Drainage Impact Assessment

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Scottish & Southern Electricity Networks (SSEN)

Fort Augustus Substation Extension
29 November 2023



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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.

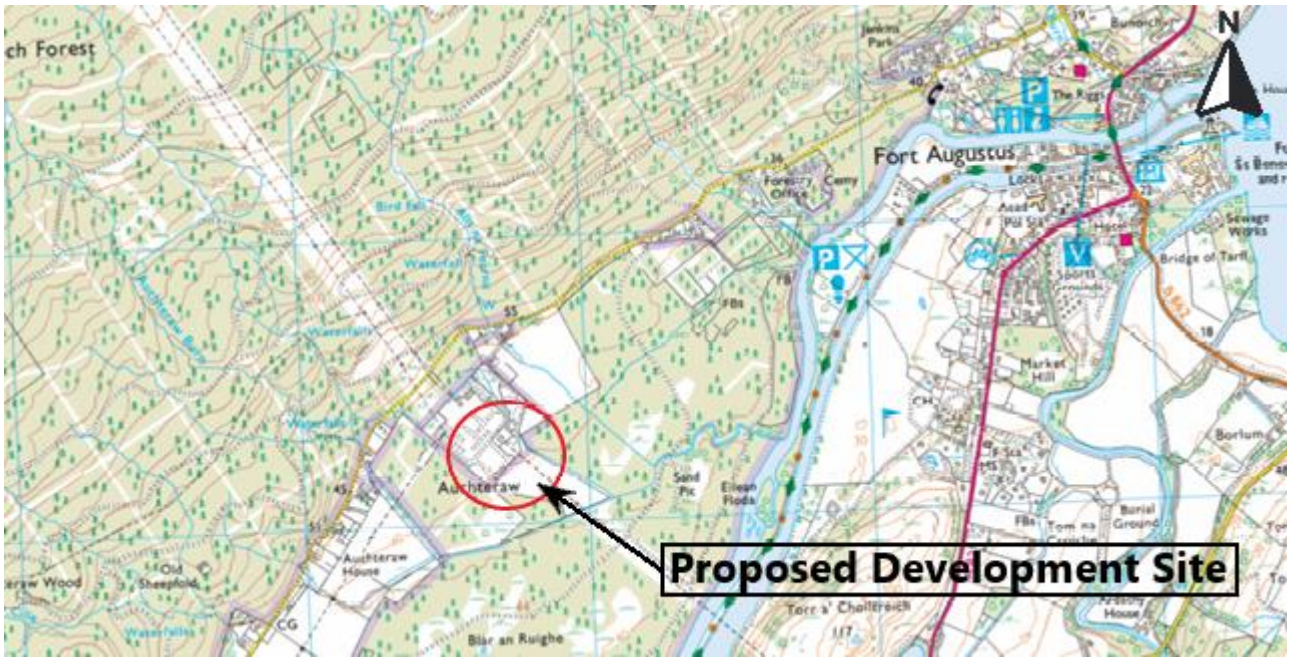


Figure 1 - Site Location Map

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 the provision of toilet and mess facilities within the proposed GIS building. The substation will be unmanned, with visits to the 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 extent of the Proposed Development in an area adjacent to the south of the GIS building. The septic tank shall be located outside of the High Voltage zone for ease of maintenance requirements and safety reasons.

Due to level constraints regarding the maximum flood level, the minimum required gradient of 1:80 for a 100mm foul drain with a peak flow of >1 l/s, as outlined in BS EN 16933-2, has not been achieved (gradient of 1:100 for pipe 1.000, as shown in drawing B2413736-JAC-HDG-PD-DE-CI-002). Therefore, it is recommended that this pipe would be regularly maintained.

The outlet invert level (38.92mAOD) of the septic tank has been designed to be above the maximum flood level (38.9mAOD) to prevent mobilisation of the sludge in the tank. To facilitate this an extension to the platform level encompassing the septic tank, FMH2 and FMH3 (refer to drawing B2413736-JAC-HDG-PD-DE-CI-002) would be required. Furthermore, the foul water network is currently located outside the flood compensation area.

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 installation documentation are provided within Appendix D. The details of the septic tank arrangement should be agreed with SEPA and authorised in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations as part of the detailed design.

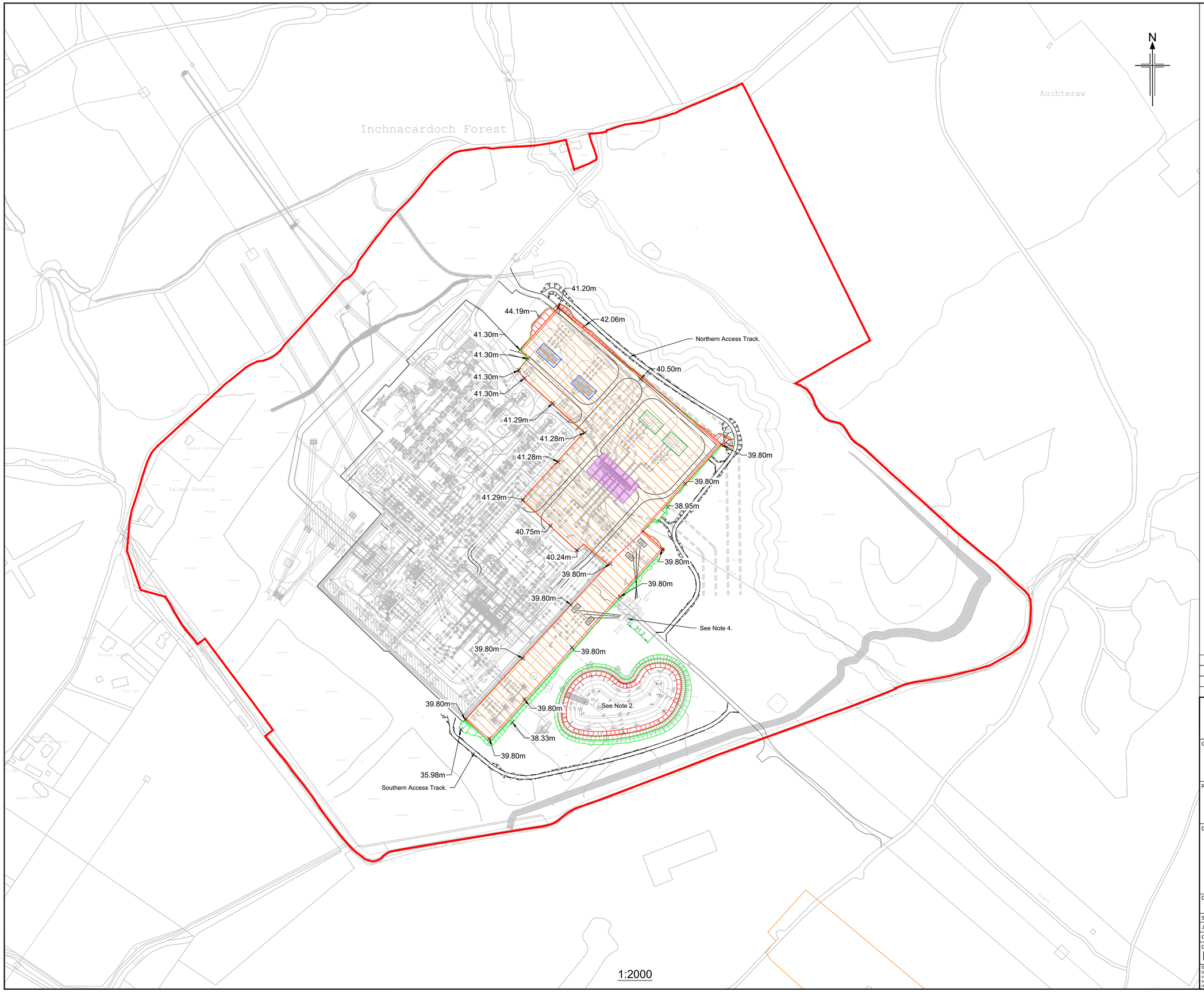
The foul water drainage design has and shall be designed, sized, and located in accordance with BS 6297:1983, the British Water Code of Practice Flow and Loads 4, the Building standards technical handbook June 2023: non-domestic and Sewers for Scotland guidance. The septic tank will be managed, inspected and drained by a licensed courier who will then dispose of the waste offsite.

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.

Platform cut and fill balance:
Preparation of platform foundation level
Cut - 36,304m^3
Fill - 4,511m^3
Net Cut - 31,793m^3

Platform Construction
Fill - 47,127m^3

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
P02	2023-11-27	THIRD ISSUE	AW	AT	MD	MD
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

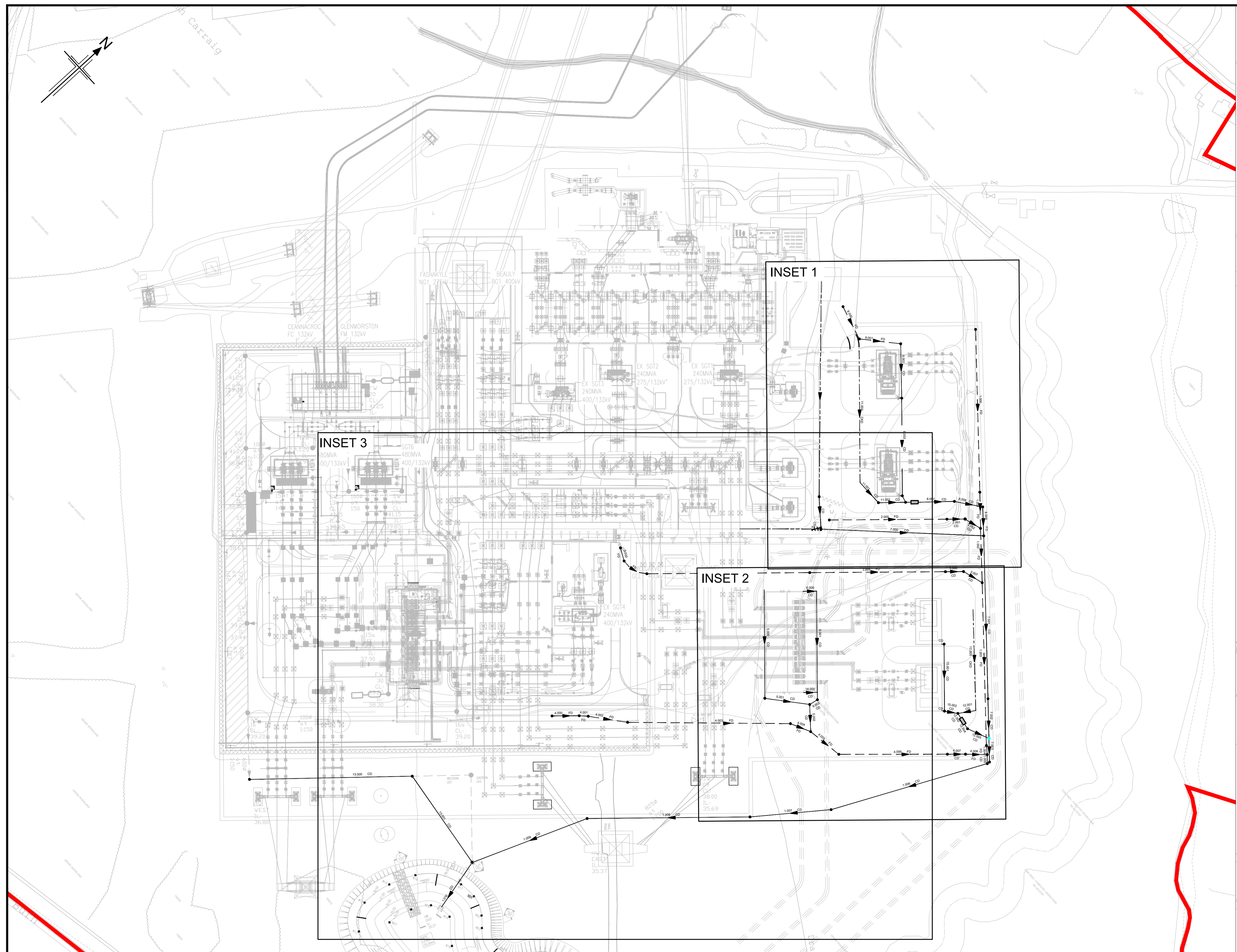
Drawing title
PLANNING APPLICATION
LT519 PLATFORM EXTENSION

Drawing status: FOR INFORMATION
Suitability: SO
Scale: 1:2000@ A1 — DO NOT SCALE
Jacobs No.: B2413736
Client No.: 9605
Rev: P02

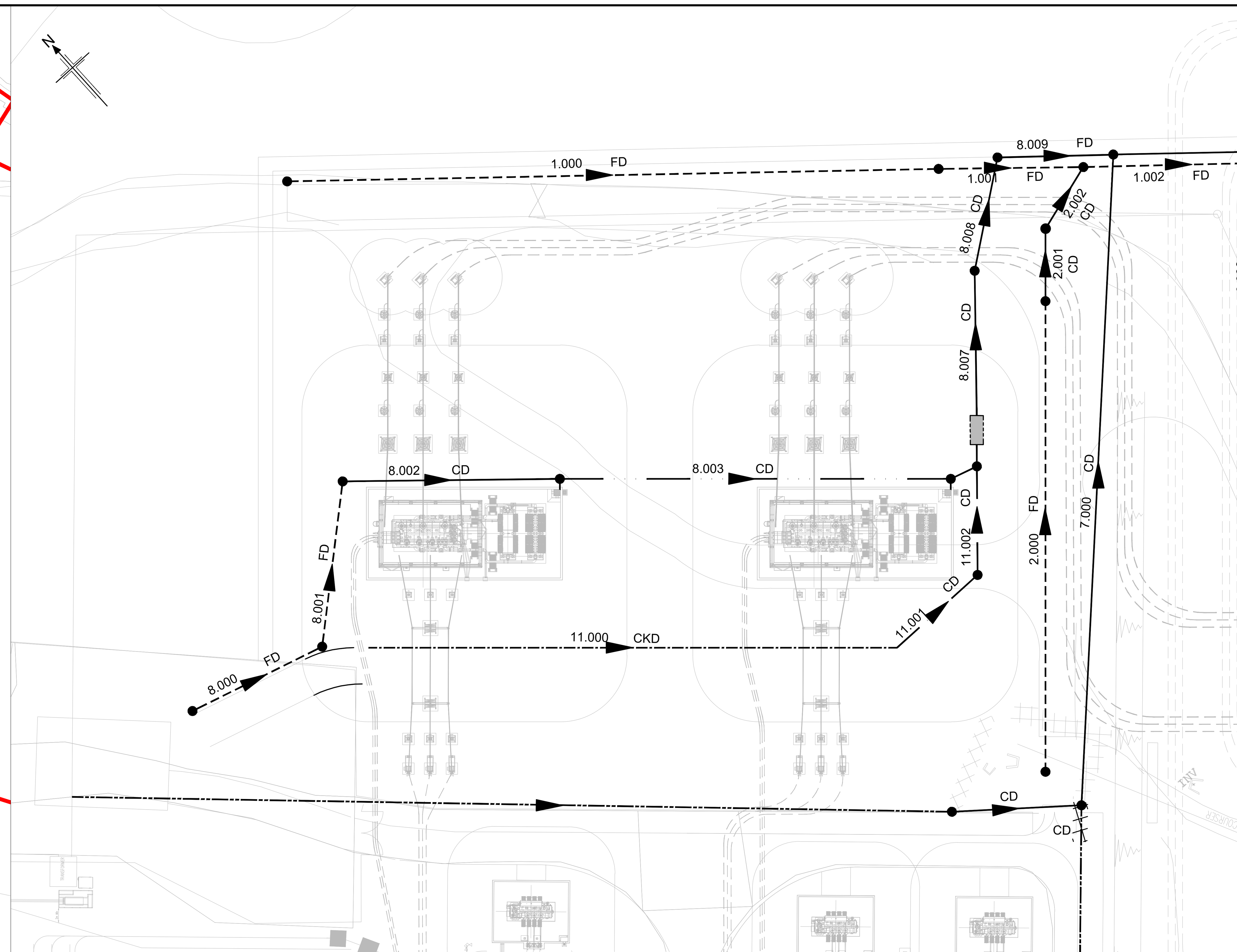
Drawing number
B2413736-JAC-HGN-FA-DR-CE-001

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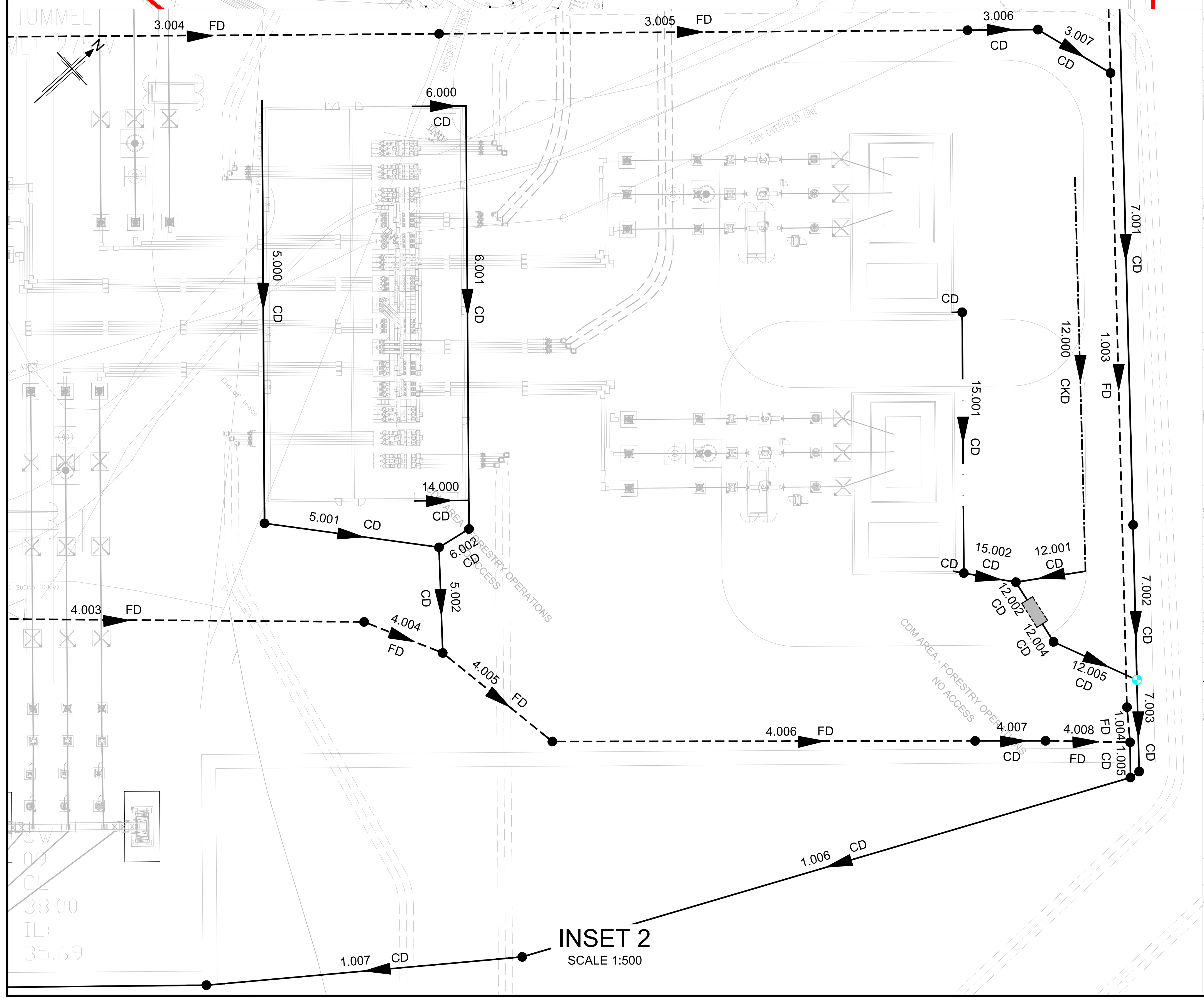
Appendix B. Indicative Surface Water Drainage Layout and Pipe Schedule



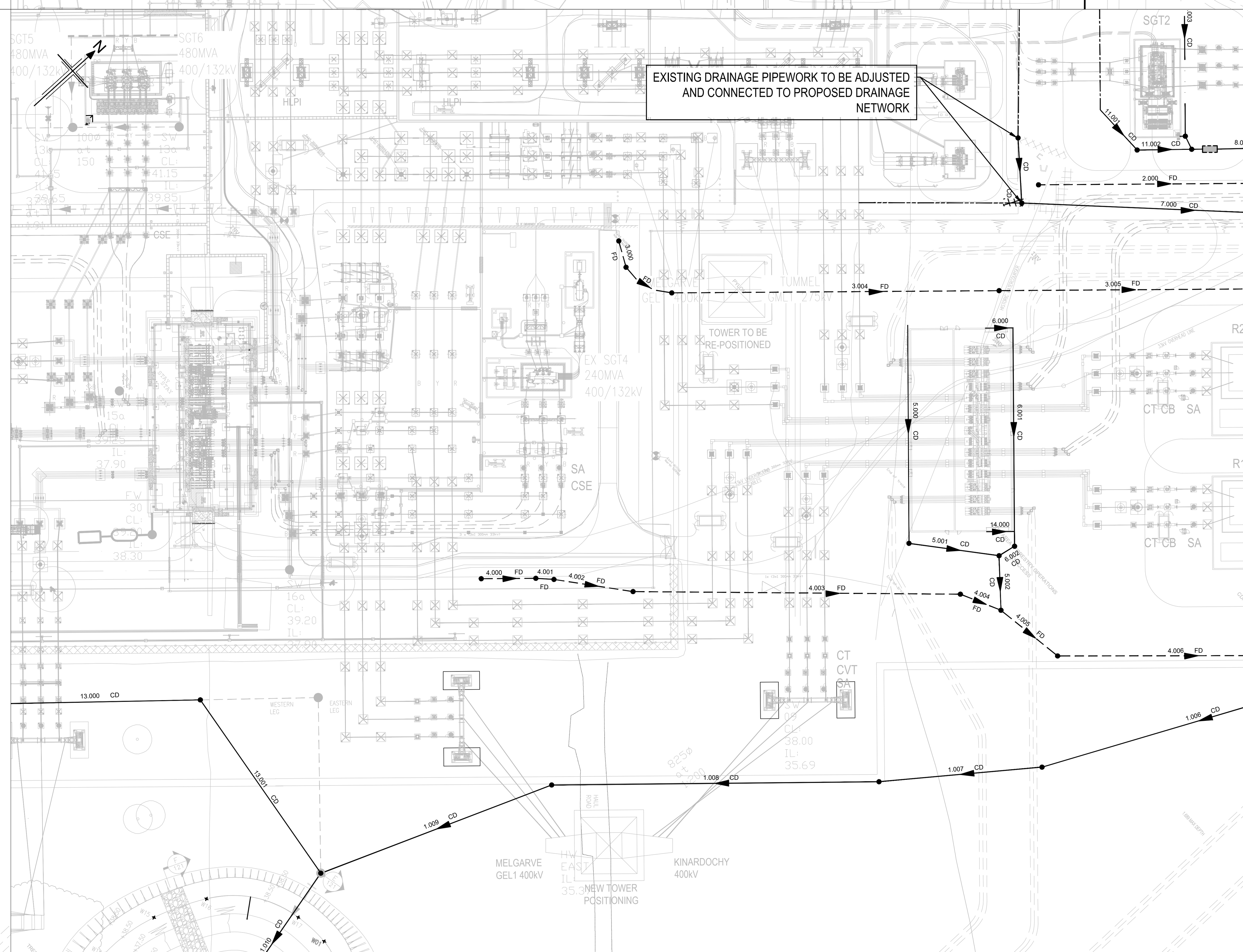
PLAN
SCALE 1:2000



INSET 1
SCALE 1:500



INSET 2
SCALE 1:500



INSET 3
SCALE 1:1000

Legend:

FD	Proposed Filter Drain (FD)
CD	Proposed Carrier Drain (CD)
CKD	Proposed Combined Kerb Drain (CKD)
	Oily Water Drainage
	Existing Drainage
	Chamber
	Penstock Chamber
	Oil Separator

Notes:

Please refer to drainage schedule for pipe sizing.

Rev	Rev. Date	Purpose of revision	Orig	Check'd	Rev'd	Apprv'd
P02	2023-11-15	UPDATE TO LAYOUT	AW	RH	GD	MD
P01	2023-10-26	FIRST ISSUE	AW	RH	GD	MD

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Client
Scottish & Southern Electricity Networks
TRANSMISSION

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
Client No.	N/A	P01

Drawing number
B2413736-JAC-HDG-PD-DE-CI-001

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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)	US/CL (m)	US D.Depth (m)	Comments
1.000	Filter Drain	225	90.000	0.892	100.9	40.128	41.553	1.200	
1.001	Filter Drain	225	20.000	0.132	151.4	39.236	40.661	1.200	
2.000	Filter Drain	225	65.000	0.544	119.5	39.857	41.282	1.200	
2.001	Carrier Drain	300	10.000	0.031	322.6	38.334	40.738	2.104	
2.002	Carrier Drain	300	10.000	0.031	322.6	38.303	40.652	2.049	
1.002	Filter Drain	300	30.000	0.254	118.1	38.272	40.550	1.978	
3.000	Filter Drain	150	7.500	0.133	56.2	39.855	41.205	1.200	
3.001	Filter Drain	150	5.000	0.150	33.3	39.721	41.071	1.200	
3.002	Filter Drain	150	5.000	0.065	76.4	39.571	40.921	1.200	
3.003	Filter Drain	150	5.000	0.065	76.4	39.506	40.856	1.200	
3.004	Filter Drain	225	90.000	0.685	131.4	39.365	40.839	1.249	
3.005	Filter Drain	300	75.000	0.396	189.6	38.605	41.040	2.135	
3.006	Carrier Drain	300	10.000	0.053	189.6	38.210	40.589	2.079	
3.007	Carrier Drain	300	12.000	0.063	189.6	38.157	40.503	2.046	
1.003	Filter Drain	300	90.000	0.287	313.6	37.869	40.381	2.212	
1.004	Filter Drain	300	5.000	0.011	454.5	37.507	39.845	2.038	
4.000	Filter Drain	150	15.000	0.275	54.5	38.707	40.057	1.200	
4.001	Filter Drain	150	5.000	0.113	44.4	38.432	39.782	1.200	
4.002	Filter Drain	225	22.000	0.289	76.1	38.319	39.669	1.125	
4.003	Filter Drain	300	90.000	0.713	126.2	37.955	39.656	1.401	
4.004	Filter Drain	300	12.000	0.063	189.6	37.167	40.048	2.581	
5.000	Carrier Drain	225	60.000	0.556	107.9	39.260	40.685	1.200	
5.001	Carrier Drain	225	25.000	0.149	167.7	38.704	40.129	1.200	
6.000	Channel Drain	150	7.640	0.076	100.9	39.554	40.904	1.200	ACO MultiDrain or similar to be installed across access to GIS building
6.001	Carrier Drain	225	60.000	0.623	96.3	39.403	40.923	1.295	
6.002	Carrier Drain	225	5.000	0.225	22.2	38.780	40.205	1.200	
5.002	Carrier Drain	300	15.000	0.047	319.1	38.405	40.174	1.469	
4.005	Filter Drain	300	19.958	0.062	321.9	36.954	39.994	2.740	
4.006	Filter Drain	300	59.997	0.187	320.8	36.892	39.844	2.652	
4.007	Carrier Drain	300	10.000	0.031	322.6	36.705	39.818	2.813	
4.008	Filter Drain	300	12.000	0.031	387.1	36.599	39.818	2.919	
1.005	Carrier Drain	300	5.000	0.086	58.1	36.493	39.816	3.023	
7.000	Carrier Drain	450	90.000	0.674	133.5	39.578	41.303	1.275	
8.000	Filter Drain	150	20.000	0.263	76.1	39.850	41.200	1.200	
8.001	Filter Drain	150	23.000	0.231	99.6	39.587	41.200	1.463	
8.002	Carrier Drain	150	30.000	0.301	99.6	39.356	41.159	1.653	
9.000	Carrier Drain	150	1.500	0.016	94.6	39.812	41.162	1.200	Oily Water Drainage
8.003	Carrier Drain	225	54.000	0.321	168.2	38.980	41.147	1.942	Oily Water Drainage
10.000	Carrier Drain	150	1.500	0.015	98.9	39.684	41.034	1.200	Oily Water Drainage
8.004	Carrier Drain	225	4.000	0.046	86.3	38.659	41.021	2.137	Oily Water Drainage
11.000	Combined Kerb Drain	150	73.000	0.817	89.4	39.840	41.190	1.200	ACO KerbDrain or Similar
11.001	Carrier Drain	150	15.000	0.168	89.4	39.023	41.209	2.037	Oily Water Drainage
11.002	Carrier Drain	150	15.000	0.168	89.4	38.855	41.115	2.110	Oily Water Drainage
8.005	Carrier Drain	300	3.000	0.012	250.0	38.537	40.986	2.149	Oily Water Drainage
8.006	Oil Separator		4.015	0.017	236.2	38.525	40.960	2.135	Pipe 8.006 has been modelled as a tank between MH9 and MH10
8.007	Carrier Drain	300	20.000	0.062	322.6	38.508	40.926	2.118	
8.008	Carrier Drain	300	16.000	0.066	243.1	38.446	40.755	2.009	
8.009	Carrier Drain	300	16.000	0.066	243.1	38.380	40.805	2.125	
7.001	Carrier Drain	450	90.000	0.634	142.0	38.904	40.629	1.275	
7.002	Carrier Drain	525	22.000	0.035	628.6	38.120	39.995	1.350	
12.000	Combined Kerb Drain	150	56.000	0.554	100.9	38.995	40.345	1.200	ACO KerbDrain or Similar
12.001	Carrier Drain	150	10.000	0.099	100.9	38.441	39.957	1.366	Oily Water Drainage
12.002	Carrier Drain	150	3.000	0.030	100.9	38.341	39.948	1.457	Oily Water Drainage
12.003	Oil Separator		4.015	0.040	100.9	38.312	39.934	1.472	Pipe 12.003 has been modelled as a tank between MH53 and MH54
12.004	Carrier Drain	150	3.000	0.030	100.9	38.272	39.914	1.492	
12.005	Carrier Drain	150	13.000	0.129	100.9	38.242	39.899	1.507	
7.003	Carrier Drain	600	13.000	0.035	371.4	37.663	39.867	1.604	Upstream Manhole (MH60) to contain penstock pollution control device
7.004	Carrier Drain	600	1.500	1.643	0.9	38.050	40.197	1.547	
1.006	Carrier Drain	600	90.000	0.180	500.0	36.107	39.986	3.279	
1.007	Carrier Drain	600	45.000	0.090	500.0	35.927	39.900	3.373	
1.008	Carrier Drain	600	90.000	0.180	500.0	35.837	39.800	3.363	
1.009	Carrier Drain	600	68.000	0.286	237.6	35.657	39.800	3.543	
13.000	Carrier Drain	600	90.000	0.180	500.0	37.550	39.800	1.650	
13.001	Carrier Drain	600	58.000	1.924	30.1	37.370	39.800	1.830	
1.010	Carrier Drain	600	30.000	2.696	11.1	35.371	37.800	1.829	Outfall to Infiltration Basin
14.000	Channel Drain	150	7.119	0.071	100.9	38.903	40.253	1.200	ACO MultiDrain or similar to be installed across access to GIS building
15.000	Carrier Drain	150	1.500	0.017	85.9	38.936	40.286	1.200	Oily Water Drainage
15.001	Carrier Drain	150	37.000	0.431	85.9	38.918	40.278	1.210	Oily Water Drainage
16.000	Carrier Drain	150	1.500	0.121	12.4	38.608	39.958	1.200	Oily Water Drainage
15.002	Carrier Drain	225	7.500	0.146	51.4	38.412	39.956	1.319	Oily Water Drainage

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

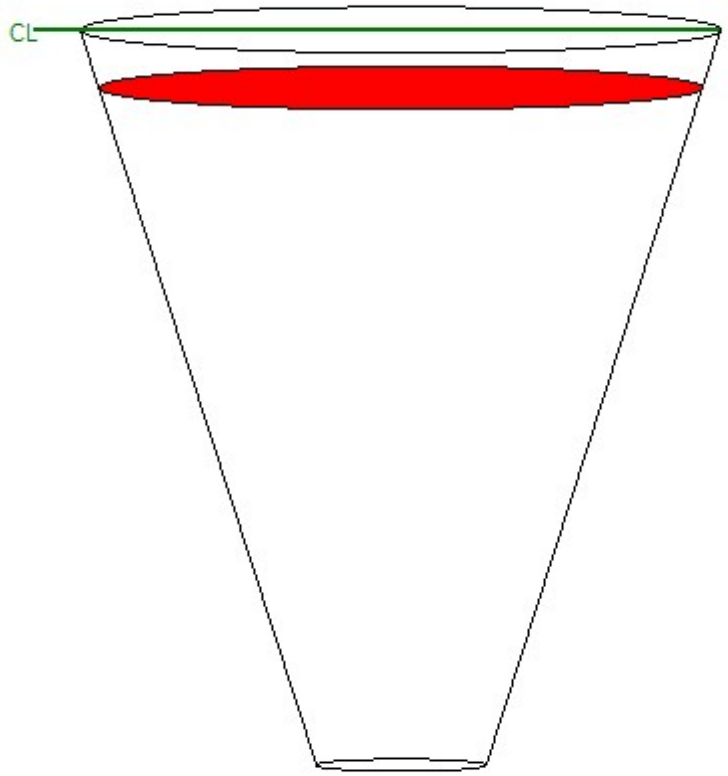
Storage is Online Cover Level (m) 38.600

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

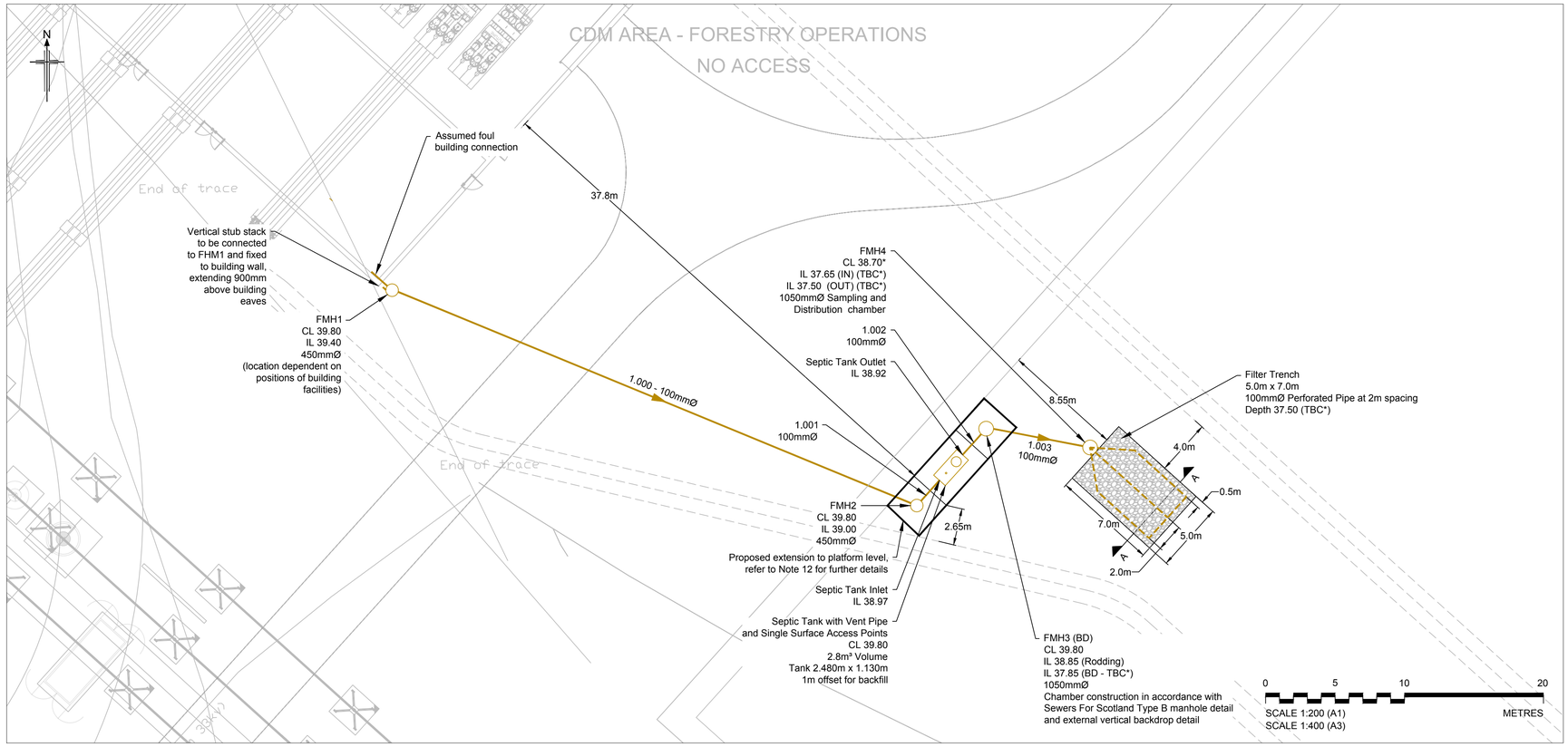
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Invert Level of Structure (m): 35.000

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Appendix D. Foul Water Layout and Construction Details

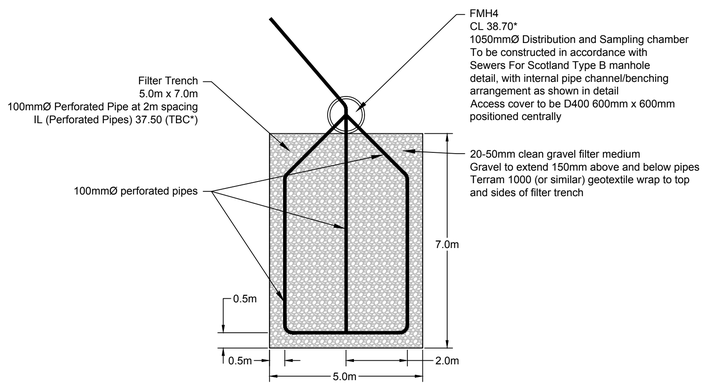


PLAN VIEW
1:200 @ A1

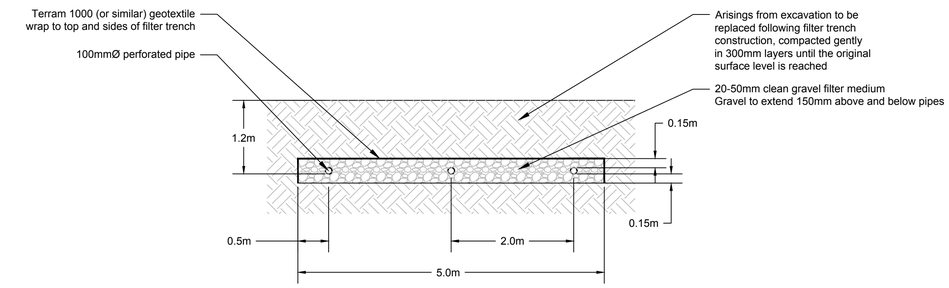
Chamber Number	Chamber Type	Cover Level (m)	Easting (m)	Northing (m)	MH Depth (m)	Manhole Dia. (mm)	Pipe Out Number	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In Number	Pipes In Invert Level (m)	Pipes In Dia (mm)	Comments
FMH1	PVC	39.80	235777.15	808286.25	0.40	450	1.000	39.40	100	Building	39.40	100 (TBC)	Vertical substack to be fitted to FMH1
FMH2	PVC	39.80	235814.93	808270.74	0.80	450	1.001	39.00	100	1.000	39.00	100	Maintenance access to 1.000 from outside HV zone
Tank	N/A	39.80	235817.40	808273.48	See detail	See detail	1.002	38.92	100	1.001	38.97	100	See tank detail
FMH3	Type B SfS	39.80	235819.93	808276.28	1.95	1050	1.003	37.85	100	1.002	38.85	100	Pipe In - backdrop - rodding
										1.002	37.85	100	Pipe in - backdrop - vertical
FMH4	Type B SfS	38.70	235827.41	808274.93	1.20	1050	Perforated (3)	37.50	100 (3)	1.003	37.65	100	Sampling and Distribution chamber

Pipe Number	Pipe Size (mm)	U/S Chamber	D/S Chamber	Length (m)	Fall (1:X)	Pipe Type
1.000	100	FMH1	FMH2	39.940	99.85	PVC
1.001	100	FMH2	Tank Inlet	2.000	66.67	PVC
1.002	100	Tank Outlet	FMH3	2.000	28.57	PVC
1.003	100	FMH3	FMH4	6.570	32.85	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
- Proposed Platform Level Extension

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 are to be in accordance with Sewers For Scotland standards.
6. FMH3 (BD) and FMH4 are 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. FMH4 to also be a sampling chamber (150mm invert drop) modified to suit required depth.
8. FMH1 and FMH2 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 the manufacturer's instructions.
9. The septic tank used in the design is a Kingspan GST028 GAMMA Septic Tank with 2.8m³ of volume and an inlet invert trimmed to 800mm. 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 Manufacturer's tank drawings and installation instructions (see Kingspan Drawing DS1267P and Kingspan 017906 GAMMA 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 pea gravel backfill, installed in accordance with manufacturer instructions (see Kingspan Drawing DS1267P and Kingspan 017906 GAMMA 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 cover and venting pipework shall be tank manufacturer-supplied components and installed in accordance with manufacturer instructions. Access covers to be D400 loading class.
12. An extension to the platform level is required to keep FMH2, the Septic Tank and FMH3 at a cover level of 39.8mAOD. This will facilitate improvements to the Septic Tank maintenance regime, whilst keeping the outlet invert level of the Septic Tank above the maximum flood level of 38.9mAOD.

*Ground levels used in the foul design are 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
P02	28-11-23	REVISED SEPTIC TANK LOCATION FOLLOWING SSE COMMENTS	SE	AW	AW	MD
P01	09-11-23	FIRST ISSUE	RG	AT	AT	MD

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Client: Scottish & Southern Electricity Networks TRANSMISSION

Project: FORT AUGUSTUS SUBSTATION PLATFORM EXTENSION

Drawing title: FOUL DRAINAGE DESIGN

Drawing status	FOR INFORMATION	Suitability SO
Scale	See Drawing	DO NOT SCALE
Jacobs No.	B2413736	Rev P02
Client No.	9605	

Drawing number: B2413736-JAC-HDG-PD-DE-CI-002

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Notes:

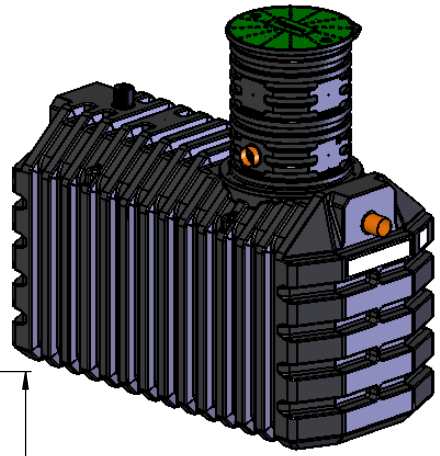
1. This drawing is for 'Dimensional Information' only. It is essential that this drawing is read in conjunction with the 'Installation Guidelines' supplied with the unit.
2. All pipe connections are Ø110mm PVCu.
3. Additional ventalation can be achieved on the incoming drain, via a stack pipe. Position to suit specific site conditions.
4. Confirm with local building regulations if additional venting is required.
5. Tank has a trimmable Inlet Invert from 500 to 1000mm. Neck can be trimmed at 100mm increments to required Invert. Refer to Drawing DS1261P.
6. Keys supplied to open th epedestrian duty cover latches.
7. **Pea-Shingle backfill is reliant on use of correct strapping and anchoring.
8. Rodding access to be extended to ground level and suitable cover fitted (by others).

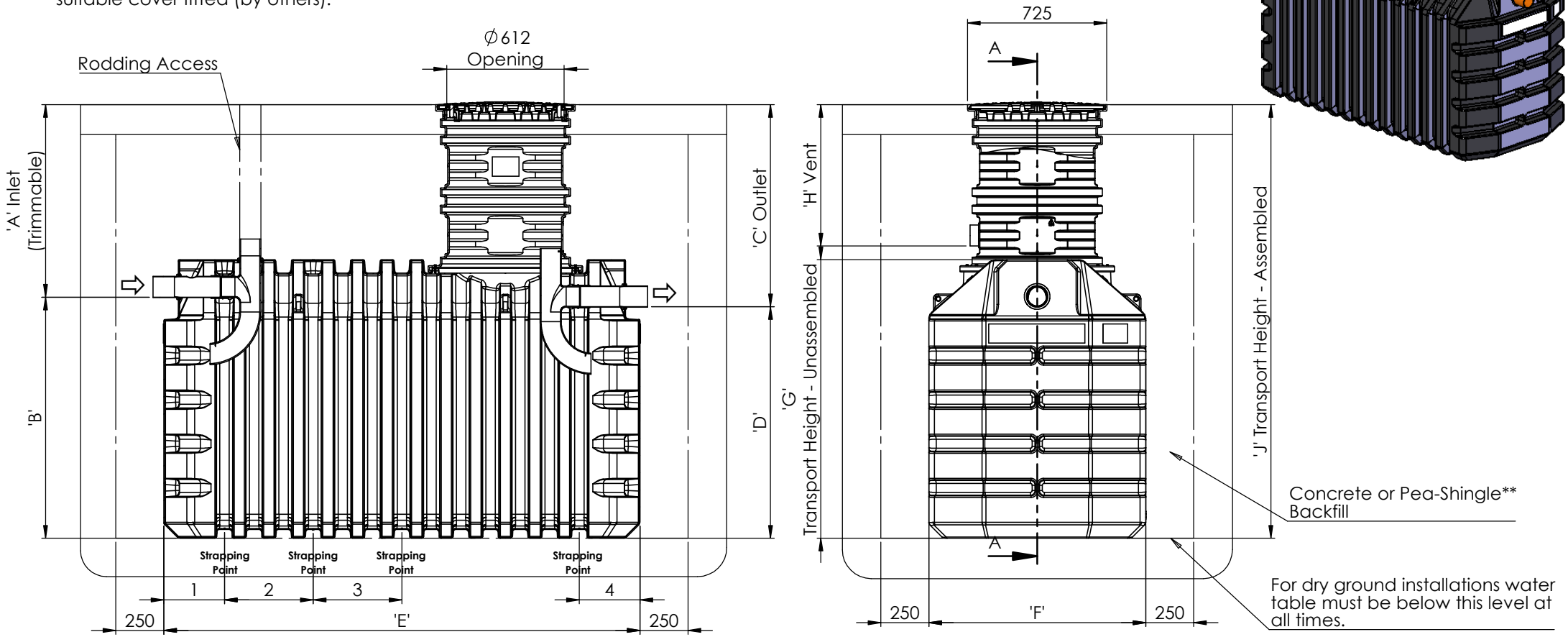
Tank Dimensional Table

Unit	Storage Volume (Ltr)	Dim 'A' (mm)	Dim 'B' (mm)	Dim 'C' (mm)	Dim 'D' (mm)	Dim 'E' (mm)	Dim 'F' (mm)	Dim 'G' (mm)	Dim 'H' (mm)	Dim 'J' (mm)	Tank Weight
GST028SzGK	2800	500-1000	1255	550-1050	1205	2480	1130	1450	735	2255	240 Kgs
GST040SzGK	4000	500-1000	1255	550-1050	1205	3360	1215	1450	735	2255	300 Kgs

Strapping Positions

Unit	1	2	3	4
GST028TzGK	315mm	460mm	460mm	315mm
GST040TzGK	315mm	900mm	900mm	315mm





Please check with Kingspan Environmental that this drawing is the latest issue				
Issue	Date	Drawn by	Approved by	Description
02	19/06/15	JMcM		CC1252
01	30/04/15	JMcM		Initial Issue

Material : Various	Tolerance :
Finish :	Thickness : n/a
Weight : 125.58 Kg Kgs	Surface Area :

Drawing : DS1267P

GAMMA Sales Drawing - S.Stage, Gravity

All dimensions in mm

Scale: Not to scale

U:\engineering\Engineering Projects\942A -Sweden Septic & Treatment Plant\Drawings\Sales Drawings\DS1267P

Kingspan Environmental reserve the right to alter the details of this drawing without prior notice.
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Kingspan Environmental

017906
GAMMA Septic Tanks
Installation & Operation Guidelines

Kingspan Environmental

Kingspan Environmental Service Contact Numbers:

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IRL: +44 283025 4077
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Enclosed Documents

DS1259P	**GAMMA Septic Tank Sales Drawing – Gravity Discharge – Twin Stage**
DS1260P	**GAMMA Septic Tank Sales Drawing – Pumped Discharge**
DS1267P	**GAMMA Septic Tank Sales Drawing – Gravity Discharge – Single Stage**
DS1322P	**2000L GAMMA Septic Tank Sales Drawing - Gravity Dis- Single Stage**
DS1323P	**2000L GAMMA Septic Tank Sales Drawing – Gravity Dis- Twin Stage**
DS1324P	**2000L GAMMA Septic Tank Sales Drawing – Pumped Discharge**
DS1261P	**GAMMA Septic Tank Neck Trimming Details**
DS1262P	**GAMMA Septic Tank Isolator Wiring Diagram**
DS1268P	**GAMMA Infiltration Pipework Layout Drawing**



HEALTH AND 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 become acquainted with the functioning of the equipment and the relevant warnings.

Installation should only be carried out by a suitably experienced contractor, following the guidelines supplied with the equipment.

A qualified electrician should carry out electrical work – Pumped Discharge Unit Only.

Sewage and sewage effluent can carry micro-organisms 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.

Covers must be kept locked.

Observe all hazard labels and take appropriate action to avoid exposure to the risks indicated.

The correct ongoing maintenance is essential for the proper operation of the equipment. Service contracts are available and recommended. Please contact our Sales department for details of your local service provider.

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.

The power supply to the equipment should be isolated at the main RCD - Pumped Discharge Unit Only.

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.

Desludging should be carried out by a licensed waste disposal contractor holding the relevant permits to transport and dispose of sewage sludge. The contractor must refer to the desludge instructions contained in these guidelines.

Our GAMMA Septic Tanks are made from high quality Polyethylene. Our nationwide network of stockists ensures prompt delivery and complete after sales service to every customer.

WHY YOU CAN INSTALL OUR TANKS WITH CONFIDENCE:

- They are robust, with high impact resistance, and can withstand all common chemicals they are likely to encounter.
- Our Tanks are trouble-free. No chemicals are required for bacterial action to take place.
- Our Tanks are strong, easy to move and simple to install. Full installation instructions are supplied with every tank.
- Our modern design means that access for desludging is easier through the wide neck.
- Our Septic Tanks come in capacities of 2000 litres (**Scandinavia Only**), 2800 litres (620 gallons), 3500 litres (775 gallons) & 4000 litres (880 gallons) and meet all the requirements of the Water Act Consent Regulations and Building Control Regulations in Great Britain and Northern Ireland.
- All our Tanks carry a 12 month warranty from date of delivery.

Unit	Storage Volume (Litres)	Standard Overall Height (mm)	Standard Inlet Invert (mm)	Standard Outlet Invert (mm)	Length (mm)	Width (mm)
GST020SzGK	**2000**	**1265 - 1765**	**500-1000**	**550-1040**	**3000**	**1180**
GST028SzGK	**2800**	**1755 - 2255**	**500-1000**	**550-1050**	**2480**	**1130**
GST035SzGK	**3500**	**1755 - 2255**	**500-1000**	**550-1050**	**3000**	**1180**
GST040SzGK	**4000**	**1755 - 2255**	**500-1000**	**550-1050**	**3360**	**1215**

BEFORE YOU BEGIN

In Great Britain and Northern Ireland you must have approval to discharge before you install a Septic Tank. You must therefore submit plans of the location of both the tank and soakaway layout to your Local Authority, who may also be able to offer you advice if required.

Our GAMMA Septic Tanks comply with the principles set down in BS 6297:2007. The design also meets all the requirements of both the Water Act Consent and Building Control Regulations in Great Britain and Northern Ireland.

WHAT ABOUT GROUND CONDITIONS?

Prior to installation care should be taken to establish the depth to the water table and land drain facilities as ground conditions will determine the type of backfill materials to be used. In dry free draining soils where the ground is dry all year round i.e. the water table never rises above the base of the tank then use method of installation for DRY GROUND.

In clays, silts, heavy ground or badly drained ground where the water table rises above the base of the tank use method of installation for WET GROUND.

WHERE SHOULD I SITE THE SEPTIC TANK?

British Standard code of practice BS EN 12566-1 recommends that septic tanks should not be closer than 7 metres from a dwelling. The outlet from the tank should be well away from any source of water supply. Care should be taken to site the tank. Roads, driveways and vehicles should not be permitted

within a distance equal to the depth of the unit, unless suitable structural protection is provided to the installation, to avoid damage to the tank structure.

Don't forget that there must be access for service vehicles during installation and desludging.
If the tank can only be installed where it will be subjected to a traffic load, then contact our sales team for details of any special requirements.

HOW SHOULD I HANDLE THE TANK?

Care should be taken when handling the Septic Tank. The tank should be lifted using a rope or sling passed through the lifting points provided on the tank. The tank must be carefully lifted from the delivery vehicle and set down on to level ground. Do not roll the tank off the delivery vehicle. Carry out an inspection for any damage before accepting the tank, and inspect again prior to installation, paying particular attention to the inlet and outlet pipes. During storage of the tank on site do not allow it to rest on these pipes at any time. The tank should always be filled with clean water during backfilling. It is desirable to temporarily cover all openings in the tank to prevent the ingress of debris during installation.

WHAT ABOUT EXCAVATION

INSTALLATION SHOULD ONLY BE CARRIED OUT BY A COMPETENT CONTRACTOR.

The septic tank is supplied with a standard neck extension giving an Inlet Invert of 500-1000mm from the top of the manhole cover to the bottom of the inlet pipe.
Excavate a hole according to the table below. Normal safety precautions must be adopted during excavation. Excavate a trench for the inlet and outlet pipework noting; the inlet invert selected, and that the outlet pipe is 50mm lower than the inlet pipe.

If the excavation is in unstable ground, take particular precautions to avoid a collapse of the sides of the excavation. Guidance on excavation to these depths and the safety measures required are given in BS6031, BS8000: Part 1 and HSE Construction Summary Sheet.
Make sure that any water collecting in the hole is pumped out during installation.

Tank Excavation Dimension

Tank Model	**Standard Overall Height** (mm)	**Length** (mm)	**Width** (mm)
GST020SzGK	1765	3500	1680
GST028SzGK	2255	2980	1630
GST035SzGK	2255	3500	1680
GST040SzGK	2255	3860	1715

WHAT ABOUT DESLUDGING

The tank has been specially designed to allow easy access for ease of cleaning when required. The tank is desludged in the usual way by suction tanker.

When desludging, which should be undertaken at least once a year, care should be taken to avoid damage to the tank by the hose nozzle. The tank should not be emptied completely, so that a residual amount is left to provide the micro-organisms to break down the sewage. The tank should be refilled with water.

HOW SHOULD I INSTALL THE TANK?

There are basically two ground types:

1. Dry ground conditions – In light, totally dry, free draining soils where the water table does not rise above the base of the tank;

2. Wet ground conditions – In clay or heavy soils where the water table can rise above the base of the tank.

INSTALLATION PROCEDURE

Please see installation drawings provided.

DRY GROUND CONDITIONS

1. Excavate the site allowing for a minimum clearance on all sides and base of the unit of 250mm and level the base. If levelling pegs are used they should only be placed at the corners of the hole, well away from the septic tank.

2. Ensure that the hole is kept dry. Should any rain or surface water collect in the hole, this should be pumped out.

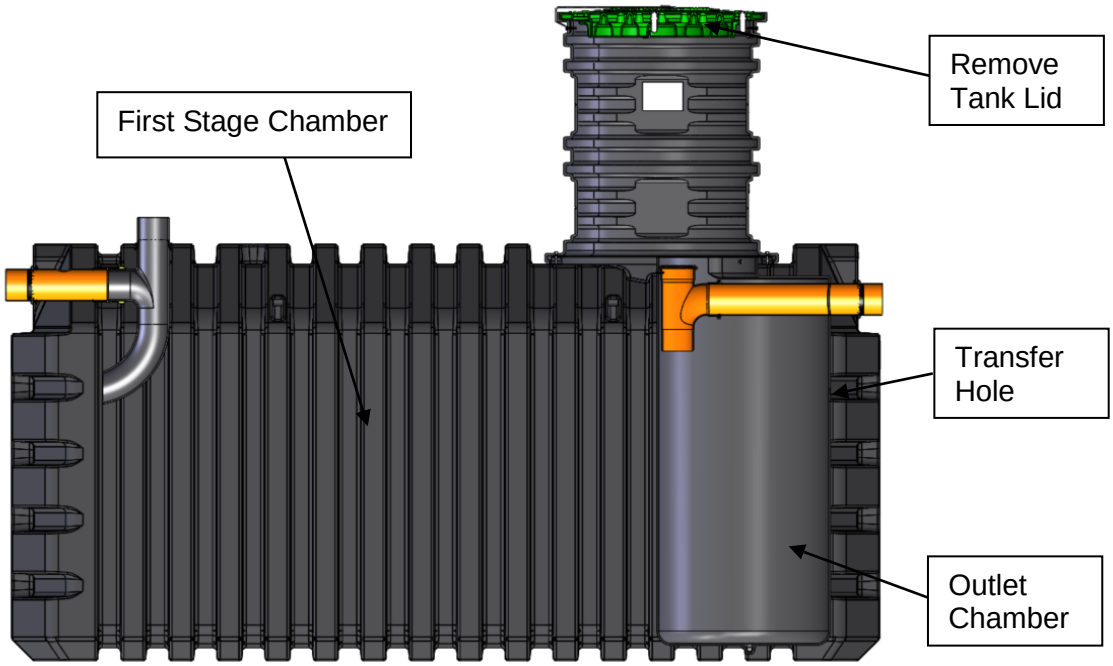
3. A base of at least 200mm of lean mix concrete should be provided.

4. Lower the septic tank into the hole using a rope sling through the lifting points provided on the tank. Under no circumstances should the sling be attached to the inlet pipe or outlet pipe.

5. Position the inlet pipe in line with the incoming drain. Note that the inlet and outlet pipes are clearly marked on the tank. The unique profile of the base will help to level the tank, but make sure the tank is in the truly upright position in order to maintain the 50mm head difference between the inlet and outlet pipes.

6. After any concrete in the base has taken up its initial set (usually after one day), ballast the tank by putting approximately 0.5m depth of water into it.

   IMPORTANT NOTE: When adding water to **Twin Stage** or **Pumped Discharge** fill via the **Outlet chamber** as noted below. The water can overflow through the **Transfer Hole** into the **First Stage Chamber.**



7. Backfill the space around the tank with pea gravel or similar material (3-8mm). The backfill should be free from organic material, large stones, bricks or sharp objects.

   Backfilling should be carried out in layers making sure that voids are not left under and around the sides of the tank and that there are no localised stress concentrations. It is most important that the installer progressively fills the tank with water to the level above the backfill in order to stabilise pressures on the tank.

8. Remove any temporary covers, and connect up the tank inlet and outlet pipe to your own pipework. Do not use reducers.

9. Backfilling can now proceed up to ground level.

10. Venting can be provided through a dedicated 110mm vent socket arrangement on the tank, additional venting can be provided via the inlet vertical pipe connections, if not used please blank off with socket and blanking cap..

WET GROUND CONDITIONS OR BADLY DRAINED GROUND

The installation procedure for wet ground conditions is similar to that for dry ground conditions, though the following additional points must be considered:

1. A lean mix concrete base of minimum depth 200mm should be provided. In wet ground conditions the installer should ensure that the base is adequate to support the weight of the septic tank and its contents. If the base of the excavation is unstable i.e. running sand or similar, excavate an additional 250-300mm below the concrete levels and fill up with compacted hard-core. Place a sheet of polythene over the hard-core and up the sides of the excavation before putting in the concrete cradle.

2. Ensure that the water is pumped from the excavation during installation and that during backfilling the water is conveyed away from the hole.

3. Backfilling material should be lean mix concrete.

4. Ensure that the concrete is not too wet and that it is tamped in around the tank. Do not use a vibrating poker.

5. Only back fill with concrete up to the top of the body sphere. Do not surround the pipework with concrete.

6. It is most important that the installer progressively fills the tank with water to a level above the backfill in order to stabilise pressure on the tank.

The Concrete Specification is a *general* specification, 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		

INSTRUCTIONS FOR TRIMMING OF ACCESS NECK

Please see attached Neck trimming instructions drawing DS1261P provided.

ELECTRICAL INSTALLATION – PUMPED DISCHARGE UNIT

It is imperative that the electrical installation of this equipment is entrusted to a competent qualified electrician working to the latest IEE regulations.

It is not possible to state a specific installation configuration that would suit all sites. The selection of current protection devices must remain the responsibility of the installer who should select a suitable cable and current overload protection, taking into account the distance from the power source to the unit and any other relevant factors. (In many cases steel wire armoured (SWA) cable, minimum 1.5 sq mm will be suitable).

When installing the electrical supply to the unit, the following points should be considered:

The electric power supply to the tank should be by means of a dedicated circuit with isolation and protection devices consistent with the requirements for fixed equipment and in accordance with the latest regulations of the Institute of Electrical Engineers.

This power supply should be independent of all other household protection devices other than the supply authority's main fuse and that provided specifically for the power supply. In particular, earth leakage devices provided for normal domestic protection must not form part of the supply circuit to the tank.

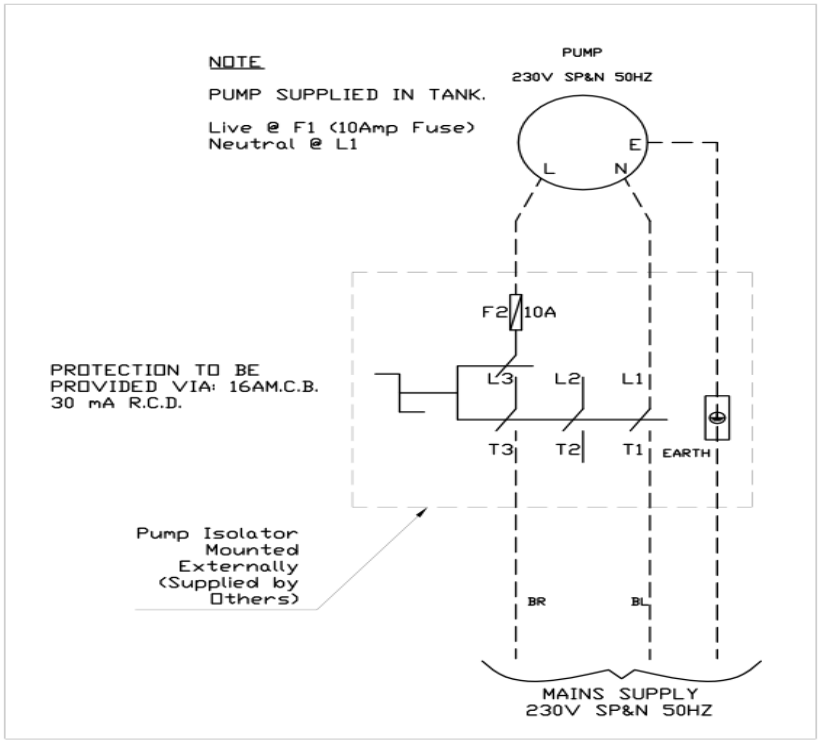
An earth leakage circuit breaker should be incorporated in the supply to the unit. A device with 30mA minimum trip current is recommended.

An appropriate Isolator IP65 rated (supplied by Contractor) needs to be mounted externally at a point where it is easily accessible.

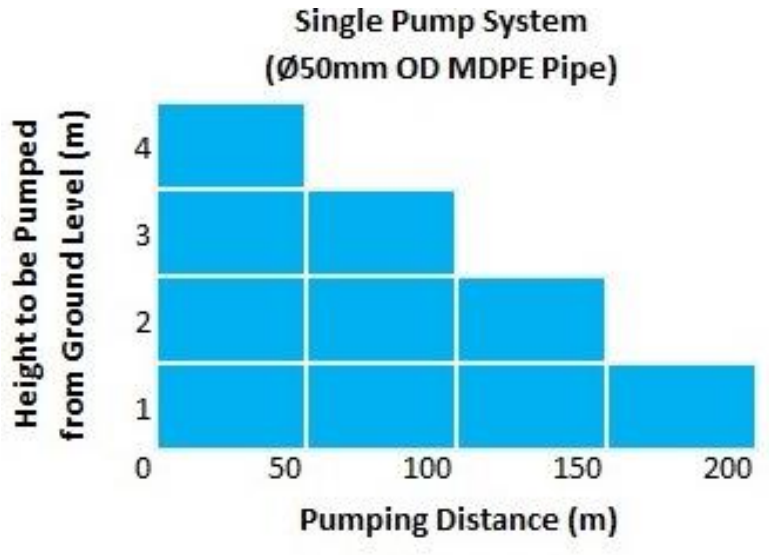
The power supply cable should connect to the IP65 rated isolator socket mounted externally. Any terminal shrouds removed during the connection of cable cores must be replaced afterwards. A separate duct or conduit should be provided by others.

The pump power cable located in the tank needs to be connected to the Isolator as per the wiring detail below;

Isolator Wiring Diagram – Pumped Discharge System – Sales Drawing - DS1262P



IPS PUMPING HEIGHT V's DISTANCE CHART



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 us.

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 is a Notice, describing the necessary maintenance of the plant in use. This should be fixed within the building.

NOTICE:

GAMMA 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 and 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 Environmental Service on +44 (0) 844 846 0500 to arrange a maintenance service or to request replacement operating instructions.

CE

Kingspan Environmental
College Road North
Aston Clinton
Aylesbury
Buckinghamshire
HP22 5EW
United Kingdom

17

EN 12566-1 : Small wastewater treatment plant: prefabricated septic tanks

Polyeythlene Septic Tank

GAMMA Septic Tanks 2000L, 2800L, 3500L & 4000L

Nominal Capacity	Single Stage: 2.0m³ (2,041 Ltrs) Twin Stage: 2.0m³ (2,133 Ltrs)
	Single Stage: 2.8m³ (2,843 Ltrs) Twin Stage: 2.8m³ (2,829 Ltrs)
	Single Stage: 3.5m³ (Ltrs) Twin Stage: 3.5m³ (Ltrs)
	Single Stage: 4.0m³ (4,010 Ltrs) Twin Stage: 4.0m³ (4,010 Ltrs)
Watertightness (Water Test)	Passed
Crushing Resistance (Pit Test) (for wet conditions also)	Passed
Hydraulic Efficiency	99.83% (Single Stage 2000L) 99.91% (Twin Stage 2000L)
	99.81% (Single Stage 2800L) 99.97% (Twin Stage 2800L)