Model: Culvert / Structure Details

Structure ID	Type	Dimensions	Material	Manning's *n* Value	Length (m)
D (New)	Rectangular Culvert	W= 4.5m H= 1.5m	Concrete	0.024	32.032
I	Open Span Rectangular Bridge	W= 2.248m H= 1.24m	Concrete	0.02	2.687
J	Open Span Rectangular Bridge	W= 4.078m H = 1.78m	Concrete	0.02	5.838
L	Circular Culvert	500mm ø	Concrete	0.015	9.307
M (New)	Rectangular Culvert	W= 3.3m H= 1.2m	Concrete	0.015	4.193

5.0 Model Results

Discussion in flood risk planning terms for the flood modelling results is presented within the FRA and thus the following sections outline and briefly discuss the salient model results.

5.1 Baseline Model

Drawing No's.APP-B-5a, 5b and 5c enclosed present the mapped flood model outputs for the 0.5% AEP, 0.5% AEP + 20% Climate Change (CC) and 0.1% AEP events for the Baseline Model.

Tables 5-1 and 5-2 below present the Baseline 1D and 2D model outflows (Peak Flow and Cumulative Volume) for the 3no. AEP events.

Table 5-1
Baseline 1D Model: Outflow Summary

AEP Event (%)	1D Peak Model Outflow (m^3/s)	1D Cumulative Outflow Volume (m^3)
0.5	6.031	148233.2

AEP Event (%)	1D Peak Model Outflow (m^3/s)	1D Cumulative Outflow Volume (m^3)
0.5 + 20% CC	6.031	150158.0
0.1	6.031	150980.7

Table 5-2
Baseline 2D Model: Outflow Summary

AEP Event (%)	2D Peak Model Outflow (m^3/s)	2D Cumulative Outflow Volume (m^3)
0.5	46.1	493514.3
0.5 + 20% CC	58.0	607047.8
0.1	73.0	774042.3

The above tabulated Baseline Model outflow results demonstrate that the 1D model outflow is significantly less than the 2D model outflow which given the extended floodplain propagation towards the 2D downstream boundary at the River Oich is expected.

The 1D model outflow is limited to the capacity of the 1D downstream boundary culverts as discussed in Section 3.4.2 and thus levels out at 6.031m^3/s (refer to Section 3.0 of Appendix FRA-A for further details).

5.2 Development Model

Drawing No's.APP-B-6a, 6b and 6c enclosed present the mapped flood model outputs for the 0.5% AEP, 0.5% AEP + 20% Climate Change (CC) and 0.1% AEP events for the proposed Development Model (without flood compensation).

Tables 5-3 and 5-4 below present the Development 1D and 2D model outflows (Peak Flow and Cumulative Volume) for the 3no. AEP events.

Table 5-3
Development 1D Model: Outflow Summary

AEP Event (%)	1D Peak Model Outflow (m^3/s)	1D Cumulative Outflow Volume (m^3)
0.5	6.031	152329.7
0.5 + 20% CC	6.031	154154.9
0.1	6.031	154887.8

Table 5-4
Development 2D Model: Outflow Summary

AEP Event (%)	2D Peak Model Outflow (m^3/s)	2D Cumulative Outflow Volume (m^3)
0.5	50.7	534348.4
0.5 + 20% CC	62.3	668238.4
0.1	80.6	847735.4

As per the Baseline Model results the 1D model outflow is significantly less than the 2D model outflow for the same reasons described above.

5.3 Baseline $_v$ Development Model Results and Flood Compensation

Table 5-5 below compares the combined 1D/2D Baseline $_v$ Development Model outflow results for Peak Flow and Cumulative Volume.

Table 5-5
Combined 1D/2D Outflow: Baseline $_v$ Development Model Comparison

AEP Event (%)	Baseline Model Results		Development Model Results	
	1D / 2D Combined Peak Model Outflow (m^3/s)	1D / 2D Combined Cumulative Outflow Volume (m^3)	1D / 2D Combined Peak Model Outflow (m^3/s)	1D / 2D Combined Cumulative Outflow Volume (m^3)
0.5	52.1	641747.5	56.7	686678.1
0.5 + 20% CC	70.0	757205.8	68.9	822393.2
0.1	79.1	925023.0	86.6	1002623.0

The results above (and as evident on Drawing No's.APP-B-6a, 6b and 6c) indicates that implementation of the Development Model increases the flood risk downstream if unmitigated.

Scottish Planning Policy (SPP) and SEPA's Technical Flood Risk Guidance dictates that a 'neutral or better' impact in terms of flood risk should be achieved to enable the proposed development to satisfy policy requirements and is pertinent to the 0.5% AEP event.

Therefore a formal Flood Compensation Scheme is required to be incorporated into Development Model to offset the increased flood risk offsite by the proposed development for the 0.5% AEP event. The results comparison above for this AEP event suggests that **c.45,000m^3** of additional floodplain storage is required to be provided within SSEs Land Ownership Boundary and the peak outflow at the combined 1D / 2D downstream boundary needs to be reduced by **4.6m^3/s** to have a 'neutral' impact on flood risk downstream.

As such Drawing No.APP-B-7 enclosed presents an overview of the initially proposed Flood Compensation Scheme which demonstrates there are sufficient means, volume and land to implement a working solution to mitigate the increased flood risk downstream as a result of the proposed development.

The initial proposal is for a flood storage bund (engineered earth and landscaped) to be elevated at a maximum of 39.2mAOD along the southern and part of the eastern SSE Land boundary to contain the additional floodplain displacement (and offset the peak outflow too) from the Baseline $_v$ Development model scenarios.

The conceptual compensation scheme confirms that c.110,000m^3 of residual storage is available at 39.2mAOD storage elevation and only c.45,000m^3 is required. The minimum bund elevation required to provide the 45,000m^3 of flood attenuation is calculated to be approximately 38.6mAOD.

In addition to this the increased peak model outflow needs to be offset by 4.6m^3/s via the inclusion of hydraulic throttles on the downstream end of Watercourse 3 (just before the confluence with the Auchteraw Burn – Watercourse 1) and Watercourse 2 immediately east of the LT94 platform at the kink in the land boundary.

A lateral weir on Watercourse 1 in the southwest corner of SSEs land boundary will also encourage floodwater within the storage area for attenuation (if required).

Clearly the final detailing / analysis and modelling of the flood compensation scheme would be undertaken at the post planning stage when there is an agreed scheme between SSE and all interested parties / stakeholders, however at this planning stage the initial analysis presented demonstrates that there is sufficient land within SSEs ownership and the means to offset the increased 0.5% AEP cumulative flood volume / peak flow as a result of the proposed LT92 and LT94 platform developments, the need to protect the existing substation platforms and the resulting proposed flood management strategy.

6.0 Conclusions

This document presents the summary Hydraulic Modelling Report (HMR) which forms Appendix FRA-B to the Flood Risk Assessment (FRA) report and summarises the construction of a linked 1-Dimensional (1D) 2-Dimensional (2D) hydraulic model of the watercourses in the vicinity of the proposed development area, developed to inform the FRA and detailed site development proposals in the context of flood risk.

This report provides relevant information concerned with the flood model construction / basis and associated design details.

The FRA report should be referred to for planning related flood risk requirements and Appendix FRA-A for the derivation of the hydraulic model Hydrological inputs.

DRAWINGS

235000 235500 236000 236500

809000 808500 808000

N

Forestry Nurs

Waterfall

Weir

Sheepfold

Waterfalls

Waterfalls

Waterfalls

Drain

Drain

Drain

Drain

Path

FB

48m

43m

39m

54m

51m

44m

41m

I1a

I1b

I2

I3a

I3b

I4

A

B

C

D

E

F

G

H

I

J

K

L

M

El Sub Sta

EXISTING SUBSTATION

EXISTING SGT4

PROPOSED LT94

PROPOSED LT92

Lundie Cottage

Talamh Carraig

Auchteraw Hostel

Torr Sionnaich

Whinhill

Auchteraw House

Auchteraw Burn

Track

Track

AUCHTERAW BURN DISCHARGES TO RIVER OICH

DOWNSTREAM 1D NETWORK BOUNDARY AT TRACK CULVERTS REPRESENTED BY RATING CURVE

FILTER DRAIN AND SOAKAWAY TO DISCHARGE FLOW FROM I4

River

0 50 100 150 200

Metres

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- WATERCOURSE 1 - AUCHTERAW BURN
- WATERCOURSE 2 - ALLT NA FEARNA
- WATERCOURSE 3 - MINOR WATERCOURSE (ENGINEERED)
- WATERCOURSE 4 - MINOR WATERCOURSE (ENGINEERED)
- MODEL INFLOW LOCATION + ID
- UPSTREAM MODEL BOUNDARY LOCATION
- DOWNSTREAM MODEL BOUNDARY LOCATION
- WATERCOURSES RELEVANT TO STUDY (NOT MODELLED)
- SITE BUILDING
- 1m CONTOUR

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HYDRAULIC MODELLING REPORT

BASELINE MODEL NETWORK OVERVIEW

APP-B-1

Scale 1:5,000 @ A3

Date NOVEMBER 2017

00660.00047.18.APP-B-1.0 Baseline Model Overview

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235000 235500 236000 236500

809000

808500

808000

SECTION OF WATERCOURSE RE-PROFILED AND UPSIZED BETWEEN CULVERTS M AND D (REFER TO DRAWING NO APP-B-3 FOR DETAILS)

CULVERT M REPLACED WITH BOX CULVERT: DIMENSIONS = 3.36m(w) x 1.2m(h)

NEW CULVERT D (BOX CULVERT) DIMENSIONS = 4.5m(w) x 1.5m(h)

EXISTING CULVERT L RETAINED FOR MODEL BUT MAY NEED REPLACED

WATERCOURSE UPSIZED TO EFFECTIVELY INTERCEPT HILLSIDE RUNOFF (BETWEEN I3 AND CULVERT L)

10m STANDOFF FROM L94 PLATFORM TO DIVERTED WATERCOURSE 3. STANDOFF DISTANCE LIKELY TO BE INCREASED TO 15-20m

NEW WATERCOURSE 3 DIVERSION ROUTE (INITIAL DESIGN), REFER TO DRAWING NO APP-B-3 FOR DETAILS

NEW INTERCEPTION DRAIN WATERCOURSE (REFER TO DRAWING NO. APP-B-3 FOR DETAILS)

STEPPED PLATFORM ELEVATIONS

PROPOSED LT94

EXISTING SUBSTATION

EXISTING SGT4

PROPOSED LT92

STEPPED PLATFORM ELEVATIONS

EXISTING WATERCOURSE 3 TO BE DIVERTED TO ACCOMMODATE LT94 PLATFORM

AUCHTERAW BURN DISCHARGES TO RIVER OICH

DOWNSTREAM 1D NETWORK BOUNDARY AT TRACK CULVERTS REPRESENTED BY RATING CURVE

I1a I1b I2 I3 I4

L M (NEW) J D (NEW)

Waterfall Weir Drain Waterfalls Drain Drain Drain Path FB Auchteraw Burn

Sheepfold Forestry Nurs Lundie Cottage Talamh Carraig Auchteraw Hostel Torr Sionnaich Whinhill Auchteraw House Track Track

48m 54m 39m 51m 41m 44m

N

0 50 100 150 200 Metres

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

2. LAYOUT AND DETAILS OF PROPOSED WATERCOURSE DIVERSIONS AND NEW WATERCOURSE ARE CONSIDERED INITIAL DESIGN AND SUBJECT TO REFINEMENT AT THE POST PLANNING STAGE.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- WATERCOURSES RELEVANT TO STUDY (NOT MODELLED)
- WATERCOURSE 1 - AUCHTERAW BURN (UNCHANGED)
- WATERCOURSE 2 - ALLT NA FEARNA (UNCHANGED)
- WATERCOURSE 3 - REVISED DESIGN
- WATERCOURSE 4 - NEW INTERCEPTION DRAIN
- SITE BUILDING
- MODEL INFLOW LOCATION + ID
- UPSTREAM MODEL BOUNDARY LOCATION
- 1D DOWNSTREAM MODEL BOUNDARY LOCATION
- 1m CONTOUR

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HYDRAULIC MODELLING REPORT

DEVELOPMENT MODEL NETWORK OVERVIEW

APP-B-2

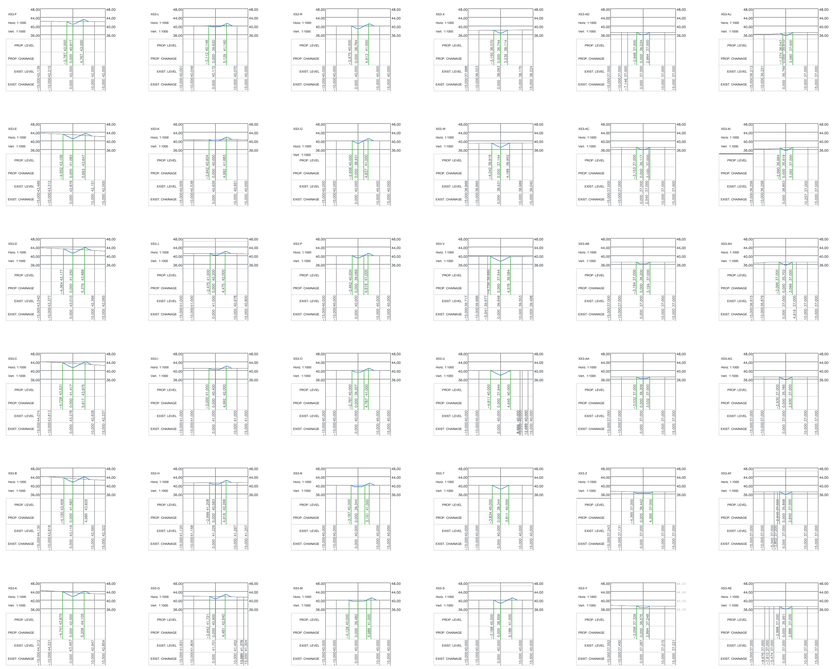
Scale 1:5,000 @ A3

Date NOVEMBER 2017

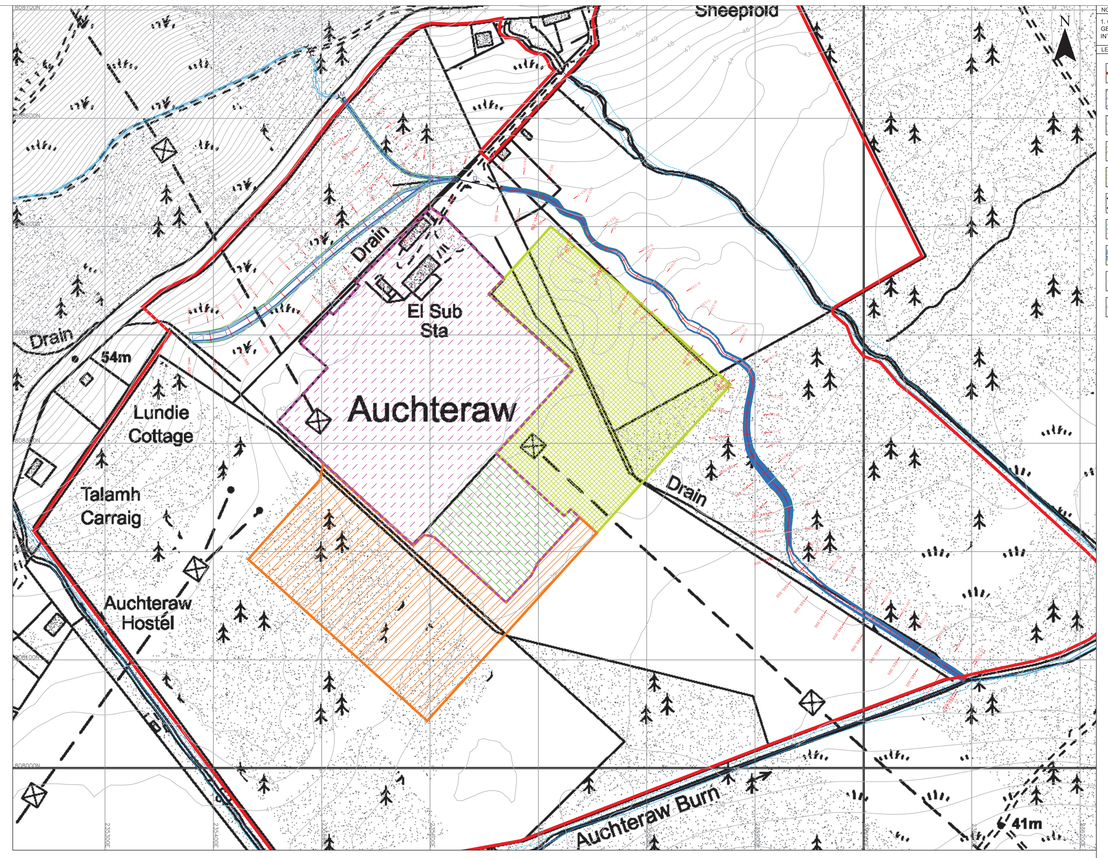
00660.00047.18.App-B-2.1 Development Model Overview

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WATERCOURSE 3 SECTION DETAILS



WATERCOURSE LOCATIONS

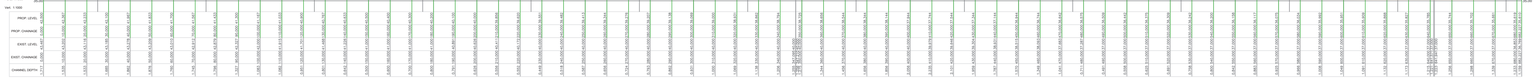
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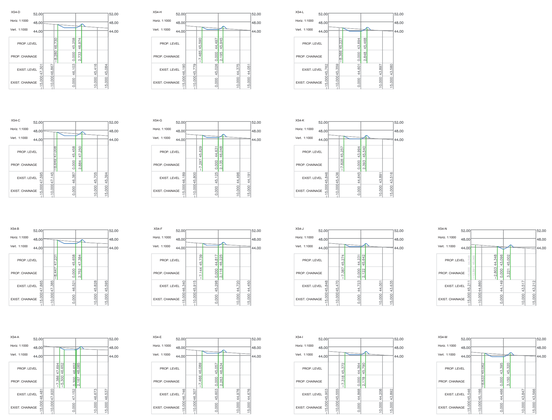
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1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

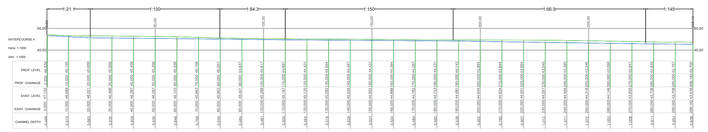
LEGEND

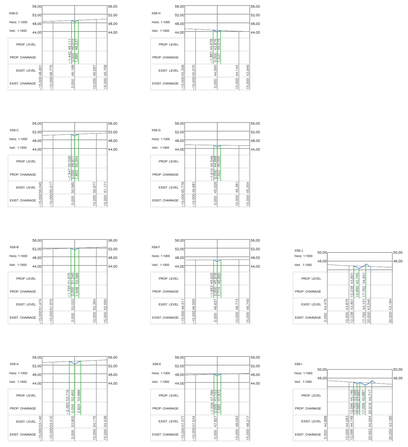
- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- EXISTING MODELLED 1D WATERCOURSE NETWORK
- PROPOSED NEW 1D WATERCOURSE NETWORK
- 1m CONTOUR
- CROSS SECTION ID AND CHAINAGE



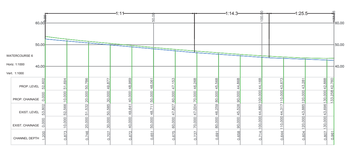


WATERCOURSE 4 SECTION DETAILS





WATERCOURSE 6 SECTION DETAILS



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HYDRAULIC MODELLING REPORT

NEW WATERCOURSE SECTION DETAILS

APP-B-4

Scale	Date
AS SHOWN @ A0	NOVEMBER 2017

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235500 236000 236500

809000

808500

808000

PEAK OUTFLOW AT 2D DOWNSTREAM BOUNDARY = 46.1m³/s

MODEL 1D DOWNSTREAM BOUNDARY AT TRACK CULVERTS

PEAK OUTFLOW AT 1D DOWNSTREAM BOUNDARY = 6.03m³/s (CULVERT CAPACITY)

MODEL 2D DOWNSTREAM BOUNDARY AT 26mAOD CONTOUR WHICH IS THE THRESHOLD FOR THE 1:1000 YEAR FLOODPLAIN EXTENT ON SEPA FLOOD MAP

Waterfall
Sheepfold
Forestry Nurseries
Picnic Area
Talamh Carraig
Whinhill
Drain
Eilean Fhada
CALEDONIAN CANAL
RIVER OICH

0 50 100 150 200
Metres

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- EXISTING MODELLED 1D WATERCOURSE NETWORK
- CULVERT + ID
- SITE BUILDING
- 1D DOWNSTREAM MODEL BOUNDARY LOCATION
- MODEL 2D DOWNSTREAM BOUNDARY
- 1m CONTOUR

FLOOD DEPTH (m) FOR 200YR FLOOD EVENT

< 0.005 not displayed (water depth lost to natural processes)	0.5 - 1
0.005 - 0.05	1 - 1.5
0.05 - 0.1	1.5 - 2
0.1 - 0.15	2 - 2.5
0.15 - 0.2	2.5 - 3
0.2 - 0.25	3 - 3.5
0.25 - 0.5	3.5 - 4
	4 - 4.5

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HYDRAULIC MODELLING REPORT

BASELINE MODEL OUTPUTS 1:200 YEAR EVENT

APP-B-4a

Scale 1:5,000 @ A3

Date NOVEMBER 2017

00660.00047.18.APP-B-4a.0 Baseline Model Outputs 200

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235500 236000 236500

809000

808500

PEAK OUTFLOW AT 2D DOWNSTREAM BOUNDARY = 57.96m³/s

MODEL 1D DOWNSTREAM BOUNDARY AT TRACK CULVERTS

PEAK OUTFLOW AT 1D DOWNSTREAM BOUNDARY = 6.03m³/s (CULVERT CAPACITY)

MODEL 2D DOWNSTREAM BOUNDARY AT 26mAOD CONTOUR WHICH IS THE THRESHOLD FOR THE 1:1000 YEAR FLOODPLAIN EXTENT ON SEPA FLOOD MAP

Waterfall
Sheepfold
Forestry Nurseries
Picnic Area
Talamh Carraig
Whinhill
Allt Eileanraw Burn
River Oich
Eilean Fada
Caledonian Canal
Drain
48m
43m
41m
44m
29m

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- EXISTING MODELLED 1D WATERCOURSE NETWORK
- CULVERT + ID
- SITE BUILDING
- 1D DOWNSTREAM MODEL BOUNDARY LOCATION
- MODEL 2D DOWNSTREAM BOUNDARY
- 1m CONTOUR

FLOOD DEPTH (m) FOR 200YR + 20% CC FLOOD EVENT

< 0.005 not displayed (water depth lost to natural processes)	0.5 - 1
0.005 - 0.05	1 - 1.5
0.05 - 0.1	1.5 - 2
0.1 - 0.15	2 - 2.5
0.15 - 0.2	2.5 - 3
0.2 - 0.25	3 - 3.5
0.25 - 0.5	3.5 - 4
	4 - 4.5

0 50 100 150 200
Metres

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HYDRAULIC MODELLING REPORT

BASELINE MODEL OUTPUTS 1:200 + 20% CC YEAR EVENT

APP-B-4b

Scale 1:5,000 @ A3

Date NOVEMBER 2017

00660.00047.18.APP-B-4b.0 Baseline Model Outputs 200 CC

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235500 236000 236500

809000

808500

808000

PEAK OUTFLOW AT 2D DOWNSTREAM BOUNDARY = 73.04m³/s

MODEL 1D DOWNSTREAM BOUNDARY AT TRACK CULVERTS

PEAK OUTFLOW AT 1D DOWNSTREAM BOUNDARY = 6.03m³/s (CULVERT CAPACITY)

MODEL 2D DOWNSTREAM BOUNDARY AT 26mAOD CONTOUR WHICH IS THE THRESHOLD FOR THE 1:1000 YEAR FLOODPLAIN EXTENT ON SEPA FLOOD MAP

Waterfall

Sheepfold

Forestry Nurseries

Picnic Area

Talamh Carraig

Whinhill

Allt Saraw Burn

Eilean Fhada

CALEDONIAN CANAL

RIVER OICH

A B C D E F G H I J K L M

0 50 100 150 200 Metres

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- EXISTING MODELLED 1D WATERCOURSE NETWORK
- CULVERT + ID
- SITE BUILDING
- 1D DOWNSTREAM MODEL BOUNDARY LOCATION
- MODEL 2D DOWNSTREAM BOUNDARY
- 1m CONTOUR

FLOOD DEPTH (m) FOR 1000YR FLOOD EVENT

< 0.005 not displayed (water depth lost to natural processes)	0.5 - 1
0.005 - 0.05	1 - 1.5
0.05 - 0.1	1.5 - 2
0.1 - 0.15	2 - 2.5
0.15 - 0.2	2.5 - 3
0.2 - 0.25	3 - 3.5
0.25 - 0.5	3.5 - 4
	4 - 4.5

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HYDRAULIC MODELLING REPORT

BASELINE MODEL OUTPUTS 1:1000 YEAR EVENT

APP-B-4c

Scale 1:5,000 @ A3

Date NOVEMBER 2017

00660.00047.18.APP-B-4c.0 Baseline Model Outputs 1000

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235500 236000 236500

809000

808500

808000

10m STANDOFF FROM L94 PLATFORM TO DIVERTED WATERCOURSE 3. STANDOFF DISTANCE LIKELY TO BE INCREASED TO 15-20m

NEW DIVERTED WATERCOURSE 3 WITH 1m HIGH EMBANKMENT TO PROTECT LT94 PLATFORM

PROPOSED UPPER LT94 PLATFORM ELEVATION = c. 42mAOD (TO TIE INTO EXISTING SUBSTATION)

NEW INTERCEPTION DRAIN (WATERCOURSE 4) PROTECTS THE EXISTING SITE (INCLUDES 1m HIGH EMBANKMENT)

PROPOSED UPPER LT92 PLATFORM ELEVATION = c. 42mAOD (TO TIE INTO EXISTING SUBSTATION PLATFORM)

INCREASED FLOODWATERS IN THIS DIRECTION AS A RESULT OF DIVERSION

INCREASED FLOODPLAIN EXTENT

INCREASED FLOODPLAIN EXTENT

PEAK OUTFLOW AT 2D DOWNSTREAM BOUNDARY = 50.66m³/s

MODEL 1D DOWNSTREAM BOUNDARY AT TRACK CULVERTS

PEAK OUTFLOW AT 1D DOWNSTREAM BOUNDARY = 6.03m³/s (CULVERT CAPACITY)

PROPOSED LOWER LT92 PLATFORM ELEVATION = 39.8mAOD (TO TIE INTO SGT4 PLATFORM)

PROPOSED LOWER LT94 PLATFORM ELEVATION = 39.8mAOD (TO TIE INTO SGT4 PLATFORM)

MAXIMUM FLOOD ELEVATION = 38.47m (5mm DEPTH OF FLOODWATER)

MODEL 2D DOWNSTREAM BOUNDARY AT 26mAOD CONTOUR WHICH IS THE THRESHOLD FOR THE 1:1000 YEAR FLOODPLAIN EXTENT ON SEPA FLOOD MAP

Waterfall
Forestry Nurseries
Picnic Area
Sheepfold
Lundie Cottage
Talamh Carraig
Drain
El Sub Sta
Track
RIVER OICH
CALEDONIAN CANAL
Eilean Fada
A82

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- EXISTING MODELLED 1D WATERCOURSE NETWORK
- PROPOSED NEW 1D WATERCOURSE NETWORK
- SITE BUILDING
- 1D DOWNSTREAM MODEL BOUNDARY LOCATION
- MODEL 2D DOWNSTREAM BOUNDARY
- 1m CONTOUR

FLOOD DEPTH (m) FOR 200YR FLOOD EVENT

- < 0.005 not displayed (water depth lost to natural processes)
- 0.005 - 0.05
- 0.05 - 0.1
- 0.1 - 0.15
- 0.15 - 0.2
- 0.2 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 3.5
- 3.5 - 4
- 4 - 4.5

0 50 100 150 200 Metres

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FORT AUGUSTUS FRA

HYDRAULIC MODELLING REPORT

DEVELOPMENT MODEL OUTPUTS 1:200 YEAR EVENT

APP-B-5a

Scale 1:5,000 @ A3

Date NOVEMBER 2017

00660.00047.18.APP-B-5a.1 Development Model Outputs 200

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235500 236000 236500

809000

808500

808000

10m STANDOFF FROM L94 PLATFORM TO DIVERTED WATERCOURSE 3. STANDOFF DISTANCE LIKELY TO BE INCREASED TO 15-20m

NEW DIVERTED WATERCOURSE 3 WITH 1m HIGH EMBANKMENT TO PROTECT LT94 PLATFORM

PROPOSED UPPER LT94 PLATFORM ELEVATION = c. 42mAOD (TO TIE INTO EXISTING SUBSTATION)

NEW INTERCEPTION DRAIN (WATERCOURSE 4) PROTECTS THE EXISTING SITE (INCLUDES 1m HIGH EMBANKMENT)

PROPOSED UPPER LT92 PLATFORM ELEVATION = c. 42mAOD (TO TIE INTO EXISTING SUBSTATION PLATFORM)

INCREASED FLOODPLAIN EXTENT

INCREASED FLOODPLAIN EXTENT

INCREASED FLOODWATERS IN THIS DIRECTION AS A RESULT OF DIVERSION

PEAK OUTFLOW AT 2D DOWNSTREAM BOUNDARY = 62.87m³/s

MODEL 1D DOWNSTREAM BOUNDARY AT TRACK CULVERTS

PEAK OUTFLOW AT 1D DOWNSTREAM BOUNDARY = 6.03m³/s (CULVERT CAPACITY)

PROPOSED LOWER LT92 PLATFORM ELEVATION = 39.8mAOD (TO TIE INTO SGT4 PLATFORM)

PROPOSED LOWER LT94 PLATFORM ELEVATION = 39.8mAOD (TO TIE INTO SGT4 PLATFORM)

MAXIMUM FLOOD ELEVATION = 38.51m (6mm DEPTH OF FLOODWATER)

MODEL 2D DOWNSTREAM BOUNDARY AT 26mAOD CONTOUR WHICH IS THE THRESHOLD FOR THE 1:1000 YEAR FLOODPLAIN EXTENT ON SEPA FLOOD MAP

Waterfall
Forestry Nurseries
Picnic Area
Sheepfold
Lundie Cottage
Talamh Carraig
El Sub Sta
Drain
Weir
CALEDONIAN CANAL
RIVER OICH
Eilean Fhada
Allow

0 50 100 150 200
Metres

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- EXISTING MODELLED 1D WATERCOURSE NETWORK
- PROPOSED NEW 1D WATERCOURSE NETWORK
- SITE BUILDING
- 1D DOWNSTREAM MODEL BOUNDARY LOCATION
- MODEL 2D DOWNSTREAM BOUNDARY
- 1m CONTOUR

FLOOD DEPTH (m) FOR 200YR + 20% CC FLOOD EVENT 171116_06600_00047_Catr...

- < 0.005 not displayed (water depth lost to natural processes)
- 0.005 - 0.05
- 0.05 - 0.1
- 0.1 - 0.15
- 0.15 - 0.2
- 0.2 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 3.5
- 3.5 - 4
- 4 - 4.5

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HYDRAULIC MODELLING REPORT

DEVELOPMENT MODEL OUTPUTS 1:200 + 20% CC YEAR EVENT

APP-B-5b

Scale 1:5,000 @ A3

Date NOVEMBER 2017

00660.00047.18.APP-B-5b.1 Development Model Outputs 200CC

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235500 236000 236500

809000 808500 808000

10m STANDOFF FROM L94 PLATFORM TO DIVERTED WATERCOURSE 3. STANDOFF DISTANCE LIKELY TO BE INCREASED TO 15-20m

NEW DIVERTED WATERCOURSE 3 WITH 1m HIGH EMBANKMENT TO PROTECT LT94 PLATFORM

PROPOSED UPPER LT94 PLATFORM ELEVATION = c. 42mAOD (TO TIE INTO EXISTING SUBSTATION)

NEW INTERCEPTION DRAIN (WATERCOURSE 4) PROTECTS THE EXISTING SITE (INCLUDES 1m HIGH EMBANKMENT)

PROPOSED UPPER LT92 PLATFORM ELEVATION = c. 42mAOD (TO TIE INTO EXISTING SUBSTATION PLATFORM)

PROPOSED LOWER LT92 PLATFORM ELEVATION = 39.8mAOD (TO TIE INTO SGT4 PLATFORM)

PROPOSED LOWER LT94 PLATFORM ELEVATION = 39.8mAOD (TO TIE INTO SGT4 PLATFORM)

MAXIMUM FLOOD ELEVATION = 38.53m (27mm DEPTH OF FLOODWATER)

MODEL 2D DOWNSTREAM BOUNDARY AT 26mAOD CONTOUR WHICH IS THE THRESHOLD FOR THE 1:1000 YEAR FLOODPLAIN EXTENT ON SEPA FLOOD MAP

INCREASED FLOODPLAIN EXTENT

INCREASED FLOODPLAIN EXTENT

INCREASED FLOODWATERS IN THIS DIRECTION AS A RESULT OF DIVERSION

PEAK OUTFLOW AT 2D DOWNSTREAM BOUNDARY = 80.57m³/s

MODEL 1D DOWNSTREAM BOUNDARY AT TRACK CULVERTS

PEAK OUTFLOW AT 1D DOWNSTREAM BOUNDARY = 6.03m³/s (CULVERT CAPACITY)

Waterfall
Weir
Sheepfold
Forestry Nurseries
Picnic Area
Path
Drain
El Sub Sta
Lundie Cottage
Talamh Carraig
Allt Cheraw Burn
Track
RIVER OICH
Eilean Floda
CALEDONIAN CANAL
48m
43
41m
39m
29m
44m

L
M (NEW)
J
D (NEW)
I

N

0 50 100 150 200
Metres

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- EXISTING MODELLED 1D WATERCOURSE NETWORK
- PROPOSED NEW 1D WATERCOURSE NETWORK
- SITE BUILDING
- 1D DOWNSTREAM MODEL BOUNDARY LOCATION
- MODEL 2D DOWNSTREAM BOUNDARY
- 171116_06600_00047_Catr...

FLOOD DEPTH (m) FOR 1000YR FLOOD EVENT

- < 0.005 not displayed (water depth lost to natural processes)
- 0.005 - 0.05
- 0.05 - 0.1
- 0.1 - 0.15
- 0.15 - 0.2
- 0.2 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 3.5
- 3.5 - 4
- 4 - 4.5

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HYDRAULIC MODELLING REPORT

DEVELOPMENT MODEL OUTPUTS 1:1000 YEAR EVENT

APP-B-5c

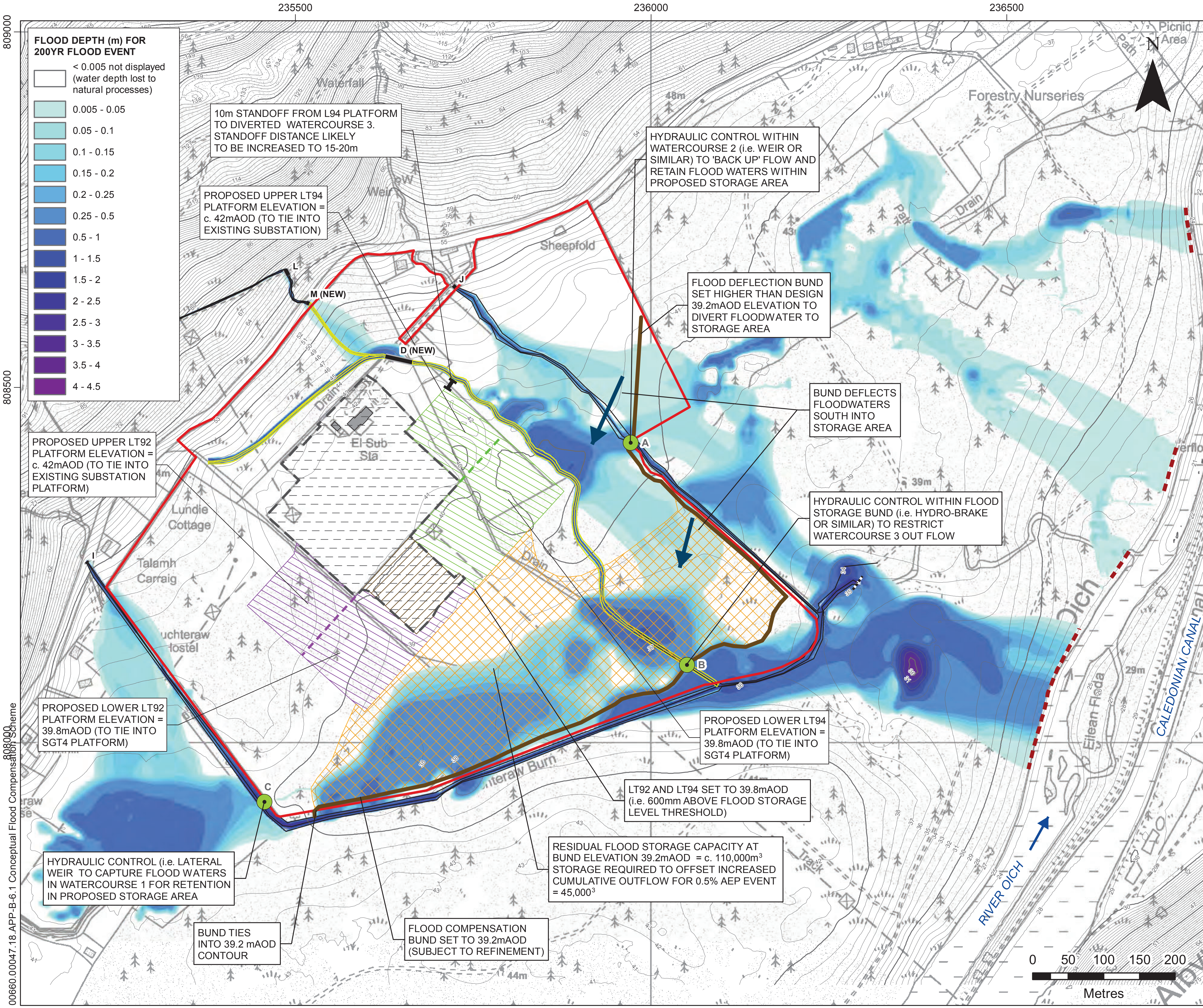
Scale 1:5,000 @ A3

Date NOVEMBER 2017

00660.00047.18.APP-B-5c.1 Development Model Outputs 1000

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0660.00047.18.APP-B-6.1 Conceptual Flood Compensation Scheme

NOTES

1. CONTOURS GENERATED FROM GETMAPPING 5m AP DERIVED DTM INTEGRATED WITH SLR TOPO SURVEY.

2. FLOODPLAIN OUTLINE IS THE SAME AS DRAWING NUMBER APP-B-5a FOR 0.5% AEP EVENT. COMPENSATION SCHEME IS FOR INFORMATION ONLY.

3. MINIMUM PROPOSED PLATFORM ELEVATIONS ARE PROVISIONAL AND SUBJECT TO REFINEMENT AT THE DETAILED DESIGN STAGE

LEGEND

- SSE LAND OWNERSHIP BOUNDARY
- EXISTING PLATFORM BOUNDARY
- SGT4 PLATFORM EXTENT
- PROPOSED LT92 PLATFORM EXTENT
- PROPOSED LT94 PLATFORM EXTENT
- CULVERT + ID
- EXISTING MODELLED 1D WATERCOURSE NETWORK
- PROPOSED NEW 1D WATERCOURSE NETWORK
- PROPOSED HYDRAULIC CONTROL
- PROPOSED FLOOD COMPENSATION BUND (ENGINEERED EARTH) AT 39.2mAOD
- PROPOSED FLOOD COMPENSATION STORAGE AREA AT 39.2mAOD
- MODEL 2D DOWNSTREAM BOUNDARY
- SITE BUILDING
- 1D DOWNSTREAM MODEL BOUNDARY LOCATION
- 1m CONTOUR

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HYDRAULIC MODELLING REPORT

CONCEPTUAL FLOOD COMPENSATION SCHEME

APP-B-6

Scale	Date
1:5,000 @ A3	NOVEMBER 2017

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APPENDIX FRA-C

Proposed Development Plan

A3

OHL LINE TO GLENMORISTON

275kV GIS BUILDING

Drain

Bl Sub Sta

OHL LINE TO BEAULY / FASHANKLE

Lundie

AREA AVAILABLE FOR POLE/TOWER RELOCATION

39.6m

30m

CABLE CORRIDOR FOR 8 CCT'S

81.7m

Auchteraw

400/275kV SGT

400/132kV SGT

132kV GIS BUILDING

12m WIDE PROVISION FOR FUTURE 400kV CABLES

15m WIDE PROVISION FOR CONSTRUCTION AREA/TRAFFIC

145.5m

OHL LINE TO DENNY/TUMMEL

400kV GIS BUILDING

PALISADE SECURITY FENCE

Drain

CONNECTION OPTION 12

SCALE 1:2500

SCALE AT 1:2500

0m 62.5m 125m 187.5m 250m

LIST OF ALL RELEVANT DRAWINGS OR DOCUMENTS THAT DIRECTLY RELATE TO THE CURRENT REVISION OF THE DRAWING

DOCUMENT REFERENCE:

NOTES:-

1. ALL PROJECT INFORMATION TAKEN FROM FORT AUGUSTUS 132kV REDEVELOPMENT DRD DOC. REF. RI-064-DRD-0 & RI-066-DRD-0.
2. EXISTING SUBSTATION LAYOUT TAKEN FROM BALFOUR BEATTY DRAWING: FAUG4_OVER_LAY.
3. GIS LAYOUT TAKEN FROM SSE DRAWING: LT92_FAUG_1104_0004.
4. NEW REACTOR POSITIONS TAKEN FROM KELVIN POWER CONSULTANTS/OMEXOM DRAWING No: J00149-L002.

KEY:-

- EXISTING PLANT
- FUTURE
- PROPOSED LT92 WORKS
- PROPOSED LT94 WORKS
- PROPOSED PALISADE FENCE
- PROPOSED 15m CONSTRUCTION ALLOWANCE
- CABLE
- GIB

OS MAP NN84NW & NN84SW
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ORDNANCE SURVEY LICENCE NUMBER EL273236.

Rev:	Drawn:	Approved:	Description:
00	PMR	NT	APPROVED FOR ISSUE.
	Checked: FC	Date: 25.05.17	

Scottish & Southern Electricity Networks

SSE Inveralmond House, 200 Dunkeld Road
Perth, PH1 3AQ, UK www.sse.com

Project: FORT AUGUSTUS 400kV & 132kV REDEVELOPMENT

Project Number: LT000092 **Location:** FORT AUGUSTUS

Title: FORT AUGUSTUS 400kV & 132kV REDEVELOPMENT GIS SITE LAYOUT CONNECTION OPTIONS OPTION 12

Drawing Status: FOR INFORMATION	**Drawn:** PMR
Scale: 1:2500 @ A3	**Checked:** FC
Date: 25.05.2017	**Approved:** NT

Drawing Number: LT92_FAUG_1104_0044 **Sheet No:** 00 **Revision No:** 00

Date Plotted: 25.05.2017

File Name: LT92_FAUG_1104_0044_00_0A_DRAFT - Fort Augustus - GIS Substation Site Layout - Option 12.dwg

APPENDIX FRA-D

SLR 2014 and 2017 Topographic Surveys

N
W E
S

NOTES

1. SURVEY CARRIED OUT BY SLR CONSULTING LTD SEPTEMBER 2014.

2. THE ACCURACY OF THIS SURVEY IS COMMENSURATE WITH THE DRAWING SCALE SPECIFIED WITHIN THE TITLE BLOCK. ALL CRUCIAL DIMENSIONS SHOULD BE CHECKED ON SITE.

4. WHILST EVERY EFFORT HAS BEEN MADE TO INCLUDE ALL ACCESSIBLE DETAIL, SOME FEATURES MAY NOT BE SHOWN IF OBSCURED AT THE TIME OF SURVEY (e.g. AREA OVERGROWN).

5. TOPOGRAPHICAL SURVEY INFORMATION SHOWN ON THIS DRAWING IS BASED UPON THE ORDNANCE SURVEY NATIONAL GRID HEIGHT AND PLAN DATUM DERIVED BY G.P.S.(OSTN02,OSGB36)

LEGEND

0 20 40 60 80m 120 160 200

Metres
1:2000

Revision	By	Chk'd By	Date	Comments
0	JC	RLM	10/14	

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Site
FORT AUGUSTUS

Project
TOPOGRAPHICAL SURVEY

Drawing Title
CROSS SECTIONS AND TOPO SEPTEMBER 2014

Scale
1:2000@A1

Date
SEPTEMBER 2014

Drawing Number
001

Revision
0

00660.00003.19.001.0_AUGUST03101014.dwg

N

0 20 30 40m 60 80 100

Metres 1:1250

NOTES

1. SURVEY CARRIED OUT BY SLR CONSULTING LTD ON THE 26-27th JUNE 2017.

2. THIS PLAN IS ORIENTATED TO ORDNANCE SURVEY NATIONAL GRID PLAN AND HEIGHT DATUM DERIVED FROM THE ORDNANCE SURVEY ACTIVE NETWORK; OSGB36(OSGM15/OSTN15).

3. WHILST EVERY EFFORT HAS BEEN MADE TO INCLUDE ALL ACCESSIBLE DETAIL, SOME FEATURES MAY NOT BE SHOWN IF OBSCURED AT THE TIME OF SURVEY (e.g. PARKED VEHICLES/SKIPS/AREA OVERGROWN).

5. THE ACCURACY OF THIS SURVEY IS COMMENSURATE WITH THE DRAWING SCALE SPECIFIED WITHIN THE TITLE BLOCK. ALL CRUCIAL DIMENSIONS SHOULD BE CHECKED ON SITE.

LEGEND

- BANK BOTTOM
- BANK TOP
- FENCE
- EDGE OF FOLIAGE
- SPOT LEVEL (+ 20.08)
- SURVEY CONTROL (STN 10 20.088)

SURVEY ABBREVIATIONS(Where used)

BOL	Bollard
BL	Bed Level
BT	Telecommunications Inspection Cover
CATV	Cable Television Cover
CCTV	Closed Circuit TV Camera
CL	Cover level
DR	Drain
ELEC	Electrical
EP	Electricity Pole
ER	Earth Rod
FH	Fire Hydrant
FW	Foul Water
G	Gully
GV	Gas Valve
IC	Inspection Cover
IL	Invert level
KO	Kerb Outlet
LB	Litter Bin
LP	Lamp Post
MH	Manhole
PB	Letter Box
PO	Post
RE	Rodding Eye
RS	Road Sign
SFL	Soffit Level
ST	Stop Tap
SV	Sluice Valve
SW	Surface Water
TL	Traffic Light
TP	Telegraph Pole
UTL	Unable to Lift
WL	Water Level
WM	Water Meter

Revision	By	Chk'd By	Date	Comments
0	JC	RLM	07/17	

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Client: SSE

Project: Fort Augustus LT92 FRA Study

Drawing Title: **TOPOGRAPHICAL SURVEY OF JUNE 2017**

Scale: 1:1250 @ A1

Date: JUNE 2017

Drawing Number: 001

Revision: 0

\\slrdata\100047\001\3_AUTOCAD\STU\05617 - Raw Survey.dwg

APPENDIX FRA-E

Stakeholder Correspondence

Zak Ritchie

From: Evidence & Flooding Advice Helpdesk <advice@sepa.org.uk>
Sent: 20 September 2017 11:40
To: Zak Ritchie
Subject: Your SEPA E&F Advice Enquiry has been closed. Call Ref: [G:0061640]

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Zak Ritchie

This confirms your enquiry **- Flood Risk Data Request: Site at Fort Augustus** has now been closed.

The final note added to the call was:

Dear Zak,

Thank you for your enquiry regarding details of the current SEPA flood map generation at River Oich. Our colleagues in the operational flood risk north team will respond to the second part of your query.

The software that has been used to develop our national hazard maps was Flood modeller Pro 2D. The National Models were run with steady inflows taken from a version of the CEH flow grid, which was updated by area weighting based on a single site analysis at gauges within the catchment where there was sufficient confidence in the flood frequency analysis. The channel capacity was accounted for by filling the DTM to top of bank and subtracting Qmed from the inflows. Domains were overlapped and the water levels from the downstream domain were used as downstream level boundary condition for the upstream domain.

The national maps have been modelled based on single source, so flood risk from other sources such as the canal has not been modelled. Therefore the hazard maps in this area will not have accounted for the weir upstream of Oich Bridge. The models have been run on a 10 m grid resolution using NEXTMAP data.

SEPA's Flood Maps are designed as strategic level tools which provide a community level assessment of those areas of Scotland potentially at flood risk in order to support the development of co-ordinated Flood Risk Management Plans and Strategies, as well as public awareness raising of flooding issues where they live or work. The Flood Maps are indicative and of a strategic nature. It is not appropriate for these Flood Maps to be used to assess flood risk to an individual site/property, therefore modelled flood level, depth and flow information from SEPA's Flood Maps are not available for site specific investigations. The Terms and Conditions of SEPA's Flood Maps state that the Flood Maps cannot be used for or related to any commercial, business, professional or other income generating purpose or activity, nor by value added resellers. The Flood Maps were developed using nationally-applied methodologies across Scotland and as such, there are certain necessary limitations/assumptions associated with these. Further information on the maps, including more information on how they were developed, can be found on SEPA's website http://www.sepa.org.uk/environment/water/flooding/flood-maps/."

Kind Regards

Danni Murren

If you do not consider that your enquiry has been resolved, please respond to this email and your call will be re-opened.

If your request was in relation to data, please be aware of our terms and conditions for data reuse.

Data Re-Use Statement

Thank you.

SEPA Evidence & Flooding Advice

Responding to this email will reopen the call:
Please rate your call. and leave a comment.

In order to improve our performance, we would welcome your feedback.

To rate your experience using our service please select one of the icons below.



SEPA will actively use this feedback to improve the service we provide to our customers.

This e-mail, its content and any files transmitted with it are intended solely for the addressee(s) and may be legally privileged and/or confidential. Access by any other party is unauthorised without the express written permission of the sender. If you have received this e-mail in error you may not copy, forward or use the contents, attachments or information in any way. Although any attachments to this e-mail have been virus checked, the sender cannot accept liability in respect of any virus which has not been detected.

Zak Ritchie

From: Evidence & Flooding Advice Helpdesk <advice@sepa.org.uk>
Sent: 25 September 2017 11:36
To: Zak Ritchie
Subject: Your SEPA E&F Advice Enquiry has been closed. Call Ref: [G:0061625]

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Zak Ritchie

This confirms your enquiry **- Flood Risk Data Request: Site at Fort Augustus** has now been closed.

The final note added to the call was:

Further to your enquiry, I would comment that unfortunately we are unable to undertake site specific flood risk enquiries. However, I can provide any flood information we have which will provide a first indication of potential flood risk.

We have reviewed the information supplied with this consultation and we note that the application site lies part within the medium likelihood (0.5% annual probability or 1 in 200 year) flood extent of the SEPA Flood Maps and may therefore be at medium to high risk of fluvial flooding from the Auchteraw Burn.

There are a number of small watercourses adjacent to the site boundary. As the catchments of the small watercourses are less than 3km², then they have not been modelled for the SEPA Fluvial Flood Map. The Auchteraw Burn flows to the south-west of the site and the Allt na Fearna burn to the north-east of the site. There are also a number of small drains to the north-east and north-west of the site.

Small watercourses are often poorly understood with respect to the severity of the flood hazard that can be generated on a catchment of this scale. SEPA holds a wealth of information on past small catchment flooding in Scotland which has led to significant impacts upon people and property.

In addition to the fluvial flood risk from the small watercourses and the Auchteraw Burn, part of the site has been identified as being at medium to high risk of surface water flooding. In line with our Interim Position Statement on Planning and Flooding we consider water quantity aspects of surface water drainage to largely be the remit of local authorities. The Highland Council is better placed to provide more detailed advice on any proposed surface water mitigation measures or drainage proposals.

We hold no records of flooding for the site or within the 500m buffer around the site. However, there are records of flooding in the general area. We hold records of flooding in Fort Augustus in 2015 caused by high water levels in the River Oich. We also hold historical records of flooding in Fort Augustus in 1989.

The SEPA Flood Maps have been produced following a consistent, nationally-applied methodology for catchment areas equal to or greater than 3km2 using a Digital Terrain Model (DTM) to define river corridors and low-lying coastal land. The maps are indicative and designed to be used as a strategic tool to assess flood risk at the community level and to support planning policy and flood risk management in Scotland. For further information please visit http://www.sepa.org.uk/flooding/flood_maps.aspx.

If you do not consider that your enquiry has been resolved, please respond to this email and your call will be re-opened.

If your request was in relation to data, please be aware of our terms and conditions for data reuse.

Data Re-Use Statement

Thank you.

SEPA Evidence & Flooding Advice

Responding to this email will reopen the call:
Please rate your call. and leave a comment.

In order to improve our performance, we would welcome your feedback.

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SEPA will actively use this feedback to improve the service we provide to our customers.

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Zak Ritchie

From: Evidence & Flooding Advice Helpdesk <advice@sepa.org.uk>
Sent: 23 October 2017 14:00
To: Zak Ritchie
Subject: Your SEPA E&F Advice Enquiry has been closed. Call Ref: [G:0061625]

Dear Zak Ritchie

This confirms your enquiry **- Flood Risk Data Request: Site at Fort Augustus** has now been closed.

The final note added to the call was:

Thank you for your enquiry. I confirm can confirm that the Allt na Fearna has not been modelled by the SEPA Flood Map as the catchment is less than 3km².

The SEPA Flood Maps have been produced following a consistent, nationally-applied methodology for catchment areas equal to or greater than 3km² using a Digital Terrain Model (DTM) to define river corridors and low-lying coastal land. The maps are indicative and designed to be used as a strategic tool to assess flood risk at the community level and to support planning policy and flood risk management in Scotland. For further information please visit http://www.sepa.org.uk/flooding/flood_maps.aspx.

If you do not consider that your enquiry has been resolved, please respond to this email and your call will be re-opened.

If your request was in relation to data, please be aware of our terms and conditions for data reuse.

Data Re-Use Statement

Thank you.

SEPA Evidence & Flooding Advice

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Zak Ritchie

From: Duncan Sharp <Duncan.Sharp@highland.gov.uk>
Sent: 28 September 2017 14:07
To: Zak Ritchie
Cc: D&I FOI
Subject: RE: Flood Risk Information Request

Follow Up Flag: Follow up
Flag Status: Flagged

Zak,

I have reviewed the information we hold and we do not have any record of flooding occurring at the site in question or within 500m of the site. Flooding may have occurred but not reported to us.

We do not hold any other flood related data for the site either.

Thanks

Duncan

From: Zak Ritchie [mailto:zritchie@slrconsulting.com]
Sent: 06 September 2017 10:28
To: Duncan Sharp
Subject: Flood Risk Information Request

Hi Duncan,

Hope you're well – it's been a while?

I'm undertaking an assessment at a site in Fort Augustus (see plan attached) and would be grateful if you provide any information THC holds on its records for any flood history and other flood risk related details for the site and area within the 500m search radius shown?

Much appreciated
Zak

SLR

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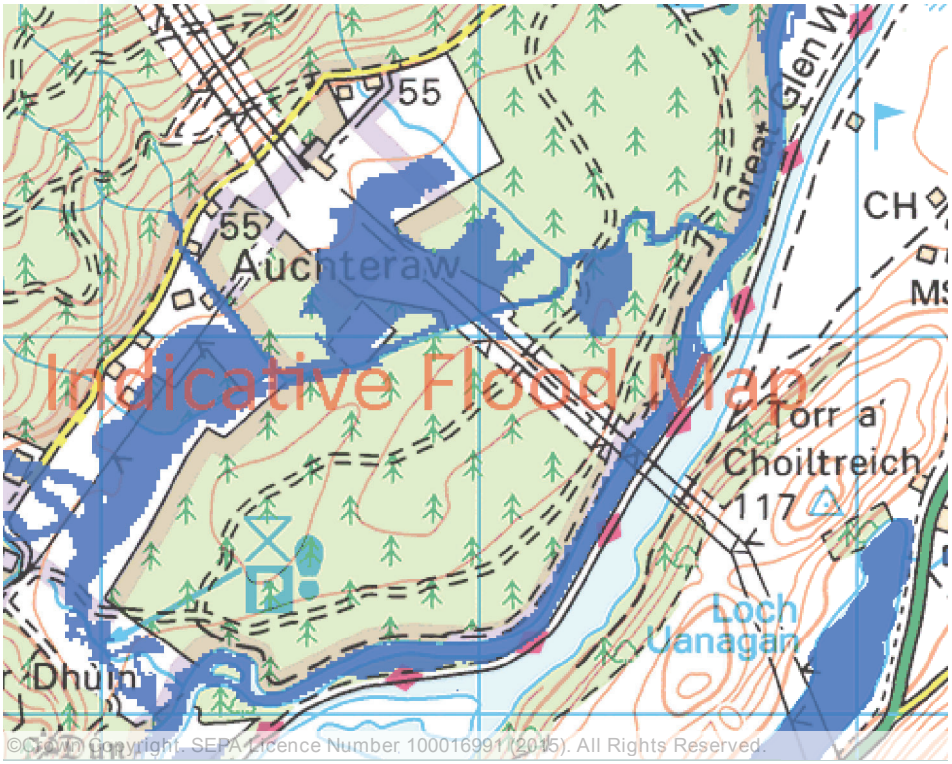
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APPENDIX FRA-F

SEPA Fluvial Flood Map Extracts

SEPA Scottish Environment Protection Agency

Flood Maps



Map Legend

Areas that may flood

River Extent - High Likelihood

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Acknowledgements

The maps were developed using data from various sources. Full acknowledgement of data providers and participating parties is from the flood maps.

Maps creation dates

Created: January 2014 This supersedes the Indicative River and Coastal Flood Map (Scotland)
Updated: 3 March 2015
Updated: 2 December 2015

The flood maps reflect the knowledge and data that was available to be incorporated at the time of publication.

For further queries please contact flooding@sepa.org.uk

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SEPA Scottish Environment Protection Agency

Flood Maps



Map Legend

Areas that may flood

River Extent - Medium Likelihood

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Created: January 2014 This supersedes the Indicative River and Coastal Flood Map (Scotland)
Updated: 3 March 2015
Updated: 2 December 2015

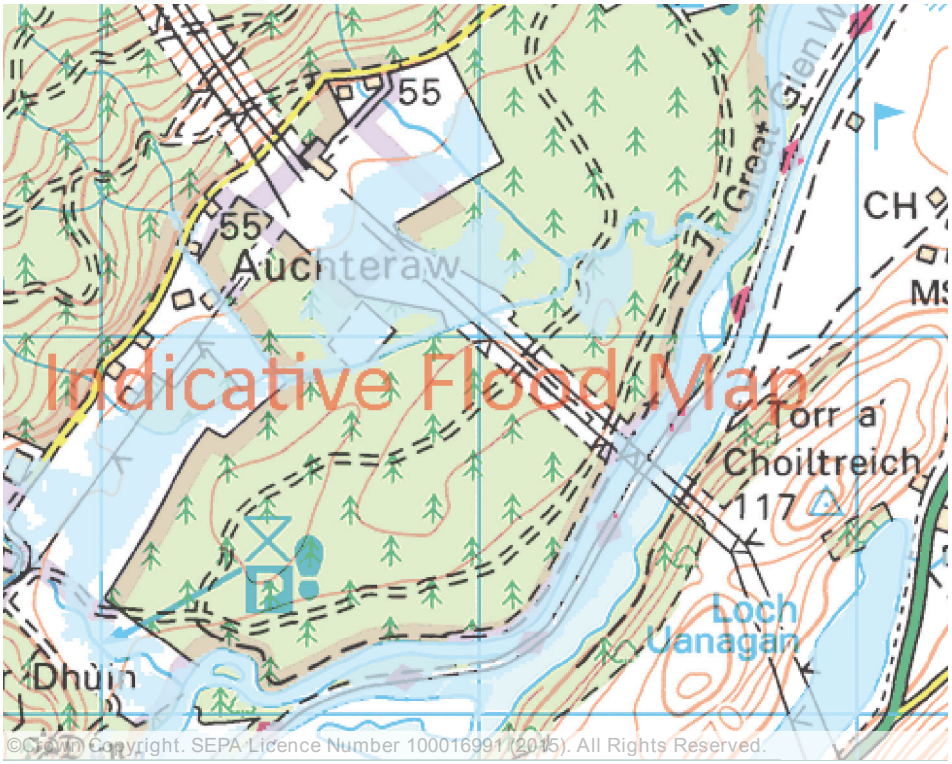
The flood maps reflect the knowledge and data that was available to be incorporated at the time of publication.

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SEPA Scottish Environment Protection Agency

Flood Maps



Map Legend

Areas that may flood

River Extent - Low Likelihood

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Updated: 3 March 2015
Updated: 2 December 2015

The flood maps reflect the knowledge and data that was available to be incorporated at the time of publication.

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Appendix E. Drainage Impact Assessment

Drainage Impact Assessment

Document Number: B2413736-JAC-SL-XX-RP-D-0001
Revision no: P01

Scottish & Southern Electricity Networks (SSEN)

Fort Augustus Substation Extension
10 November 2023



Drainage Impact Assessment

Client name:	Scottish & Southern Electricity Networks (SSEN)		
Project name:	Fort Augustus Substation Extension		
Client reference:	n/a	**Project no:**	B2413736
Document no:	B2413736-JAC-SL-XX-RP-D-0001	**Project manager:**	Michael Dineen
Revision no:	P01	**Prepared by:**	Ross Hunter
Date:	10 November 2023	**File name:**	B2413736-JAC-SL-XX-RP-D-0001

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
P0	18/10/23	Draft for comment	RH	GG	GG	MD
P01	10/11/23	Updates following Client review	RH	GG	MD	MD

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Revision	Issue approved	Date issued	Issued to	Comments
P0	Michael Dineen	18/10/23	SSEN	Draft for comment
P01	Michael Dineen	10/11/23	SSEN	Final for Issue

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Contents

1. Introduction **2**
1.1 Background 2
1.2 Site Details 2
1.3 Geological Features and Ground Investigations 3
1.4 Hydrological Features 3
1.5 Existing Drainage Arrangements 3
2. Development Proposals **5**
2.1 Description 5
2.2 Planning Context 5
2.2.1 Planning Requirements 5
2.2.2 Application of Planning Policy 6
3. Climate Change **7**
4. Surface Water Drainage Strategy **8**
4.1 Sustainable Drainage System 8
4.2 Hierarchical Drainage Options 8
4.3 Proposed Outline SuDS Strategy 9
4.4 Contributing Area 10
4.5 Control of Runoff Volume 10
4.6 Water Quality 11
5. Principal Operation and Maintenance Requirement **13**
6. Foul Water Drainage **16**
7. Construction Stage Water Management **17**

Appendices

Appendix A. Proposed Site Layout **18**
Appendix B. Indicative Surface Water Drainage Layout and Pipe Schedule **20**
Appendix C. Micro Drainage Output **23**
Appendix D. Foul Water Layout and Construction Details **29**

1. Introduction

1.1 Background

This Drainage Impact Assessment (DIA) has been produced in support of a planning application for the construction of an extension to the existing Fort Augustus Substation located to the south-west of Fort Augustus. The current proposal includes replacement of the two existing 275/132kV Super Grid Transformers (SGT) with 400/132kV SGTs and removal of the existing 275kV busbar from the site.

This DIA outlines the proposed drainage strategy to manage surface water runoff resulting from the new substation and access track.

The DIA has been completed in accordance with the guidance provided in:

- The National Planning Framework for Scotland 4 (NPF4), 2023;
- Scottish Planning Policy (SPP), 2014;
- Scottish Environment Protection Agency (SEPA) Technical Flood Risk Guidance for Stakeholders, 2022;
- SEPA Climate Change Allowances for Flood Risk Assessment in Land Use Planning, 2023;
- CIRIA SuDS Manual, 2015;
- The Highland Council - Flood Risk and Drainage Impact, 2013; and
- The Highland Council - Highland-wide Local Development Plan, 2012.

1.2 Site Details

The Proposed Development site comprises an area of approximately 3.4 hectares directly adjoining the existing substation platform and is located approximately 2 kilometres south-west of the town of Fort Augustus, with a grid reference of NH 35741 08288 (Figure 1). The Proposed Development is situated at the south-eastern extent of the existing substation platform. There are gentle elevation changes across the development site, with the existing levels falling from approximately 42 metres Above Ordnance Datum (AOD) to 40 metres AOD in a south-eastern direction. A preliminary development layout is provided in Appendix A.



Figure 1 - Site Location Map

1.3 Geological Features and Ground Investigations

British Geological Survey data indicates that the superficial deposits comprise Devensian Glaciofluvial Sheet Deposits comprised of sand, gravel, and boulders.

Trial pits and boreholes undertaken during Ground Investigation (GI) by Raeburn Geotechnical Ltd in August 2023 have confirmed the presence of medium to coarse sand and fine to coarse gravel with low to medium cobble and low boulder content across the area of the Proposed Development.

From existing borehole records, groundwater has been encountered between 8 and 13 metres below ground level (bgl).

For the purposes of this report and associated calculations, an infiltration rate of 5.6x10-5 m/s (0.20160m/hr) has been applied. The infiltration rate applied is the lowest value identified within trial pit FATP15, located adjacent to the existing pond, from analysis of the recent GI undertaken by Terra Tek. Increased infiltration rates were identified during testing within FATP15; however, this rate represents a worst-case infiltration scenario and has been chosen as part of a conservative approach applied in the calculation of run-off from the Proposed Development, LT92 and the existing substation.

This infiltration rate has been validated based on the subsoils from previous GI in the vicinity of the Proposed Development. The borehole records show sandy and gravelly strata to depths of 15 metres bgl. Table 25.1 of the SuDS Manual outlines estimated infiltration coefficients based on differing soil textures. The soil textures observed on site are considered to fall within the gravel and sand soil types outlined within Table 25.1. From the table, sand and gravel are noted as being a good infiltration media with typical infiltration coefficients in the range of $1x10^{-5}$ and $3x10^{-2}$ m/s.

The SuDS Manual notes that, infiltration viability should be considered where infiltration rates are greater than 0.000001 m/s. Acknowledging the satisfactory infiltration capacity of the underlying soils in the vicinity of the Proposed Development, infiltration as a means of drainage for collected surface water will be considered within the drainage hierarchy.

1.4 Hydrological Features

The Proposed Development is located within the surface water catchment of the Auchteraw Burn which originates in the steep terrain to the northwest of the site. The watercourse flows south then east, around the Proposed Development area, prior to discharging to the River Oich at a point 960m to the east of the Proposed Development. The River Oich outfalls into Loch Ness at Fort Augustus approximately 2.5km downstream of the site.

The Allt na Fearna watercourse runs immediately to the northeast of the site, approximately 200m from the Proposed Development. This watercourse flows southeast forming a tributary of the Auchteraw Burn.

In addition, there are minor unnamed engineered watercourses which run through the existing site. These watercourses intercept hillside runoff from the north of the site and discharge into a single point on the Auchteraw Burn, approximately 450m southeast of the Proposed Development.

1.5 Existing Drainage Arrangements

The existing substation which is located within the north-western extent of the site, discharges surface water into the engineered watercourse which flows along the eastern extent of the existing site.

An extension to the substation, referred to as LT92, was constructed in 2019 on the southern extent of the existing substation platform. SLR drawing number C8-9-002 indicates that LT92 has a network of filter drains collecting surface runoff from the internal access tracks and hardstanding areas which discharge to a small infiltration basin located at the southern corner of the extension.

Bunded transformers constructed as part of the LT92 extension have an oily water drainage network that drain to two separator tanks. Fuel delivery areas have been locally lowered and contain kerb drainage

conveying runoff via underground pipework to the separator tanks. The separators convey all flows via underground pipework to the small infiltration basin.

Foul water from the two buildings constructed as part of the LT92 extension are first treated in a septic tank located within the substation platform before being pumped via a rising main to a filter mound located at the north-western extent of the extension (refer to Section 6).

A second larger infiltration basin has been constructed to the southeast of the existing site which has not been connected to any drainage networks within the existing substation platform. It is the intention to utilise this larger basin to collect and allow infiltration of surface water from LT92 and the Proposed Development. It has been assumed that the existing substation catchment will also drain into the larger basin due to limited information regarding existing drainage arrangements. Any existing outfall to the ditch east of the existing site would be removed through the construction of the proposed extension.

Modelling set out later in this report has confirmed that this strategy is viable as the existing larger basin has sufficient capacity to store runoff for a 1:1000-year event from the existing substation, LT92 and the Proposed Development.

It is noted that the SLR report (no. 405.00660.00047) and drawing number C8-9-002, produced for the initial LT92 substation extension, outlined design and construction proposals for two basins located to the south of the site. These basins were designed to accommodate run-off from the existing substation and proposed extensions to the east and west of the site for a 1:1000 storm event, conservatively assuming the areas within these catchments were impermeable.

Neither of the basins constructed match the size, shape or location of those basins proposed within the SLR report and drawing. Both existing basins are deeper than those proposed in the SLR report, with the larger infiltration basin located on the southeast of the site also having a greater plan area than the eastern basin proposed in the SLR report.

2. Development Proposals

2.1 Description

The Proposed Development will comprise of a platform extension to the existing substation (including LT92) on undeveloped land immediately adjacent to the eastern and southern extent of the existing substation compound (Appendix A). The extension will provide a platform area for a new Gas Insulated Switchgear (GIS) building, two new 400/132kV SGTs, two new black start reactors, and associated apparatus including cable gantries. The platform will require a fill exercise to match ground levels of LT92 and the lower platform of the existing substation.

The proposed transformer upgrade works will comprise the construction of two new transformer bunds within the proposed extension. Multiple hardstanding areas to accommodate gantries and other substation apparatus will also be constructed.

A new 5-metre-wide sealed pavement internal access road will be constructed within the proposed extension, providing access to the new SGTs, GIS building and associated apparatus. This road will connect to the existing access roads within the existing substation platform and LT92. The access will be constructed with a combination of flush and raised pre-cast kerbs installed each side. The minimum crossfall will be 2.5%. Runoff from the access roads will be collected by the site drainage system using either filter drains located immediately adjacent to the roads or ACO type drainage kerbs where the road is locally lowered for fuel delivery areas.

The make-up of the platform will consist of three layers as per SSE's SP -NET-CIV-501 specification:

- A 75mm thick upper layer consisting of free draining angular gravel.
- A 200mm thick middle layer consisting of Specification for Highway Works (SHW) Type 3 permeable sub-base material.
- A 725mm thick lower layer consisting of selected granular material which will also be free draining.

Areas of the Proposed Development not used for equipment foundations, roads, hardstanding areas and buildings will generally be covered with 75mm of gravel to provide a free draining finish over the site.

The GIS building will contain a mess room and toilet. Foul water discharge is proposed to be via solid pipe gravity pipework from the relevant facilities to a septic tank to be located in-front of the GIS building, accessible via proposed access tracks. Following treatment, the effluent will be conveyed to an adjacent field soakaway.

After construction, the substation will normally be unmanned resulting in a low risk of contamination from vehicles or operatives. Equipment identified as having a special contamination risk, such as transformers, will be constructed with bunding, oil separation and flow controls to ensure the platform and drainage system is not contaminated.

Oily water and surface water will be conveyed from the proposed transformer bunds and fuel delivery areas to a new oil separator, which will in turn drain into the proposed surface water drainage network and then onwards to the infiltration basin located at the southeast of the existing site.

2.2 Planning Context

2.2.1 Planning Requirements

In accordance with the Highland Council Flood Risk & Drainage Impact Assessment Supplementary Guidance this report will seek to:

- Provide sufficient information to the relevant authorities to demonstrate that the Proposed Development will not increase flood risk and where there are already flooding issues within a catchment, demonstrate net betterment.

- Provide sufficient information to the relevant authorities to demonstrate that the Proposed Development will not be subject to an unacceptable risk of flooding as per SPP.
- Provide sufficient information to the relevant authorities to demonstrate that the Proposed Development will safeguard water quality and have adequate and effective maintenance arrangement.

2.2.2 Application of Planning Policy

The SPP contains a flood risk framework that should be used to guide planning and decision making in relation to flood risk. The framework uses the risk designations from the SEPA online indicative Flood Maps detailed below to categorise river and coastal flood risk:

- Low likelihood – The annual probability of a flood event occurring in the defined area is less than 0.1% (1:1000-year event);
- Medium likelihood - The annual probability of a flood event occurring in the defined area is 0.5% (1:200-year event); and
- High likelihood – The annual probability of a flood event occurring in the defined area is 10% (1:10-year event).

Storm and flood risks are typically expressed by the probability of occurrence of an event of stated magnitude in any one year, termed the Annual Exceedance Probability (AEP). This may be expressed as a percentage (0.1%, 0.5%, 10%) or by the equivalent chance of occurrence (1:1000, 1:200, 1:10).

The SSE policy guidance SP-NET-CIV-502 Revision 1.01 (2020) "Drainage Specification" sets out minimum design criteria for new site drainage systems for 1:20, 1:200 and 1:1000-year rainfall events over the lifetime of the Proposed Development. The surface water drainage system for the Proposed Development shall be designed and constructed to ensure that:

- For a 5% (1:20) AEP rainfall event, there should be no flooding to non-critical operational areas (e.g., laydown yards and car parks);
- For a 0.5% (1:200) AEP rainfall event, there should be no flooding on operational areas of the site; and
- For a 0.1% (1:1000) AEP rainfall event, standing water on the site should not affect critical equipment.

3. Climate Change

During the lifetime of the proposed substation development, surface water runoff rates and volumes from the roads, building and other paved areas may increase as a result of the potential increase in extreme rainfall due to climate change.

SEPA's climate change allowances for flood risk assessment in land use planning (2023) provides climate change allowances for peak rainfall intensity based on geographic location. For the North Highland Catchment where the Proposed Development is located, a peak rainfall allowance of 42% for future climate change is recommended. Where an allowance for future climate change has been considered, the abbreviation +CCA (plus Climate Change Allowance) will be used in this report.

4. Surface Water Drainage Strategy

4.1 Sustainable Drainage System

Surface water drainage systems developed in line with the ideals of sustainable development are referred to as Sustainable Drainage Systems (SuDS). The philosophy of SuDS is to replicate, as closely as possible, the natural drainage from a site before development. Their main aim is to prevent flooding of the development site without increasing the risk of flooding to downstream receptors for a wide range of design storms. They should also maximize water quality, amenity and biodiversity opportunities where appropriate.

CIRIA's The SuDS Manual is the current best practice guidance document and promotes sustainable water management using SuDS. The SuDS Manual outlines a hierarchy of SuDS for managing runoff, referred to as a management or treatment train:

- Prevention – preventing runoff and pollution through good site design and housekeeping measures on individual sites (e.g., minimising impermeable areas);
- Source Control – control of runoff at or as close to its source as possible (e.g., use of rainwater harvesting);
- Site Control – management of water from several sub-catchment including routing water from roofs/carparks/hardstanding areas to a soakaway or series of soakaways for the whole site; and
- Regional Control – management of runoff from several sites, typically in a pond or wetland.

Table 1.1 in the SuDS Manual presents a concise summary of sustainable drainage techniques that should be considered when developing a management train with more detailed descriptions of the techniques also presented within the manual.

4.2 Hierarchical Drainage Options

Following the guidance within The SuDS Manual, the information within Table 1 outlines the most appropriate option to dispose of surface water from the Development along with the rationale.

Table 1: Surface Water Disposal Methods

Disposal Route	Method Suitable? (Y/N)	Rationale
Re-use onsite	N	There is an existing water supply to the site, therefore no demand for water re-use.
Infiltration to ground	Y	Infiltration tests undertaken during Ground Investigation of the site suggest existing strata is suitable for infiltration.
Discharge to surface waters	N	Discharge to local watercourses will not be required as surface water runoff can be managed through infiltration.
Discharge to combined sewer	N	Connection to a public sewer is not viable due to the distance and elevation difference between the site and the closest sewer.

4.3 Proposed Outline SuDS Strategy

Table 1.1 in The SuDS Manual has been consulted to establish the most suitable SuDS techniques based on the hierarchical assessment of drainage options. It is proposed to manage surface water runoff from the impermeable areas of the Proposed Development via the following 'Source Control', 'Conveyance' and 'Site Control' options as set out in table 2 below:

Table 2 - Surface Water Management SuDS Options

SuDS Management Train Mechanism	Application	SuDS Features to be Used
Source Control	For the interception of surface water runoff at the source such as buildings, access roads and hardstanding areas.	Filter Drains or ACO type kerb drainage
Conveyance	To convey surface water runoff from 'Source Control' mechanisms to 'Site Control'.	Solid drains and filter drains
Site Control	Provides the required surface water attenuation of storage prior to controlled discharge to the ground	Infiltration basin

Areas of the Proposed Development will remain unsurfaced with the above noted 75mm granular (gravel) topping layer to allow free infiltration to the platform layers and will not require specific drainage features. Filter drains will also be provided as required. The new internal access road connecting the Proposed Development to LT92 and the existing substation will, as noted above, be sealed and drained with a filter drain network and ACO type drainage kerbs where the road is locally lowered. This drainage will be conveyed via the surface water drainage system to an outfall in the infiltration basin.

Roof drainage from the proposed GIS building will be drained via gutters and downpipes to the surface water network.

The bunded transformer areas and associated hard standing areas, noted in Section 2.1 of this report, will be drained via a sealed system to a new oil separator to be located within the eastern extent of the platform area. After separation, the treated water would be discharged to the local water environment. The oily water management will be designed in accordance with SSE specification, which includes the following features:

- Secondary containment systems, which will include bunded areas;
- A water control system within each bunded area, which includes two pumps discharging to an oil separator prior to discharge into the site SuDS system;
- A sensor system that differentiates between oil and water, raising an alarm on detection of high oil levels;
- Telemetry to an SSE control room to raise alarms on pump failure or high oil level; and
- Bund volume for proposed transformers.

It is proposed that the larger, currently unused infiltration basin constructed to the southeast of the existing site is utilised to collect and allow infiltration of surface water from the Proposed Development and LT92. For the purposes of the modelling included within this report, it has also been assumed that runoff from the existing substation will also discharge into the larger basin. The existing outfall for LT92, which currently discharges into the smaller infiltration basin on the southern extent of the existing substation platform, will require to be re-directed to the larger basin. An indicative surface water drainage layout and pipe schedule has been provided within Appendix B.

The existing basin has 1 in 5 slopes and a depth of 3.5m, measuring from base level at 35mAOD to 38.5mAOD at the top of the bund. Due to the location of the basin within a flood compensation area, it is proposed that the height of this bund is increased from 38.5mAOD to 38.9mAOD. For the purposes of the capacity assessment, the basin has been modelled in Micro Drainage with 300mm freeboard. A discharge

point with a headwall has been constructed with an invert level of 35.37mAOD; however, it is likely that this will be adjusted to receive the outfalls from LT92 and the Proposed Development.

4.4 Contributing Area

The area of the Proposed Development discharging run-off to the infiltration basin is approximately 3.4 hectares. This includes internal roads, the control building, hardstanding areas and two proposed transformer bunds.

In addition, a combined area of approximately 7.4 hectares run-off from LT92 and the existing substation will also discharge run-off to the infiltration basin. This is on the assumption that the existing substation drainage outfalls via the existing LT92 drainage network.

A conservative approach has been taken in the modelling and calculation with an impermeable (runoff) coefficient of 100% assumed for the areas noted above.

4.5 Control of Runoff Volume

Section 3.3.1 of The SuDS Manual sets out volume control criteria for two scenarios:

1. **Extreme rainfall events** - The SuDS Manual states that the drainage system should be designed so that the volume of runoff discharged from the site during extreme events is controlled. Where possible the volume of runoff from the development should not exceed the volume of runoff from the equivalent area in its natural "greenfield" state.

   Flows from the existing substation platform, the LT92 extension and Proposed Development will be collected within the infiltration basin. From modelling undertaken in Micro Drainage, a maximum storage capacity of approximately 10,643m^3 for a 1:1000 storm event (+42%CCA) can be accommodated within the existing basin whilst maintaining a freeboard greater than 300mm.

2. **Frequent rainfall events** – The SuDS Manual states that the drainage system should be designed so that runoff from the site to receiving surface water does not occur for the majority of small rainfall events. The prevention of runoff from site for the majority of small (frequent) rainfall events (or for the initial depth of rainfall for larger events) is referred to as Interception. The SuDS manual advises that Interception of about 5 millimetres is normally achievable.

   As detailed in Section 24.8 of The SuDS Manual, Interception can be delivered using one or a combination of processes:
   - Rainwater harvesting.
   - Infiltration.
   - Evapotranspiration using temporary shallow ponding or storage within the soil or upper aggregate layers.

   Interception of runoff through site will be achieved through a network of filter drains and drainage kerb which will then be conveyed to the infiltration basin.

Section 3.3.2 of The SuDS Manual sets out peak rate of runoff criteria for:

- Events likely to impact on morphology, ecology or capacity of the receiving surface waters, or the capacity of receiving sewers.
- Extreme events.

The design rainfall is based on Flood Studies Report (FSR) data within Micro Drainage software. The discharge rate from the Proposed Development will not exceed a 1:2-year greenfield event. In general, the measures should be designed to ensure that flow arising from a 1:10 year +CCA event is attenuated on site and then released at a rate no greater than the pre-development peak flow rate and that flooding does not occur in any operational area during a 1:200 year +CCA event, with no standing water which could affect critical equipment during a 1:1000-year +CCA event.

Results of modelling undertaken within Micro Drainage, confirming that a 1:1000 (+42%CCA) can be accommodated within the existing large infiltration basin with the minimum 300mm freeboard achieved, are attached within Appendix C.

4.6 Water Quality

The Proposed Development will involve the construction and operation of a substation involving less than 300 traffic movements per day. Table 26.2 of The SuDS Manual provides Pollution Hazard Indices for different land use classifications. From this, the water runoff generated by the impermeable areas of the site are considered to have a 'Low' Pollution Hazard Level as set out in Table 3.

Table 3: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids	Metal	Hydrocarbons
Commercial/Industrial Roofs (low potential for metal leaching)	Low	0.3	0.2	0.05
General Access Roads	Low	0.5	0.4	0.4

The proposed SuDS strategy is required to demonstrate sufficient treatment capability to manage the specified Pollution Hazard Indices.

As outlined in Section 4.3, it is proposed for surface water runoff resulting from the Proposed Development to be intercepted by filter drains and collected within the infiltration basin. The SuDS Mitigation Indices provided by the proposed SuDS system for a discharge to surface water are compared to the Pollution Hazard Indices in Table 4 below.

Table 4: SuDS Mitigation Indices

Land Use	Pollution Hazard Level	Pollution Hazard and SuDS mitigation Comparison					
		Total Suspended Solids		Metal		Hydrocarbons	
		Pollution Index	SuDS Mitigation Index[1]	Pollution Index	SuDS Mitigation Index[1]	Pollution Index	SuDS Mitigation Index[1]
Commercial/ Industrial Roofs	Low	0.3	0.6	0.2	0.5	0.05	0.6
General Access Roads	Low	0.5	0.6	0.4	0.5	0.4	0.6

[1] While filter drains will be used for the collection and conveyance of surface water runoff from industrial roofs and access roads, the infiltration basin will be the primary method for attenuation of surface water runoff prior to discharge to groundwater. As such, the type of SuDS component for SuDS Mitigation Indices has been taken from Table 26.4 of The SuDS Manual. For the infiltration basin, the 'Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates' has been selected as 'a layer of dense vegetation underlain by a soil with good contaminant attenuation potential of at least 300mm in depth'.

As the SuDS Mitigation Index provided by the proposed SuDS measures are greater than or equal to the Pollution Hazard Index for discharge to surface waters, the quality assessment criteria are satisfied.

5. Principal Operation and Maintenance Requirement

It will be the responsibility of SSE to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. A nominated person will also have responsibility for reporting on the functionality of drainage measures.

Where impermeable areas remain through the lifetime of the Proposed Development, the SuDS measures serving these areas will be checked on a regular basis. Should drainage measures require dredging or unblocking, this will be undertaken as soon as practicable by a local contractor engaged by SSE.

It is not anticipated that The Highland Council or Scottish Water will adopt the new drainage network. Therefore, it will be the responsibility of SSE to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. Outline management/maintenance plans for the filter drains and infiltration basin to be provided as part of the Proposed Development are shown in Tables 5 and 6.

Table 5 - Outline Maintenance Plan - Filter Drains

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockage, clogging standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly (or as required)
Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (NJUG 2007 or BS3998:2010).	As required
	At location with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Table 6: Outline Maintenance Plan – Infiltration Basin

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)

Maintenance Schedule	Required Action	Recommended Frequency
	Cut grass – landscaped areas and access routes	Monthly (or as required)
	Cut meadow grass	Half yearly (spring, before nesting season and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, e.g. penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay	Every 1-5 years, or as required
Occasional Maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, e.g. every 25–50 years
Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required

Maintenance Schedule	Required Action	Recommended Frequency
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damages	As required
	Repair/rehabilitate inlets. Outlets and overflows	As required

6. Foul Water Drainage

During the construction phase a temporary 'porta-loo' facility will be onsite, with waste being stored, managed and carried offsite by the Principal Contractor and a licensed waste management courier.

As noted in Section 2.1, the Proposed Development includes provision of toilet and mess facilities within the proposed GIS building. The substation will be unmanned, with visits to site only required for routine maintenance, inspection and any necessary repair works.

The foul water will be discharged to a septic tank located within the extents of the Proposed Development in an area adjacent to the south of the GIS building. Following treatment, the effluent will be conveyed to an adjacent field soakaway located to the southeast of the Proposed Development. An indicative foul water layout and associated septic tank detail and instillation documentation are provided within Appendix D. The details of the septic tank arrangement would be agreed with SEPA and authorised in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations as part of the detailed design.

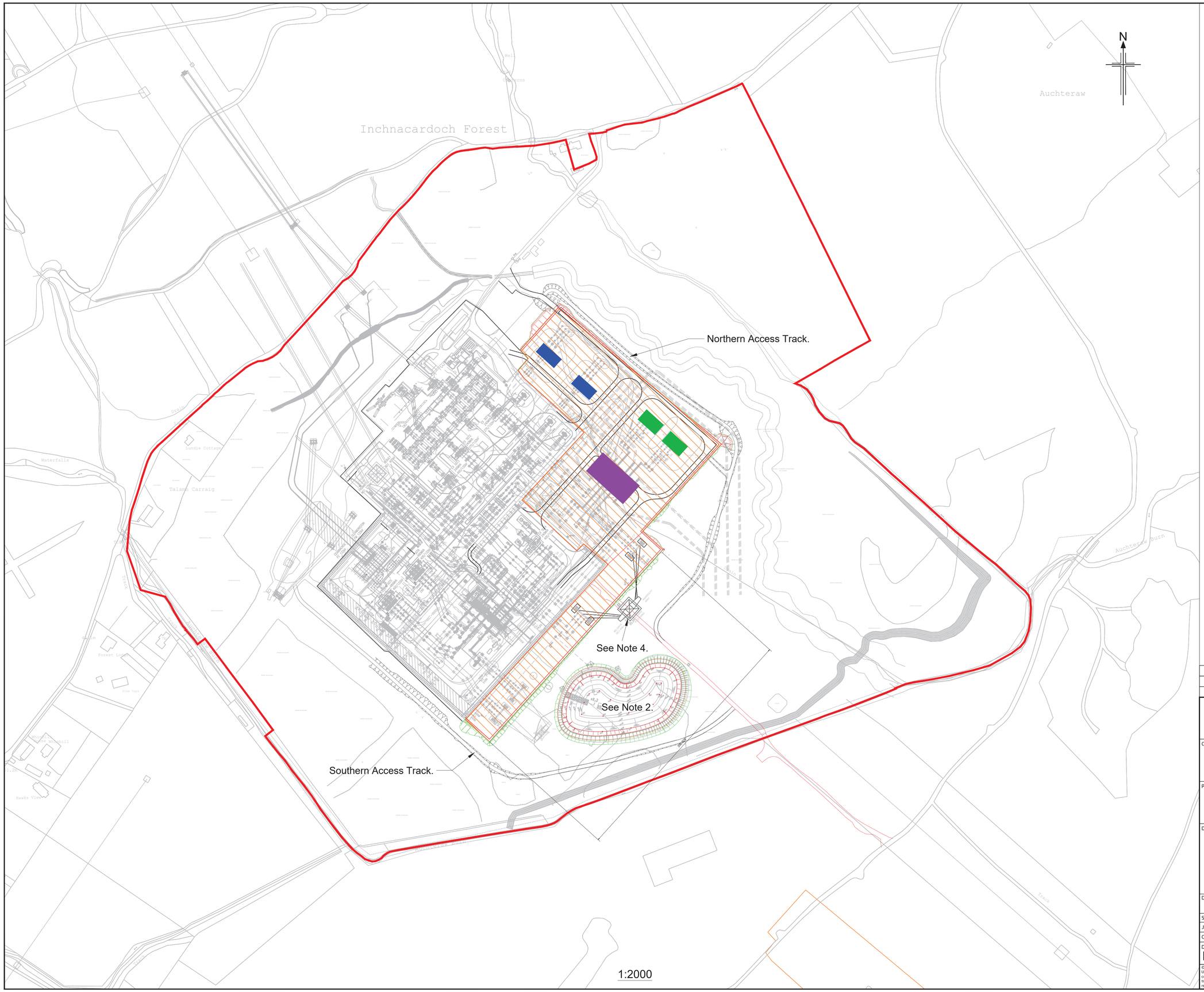
Septic tanks shall be designed and sized at detailed design stage in accordance with BS 6297:1983 and the British Water Code of Practice Flow and Loads 4. The septic tank will be managed and inspected.

7. Construction Stage Water Management

During construction, surface water runoff will require to be managed during all phases to avoid silt-laden or contaminated water run-off.

Construction stage water management proposals will be developed separately by the Principal Contractor for the Proposed Development in a Pollution Prevention Plan (PPP). The PPP will require to be agreed and approved by SEPA for a Construction Site License to be issued in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011.

Appendix A. Proposed Site Layout



Notes:
1) All dimensions in meters unless otherwise stated.
2) Bund height around existing pond increased to 38.9m AOD.
3) Internal access roads are indicative.
4) Proposed Relocated Tower.

Key:

- Green gradings indicate areas of fill
- Red gradings indicate areas of cutting
- Redline Boundary
- Proposed LT519 Development
- Proposed Building - Apex Height 14.5m
- Proposed SGT - Height 12.5m
- Proposed Reactor - Height 11m

0 50 100 200

SCALE 1:2000 METRES

Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd
P01	2023-10-26	SECOND ISSUE	RW	AT	MD	MD
P00	2023-10-18	FIRST ISSUE	RW	AT	MD	MD

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Client
SCOTTISH & SOUTHERN ELECTRICITY NETWORKS

Project
FORT AUGUSTUS PLATFORM EXTENSION

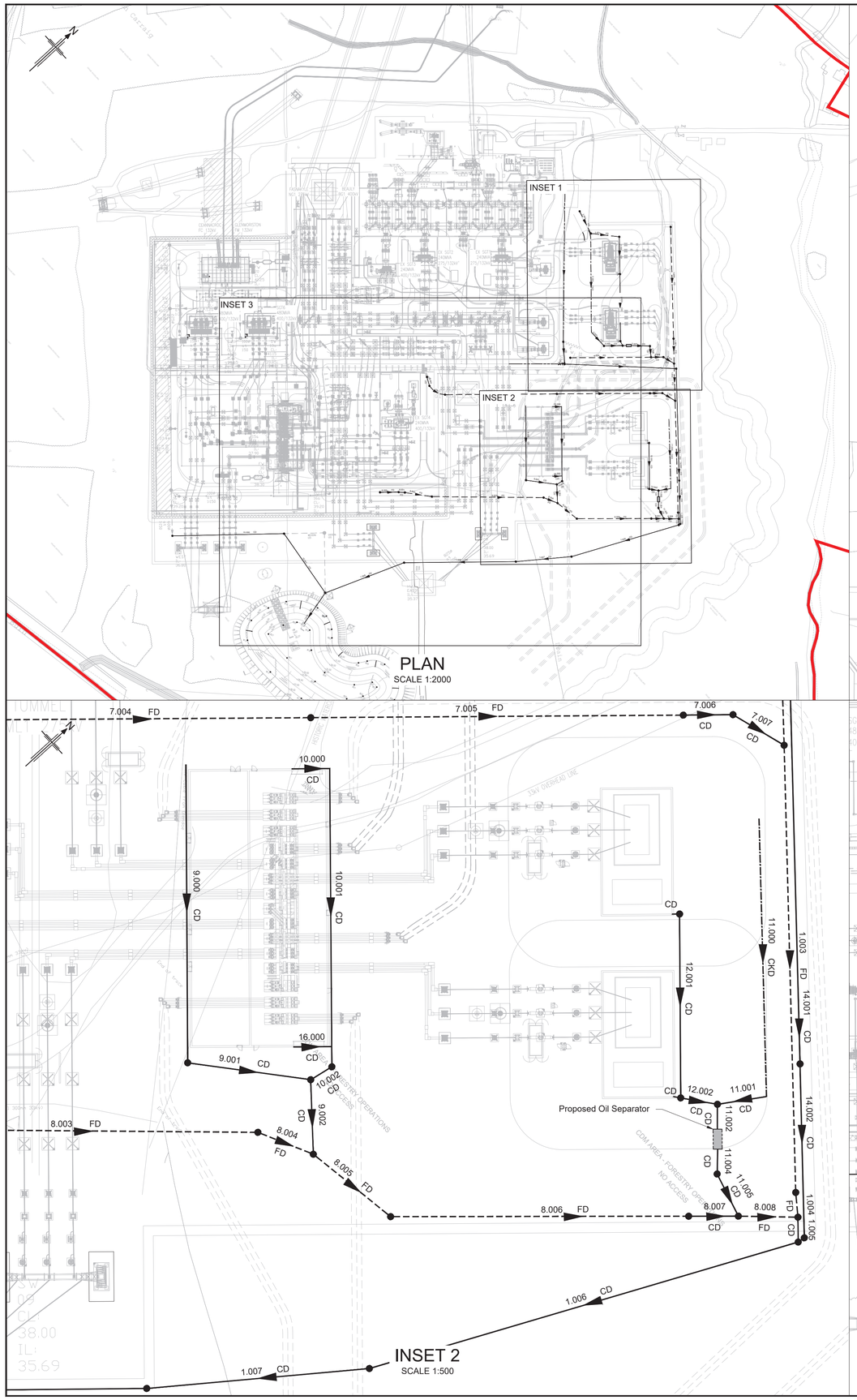
Drawing title
PLANNING APPLICATION
LT519 PLATFORM EXTENSION

Drawing status	FOR INFORMATION	Suitability SO
Scale	1:2000@ A1	DO NOT SCALE
Jacobs No.	B2413736	Rev P01
Client No.	9605	

Drawing number
B2413736-JAC-HGN-FA-DR-CE-001

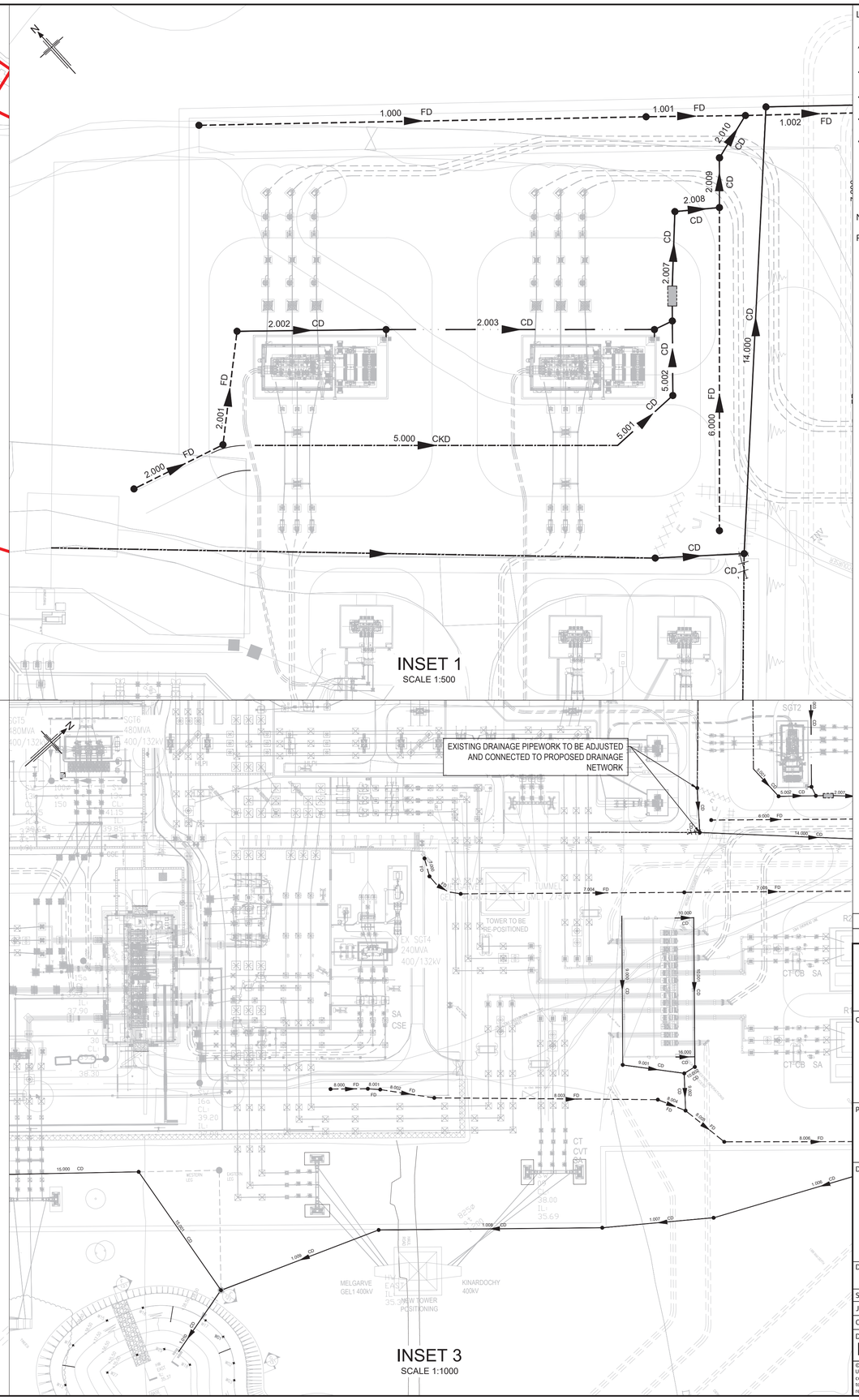
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Appendix B. Indicative Surface Water Drainage Layout and Pipe Schedule



PLAN
SCALE 1:2000

INSET 2
SCALE 1:500



INSET 1
SCALE 1:500

INSET 3
SCALE 1:1000

Legend:

- Proposed Filter Drain (FD)
- Proposed Carrier Drain (CD)
- Proposed Combined Kerb Drain (CKD)
- Oily Water Drainage
- Existing Drainage
- Chamber
- Oil Separator

Notes:

Please refer to drainage schedule for pipe sizing.

Rev	Rev. Date	Purpose of revision	AW	RH	GD	MD
P01	2023-10-26	FIRST ISSUE	Orig	Check'd	Rev'd	Apprv'd

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Project: FORT AUGUSTUS SUBSTATION PLATFOM EXTENSION

Drawing title: INDICATIVE SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 1

Drawing status	FOR INFORMATION	Suitability
Scale	AS SHOWN	DO NOT SCALE
Jacobs No.	B2413736	Rev P01
Client No.	N/A	

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Fort Augustus Substation Extension (LT519) - Surface Water Drainage Pipe Schedule

Pipe Number	Pipe Type	Pipe DIA (mm)	Pipe Length (m)	Fall (m)	Slope (1:X)	US/IL (m)	DS/IL (m)	US/CL (m)	US D.Depth (m)	Comments
1.000	Filter Drain	225	90.000	0.892	100.9	40.128	39.236	41.553	1.200	
1.001	Filter Drain	225	20.000	0.132	151.4	39.236	39.104	40.661	1.200	
2.000	Filter Drain	150	20.000	0.263	76.1	39.850	39.587	41.200	1.200	
2.001	Carrier Drain	150	23.000	0.231	99.6	39.587	39.356	41.200	1.463	
2.002	Carrier Drain	150	30.000	0.301	99.6	39.356	39.055	41.159	1.653	
3.000	Carrier Drain	150	1.500	0.016	94.6	39.812	39.797	41.162	1.200	Oily Water Drainage
2.003	Carrier Drain	225	54.000	0.321	168.2	38.980	38.659	41.147	1.942	Oily Water Drainage
4.000	Carrier Drain	150	1.500	0.015	98.9	39.684	39.668	41.034	1.200	Oily Water Drainage
2.004	Carrier Drain	225	4.000	0.046	86.3	38.659	38.612	41.021	2.137	Oily Water Drainage
5.000	Combined Kerb Drain	150	73.000	0.817	89.4	39.840	39.023	41.190	1.200	ACO KerbDrain or Similar
5.001	Carrier Drain	150	15.000	0.168	89.4	39.023	38.855	41.209	2.037	Oily Water Drainage
5.002	Carrier Drain	150	15.000	0.168	89.4	38.855	38.687	41.115	2.110	Oily Water Drainage
2.005	Carrier Drain	300	3.000	0.012	250.0	38.537	38.525	40.986	2.149	Oily Water Drainage
2.006	Oil Separator		4.015	0.017	236.2	38.525	38.508	40.960	2.135	Pipe 2.006 has been modelled as a tank between MH9 and MH10
2.007	Carrier Drain	300	15.000	0.062	241.9	38.508	38.446	40.926	2.118	
2.008	Carrier Drain	300	9.000	0.037	243.2	38.446	38.409	40.794	2.047	
6.000	Filter Drain	225	65.000	0.544	119.5	39.857	39.313	41.282	1.200	
2.009	Carrier Drain	300	10.000	0.031	322.6	38.334	38.303	40.738	2.104	
2.010	Carrier Drain	300	10.000	0.031	322.6	38.303	38.272	40.652	2.049	
1.002	Filter Drain	300	30.000	0.254	118.1	38.272	38.018	40.550	1.978	
7.000	Filter Drain	150	7.500	0.133	56.2	39.855	39.721	41.205	1.200	
7.001	Filter Drain	150	5.000	0.150	33.3	39.721	39.571	41.071	1.200	
7.002	Filter Drain	150	5.000	0.065	76.4	39.571	39.506	40.921	1.200	
7.003	Filter Drain	150	5.000	0.065	76.4	39.506	39.440	40.856	1.200	
7.004	Filter Drain	225	90.000	0.685	131.4	39.365	38.680	40.839	1.249	
7.005	Filter Drain	300	75.000	0.396	189.6	38.605	38.210	41.040	2.135	
7.006	Carrier Drain	300	10.000	0.053	189.6	38.210	38.157	40.589	2.079	
7.007	Carrier Drain	300	12.000	0.063	189.6	38.157	38.094	40.503	2.046	
1.003	Filter Drain	300	90.000	0.287	313.6	37.869	37.582	40.381	2.212	
1.004	Filter Drain	300	5.000	0.011	454.5	37.507	37.496	39.845	2.038	
8.000	Filter Drain	150	15.000	0.275	54.5	38.707	38.432	40.057	1.200	
8.001	Filter Drain	150	5.000	0.113	44.4	38.432	38.319	39.782	1.200	
8.002	Filter Drain	225	22.000	0.289	76.1	38.319	38.030	39.669	1.125	
8.003	Filter Drain	300	90.000	0.713	126.2	37.955	37.242	39.656	1.401	
8.004	Filter Drain	300	12.000	0.063	189.6	37.167	37.104	40.048	2.581	
9.000	Carrier Drain	225	60.000	0.556	107.9	39.260	38.704	40.685	1.200	
9.001	Carrier Drain	225	25.000	0.149	167.7	38.704	38.555	40.129	1.200	
10.000	Channel Drain	150	7.640	0.076	100.9	39.554	39.478	40.904	1.200	ACO MultiDrain or similar to be installed across access to GIS building
10.001	Carrier Drain	225	60.000	0.623	96.3	39.403	38.780	40.923	1.295	
10.002	Carrier Drain	225	5.000	0.225	22.2	38.780	38.555	40.205	1.200	
9.002	Carrier Drain	300	15.000	0.047	319.1	38.405	38.358	40.174	1.469	
8.005	Filter Drain	300	20.000	0.062	321.9	36.954	36.892	39.994	2.740	
8.006	Filter Drain	300	60.000	0.187	320.8	36.892	36.705	39.844	2.652	
8.007	Carrier Drain	300	10.000	0.031	322.6	36.705	36.674	39.818	2.813	
11.000	Combined Kerb Drain	150	56.000	0.554	100.9	38.995	38.441	40.345	1.200	Oily Water Drainage
11.001	Carrier Drain	150	10.000	0.099	100.9	38.441	38.341	39.957	1.366	Oily Water Drainage
12.000	Carrier Drain	150	1.500	0.017	85.9	38.936	38.918	40.286	1.200	Oily Water Drainage
12.001	Carrier Drain	150	37.000	0.431	85.9	38.918	38.487	40.278	1.210	Oily Water Drainage
13.000	Carrier Drain	150	1.500	0.121	12.4	38.608	38.487	39.958	1.200	Oily Water Drainage
12.002	Carrier Drain	225	7.500	0.146	51.4	38.412	38.266	39.956	1.319	Oily Water Drainage
11.002	Carrier Drain	300	5.000	0.021	241.9	38.191	38.171	39.948	1.457	Oily Water Drainage
11.003	Oil Separator		4.015	0.017	241.9	38.171	38.154	39.920	1.449	Pipe 11.003 has been modelled as a tank between MH40 and MH41
11.004	Carrier Drain	300	5.000	0.021	241.9	38.154	38.134	39.896	1.442	
11.005	Carrier Drain	300	9.500	0.039	241.9	38.134	38.094	39.867	1.434	
8.008	Filter Drain	300	12.000	0.031	387.1	36.599	36.568	39.818	2.919	
1.005	Carrier Drain	300	5.000	0.086	58.1	36.493	36.407	39.816	3.023	
14.000	Carrier Drain	450	90.000	0.674	133.5	39.578	38.904	41.303	1.275	
14.001	Carrier Drain	450	90.000	0.634	142.0	38.904	38.270	40.629	1.275	
14.002	Carrier Drain	525	35.000	0.070	500.0	38.120	38.050	39.995	1.350	
14.003	Carrier Drain	525	1.500	1.643	0.9	38.050	36.407	40.197	1.622	
1.006	Carrier Drain	525	90.000	0.180	500.0	36.107	35.927	39.986	3.354	
1.007	Carrier Drain	525	45.000	0.090	500.0	35.927	35.837	39.900	3.448	
1.008	Carrier Drain	525	90.000	0.180	500.0	35.837	35.657	39.800	3.438	
1.009	Carrier Drain	525	68.000	0.286	237.6	35.657	35.371	39.800	3.618	
15.000	Carrier Drain	600	90.000	0.180	500.0	37.550	37.370	39.800	1.650	
15.001	Carrier Drain	600	58.000	1.924	30.1	37.370	35.446	39.800	1.830	
1.010	Carrier Drain	600	30.000	2.696	11.1	35.371	32.675	37.800	1.829	Outfall to Infiltration Basin
16.000	Channel Drain	150	7.119	0.071	100.9	38.903	38.833	40.253	1.200	ACO MultiDrain or similar to be installed across access to GIS building

Appendix C. Micro Drainage Output

Summary of Results for 1000 year Return Period (+42%)

Half Drain Time : 417 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	36.499	1.499	131.7	3278.2	O K
30 min Summer	36.986	1.986	163.6	4845.1	O K
60 min Summer	37.428	2.428	193.6	6510.4	O K
120 min Summer	37.798	2.798	219.8	8100.4	O K
180 min Summer	37.974	2.974	232.4	8922.4	O K
240 min Summer	38.073	3.073	239.6	9401.8	O K
360 min Summer	38.175	3.175	247.1	9911.6	O K
480 min Summer	38.235	3.235	251.6	10221.4	O K
600 min Summer	38.273	3.273	254.4	10418.5	O K
720 min Summer	38.297	3.297	256.2	10542.1	O K
960 min Summer	38.316	3.316	257.6	10643.3	Flood Risk
1440 min Summer	38.290	3.290	255.7	10505.0	O K
2160 min Summer	38.185	3.185	247.9	9965.2	O K
2880 min Summer	38.063	3.063	238.9	9354.4	O K
4320 min Summer	37.826	2.826	221.8	8227.9	O K
5760 min Summer	37.616	2.616	206.8	7297.3	O K
7200 min Summer	37.436	2.436	194.2	6544.1	O K
8640 min Summer	37.281	2.281	183.5	5927.9	O K
10080 min Summer	37.144	2.144	174.2	5413.2	O K
15 min Winter	36.499	1.499	131.7	3279.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	140.388	0.0	26
30 min Summer	104.935	0.0	40
60 min Summer	72.274	0.0	68
120 min Summer	47.207	0.0	126
180 min Summer	36.325	0.0	186
240 min Summer	30.047	0.0	244
360 min Summer	22.910	0.0	314
480 min Summer	18.861	0.0	378
600 min Summer	16.208	0.0	442
720 min Summer	14.317	0.0	510
960 min Summer	11.773	0.0	650
1440 min Summer	8.915	0.0	928
2160 min Summer	6.722	0.0	1328
2880 min Summer	5.491	0.0	1736
4320 min Summer	4.123	0.0	2512
5760 min Summer	3.365	0.0	3248
7200 min Summer	2.879	0.0	3976
8640 min Summer	2.538	0.0	4752
10080 min Summer	2.285	0.0	5448
15 min Winter	140.388	0.0	26

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Summary of Results for 1000 year Return Period (+42%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	36.988	1.988	163.7	4850.0	O K
60 min Winter	37.431	2.431	193.8	6522.6	O K
120 min Winter	37.805	2.805	220.2	8130.2	O K
180 min Winter	37.984	2.984	233.2	8969.1	O K
240 min Winter	38.087	3.087	240.7	9469.9	O K
360 min Winter	38.187	3.187	248.0	9974.2	O K
480 min Winter	38.236	3.236	251.6	10222.9	O K
600 min Winter	38.266	3.266	253.9	10381.0	O K
720 min Winter	38.279	3.279	254.8	10447.1	O K
960 min Winter	38.273	3.273	254.4	10415.5	O K
1440 min Winter	38.193	3.193	248.5	10003.1	O K
2160 min Winter	38.015	3.015	235.4	9116.8	O K
2880 min Winter	37.828	2.828	221.9	8235.4	O K
4320 min Winter	37.487	2.487	197.8	6754.0	O K
5760 min Winter	37.204	2.204	178.3	5637.7	O K
7200 min Winter	36.970	1.970	162.5	4788.6	O K
8640 min Winter	36.773	1.773	149.5	4127.0	O K
10080 min Winter	36.607	1.607	138.6	3602.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	104.935	0.0	40
60 min Winter	72.274	0.0	68
120 min Winter	47.207	0.0	124
180 min Winter	36.325	0.0	182
240 min Winter	30.047	0.0	238
360 min Winter	22.910	0.0	342
480 min Winter	18.861	0.0	388
600 min Winter	16.208	0.0	464
720 min Winter	14.317	0.0	542
960 min Winter	11.773	0.0	696
1440 min Winter	8.915	0.0	990
2160 min Winter	6.722	0.0	1416
2880 min Winter	5.491	0.0	1824
4320 min Winter	4.123	0.0	2604
5760 min Winter	3.365	0.0	3392
7200 min Winter	2.879	0.0	4112
8640 min Winter	2.538	0.0	4848
10080 min Winter	2.285	0.0	5552

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1000	Cv (Summer)	0.900
Region	Scotland and Ireland	Cv (Winter)	0.900
M5-60 (mm)	15.600	Shortest Storm (mins)	15
Ratio R	0.200	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+42

Time Area Diagram

Total Area (ha) 10.758

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.267	4	8	6.944	8	12	3.470	12	16	0.077

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Model Details

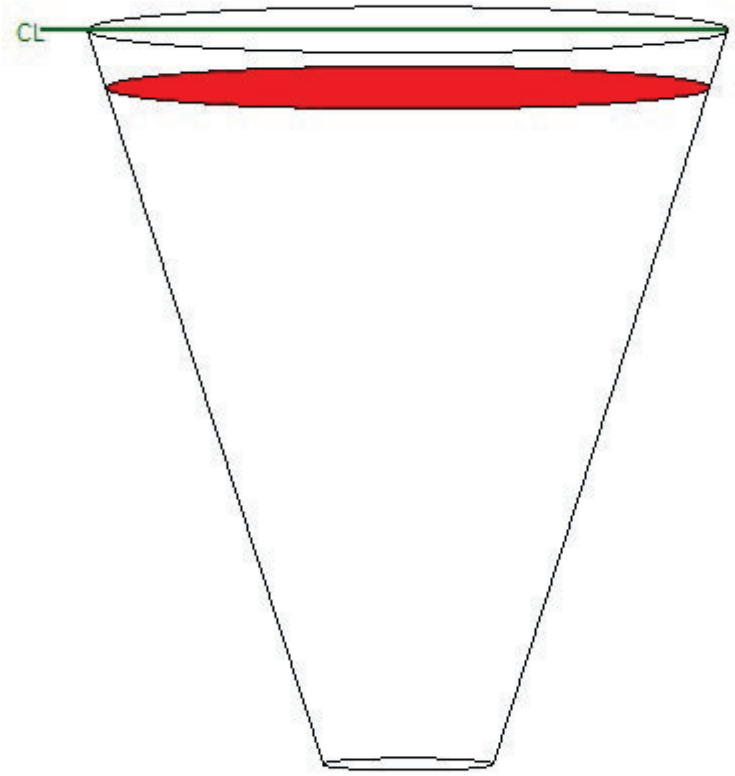
Storage is Online Cover Level (m) 38.600

Infiltration Basin Structure

Invert Level (m) 35.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.20160 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.20160

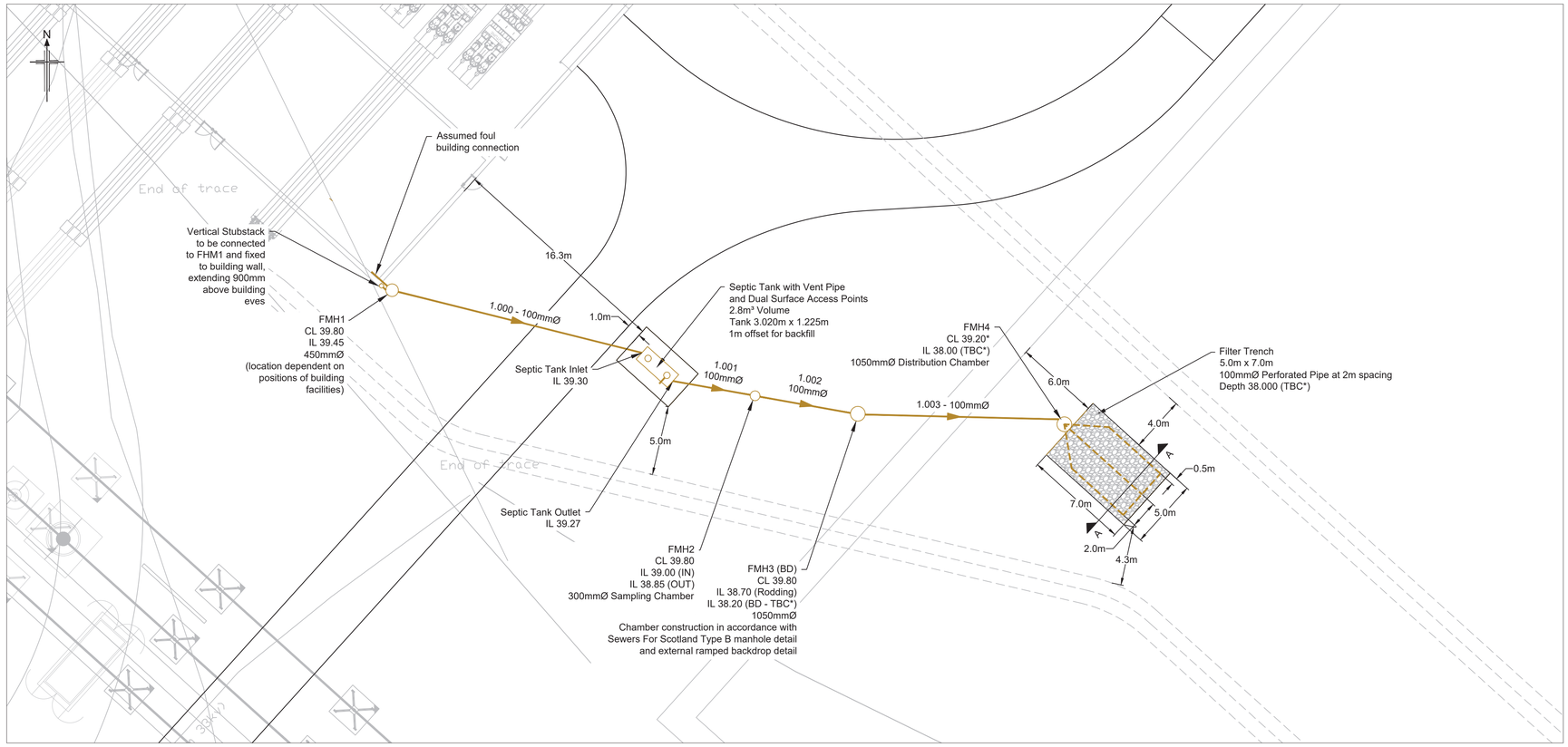
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1516.6	3.600	5709.6

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Appendix D. Foul Water Layout and Construction Details

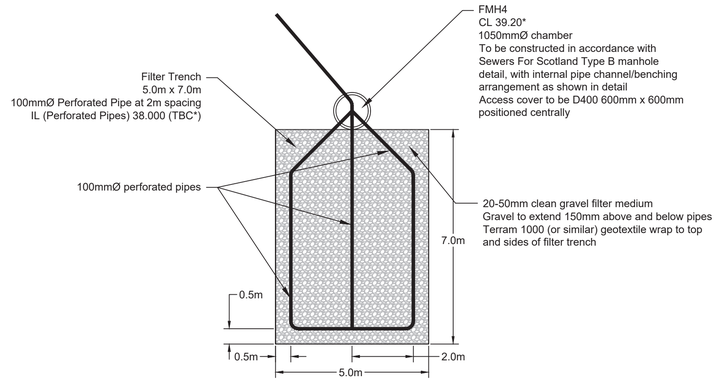


PLAN VIEW
1:200 @ A1

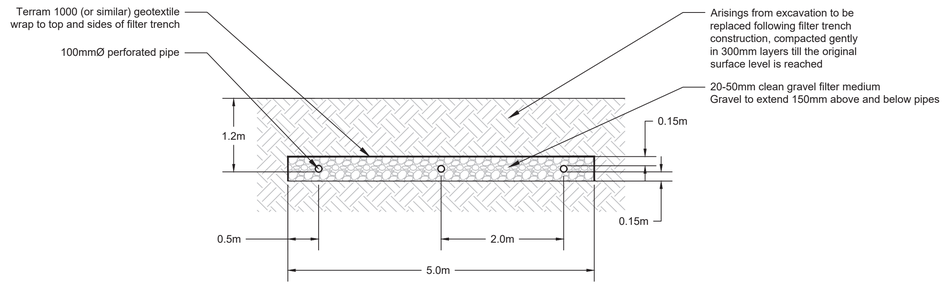
Chamber Number	Chamber Type	Cover Level (m)	Easting (m)	Northing (m)	MH Depth (m)	Manhole Dia. (mm)	Pipe Out Number	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In Number	Pipes In Invert Level (m)	Pipes In Dia (mm)	Comments
FMH1	PVC	39.80	235777.15	808286.25	0.35	450	1.000	39.45	100	Building	39.45	100 (TBC)	Vertical substack to be fitted to FMH1
Tank	N/A	39.80	235796.26	808280.73	See detail	See detail	1.001	39.27	100	1.000	39.30	100	See tank detail
FMH2	PVC	39.80	235803.29	808278.65	0.95	300	1.002	38.85	100	1.001	39.00	100	Sampling chamber
FMH3	Type B SfS	39.80	235810.69	808277.36	1.60	1050	1.003	38.20	100	1.002	38.70	100	Pipe In - backdrop - rodding
										1.002	38.20	100	Pipe in - backdrop - ramped
FMH4	Type B SfS	39.20	235825.56	808276.60	1.20	1050	Perforated (3)	38.00	100 (3)	1.003	38.00	100	Distribution chamber

Pipe Number	Pipe Size (mm)	U/S Chamber	D/S Chamber	Length (m)	Fall (1:X)	Pipe Type
1.000	100	FMH1	Tank Inlet	18.095	120.00	PVC
1.001	100	Tank Outlet	FMH2	5.650	21.00	PVC
1.002	100	FMH2	FMH3	6.640	44.00	PVC
1.003	100	FMH3	FMH4	13.936	70.00	PVC

CHAMBER AND PIPE SCHEDULE



PLAN VIEW - FILTER TRENCH
1:100 @ A1



SECTION A-A - FILTER TRENCH
1:50 @ A1

KEY

- Proposed Foul Carrier Pipe
- Proposed Foul Chamber
- Proposed Perforated Pipe
- Proposed Filter Trench

NOTES

1. Do not scale from this drawing.
2. All dimensions are in metres, unless otherwise stated.
3. The Contractor shall identify and locate all existing/proposed underground/overground utilities within the works area prior to construction commencement, and develop appropriate method statements and risk assessments to address utility constraints during the construction stage.
4. All proposed underground pipework, excluding perforated filter trench pipes, to have Class Z bedding and surround applied in accordance with Sewers For Scotland standard bedding details.
5. All pipe trench backfilling operations following pipe laying to be in accordance with Sewers For Scotland standards.
6. FMH3 (BD) and FMH4 to be constructed in accordance with Sewers For Scotland Type B manhole details, but with a reduced 1050mm chamber size. Access covers on aforementioned chambers shall be 600mm x 600mm D400 class, centrally positioned.
7. FMH1 to be PVC 450mmØ unit modified to suit required depth, with manufacturer supplied access cover to D400 class. Chamber to be installed in accordance with manufacturers instructions.
8. FMH2 to be PVC 300mmØ sampling chamber unit (150mm invert drop) modified to suit required depth, with manufacturer supplied access cover to D400 class. Chamber to be installed in accordance with manufacturers instructions.
9. Septic tank used in the design is a Kingspan STH028 Shallow Dig Septic Tank with 2.8m³ volume. Should the Contractor wish to utilise a different tank supplier, they shall consult with the Designer to ensure the suitability of the tank and inlet/outlet invert levels. The Contractor shall install the tank in accordance with the Manufactures tank drawings and installation instructions (see Kingspan Drawing DS1203 and Kingspan 015710 Shallow Dig Septic Tanks Installation & Maintenance Guidelines documentation supplied supplemental to this drawing).
10. Septic tank anchoring to be either concrete surround or anchor blocks and strapping with gravel backfill, installed in accordance with manufacturer instructions (see Kingspan Drawing DS1203 and Kingspan 015710 Shallow Dig Septic Tanks Installation & Maintenance Guidelines documentation supplied supplemental to this drawing). At the time of the design being developed, groundwater levels in the proposed tank area were unknown, thus the anchoring solution should be discussed and agreed with the Client (SSE) prior to construction commencement.
11. Septic tank access covers and venting pipework shall be be tank manufacturer supplied components and installed in accordance with manufacturer instructions. Access covers to be D400 loading class.

*Ground levels used in the foul design to be validated by the Contractor prior to construction commencement. Should variations to levels shown on the drawing be apparent, the Contractor is to consult the Designer.

Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd
P01	2023-11-09	FIRST ISSUE	RG	AT	AT	MD

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Client: SCOTTISH & SOUTHERN ELECTRICITY NETWORKS

Project: FORT AUGUSTUS PLATFORM EXTENSION

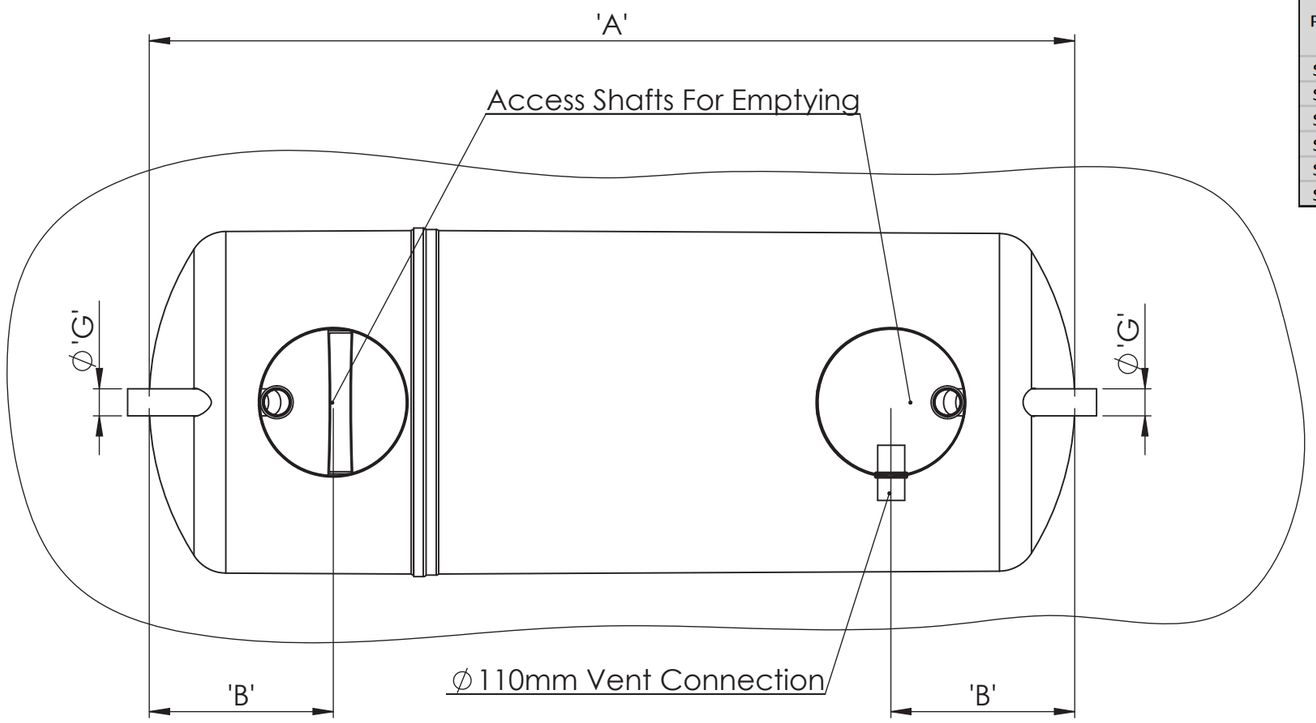
Drawing title: FOUL DRAINAGE DESIGN

Drawing status: FOR INFORMATION
Suitability: SO

Scale	See Drawing	DO NOT SCALE
Jacobs No.	B2413736	Rev P01
Client No.	9605	

Drawing number: B2413736-JAC-HDG-PD-DE-CI-002

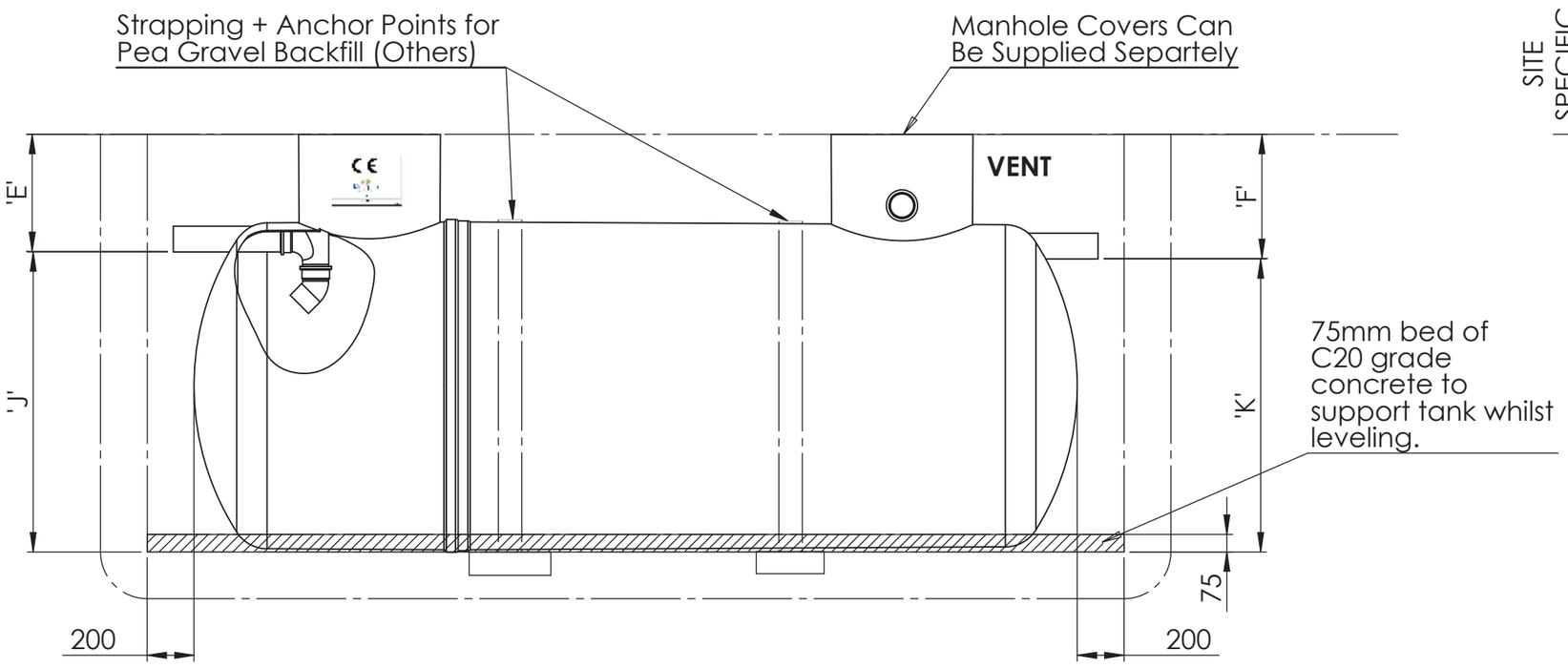
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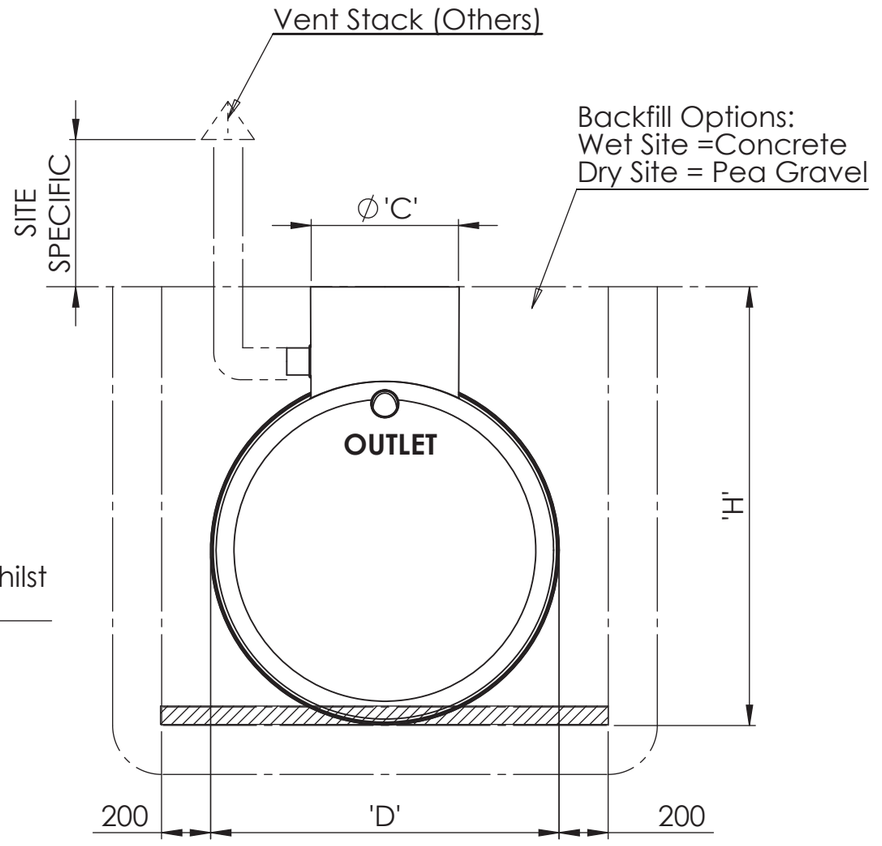


Product Information Table											
Product	Volume (L)	Empty Weight (kg)	Dimensions (mm)								
			'A'	'B'	'C'	'D'	'E'	'F'	'G' SEE NOTE 7	'H'	'J'	'K'
STH028	2800	165	3020	600	Ø460	Ø1225	500	530	Ø110	1560	1060	1030
STH038	3800	185	3900	600	Ø460	Ø1225	500	530	Ø110	1550	1050	1020
STH048	4800	195	3775	750	Ø600	Ø1425	500	530	Ø110	1750	1250	1220
STH057	5700	205	4275	750	Ø600	Ø1425	500	530	Ø110	1750	1250	1220
STH071	7150	280	3230	675	Ø600	Ø1920	500	550	Ø160	2190	1690	1640
STH091	9150	325	3965	675	Ø600	Ø1920	500	550	Ø160	2190	1690	1640

Notes:

1. Tanks have an inlet invert depth of 0.5m as standard. Upon request this may be extended up to 1.5m via neck GRP riser pieces.
2. This drawing should be used for dimensional information only. Refer to installation guidelines for full tank installaton.
3. Additional ventilation can be achieved on the incoming drain, via a stack pipe. Position to suit specific site conditions.
4. Confirm with local building regulations if additional venting is required.
5. If backfilling with peashingle on wet sites the tank must be strapped down using suitabel anchoring points and strapping (by others)
6. Product is tested and approved to EN 12566-1 (99.7% Efficency)
7. STH028, 038, 048 & 057 Available with Ø160mm pipework, this is not as tested, and base to inlet invert, base to outlet invert and overall height will reduce by 40mm.





Please check with Kingspan Environmental that this drawing is the latest issue				
Issue	Date	Drawn by	Approved by	Description
07	02/09/22	JMcM	JMcM	ECR189/ECN1626 - Remove Tank Feet
06	15/07/22	JMcM	JMcM	CN0361 - No Feet Trial

LN Number :	Tolerance (unless stated) :
Finish :	Thickness : n/a
Weight : 163.80 Kg	Surface Area : m²
Modelled By : Name	Material : Various

All Dimensions In mm | Scale: Do Not Scale | Third Angle Projection

A:\Wastewater\Engineering\Drawing Data\02 - Sales Drawings\DS\DS - 12\DS1203

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Drawing : DS1203

STH Shallow Dig Septic Tank Range

Kingspan

015710
Shallow Dig Septic Tanks (EN12566-1 Approved)
Installation & Maintenance Guidelines

Kingspan Water & Energy Service Contact Numbers:

GB: 0333 240 6868

NI: 028 3836 4600

IRL: 0818 543 500

Enclosed Documents

DS1203	**Shallow Dig Septic Tanks (2800, 3800, 4800, 5700, 7150 & 9150 Litres)**
DS1335	**Shallow Dig Septic Tanks (2800, 3800, 4800, 5700, 7150 & 9150 Litres) - Norway**

Issue	Description	Date
05	ECR 189 / ECN1626 – Remove Tank Feet	September 2022
04	ECN 1621	August 2022

HEALTH & SAFETY

These warnings are provided in the interest of safety. You must read them carefully before installing or using the equipment.

It is important that this document is retained with the equipment for future reference. Should the equipment be transferred to a new owner, always ensure that all relevant documents are supplied in order that the new owner can be acquainted with the functioning of the equipment and the relevant warnings.

Installation should only be carried out by a suitably experienced contractor, following these guidelines.

We recommend the use of a dust mask and gloves when cutting GRP components.

Electrical work should be carried out by a qualified electrician.

Contaminated surface water can contain substances harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.

Access covers should be selected with reference to the location of the unit and traffic loads to be accommodated. These are not (normally) part of the units supply.

When covers are removed precautions must be taken against personnel falling into the unit.

Should you wish to inspect the operation of the equipment, please observe all necessary precautions, including those listed below, which apply to maintenance procedures.

Ensure that you are familiar with the safe working areas and accesses. Ensure that the working area is adequately lit.

Take care to maintain correct posture, particularly when lifting. Use appropriate lifting equipment when necessary. Keep proper footing and balance at all times. Avoid any sharp edges.

MAINTENANCE

The correct ongoing maintenance is essential for the proper operation of the equipment. Operators who rely on high level alarms to prompt them to empty the unit run the risk of polluting, should the alarm not work, hence the ongoing maintenance of the alarm systems is fundamental if pollution incidents are to be avoided.

The removal of sludge and liquid from the unit should be carried out by a contractor holding the relevant permits to transport and dispose of such waste. The contractor should refer to the guidelines in this document.

CONTENTS

HEALTH & SAFETY 2
1.0 Introduction 3
2.0 Handling & Storage 3
3.0 Site Planning 4
4.0 Installation – General 5
5.0 Unit Installation 5
6.0 Operation 6
7.0 Maintenance 6
8.0 Warranty 7
NOTICES: 8

1.0 Introduction

1.1 Kingspan shallow installation septic tanks are designed to be installed in areas where shallow dig depths are required due to minimal invert levels or difficult ground conditions. Typically, in areas where granite rock strata is close to the surface.

1.2 The septic tanks have two manhole shafts for ease of emptying,

1.3 These Guidelines cover Septic tanks where a discharge is permitted to a correctly sized and designed soakaway system.

1.4 The use of Borehole soakaways with Kingspan sewage treatment products is only acceptable when the Environment Agency discharge license allows it. Borehole soakaways are not accepted under building regs or BS6297 meaning it is only under special circumstances that the EA allows this type of soakaway

1.5 Should you require information regarding soakaway system design and sizing please contact us.

1.6 Large capacity septic tanks do require extensive suitable areas of land. In the UK BS: 6297 provides drainage field designs. In Ireland, the single house EPA manual provides design guidance. Percolation test methods to identify soil suitability are slightly different in UK and Ireland.

1.7 Equipment selection and application guidance is provided in the UK by the Environment Agency Pollution Prevention Guidelines PPG 4 or in Ireland by the EPA manuals.

1.8 You may require permission to install a tank, and permission to discharge. Consult your local authority as the installation may require Planning and Building Control approval. In the UK, you will need to be aware of publication DETR 3/99 (Welsh office 10/99) “Planning requirement in respect to use of non mains sewerage incorporating septic tanks in new development and building regulations H2”. In Ireland, circular letter SP/03 for the protection of groundwater. These documents require detailed site assessments.

1.9 Septic tanks are covered within the UK by H2 Building regulations 2000. A building inspector may wish to examine the site before, during or after tank installation and may require site of percolation test results.

1.10 In Ireland, building regulations 1997, Technical guidance document H details the regulations for septic tanks.

1.11 Septic tanks shall be of adequate capacity, impermeable to liquids and adequately ventilated.

1.12 Tanks should be so sited and constructed that they are not prejudicial to the health of any person, will not contaminate any watercourse, underground water or water supply. They must have adequate means of access for maintenance and emptying.

1.13 Septic tanks serving <50 population, i.e., an influent volume of less than 10m3 per day should meet the requirements of EN12566 part 1 or part 4. Larger tanks should meet the relevant requirements of EN 12255.

1.14 Buildings which utilise Septic tanks should have a notice affixed within the building. This notice should advise the estimated emptying frequency and the need to use a licensed waste disposal contractor. The owner is legally responsible for ensuring that the system does not cause pollution, a health hazard or a nuisance.

1.15 These guidelines represent Best Practice for the installation of the above units. Many years of specialist experience has led to the successful installation of thousands of units it must be noted, however, that these Guidelines are necessarily of a general nature. It is the responsibility of others to verify that they are appropriate for the specific ground conditions and in-service loads of each installation. Similarly, a qualified specialist (e.g., Civil engineering consultant) must verify any information or advice given by employees or agents of the company regarding the design of an installation.

1.16 Our septic tanks are structurally tested in accordance with EN 12566-1, which specifies structural stability testing for both wet and dry sites using granular backfill 3-8mm. However, in GB it would be typical for tanks to be installed in concrete due to rising water table, and it can generally be assumed that buoyancy prevention of concrete backfill is more advantageous than the granular backfill materials used in testing.

2.0 Handling & Storage

2.1 Care must be taken to ensure that units are not damaged during delivery and handling on site.

2.2 The design requirements of our products will frequently mean that the centre of gravity of the unit is “offset”. Care must therefore be taken to ensure that the unit is stable when lifting. Rainwater may also collect inside units, particularly if they have been stored on site prior to installation, adding weight and increasing instability. Check units before lifting and pump out any excess water.

2.3 When lifting units, use webbing slings of a suitable specification. DO NOT USE CHAINS.

2.4 A suitable spreader bar should be used to ensure that units are stable and that loads are evenly distributed during lifting. When lifting units, a spreader bar should be used where the slings would otherwise be at an angle > 30 degrees to the vertical.

2.5 Lifting equipment should be selected by taking into account the unit weight, length and the distance of lift required on site.

2.6 We accept no responsibility for the selection of lifting equipment.

2.7 Whenever units are stored or moved on site, ensure that the storage location is free of rock, debris and any sharp objects, which may damage the unit. The units must be placed on ground, which is flat and level to evenly support the base of the unit. Do not roll units. The unit has two stability feet at its base.

3.0 Site Planning

The following points should be considered before installation of the equipment:

3.1 The discharge should have the consent of the relevant Environmental Regulator. See Environment Agency Guidelines PPG4.

3.2 The installation should have Planning and Building Control approval. See DETR 3/99 Planning requirement in respect to use of none- mains sewerage incorporating septic Tanks in new development and building regulations H2.

3.3 Position the unit at the maximum distance from habitation. Distances in excess of 15m are usually the minimum acceptable to the planners, but this varies depending on your local authority. The installation must be sited so as not to be prejudicial to health, nor to contaminate water supplies.

3.4 See BS EN 752-4 Drain & sewer systems outside Buildings.

3.5 Consider placing inspection points in the drain line before and after Units.

3.6 Tanks and treatment systems installed in series should be set with appropriate falls between them. Allow a minimum of 50mm, if not more. Connecting pipework should never run uphill.

3.7 Consider venting of the unit. Comply with local regulations. Larger tanks serving multiple properties should have a vent fitted to the neck to enable localized high-level venting.

3.8 Uncontaminated run off such as roof and surface water should be excluded from the unit to avoid over frequent filling. Separate drains must be provided for surface water which must NOT enter the unit.

3.9 Ground conditions and water table level should be assessed. If the water table will be above the base of the unit at any time of the year, adequate concrete backfill must be provided to avoid flotation. In poorly draining ground, consideration should also be given to the likelihood of flotation due to surface water collecting in the backfill, and an appropriate installation method devised to avoid this.

3.10 If the discharge is to a soakaway, a porosity test should be carried out as part of the assessment of suitability for sub-soil drainage. UK – See BS6297, Ireland EPA Manual.

3.11 The unit must be installed at a level that will allow connection to the incoming drain and a free discharge at the system outlet.

3.12 Do not install the unit deeper than necessary. The minimum invert depth of the unit is shown on the relevant equipment drawing.

3.13 Sample/Inspection chambers may be required.

3.14 Adequate access to the unit must be provided for routine maintenance. Vehicles should not be permitted within a distance equal to the depth of the unit, unless suitable structural protection is provided to the installation.

3.15 There must be at least 1 meter of clear, level ground all around the access covers to allow for routine maintenance.

3.16 Provide electrical supply for alarm system. (If required)

3.17 Installation should only be carried out by suitably qualified and experienced contractors in accordance with current Health and Safety Regulations. Electrical work should be carried out by a qualified electrician, working to the latest edition of IEE.

3.18 Manhole covers and frames should suit the duty for the intended location.

4.0 Installation – General

4.1 When units are installed in unstable ground conditions where movement of the surrounding material and/or unit may occur, the connecting pipework should be designed to minimize the risk of damage from differential movement of the unit(s) and/or surrounding material.

4.2 The excavation must be deep enough to provide bedding and cover depth as determined by the type of surface pavement and loading. Asphalt and concrete pads should extend a minimum of 300mm horizontally beyond the unit in all directions.

4.3 In situations where the excavation will not maintain a vertical wall, it will be necessary to shore up the side walls of the excavation with suitable trench sheets and bracing systems to maintain a vertical wall from the bottom to the top of the excavation. DO NOT completely remove the shoring system until the backfilling is complete, but before the concrete fully hardens.

4.4 In areas where the water table is above the bottom of the excavation and/or the excavation is liable to flood, the excavation should be dewatered using suitable pumping equipment and this should continue until the installation is complete.

4.5 During installation care must be taken to ensure that the body of any unit is uniformly supported so that point loads through the unit are avoided.

4.6 The concrete Specification is a general specification. It is not a site-specific installation design.

GENERAL CONCRETE SPECIFICATION IN ACCORDANCE WITH BS EN 206-1 (BS 8500-1)		
TYPE OF MIX		(DC) DESIGN
PERMITTED TYPE OF CEMENT		BS 12 (OPC): BS 12 (RHPC): BS 4027 (SRPC)
PERMITTED TYPE OF AGGREGATE (coarse & fine)		BS 882
NOMINAL MAXIMUM SIZE OF AGGREGATE		20 mm
GRADES: C25 /30 C25 /30 C16 /20		REINFORCED & ABOVE GROUND WITH HOLDING DOWN BOLTS REINFORCED (EG. FOR HIGH WATER TABLE) UNREINFORCED (NORMAL CONDITIONS)
MINIMUM CEMENT CONTENT	C30 C20	270 - 280 Kg/M^3 220 - 230 Kg/M^3
SLUMP CLASS		S1 (25mm)
RATE OF SAMPLING		READY MIX CONCRETE SHOULD BE SUPPLIED COMPLETE WITH APPROPRIATE DELIVERY TICKET IN ACCORDANCE WITH BS EN 12350-1
NOTE: STANDARD MIXES SHOULD NOT BE USED WHERE SULPHATES OR OTHER AGGRESSIVE CHEMICALS EXIST IN GROUND WATER		

5.0 Unit Installation

5.1 Excavate a hole of sufficient length and width to accommodate the tank and a minimum 150mm concrete surround and to a depth that allows for the burial depth of the unit plus concrete base slab of 300mm.

5.2 Construct a suitable concrete base slab appropriate to site conditions. Ensure that the slab is flat and level.

5.3 When the concrete base slab has set enough to support the installed load, install a 75mm deep level bed of C20 grade concrete. This will provide support for the tank and allow the tank to be levelled up when installed. Lower the unit onto the slab using suitable webbing slings and lifting equipment. The selection of lifting equipment is the responsibility of the installer considering unit weight, length, height and distance of lift.

5.4 Pour no more than 300mm depth of clean water into the unit, avoiding shock loads. DO NOT OVERFILL, the unit is not designed to hold water whilst unsupported.

5.5 Place concrete backfill to approximately 300mm depth under and to the sides of the tank ensuring good compaction to remove voids. Concrete backfill must be manually compacted; we DO NOT recommend the use of vibrating lances. Allow initial concrete set to occur before proceeding. Ensure concrete fills the voids underneath the tank and feet.

5.6 Continue adding concrete backfill, simultaneously keeping the internal water level no more than 300mm above the backfill level at all times, until the backfill is just below the underside of the outlet drain, giving sufficient room to connect the inlet and outlet pipework.

5.7 Connect inlet and outlet drains and vent pipes when safe access to the backfill can be gained.

5.8 The inlet & outlet pipe (110mmDia) should be extended to ground level.

5.9 The maximum recommended inlet invert is 500mm.

5.10 Continue backfilling with concrete over the tank body to the required level. Build up a shell of concrete, minimum 150mm thick, around the access shaft(s), inlet/outlet pipe and alarm access tube (as applicable). Temporarily strut the access shaft to avoid distortion.

5.11 Do not install in trafficked areas unless a suitable top slab has been designed and constructed. The top slab should bear on a suitable foundation to prevent superimposed loads being transmitted to the unit and access shafts. Loads applied to covers and frames must bear on the top slab, not the access shaft.

5.12 Trafficked Areas, the tank should be installed at a suitable distance from any trafficked areas so as to prevent superimposed loading by vehicles.

5.13

5.14 The unit should be filled with clean water up to the invert level of the outlet pipe. Check that there is a discharge.

5.15 Leave until the concrete is fully cured. Septic tanks are now ready for use. Do not empty the tank until the concrete backfill has cured to an adequate strength (typically 1 - 2 days minimum).

6.0 Operation

6.1 The unit should be filled with clean water up to the invert level of the outlet pipe. Check that there is a discharge.

6.2 Leave Septic tanks have both an inlet and outlet. Separated solids both floating and sinking are retained within the tank. Separated liquid discharges through the outlet into a soakaway system.

6.3 Septic tanks are sized according to a population equivalent formula. Users should be aware that their sewage enters a septic tank so that they can dispose of their waste considerately. Not everything is suitable for disposal into the tank, for example oils, fats and grease, medications should not be disposed of. We can provide User leaflets with more information for individual householders on request.

6.4 In addition, properties should display a notice within the building see section on notices.

7.0 Maintenance

7.1 Septic tanks accumulate solids and must be emptied periodically. The period between emptying depends up on the population served by the tank or, the amount of use to which the tank is put. Generally, the period is at least 6 months, however, tanks which are over utilized may require more frequent emptying. Tanks which are not emptied will release solids which will block the drainage filed and might lead to pollution.

7.2 All sludge should be removed when the unit is emptied. Solids should not be allowed to accumulate in more than half the tank as this reduces the retention time and separation efficiency and will detrimentally affect the soakaway system. DO NOT EXTEND THE EMPTYING FREQUENCY, as this can lead to blocked drainage fields/soakaways.

7.3 The following calculation can be used to estimate emptying frequency.

Tank volume (in liters) divided by 2 divided by 1.2 = Population x No of days

E.g., 26000 litre tank

26000 / 2 = 13000 / 1.2 =10833

7.4 If the population being served by the tank is 30, then the tank needs emptying approx. every 360 days

7.5 If the population is 80, then the tank needs to be emptied approx. every 135 days.

7.6 Different allowances/calculations should be made for non-domestic inputs such as pubs and other commercial premises. Consult us.

7.7 The waste should be removed under the terms of The Waste Management Code of Practice. The Code imposes a duty of care on the waste producer to ensure that the cleansing contractor is registered with the Environment Agency and that the final disposal of the waste is to a licensed facility. Owners have a responsibility to use licensed waste contractors.

7.8 Covers should be replaced.

7.9 Our site engineers are available to carry out inspection, service and maintenance visits. We recommend regular maintenance contracts for units with complex operational or electrical requirements. A service to supervise tank emptying is also available. Contact details are provided on the cover sheet.

8.0 Warranty

Taken from 'Kingspan's Terms & Conditions of Sale'

The company will replace or, at its option, properly repair without charge any goods which are found to be defective and which cause failure in normal circumstances of use within a period of twelve months from the date of delivery.

This warranty is conditional upon:

(a) the Buyer notifying the Company of any claim within Seven days of the failure becoming discernible.
(b) the Company being allowed a reasonable opportunity to inspect the goods so as to confirm that they are defective.
(c) the goods not having been modified, mishandled or misused and being used strictly in accordance with any relevant instructions issued by the Company.

The Company's liability under this Clause is limited to the repair or replacement of the defective goods, and does not cover costs of transport, installation or associated site costs, if applicable.

The Company's liability to replace or repair the goods is in lieu of and excludes all other warranties and conditions, and in particular (but without limitation) the Company shall have no liability of any kind for consequential loss or damage.

For any further advice, please contact the Warranty department on 0844 225 2785

A Warranty Form is included in this package, to register your unit for Warranty. Please complete ALL sections of the Form and return it at your earliest convenience.

Also within this package are Notices, describing the necessary maintenance of the plant in use. This should be fixed within the building.

Our service provider: Kingspan Water & Energy Services: 0844 846 0500

NOTICES:

SEPTIC TANK

The foul drainage from this property discharges to a Septic Tank and an irrigation system / soak-away.

The tank requires monthly inspections of the outlet chamber or sample chamber to observe that the effluent is free-flowing and clear. The soak-away should also be inspected regularly.

The septic tank requires emptying at least once every 12 months by a licensed contractor.

THE OWNER OF THE PROPERTY IS LEGALLY RESPONSIBLE FOR ENSURING THAT THE SYSTEM DOES NOT CAUSE POLLUTION, A HEALTH HAZARD OR A NUISANCE.

We recommend that a separate log is kept of all service visits, the log should detail the date and any action taken, e.g., Regular maintenance service, breakdown visit, de-sludge volume removed.

This notice should be fixed by the owner within the building alerting current and future owners to the maintenance requirement. (Building regulation H2 (1.57)

Please contact Kingspan Water & Energy Services on +44 (0) 844 846 0500 to arrange a maintenance service or to request replacement operating instructions.